UNIVERSIDADE DE SÃO PAULO

FACULDADE DE ECONOMIA, ADMINISTRAÇÃO E CONTABILIDADE

DEPARTAMENTO DE ADMINISTRAÇÃO

PROGRAMA DE PÓS-GRADUAÇÃO EM ADMINISTRAÇÃO

TESE DE DOUTORADO

COMPRA HEDÔNICA E UTILITÁRIA E *CONSTRUAL LEVEL THEORY* NA PERCEPÇÃO DE JUSTIÇA E DE JUSTIÇA DE PREÇO: PERSPECTIVAS COMPORTAMENTAIS E FISIOLÓGICAS

HEDONIC AND UTILITARIAN PURCHASES AND CONSTRUAL LEVEL THEORY IN THE PERCEPTION OF JUSTICE AND PRICE FAIRNESS: BEHAVIORAL AND PHYSIOLOGICAL PERSPECTIVES

Giuliana Isabella

Advisor: Prof. Dr. José Afonso Mazzon

SÃO PAULO
2015

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GIULIANA ISABELLA

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Dissertation presented to Business Administration Post Graduation Program from Business Administration Department from Economics, Administration and Accounting School of University of São Paulo as a partial requirement for obtaining the title of Doctor of Science.

Advisor: Prof. Dr. José Afonso Mazzon

SÃO PAULO
2015

CATALOG CARD
Prepared by the Technical Processing Section I SBD / FEA / USP

Isabella, Giuliana
Hedonic and utilitarian purchases and construal level theory in the perception of justice and price fairness: behavioral and physiological perspectives / Giuliana Isabella. – São Paulo, 2015.
249 p.

Tese (Doutorado) – Universidade de São Paulo, 2015.
Orientador: José Afonso Mazzon.

1. Comportamento do consumidor 2. Marketing 3. Experimento científico 4. Fisiologia 5. Neurofisiologia I. Universidade de São Paulo. Faculdade de Economia, Administração e Contabilidade. II. Título.

CDD – 658.8342

My dedication is to everybody who does not give up of his or her dreams, no matter the difficulty size.

ACKNOWLEDGMENTS

Professors, PhD and masters students, USP and Temple researchers and staff, friends, and family, this dissertation could not have been accomplished without your help and encouragement. I would like to thank everybody who, in different ways, helped me take one more step forward in my career.

First, I would like to thank my supervisor, Dr. José Afonso Mazzon, for believing that I would be able to complete my dissertation with interdisciplinary approaches without a background in this area; for his patience and all his support; for providing me much of his time even helping me during such crazy hours as Sunday morning; and for being not only more than an advisor and an encouraging person, but a friend!

Secondly, I want to thank Dr. Angelika Dimoka for giving me the great opportunity to research and study at Temple University. I was extremely grateful to learn more about neuroscience with her and her team at Center of Neural Decision Making (CNDM). I was very well received by the team in Philadelphia, who made it easier to be away from my friends and family in Brazil. Without Angelika's support, I would not have been able to collect physiological data for my dissertation. I couldn't have asked for a better experience with Angelika. I thank her so much for "adopting" me.

I also would like to thank Dr. Adam Duhachek, from Indiana University, who gave me online assistance when I had questions about behavioral experiments, and who traveled to participate in my qualification, giving me insights on how to improve my dissertation. In the same way, I thank Dr. Geraldo Toledo for all the contributions during the qualification and for his kind way of showing me how to improve this study. From my dissertation committee, I want to thanks Dr. Danny Pimentel Claro from Insper (Instituto de Ensino e Pesquisa), Dr. Valter Afonso Vieira from University of Maringá (UEM) and Wagner Kamakura from Rice University. All of you are great example of good researchers in Marketing. I am glad I can inspire myself in great professors and people. All your contributions during my defense were really valuable. I am really grateful that you could participate in this day.

The first researcher who I would like to thank is Khoi Vo, my best friend at Temple and one of the smartest people I met during my time there. Khoi taught me a lot about neurophysiological data collection and analysis. Without his help inside E-prime and BIOPAC, I would have struggled to program my dissertation.

Still at Temple, I would like to thank SangSuk Yoon and Evarist Some for being my running and swimming partners, and of course, friends. Without them, my life in Philly would have been less interesting. I also thank William Hampton, Dave Marston, Emily Halliday and Christina Owin thanks for the friendship and all the English help. I thank Rhea Malaluan, Shikha Taiwar and Dafna Paltin for all the help during my data collection. They were amazing. I thank Dr. Vinod Venkatraman and Andrew Reinaker for their advising during lab meeting. Jim Thompson, thank you for all the words of encouragement and incentives. I also would like to thank WooYang Kim for spending time discussing with me ideas for my dissertation. Ning Ye, the newest PhD at that time of my research, thank you for trying to get people into my study and been my friend! I also could not forget Dr. Jin Jun Luo, director of the EMG - Neuromuscular Medicine Lab - for constantly encouraging me to use fEMG in my dissertation even when many barriers arose. To all my friends from Philly, thank you so much for the great time! I will miss you always!

Back to Brazil, I really want to thank a lot Fábio Meletti for giving me support with the data analysis, organizing the two terabytes of data in SPSS format. Without his help, I would have needed to do another master's degree in computer technology or spend two years organizing the data. I also owe a big thank to Jane Marques for helping me with all the bureaucracy and for the friendship that developed. Related to this group, I would also like to thank Gislaine Lino, Adriana Cristo, Karen Barraca for putting up with me during this period. I also want to thank Ana Maria Vizzoni and Edson Bourguignon Oliveira for hosting me in their USP'room for one year as I wrote this dissertation.

I also would like to thank to all the professors from USP who helped me in some way, especially Dr. Roberto Brito, Dr. Leandro Leonardo Batista and Dr. José de Oliveira Siqueira for teaching me, respectively, neuroscience; perception, attention and memory; and statistics. I am really grateful for allowing me to be a student in your classes, even knowing that I and not from psychology, communication or biomedical schools.

I send a special thanks to the following people, who gave me much advices on how to analyze my physiological data: Camilo Rodegheri from DEV Tecnologia, Pedro Zuccolo from IP, Altay Souza from UNIFESP (Universidade Federal de São Paulo), Rafael Cinoto from IME (Instituto de Matemática e Estatística – School of Statistics and Mathematics), Mickey Rowe from BIOPAC, Cristovão Albuquerque from Positivamente and Fábio Alves Carvalho from TOBBI. Without all the tips, papers, books, and their time, I would have encountered much more difficult in completing the analysis.

For the English support in specific articles derived from this dissertation, published in conferences and journals, I also thank a lot Nam Mi Choi, and Farah Diba Braga.

My lovely Brazilian friends, I thank you for understanding my absence and encouraging me to do my best. My special thank for all my FGV and USP friends (actual and future PhD and masters students) who were close to me during these four years. All the lunches, dinners, and the parties that we had together were very important in maintaining a balanced life.

I give particular thanks to my family (mom, dad, and brother) and Duk Young Choi for their unending encouragement and for calming down when I was completely stressed out.

Finally, but not less important, I thank the Young Scholar Program from Temple for allowing me to participate in the funding research competition during my exchange program. The funding from Temple helped me pay the subjects for participating in my dissertation. I am also grateful to CAPES for the two-years of scholarship.

With a heart beating strong and fast and a strong activation on *zygomaticus major* muscle, I thank to all of you!

ABSTRACT

Consumers make purchasing decisions every day. Among their purchases, consumers shop for hedonic and utilitarian products. In general, hedonic consumption is related to fun, pleasure, excitement, fantasy, experimental situations, or sensual pleasure. On the other hand, utilitarian consumption is related to instrumental and functional needs or products. Studies in psychology have shown that the information processes used to understand words and pictures are different. Since marketing researchers employ both types of stimuli, it is necessary to test how different stimuli can influence consumer behavior. Therefore, this study verified the influence of hedonic and utilitarian purchases and presentation types (pictures versus words) on consumers' perceptions of justice and price fairness based on anger as a mediators and construal level theory. Because discriminatory pricing is a widely employed market practice, it was used the price changing (increasing or decreasing) contexts in the studies to manipulate perception of justice and price fairness. Based on that, ten hypotheses were developed and divided into sub items, which were tested with behavioral or physiological studies. The physiological data were collected by an electrocardiogram, electrodermal, and electromyography. The data analyses were done with analyses of variance (ANOVA), analyses of covariance (ANCOVA), and generalized estimation equations (GEE). The main result was that in picture presentations (low construal level), when consumers pay more than others to purchase utilitarian products, they perceive the situation as less just and more price unfairness compared to when the product is hedonic. In a word presentation (high construal level), the perceptions of justice, price fairness, perception of value, and the intention to repurchase are lower with the presentation of utilitarian products compared to hedonic products. In terms of physiological analyses, attention, arousal, and valence were tested to compare the product and presentation types. This study is relevant to marketing theory, as many academics utilize words and pictures as stimuli, but few address the differences due to representation types. By studying different products, such as hedonic and utilitarian, and using consumers' affective and rational properties, it was found that the anger evoked in consumers by products are mediators in price fairness perception. This dissertation also contributes to understanding product evaluations in post-purchase situations, as opposed to during the choice process, which is found in the literature most often. For practitioners, this study makes important contributions by showing that the way a product is exposed (with words or pictures) influences the perception of justice when consumers realize that discriminatory pricing is being practiced.

Keywords: Consumer Behavior, Marketing, Experiment, Physiology, Neurophysiology.

RESUMO

Os consumidores tomam decisões de compra frequentemente, envolvendo produtos hedônicos e utilitários. Em geral, o consumo hedonista está relacionado com diversão, prazer, excitação, fantasia, prazer sensitivo até mesmo experienciar a compra. Por outro lado, o consumo utilitário está relacionado com as necessidades ou produtos instrumentais e funcionais. Estudos em psicologia têm mostrado que os processos de captação das informações para o entendimento das palavras e imagens são diferentes. Já que os pesquisadores de marketing empregam os dois tipos de estímulos em seus estudos, é importante testar como as diferentes formas de estímulos podem influenciar o comportamento do consumidor. Desta forma, esta dissertação buscou verificar a influência de diferentes formas de apresentação dos produtos (por figuras e palavras) hedônicos e utilitários na percepção de justiça e na justiça de preços, e seu mediador (raiva) com base na teoria de *construal level* quando existe uma mudança de preço pago pelo consumidor. Como preços discriminatórios é uma prática amplamente utilizada no mercado, é relevante entender como os consumidores percebem e reagem em situações de mudança (aumento ou diminuição) de preços. Com base neste contexto, dez hipóteses com subitens foram desenvolvidas. Estas foram testadas por meio de estudos comportamentais ou fisiológicos. Os dados fisiológicos foram coletados por meio de eletrocardiograma, condutância da pele e eletromiografia. As análises de dados foram realizadas com análise de variância (ANOVA), análise de covariância (ANCOVA), e equações de estimação generalizadas (GEE). Os principais resultados desse estudo foram que quando o estímulo foi a apresentação de produtos por figura (baixo nível de interpretação), e quando os consumidores pagaram mais que outras pessoas, em compras de produtos utilitários, eles perceberam a situação como menos justa e o preço mais injusto quando comparados a compras de produtos hedônicos. Entretanto, em apresentações de produtos por palavras (alto nível de interpretação), a percepção de justiça, de justiça de preço, percepção de valor e de intenção de recompra foram menores quando os produtos eram utilitários comparados aos produtos hedônicos. Em relação às análises fisiológicas, foram testados os produtos e a forma de apresentação quanto a sua atenção, excitação e valência. Ao estudar os diferentes tipos de compra hedônicas e utilitárias e as propriedades afetivas e cognitivas dessa compra, verificou-se que a raiva evocadas pelos consumidores na situação de preço mais elevado é um mediador da percepção de justiça de preço. Esta dissertação contribui para a compreensão das avaliações de produtos em situações de pós-venda, ao contrário da maioria dos estudos da literatura que focam no processo de escolha de um produto. Para o mercado, este estudo faz importantes contribuições ao mostrar que a forma como o produto é exposto (com palavras ou imagens) influencia na percepção de justiça quando os consumidores percebem que preços discriminatórios estão sendo praticados.

Palavras-chave: Comportamento do Consumidor, Marketing, Experimentos, Fisiologia, Neurofisiologia

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1 INTRODUCTION

Consumers make purchasing decisions every day. Among these decisions are shopping for different types of products such as hedonic, functional, or utilitarian products. Products can be presented to customer in a variety of ways, such as with words, pictures, and photos; they can also be tangible presented, where people can touch the products.

Products and purchasing situations can evoke various emotions. People may feel sadness when they cannot find a product, happiness when they can purchase a product, and surprise when they find a great sale. People may even feel fear when they see last week's flyer of a discount, but they do not know if they will have time to go to the store to buy it.

Postpurchase evaluation by consumers is also involved in the experience of buying a products. One specific situation that can evoke a perception of injustice or price unfairness is when one knows that someone else bought the same product in the same place for a cheaper price. Imagine going to the mall and purchasing a nice T-shirt and two days later, meeting a friend wearing the same T-shirt. Talking to him or her, one realized that he or she bought the same product in the same place and in the same week for 25% less. How would you feel – angry, surprised, or sad? Maybe you would not feel anything; you might think “My friend is lucky!”.

This dissertation in based on all of these different purchasing situations. The present dissertation aims to study emotions and perceptions of justice in hedonic and utilitarian product purchasing situations, when words or pictures present the products. To examine the perception of justice, a specific marketing strategy and pricing strategy is explored: the price discriminant.

Since these situations involve emotions and respondents have difficulty describing or resconstructing their emotions in a self-report, physiological measures will be used. Marketing theories are better developed when expected results from empirical researches are analyzed and rethought with different methods. Therefore, this dissertation aims to apply behavioral and physiological methods.

1.1 RELEVANCE

1.1.1 Why Should we Study Hedonic and Utilitarian Purchases?

Studies about hedonic and utilitarian products, services, or contexts are not new and have been explored before. Many studies have shown that consumers act differently to these products or purchase situations (e.g. Alba & Williams, 2013; Aydinli, Bertini, & Lambrecht, 2014; Gaston-Breton & Duque, 2015; Kronrod & Danziger, 2013; Palazon & Delgado-Ballester, 2013; Park & Ha, 2015; Sela & Berger, 2012). However, this topic it is still very important and has not been exhaustively examined. This dissertation aims to complement this literature, exploring hedonic and utilitarian purchases in postpurchase evaluation, more specifically exploring the perception of justice and price fairness.

1.1.2 Why Should we Study Picture or Word Presentation?

Psychology and neuroscience studies have shown differences between words and pictures in information processing (Amit, Algom, & Trope, 2009; Hinojosa, Carretié, Valcárcel, Méndez-Bértolo, & Pozo, 2009; Knapp & Abrams, 2012; Miwa, Libben, Dijkstra, & Baayen, 2014; Schlochtermeier et al., 2013). Based on the construal level theory, it seems that the presentation form can influence consumer behavior. Since these two presentation formats are used in academics and in the marketplace (physical or virtual), it is important to verify how the presentation can influence consumers.

1.1.3 Why Should we Study Pricing Discrepancy?

Pricing strategy is a critical activity for marketing managers. Price discriminantion or dynamic pricing is common and occurs in many situations, such as with airplane tickets or e-commerce. This pricing strategy may increase company profitability, but it may also bring negative consequences, such as a sense of unfairness (Ashworth & McShane, 2012; Jin, He, & Zhang, 2014; Kukar-Kinney, Xia, & Monroe, 2007; Wang & Krishna, 2012). Therefore, understanding how consumers react to pricing changes can help managers predict how consumers will likely respond.

1.1.4 Why Should we Study Emotions?

By studying different products, such hedonic and utilitarian products, and by using the affective and rational proprieties, we can add the emotions from the products as another possible influence on the price fairness perception. In addition, in price-changing situations involve emotion; understanding how the emotions are related can be important to practitioners and academics since we can understand not long their reactions but also their feelings (Lee-wingate & Corfman, 2011; Neill & Lambert, 2001; Shirai, 2009).

1.1.5 Why Should we Apply Physiological Methods?

Within the past few years, marketing researchers have begun to explore neurophysiological methods. These methods, borrowed from psychophysiology, medicine, and neuroscience, allow social scientists to study the underlying emotions and behaviors. Since this dissertation aims to understand emotions better, physiological methods can help. These methods can contribute to the marketing literature, bring new biometric findings to social science, and provide more information to marketing managers about consumers' feelings in different situations (Dimoka, Davis, Pavlou, & Dennis, 2012; Dimoka, 2012; Fugate, 2007; Suomala et al., 2012).

1.2 OBJECTIVE OF THIS DISSERTATION

The present study aims to evaluate the differences between hedonic and utilitarian products in the perception of justice and price fairness. In addition, based on the assumption that presentation type can influence cognitive and emotional responses, this dissertation has the goal of investigating the impact of presentation type on the perception of justice and price fairness. Since there are central components in marketing that can also produce different experiences; emotions and unconscious reactions are examined within behavioral and physiological methods.

1.3 METHODS USED

To achieve the goals, this dissertation presents ten hypotheses that are tested applying behavioral experiments or electrocardiogram, skin conductance, and facial electromyography measures. The electrocardiogram analysis can help measure pleasant or unpleasant responses to external stimulus. The skin conductance responses are highly correlated with arousal, showing the participant's state (under awake, or over awake). The electromyography is considered the most adequate method in collecting physiological data of emotion.

The decision to use physiological data comes from the perspective of the future and from developed countries that have not been limited to the scope of using a single discipline in exploring some research questions. Complex research questions have brought together many disciplines. Hence, a growing number of marketing papers detail studies that employ neurophysiological methodologies.

1.4 DISSERTATION STRUCTURE

This dissertation is divided into six parts: an introduction, four articles (called here as Chapters 2,3,4 and 5), and one final consideration. The introduction has the goal of presenting an overview of the dissertation. The next four chapters are built as independent papers with an introduction, theoretical background, empirical studies (when applied), analysis, and a short conclusion. All of them have a relationship between them.

The idea is that all of the articles/chapters presented in this dissertation become, with necessary improvements or changes, academic papers. The following chapters are:

Chapter 2 “A study of the perception of justice and price fairness in hedonic and utilitarian purchases”. This chapter studies the perception of justice and price fairness in discriminant pricing for hedonic and utilitarian purchases. Emotion as a mediator is also tested. In this chapter, two online experimental studies are described. The main idea of this article was presented at the 2015 Winter Marketing Educators' Conference American Marketing Association (AMA) Conference in San Antonio, Texas, United States.

Chapter 3 “Discriminatory pricing, product type and representation type: their impacts on purchase intention and product evaluation”. This chapter investigates the influence of representation type (picture versus word) in the perception of justice, price fairness, and product evaluation, such as the intent of purchase. The base theory of this paper was the construal level theory, showing the impact of abstract and constructive mental images influencing on consumer behavior, specifically hedonic and utilitarian purchases. This chapter has three experiments two online and one in the laboratory. An extended abstract and preliminary idea of this chapter was presented at the International Marketing Trend Conference (IMTC) in Paris, France. The full paper with the first two experiments displayed in this chapter was presented at Business Association of Latin American Studies (BALAS) conference San Juan, Puerto Rico, in 2015 and receive the award – Student Kelly.

Chapter 4 “Integrating new methods in marketing reseach”. This chapter presents an overview of all of the neurophysiological methods with examples of their applications in marketing. This chapter also sumarizes the origins of the concept “neuromarketing”. A theoretical paper based on this chapter was presented Congresso Latino Americano de Varejo (CLAV), a Latin American retailing conference in São Paulo in 2013. The conference gave a great feedback; the results was an empirical paper that was posteriorly presented at the 2014 American Consumer Research (ACR) Latin American Conferece in Guadalajara, Mexico. With the feedback, an article initially based on this chapter, together with the Latin America and Neuro Culture perspectives resulted in a new paper approved by the Journal of International Consumer Marketing that may be published at the end of 2015.

Chapter 5 “Product, price and presentation format: A physiological study”. This chapter uses the same ideas from the previous chapters, focusing on arousal and valence from the product type, the presentation type, and the pricechanging situation. In addition, it can also be considered a manual for physiological data collecton and data analysis. It explains in detail how to use electrocardiogram, skin conduction, and facial electromyography. This chapter has not been presented or published in any conference, yet. However, it will be posteriorly submitterd to a conference and journal.

Chapter 6 presents the final consideration that ties all of the chapters together. In this chapter the reader will read about the theoretical and management implications, and suggestion for future researches.

2 A STUDY OF THE PERCEPTION OF JUSTICE AND PRICE FAIRNESS IN HEDONIC AND UTILITARIAN PURCHASES

2.1 INTRODUCTION

How does a consumer purchase a new, technological tablet or a simple microwave? How do they feel after renting a house close to work? How do they feel about paying less for a fruit salad than their friend paid? How do they feel when they purchase a piece of chocolate cake and find out that their friend paid much more? What if they had to choose between fruit salad or chocolate cake? Consumers make purchasing decisions every day. Among their decisions, a lot of emotions are involved before, during, and after the purchase process.

Among these purchases, consumers shop for hedonic and utilitarian products. In general, hedonic consumption is related to fun, pleasure, excitement, fantasy, experimental situations, or sensual pleasure, such as purchasing watches, games, wine, songs, or chocolate cake. On the other hand, utilitarian consumption is related to instrumental and functional needs or products, such microwaves, toilet paper, laundry detergent, or fruit salad (Batra & Ahtola, 1990; Curry, 2001; Hirschman & Holbrook, 1982; Khan, Dhar, & Wertenbroch, 2004; Wertenbroch & Dhar, 2000). Following Dhar and Wertenbroch (2000), O'Curry and Strahilevitz (2001), and Okada (2005), we believe that products can have hedonic and utilitarian characteristics, with products evaluated as more hedonic if they contain more hedonic attributes or more utilitarian if they contain more utilitarian attributes.

Consumers evaluate these products differently (Alba & Williams, 2013; Botti & McGill, 2011; J. Choi, Li, Rangan, Chatterjee, & Singh, 2014; Curry, 2001; Shiv & Fedorikhin, 1999). The product evaluation has different components and attitudes, which can be distinguished (Mano & Oliver, 1993). Consumers evaluate their decision during and after purchasing a product. When "people compare the ratio of their outputs (what they receive) to inputs (what they pay – financial and non-financial) to the ratio of the other party", they make a perception of justice (Patterson, Cowley, & Prasongsukarn, 2006, p. 264). If the difference is in the individual's favor, he or she can judge the decision as fair. If the difference is in detriment of the individual's favor, he or she can judge it as unfair (Bos, Lind, Vermunt & Wilke, 1997). The perception of unfairness may lead to negative outcomes in retailing, such as buyers leaving the exchange, encouraging other consumers not to purchase from the same store, or trying to damage the company in some way (Campbell, 1999; Xia, Monroe, & Cox, 2004).

Similar to the perception of justice, the consumer's subjective sense of a right price, just or legitimate versus wrong, and unjustness or illegitimacy is called the perception of price (un)fairness (Campbell, 2007). Because pricing strategy is a critical activity for marketing managers (Campbell, 1999), it is important to understand how consumers react to changing prices. Price change is very common and occurs in many situations such as the price of transportation tickets (buses, train, airplanes), gasoline and ethanol prices, smart vending machines, or Amazon.com's dynamic pricing (Xia et al., 2004). Therefore, by understanding how consumers react to changing prices, more specifically to hedonic and utilitarian products, managers can predict how consumers are likely to respond.

Studies about hedonic and utilitarian products, services, or contexts have been explored since the 80's decade (Alba & Williams, 2013). Although the topic can be considered old and unfashioned, it is still very important and has not been examinated exhaustively. Nowadays, we still find studies about this topic in the top 10 marketing journals (e.g. Alba & Williams, 2013; Aydinli et al., 2014; Kronrod & Danziger, 2013; Palazon & Delgado-Ballester, 2013; Sela & Berger, 2012).

The importance of hedonic and utilitarian research is also present in a number of papers For example, Choi et al. (2014) examined how odd-ending prices influence the consumption of hedonic and utilitarian products. Yim et al. (2014) studied the effect of hedonic and utilitarian shopping motivation in superstores. Kronrod and Danziger (2013) studied the language applied to advertising products and found that figurative language has a higher attitude in the hedonic context compared to the utilitarian context. Botti and McGill (2011) explored the hedonic and utilitarian goals in choices. Khan and Dhar (2010) examined the savings discount on a particular item in cross category bundles. Regarding trade-off choices, studies have explored how consumers choose between hedonic and utilitarian items. These studies showed that the choice depends on the context and the characteristics of the decision task (Okada, 2005; Wertenbroch & Dhar, 2000). Others have explored the systematic affective (hedonic) versus functional (utilitarian) content of products, presenting effects on how consumers make their trade-offs (Khan et al., 2004). Others explored the context of the time-inconsistent preference, where the time for purchasing a product changes consumer preferences. For instance, a discount reflects on an immediate consumption as opposed to a delayed consumption (Caillaud & Jullien, 2000). People on diets incorporate future health consequences instead of the present pleasure (Dodd, 2008). "Longer waiting times may also increase preference for hedonic items" (Khan et al., 2004, p. 26). The combination of time and money seems more related to hedonic

purchases than utilitarian purchases, where consumers are more willing to pay in time for hedonic products than for utilitarian purchases (Palazon & Delgado-Ballester, 2013). In this stream, it is common to find papers related to impulsive consumption (e.g. Yim et al., 2014) or lack of self-control (e.g. Kivetz & Simonson, 2012).

Although the topic has been explored in many contexts and in many theories it cannot be considered exhausted. The present study aims to evaluate the differences between hedonic and utilitarian products in perception of justice and price fairness. Xia, Monroe and Cox (Xia et al., 2004) explain the concept of price fairness by exploring a conceptual framework based on four factors that influence price fairness perceptions: (1) the situation with transaction similarity and choice comparison context (based on the theory of distributive justice); (2) the attribution of responsibility by the consumer perception; (3) the relationship and trust between the buyer and seller; and (4) the interference of knowledge, beliefs, and social norms. By studying different products, such hedonic and utilitarian, and using the affective and rational properties, we can add the emotions from products as another possible influence on the price fairness perception.

Therefore, this paper aims to study the perception of justice and price fairness in purchase situations involving hedonic and utilitarian products. Based on the assumption that emotional and rational attitudes are respectively associated with hedonic and utilitarian consumption (Alba & Williams, 2013; Aydinli et al., 2014; Kronrod & Danziger, 2013; Wertenbroch & Dhar, 2000), we believe that utilitarian products will produce more price unfairness and less perception of justice than hedonic products.

Indeed, the theoretical background is divided into four parts: (1) utilitarian and hedonic concepts, (2) perception of justice and price fairness, (3) emotion and perception of justice, and (4) building the hypothesis. After that, the methodology is presented, followed by the analysis and their results.

2.2 THEORETICAL BACKGROUND

2.2.1 Hedonic and Utilitarian Concepts

The products have two major dimensions: the instrumental or utilitarian dimension and the hedonic dimension (Mano & Oliver, 1993).

The utilitarian products are instrumental and goal oriented (Wertenbroch & Dhar, 2000). They can be considered functional, sensible, and usable (Botti & McGill, 2011), accomplishing functional and practical tasks. Consequently, they can also be considered necessary (Choi et al., 2014). Usually the benefits are perceived as tangible and concrete (Sela & Berger, 2012). Some examples of products with a strong utilitarian dimension are: detergents, delight products, home security systems, microwaves, minivans, personal computers, scientific calculators, and toothpaste (Curry, 2001; Hirschman & Holbrook, 1982; Okada, 2005; Wertenbroch & Dhar, 2000).

The hedonic dimension can be considered as an imaginative reality. People can purchase a product of desire and anticipate the experience or fantasy (Hirschman & Holbrook, 1982; Holbrook & Hirschman, 1982) based on what they expect will be a pleasure (Alba & Williams, 2013). The hedonic approach to consumer behavior has a role of mental construct, involving the multisensory system and emotional arousal (Hirschman & Holbrook, 1982; Holbrook & Hirschman, 1982). Consumers perceive symbolic meanings to the subjective characteristics (Shiv & Fedorikhin, 1999). For instance, perfume can make people feel more attractive to themselves. The hedonic product is usually valued for their product pleasing properties (Mano & Oliver, 1993). In this dimension, the attributes for a product are not perceived as necessary, but as something that the product can work without (Sela & Berger, 2012). There is a list of products that are strongly related to the hedonic dimension such as: art services or products (performance arts – ballet; plastic art; painting or popular culture – movies), beer, chocolate, DVDs/CDs, downloaded music, television sets, tobacco, and video games (Childers, Carr, Peck, & Carson, 2001; Curry, 2001; Hirschman & Holbrook, 1982; Okada, 2005; Voss, Spangenberg, & Grohmann, 2003).

It is common to view hedonic and utilitarian dimensions on a bipolar scale. However, many researchers have shown that products that are both hedonic and utilitarian sometimes appeal to one of the dimensions more than the other. The hedonic and utilitarian product characteristics or features are used to show the presence of these two dimensions in one product. According to Batra and Ahtola (1990), there are two reasons why people consume products: a consummatory affective gratification (hedonic reason) and the instrumental, utilitarian reasons based on functional and nonsensory attributes.

The "hedonic value is experienced on both affective and cognitive levels while the utilitarian component, which also may include both affective and cognitive dimensions, is dominated by the cognitive element" (Spangenberg, Voss, & Crowley, 1997 p. 265). Furthermore, the hedonic product or consumption is related to emotional desires. According to Shiv and Fedorikhin (1999), an affective response comes from a rapid automatic processing and the rational reaction occurs by cognitive and deliberated reactions. Cognitive reactions seek to stimulate the process of thinking about the situation or the product. Meanwhile, affective reactions are more related to sensations and the experience through the five senses (Spangenberg et al., 1997). Because the utilitarian product is usually related to utilitarian consumption, and consequently to a more rational consumption than hedonic consumption, it is easier for consumers to create reasons for purchasing utilitarian products than hedonic products (Okada, 2005).

As previously stated, researchers have perceived that consumers have more difficulty justifying hedonic purchases than utilitarian purchases. One explanation for this situation is related to the emotion: guilt (Curry, 2001). Since the consumption of hedonic products can arouse in guilt (Khan et al., 2004; Palazon & Delgado-Ballester, 2013), consumers with high self control can avoid purchasing hedonic products. Consumers can feel guilt when they have to choose between a hedonic item and utilitarian item (Dahl, Honea, & Manchanda, 2003). For instance, imagine choosing between a fruit salad and a piece of chocolate cake. Although you might prefer the chocolate cake, you chose the fruit salad because you do not want to feel guilty for going against your diet (Khan et al., 2004). However, when the context helps justify hedonic consumption, the consumer has an excuse to purchase it and the preference changes back to the product (Okada, 2005). One example is charity. When consumers want to purchase a hedonic product, charity can reduce the sense of guilt and facilitate the purchase (Strahilevitz & Myers, 1998). In situations of gift giving, where there is no guilt involved because the idea is to please the receiver. Therefore, people prefer purchasing hedonic products (Kivetz & Simonson, 2012). Moreover, people enjoy receiving hedonic gifts, even though they would not purchase it for themselves (Thaler, 1980).

Another discussion related to hedonic and utilitarian attributes is preferences. Some researchers suggest that affective preferences or hedonic preferences are linked to "wants", while utilitarian preferences are underlined by "should" (Sela & Berger, 2012; Wertenbroch & Dhar, 2000). Researchers have showed that in "joint evaluation", where consumers have to choose between a hedonic and a utilitarian product, the "should" is dominant and consumers choose the

utilitarian products. However, when they have to choose separate products, the "want" is dominant and consumers are more attractived to the hedonic products (Okada, 2005). When consumers see both products, they suffer a conflict between what they want to buy and what they should buy. Some researchers call this situation "the heart versus mind" conflict (Khan et al., 2004; Shiv & Fedorikhin, 1999). It is important to note that when the consumers do not have to choose between these two kinds of products, the affective and rational components are predominant reasons in the purchase situation.

Moreover, it is not difficult to assert the differences between hedonic and utilitarian products in consumer acquisition and consumption (Alba & Williams, 2013; Khan et al., 2004; Wertenbroch & Dhar, 2000). Astonishingly, we did not find any study that have explored the impact of these products after the decision has been made. Therefore, this paper will explore how these products can influence the perception of justice or price fairness after the choice and purchase situation.

2.2.2 Perception of Justice and Price Fairness

Justice is an evaluation of the appropriateness of a person's treatment by others (Chebat & Slusarczyk, 2005; Schoefer & Ennew, 2005). The perception of justice concerns the process through which outcomes are obtained. The outcome is perceived in the company or person responsible for the outcome (Maxwell, 2002). The perception of justice has an important consequence on satisfaction, commitment, and trust (Colquitt & Rodell, 2011; McFarlin & Sweeney, 1992; McMahon-Beattie, 2010).

In general, justice is expressed in three dimensions: procedural, interactional, and distributive (Homburg & Fürst, 2005; Maxham & Netemeyer, 2003). The procedural dimension encompasses the deservedness of rules, processes, and treatments. It is related to the judgment of fair process (Colquitt & Rodell, 2011; Lucas, 2009). It is also related to the process of control, timing/speed, and flexibility to adapt to the customer's needs (Schoefer & Ennew, 2005). The interactional dimension is related to the communication process, or how the consumer and the seller interact. The manner in which people are treated during the buying process, including elements such as rudeness, courtesy, politeness, or empathy, is considered interactional justice (Schoefer & Ennew, 2005). The distributive dimension comes from the resources allocated and the results of the exchange. It is related to the deservedness of outcomes or allocations (Lucas, 2009). The procedural dimension, as the name suggests, refers

to the procedure used to reach the outcomes of the exchange. It focuses on the perceived fairness of the outcome (Schoefer & Ennew, 2005).

Related to price, many researchers state that when consumers perceive a price as high, they judge it as unfair and consider either leaving the store or complaining about it (Maxwell, 2002). Based on this, an economically fair price means a cheap price. According Maxwell (2002), social fairness is defined in the dictionary as "according to the rules". Rules, in this case, are the processes or the outcomes of pricing. The fairness concept has two main aspects: social and economic. Economic fairness is related to the economic theory that we could extrapolate aspects of emotions. "Buyers are assumed to be self-interested utility maximizer who rationally review the magnitude of a price and judge its economic acceptability based on their own best self-interest" (Maxwell, 2002, p. 192).

Meanwhile, some researchers believe that it is hard to separate the two aspects of fairness in price since people judge the economic acceptability of price magnitude in relation to their own self-interest. This includes social acceptability of price and the conformation to rules they believe are right or wrong. All purchases are based on rules (Maxwell, 2002). These rules do not need to be written or be exposed in signs. They are developed over time between the seller and the buyer, and consequently, through the system of buying and selling. When the rules are not followed, people judge the price unfair and can change their future behavior (Namkung & Jang, 2010). The expectation of the price is not only based on the internal and external reference price, but also on what the consumer feels that he or she deserves (self-interest). When the actual price does not match the desired price, people resent the violation of the rules. This perception of unfairness is based on the process of perception of justice.

Imagine a consumer goes to a place and purchases a product with a determined price of "x". Then his friend goes to the same place, on the same day, and purchases the same product for "x-25%x". In this case, the consumer paid more than his friend. Since the purchase expectation and economic rules are not respected, the perception of justice will be shaken (Hoffman & Kelley, 2000; Maxwell, 2002; Xia et al., 2004).

This kind of situation is common with price discrimination because companies want to maximize their profit (McMahon-Beattie, 2010). On the other hand, they try to avoid treating consumers unfairly because consumer perceptions of unfair prices can lead to decreased profitability in the short and long period (Piron & Fernandez, 1995). The viability of online

dynamic pricing or differential pricing for the same product from the same seller has been increasing, especially in online retailing (Weisstein, Monroe, & Kukar-Kinney, 2013). Price fairness is not only important to online retailers, but also to consumers, policy makers, and politicians (Campbell, 2007b).

While price perception can be explored through the perception of justice, many researchers have been using a concept called price fairness. Similar to perception of justice, fairness is defined as the judgment of whether or not the outcome and/or process to reach the outcome is reasonable, acceptable, or just (Bolton, Keh, & Alba., 2010; Bolton, Warlop, & Alba, 2003; Xia & Monroe, 2010). Xia et al. (2004) complement that "the cognitive aspect of this definition indicates that price fairness judgments involve a comparison of a price or procedure with a pertinent standard, reference, or norm". According to Kahneman, Knetsch, and Thaler (1986), price fairness is the consumer's judgment regarding the difference between what they expect and what they accept. Table 2.1 shows some descriptions of the concept of price fairness.

Table 2.1 – Price Fairness

Definitions	Authors
"Fairness might refer to the extent to which outcomes are deemed reasonable and just."	(Bolton et al., 2003 p.475)
"Fairness has been defined as a judgment of whether an outcome and/or the process to reach an outcome are reasonable, acceptable, or just."	(Xia et al., 2004 p.1)
"Perceptions of price (un)fairness encompass a consumer's subjective sense of a price as right, just, or legitimate versus wrong, unjust, or illegitimate."	(Campbell, 2007b p.261)
"A consumer's assessment of whether the difference (or lack of a difference) between a seller's price and the price of a comparative other party in a transaction is equitable, reasonable or justifiable."	(Xia & Monroe, 2010 p.885)
"Have a pre-determinate internal standard for prices that may or may not correspond to any actual price at the time the comparative judgment is being made."	(Namkung & Jang, 2010 p.1236)

In a simple situation, people compare the product price with a similar product price, perceiving if the product desired has an equal price. If the price is cheaper than the reference price, they understand it as an advantage price inequity. If the product price is more expensive than the reference price, they perceive it as a disadvantage price inequity (Xia & Monroe, 2010). When the perception of price is a disadvantage price inequity, researchers describe it as a perception of price unfairness (Xia et al., 2004). Campbell (2007b) used the definition not only for disadvantage price inequity, but also when consumers feel fairness. She used the concept "perception of price (un)fairness". Her notion when people sense the price as right, just or

legitimate versus wrong, unjust or illegitimate is the same as other researchers. The main difference is that she uses the concept in a positive and negative view.

Xia and Monroe (2010) state that the perception of price unfairness can also come from a comparison of the individual who receives the outcome. For instance, if you pay a higher price than another customer (for the same product, from the same vendor, at the same time) you can be led to particularly strong perceptions of unfairness relative to price differences across products, vendors, or time (Bolton et al., 2010).

Similar to the perception of justice, Lii and Sy (2009) state that price fairness has two components: the economic component and the social component. The economic component comes from the belief that consumers follow the utility maximization theory and will judge a price as fair as long as the product price covers the cost of the benefits. Meanwhile, the social component results from social rules and regulations, or whether the product is socially accepted as a fair price.

Justice is usually considered to be a cognitive concept, in which its effects have been shown to be both emotional and behavioral (Campbell, 1999; Chebat & Slusarczyk, 2005; Choi & Choi, 2013; Lee, Joshi, & Kim, 2011; Neill & Lambert, 2001). The same occurs for price fairness, where there is an emotional and behavioral effect on consumers (Launspach & Burmann, 2010; Lee-Wingate & Corfman, 2011; Shirai, 2009). In this context, it is important to comment about the emotions regarding the perception of justice and price fairness.

2.2.3 Emotion and Perception of Justice

According to O'Neill and Lambert (2001), emotions have not been part of the manner in which price has been studied. However, consumers state that they can feel irritation, pleasure, or relief with some prices. According to Zielke (2011), future studies should try to understand the formation of emotions as part of a price image. Major price researches have cognitive perspectives, but they do not explore the emotions due to price (Campbell, 1999, 2007b; Xia & Monroe, 2010).

O'Neill and Lambert (2001) wrote one of the first papers exploring price and emotion (Zielke, 2011). O'Neill and Labert (2001) explored price affecting enjoyment, surprise, distress, anger, disgust, and contempt using a pair of athletic shoes as a stimulus. The emotional data was collected using Izard's (1977) differential emotion scales. To examine the role of price, they

investigated price affecting emotions, price consciousness, price-quality inferences, and product involvement. In result, they found an effect for price enjoyment and surprise.

Some years later, using the idea of unexpected price, Shirai (2009) investigated the emotions elicited from observing unexpectedly high or low prices. Based on 11 emotions from the Richin (1997) scale, she explored prices eliciting neutral, positive, and negative emotions. The main result showed that when the participants did not "like" the price, they showed intense negative emotions. For example, they felt elicited, discontented, depressed, and frustrated. Meanwhile, when the participants did "like" the price, they felt pleased, excited, enthusiastic, contented, and thrilled (Shirai, 2009). As expected, the surprised and amazed emotions were strongly elicited in high or low prices. In addition, Shirai found that "the negative emotions were stronger for the negative price experience than for the positive experience, whereas all the positive emotions are stronger for the positive price experience than for the negative price experience" (Shirai, 2009 p.05). She concludes that the consumer feels different emotions depending on the product/service price. For instance, while consumers are likely to feel happy if they are satisfied with the offered price, they can also become angry if the price level perception is high.

Zielke (2011) explored price level perception and discrete emotions. He supposed that when a customer perceives a product price level as cheap he or she would feel enjoyment, contempt, shame, or guilt. On the other hand, when a consumer perceives the price as expensive, he or she would feel distress, anger, fear, or interest. To measure emotions, he used Izard's Differential Emotions Scale (1977) in the context of price. For enjoyment, he used the following: "I am often delighted at the prices in this shop" or "When I think about the prices in this shop, I am happy." As a result, he found that only enjoyment, contempt, shame, guilt, fear, and interest are positively influenced by price-level. He did not find any influence on distress or anger.

According Zielke (2011), people can have incongruent goals, and consquently, they can feel more than one emotion at the same time. For example, a customer could feel happy about saving money on a cheap product. At the same time, the customer could feel guilt if he or she suspects that the product was produced under unethical conditions, which is incongruent to the social responsibility goal.

Relating emotion to price and the perception of justice or price fairness, some researchers have used the idea of price change to explore emotions as a consequence of the changing prices (Chebat & Slusarczyk, 2005; Lii & Sy, 2009; Lucas, 2009; Namkung & Jang, 2010; Xia et al., 2004).

For instance, Chebat and Slusarczyk (2005) explored the three dimensions of perceived justice (procedural, distributive, and interactional) which affect positive and negative emotions. To explore this idea, they collected data from a Canadian bank. Their results showed that procedural justice affects negative emotions, whereas distributive justice and interactional justice affect negative emotions negatively and the positive emotions positively. Interactional justice is the only dimension that affects the customer loyalty directly. With this result, Chebat and Slusarczyk concluded that in the service recovery context, emotions mediate the relationship between the perceptions of justice and loyalty.

Lucas (2009) confirms that the distributive and procedural dimensions of perceiving justice may evoke positive or negative emotions. According to him, positive emotion and distributive justice are linked because a discrete emotion, such as happiness, is associated with receiving favorable outcomes at a low price.

Xia et al. (2004) created a framework presenting the effects of price on emotion. Figure 2.1 presents the conceptual framework of price fairness. Note that the perceived price fairness has both a cognitive and an affective component. This paper was one of the first to explore how price changes emotional response. More specifically, it explored how price fairness evokes negative emotional responses. Some negative emotions, such as disappointment, anger, outrage, uneasiness, and guilt, are associated to the unfairness price perception. Xia et al. (2004) proposed that when buyers perceive a price as unfair, negative emotions become the major driver of their actions. Several years later, in another paper, positive emotions were also explored in addition to the negative emotions (Xia & Monroe, 2010). Using the context of the DVD player purchase scenario, Xia and Monroe manipulated the comparative references and price differences, supporting that the perceived price fairness can change negative and positive emotions. “When participants were paying a higher price than their reference, they perceived a lower transaction value as well as an unfair price” (Xia & Monroe, 2010, p. 889).

With the same idea, Lii and Sy (2009) studied the internet business environment (in e-commerce). Differential pricing showed that price fairness evokes emotional responses, such as positive and negative emotions, which result from word of mouth, complaints, repurchase intentions, and switching behavior. Lii and Sy (2009) explain that when a consumer perceives price fairness, they feel positive emotions. Meanwhile, when a consumer perceives price unfairness, they feel negative emotions.

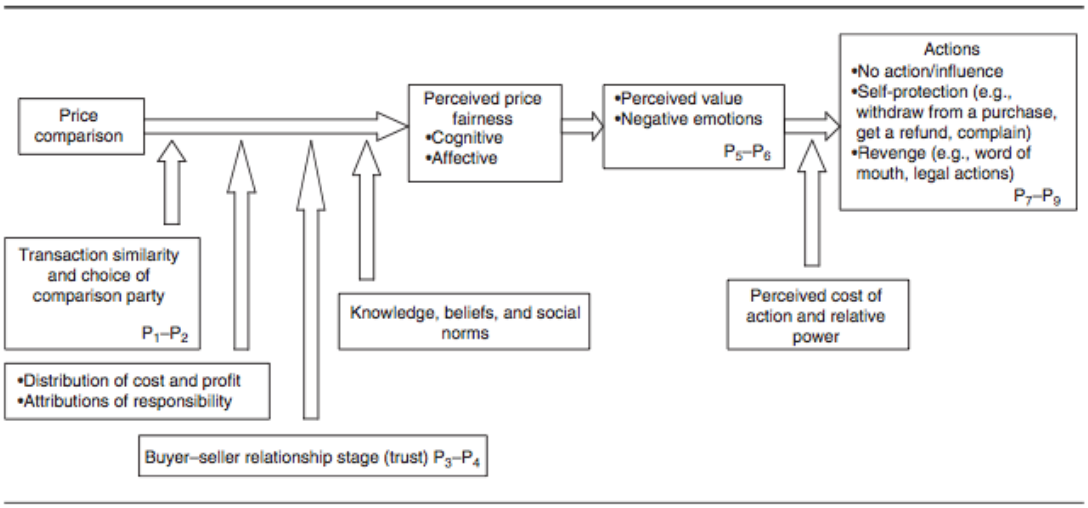

Figure 2.1 – Frame of Price Fairness From Xia et al. (2004)
Reference: Xia et al. (2004, p. 2)

Using a restaurant context, Namkung and Jang (2010) also explored fairness in situations evoking positive and negative emotions, and consequently, behavioral intentions.

So, it is unquestionable that the perception of justice and price fairness can affect consumers' emotions. Based on the different products (hedonic and utilitarian), perception of justice, price fairness, and emotional background, we are able to build the hypothesis of this paper.

2.2.4 Developing the Hypotheses

In this section, we introduce the automatic and rational systems that influence consumer behavior (Chaudhuri, 2012; LeDoux, 1995; Shiv & Fedorikhin, 1999). These systems are related to affection/experiential and cognitive processes, which are sometimes referred to as experiential and analytic, respectively (Epstein, 1994). In addition, we will connect this theory with the perception of justice and price fairness, constructing the hypothesis of this paper.

Hogarth, Portell, Cuxart, and Koley (2011, p. 203) state that "the major distinction between the systems is that whereas the analytic system requires conscious effort and works in an explicit step-by-step manner, the experiential is largely covert and relies heavily on rapidly processed feelings or emotions that a person may not be able to specify". In other words, the cognitive process is more conscious and related to attribution and strategies. Meanwhile, the affective process is more automatic with less interpretation and cognition of the fact (Shiv & Fedorikhin, 1999).

Relating the different processes to hedonic and utilitarian purchases, we can say that hedonic products are closer to affection and that positive emotions could be processed faster and more automatically than utilitarian products. Emotion and reason occur independently. One explanation for this is that they derive from different brain structures (Chaudhuri, 2012). Although these processes occur separately, they can also be complementary and occur at the same time. Therefore, we believe that products can have hedonic and utilitarian attributes, but they will not always be well balanced (Chaudhuri, 2012; Curry, 2001; Okada, 2005; Wertenbroch & Dhar, 2000). So, we can consider one product, experience, or purchase as more utilitarian or hedonic.

When utilitarian products are purchased or preferred, the experience is relatively more instrumental and practical; it seems to be more logically associated and compatible with cognitive reactions than affective reactions evoked by hedonic products (Alba & Williams, 2013; Millar & Tesser, 1986; van den Berg, Manstead, van der Pligt, & Wigboldus, 2006). In utilitarian experiences or product purchases, there is a mediating effect from cognitive processes in the decision process (Chitturi, Raghunathan, & Mahajan, 2007; Palazon & Delgado-Ballester, 2013).

Following this idea, we assume that the cognitive process of utilitarian purchases impact the perception of justice and price fairness in discriminating prices. When a utilitarian product is preferred or presented, cognitive reactions will directly impact the perception of justice. Because the process involved is more rational, consumers will be more aware of the product and prices. Therefore, when the seller plays unfairly by not adhering to the "common" rules of the purchase process (Maxwell, 2002), in utilitarian purchase experiences, the consumers will perceive the situation as unfair than compared to hedonic purchase experiences. The same would occur for prices. When a seller plays unfairly with the price, the price fairness would be lower in utilitarian purchases.

H_{1A}: When consumers pay more than others for purchasing utilitarian products, they perceive this situation as less just than when the product is hedonic.

H_{1B}: When consumers pay more than others for purchasing utilitarian products, they perceive the price unfairness compared when the product is hedonic.

The majority of papers explore the unfairness view, or when the perception of price is higher than what the consumer considered to be just and fair (Maxwell, 2002; Namkung & Jang, 2010; Wu, Liu, Chen, & Wang, 2012). However, it is important to see if there are any differences in the situation where consumers perceive the situation and price just, fair, and reasonable (Xia & Monroe, 2010).

Xia and Monroe (2010) demonstrated that there is not an equivalent magnitude to the degree of unfairness a consumer feels towards advantaged and disadvantaged price inequities. By exploring the effects of price differences on price fairness and transaction value when consumers learn that they are paying less than another customer, the authors showed that "although counter-intuitive, (…) paying a price that is less than the reference price may be perceived to be less fair when the reference price is a higher price paid by another customer for a similar transaction (…) in the context of social comparisons, an advantaged price inequity had a negative effect on fairness perceptions" (Xia & Monroe, 2010, p. 892). In other words, a good price is not necessary converted into higher purchase intentions or a positive word-of-mouth. In addition, Xia and Monroe showed that people perceive less fair prices as an advantage price inequity that produces a positive transaction value compared to paying the same price as others.

We believe that our results will be consistent with the Xia and Monroe (2010) study, where the consumers with a better deal would feel that the situation is not fair. Also, when we compare this to the situation where the consumers paid more than they should, we will not find a significant difference. In other words, we will not find a different perception of justice or price fairness when the consumers realize that the retailer changed the price 25% (up or down). In both cases, the situation is unfair.

In the Xia and Monroe (2010) study, three experiments were done using what we consider to be a hedonic product – a DVD player – which changed its price by a 25% increase and decrease. Since the following experiments proposed in this paper also used a manipulation of 25% up and down, we assume that the consumers will not perceive any differences in both cases. It is crucial to say, however, that the consumer can perceive differences if other percentage price changes occur.

Since consumers will perceive some unfairness on "low price" products after purchasing them, we could assume that the cognitive process from utilitarian purchases will impact more on the perception of justice and price fairness in discriminate prices than on hedonic products. Therefore, we could say that the perception of injustice and price fairness will be higher in utilitarian products than hedonic products.

H_{2A}: When consumers perceive that they paid less than others for purchasing utilitarian products, they perceive it as less just than when the product is hedonic.

H_{2B}: When consumers pay less than others for purchasing utilitarian products, they perceive the price unfairness compared when the product is hedonic.

Emotions have been known to mediate the effects of justice perception in different behavior responses (Namkung & Jang, 2010), such as loyalty in service recovery situations (Chebat & Slusarczyk, 2005; Choi & Choi, 2013), word of mouth (Xia et al., 2004), complaints (Schoefer & Ennew, 2005), satisfaction (Lee et al., 2011), purchase intention (Palazon & Delgado-Ballester, 2013).

As described before, some negative emotions such as anger, outrage can be associated to the unfairness price perception (Xia et al., 2004) since when buyers perceive a price as unfair, negative emotions are the major driver of their actions (Xia & Monroe, 2010). Therefore, specific emotions as anger can also be a mediator of perception of justice in specific situations.

Following the same ideia presented by perception of justice, we can believe that the change price can produce fairness, more specifically price fairness, if negative emotions, in this case anger, can be a mediatior the effects of discriminant/price change and justice perception, the same may occur to price fairness.

Based on that we propose:

> **H_{3A}: The relationship between price change perception and perception of justice will be mediated by anger.**

> **H_{3B}: The relationship between price change perception and price perception will be mediated by anger.**

In addition if the perception of justice affects emotions, we believe that utilitarian purchases, with a more cognitive approach and impact on the perception of justice and price fairness evokes a higher negative emotion (anger) when the consumer recoginizes the situation as unfair compared to hedonic purchases.

> **H_{4A}: In unfairness situations, consumers feel more anger to utilitarian products than hedonic ones.**

2.2.5 Hypothesis Summary

The Table 2.2 shows a summary of the hypotheses proposed before.

Table 2.2 – Hypothesis Summary

Theoretical Model	Objective	Hypothesis	Variables
Hedonic and Utilitarian Effects on the Perception of Justice and Price Fairness	Identify if different kinds of products have an effect on the perception of justice and price fairness of price changes	H_{1A}: When consumers pay more than others for purchasing utilitarian products, they perceive this situation as less just than when the product is hedonic. H_{1B}: When consumers pay more than others for purchasing utilitarian products, they perceive the price unfairness compared when the product is hedonic. H_{2A}: When consumers perceive that they paid less than others for purchasing utilitarian products, they perceive it as less just than when the product is hedonic. H_{2B}: When consumers pay less than others for purchasing utilitarian products, they perceive the price unfairness compared when the product is hedonic.	Independent Variable: Products (Hedonic and Utilitarian) Dependent Variable: Perception of Justice and Price Fairness
Hedonic and Utilitarian Products' Effect on Emotion	Identify if different kinds of products have an effect on anger when the product price is changed	H_{3A}: The relationship between price change perception and perception of justice will be mediated by anger. H_{3B}: The relationship between price change perception and price perception will be mediated by anger. H_{4A}: In unfairness situations, consumers feel more anger to utilitarian products than hedonic ones.	Independent Variable: Products (Hedonic and Utilitarian) Mediator: Anger

2.3 EMPIRICAL STUDY

Two studies were performed to test the hypothesis proposed. All pretests and full studies received approved by the Institutional Review Board (IRB) (Code: 21561) at Temple University. Before the project submission to IRB, Angelika Dimoka – my advisor at Temple and I (Giuliana) had to do online classes and exams to get the CITI – Collaborative Institutional Training Initiative. This documents is valid per two year and shows that the person did Human

Research, Social/Behavioral Research Course. In all the studies participants signed an agreement before starting answering the questions. The Appendix A shows the CITI and the online consent form.

The context situation in the study one was the price chance in a physical store. In the study two, participants imagined purchasing a product online. The products and the order of emotion questions were different in each context. The measure scales were similar in both cases.

To investigate the hypotheses created, we measured the perception of price justice using five statements from the perception of justice dimension on price image from De Toni and Mazzon (2014) study. The statements were: "The benefits offered by this product are compatible with the sacrifices to obtain it", "This product is worth its price", "I believe that this product is being sold at an acceptable price", "Comparing the price of this product with prices of similar products in the market, I consider it a fair price", and "Considering the knowledge I have concerning the costs of this product, I may say that its price is fair".

Since many papers in this area have been using Darke and Dahl's (2003) adapted price fairness scale, we also asked participants to rate if the situation was unfair, reasonable, and fair (the first one reverse scored) (e.g. Ashworth & McShane, 2012; Bolton et al., 2010; Lee-wingate & Corfman, 2011). To measure the emotions, we used Richins' scale (1997). Richins defines the emotions based on clusters of adjectives. For instance, for the anger dimension, the adjectives ''frustrated", ''angry", and ''irritated" are used. The words ''depressed", ''sad", and ''miserable" are used for sadness; ''happy", ''pleased", and ''joyful" for joy; and ''surprised", ''amazed", and ''astonished" for surprise. This scale is also very well known and used by many researchers (Namkung & Jang, 2010; Shirai, 2009; Sweeney & Soutar, 2001; Zielke, 2009). We used all of the previous described scales with the seven-point Likert scale.

The hedonic and utilitarian products need to be defined and classified by the consumers to guarantee that they perceive the products differently. So, pretests and manipulation checks were done during each study.

To measure if the product is more hedonic than utilitarian or vice-versa, we used the short Hedonic and Utilitarian Attitude Consumer scale from Voss, Spangenber, and Grohmann (2003) based on Hischman and Holbrook (1982) concepts. The questions used were seven-point semantic differential items: necessary–unnecessary; effective–ineffective; helpful–unhelpful; functional–not functional for the utilitarian dimension and not fun–fun; dull–

exciting; not delightful–delightful; not thrilling–thrilling; enjoyable–unenjoyable for the hedonic dimension.

The inclusion of four questions regarding price-level perception was done to control when the participants where influenced from the price perception. To evaluate price-level perception, we based our analysis on the Zielke (2011) study, which originated from the Zielke (2006), Muller (2003), and Diller (1997) scales. This research used four statements: "This product price is cheap", "The price of this product is very high", "In this online store I pay less for the same quality than elsewhere", and "This online store has product with accessible price". The scales ranged from totally disagree (1) to totally agree (7). This scale came right after the product presentation (website stimulus).

2.3.1 Study One

The first study was done to verify the hypothesis H_{1A}, H_{1B}, and $H_{4.}$ One part of the sample answered the emotion scale before the price change, and the second part of the sample answered it after the price variation. We also controlled the price-level perception with a scale.

The experiment design was 2 (product: hedonic and utilitarian) vs 2 (two different prices). Following the choice of hedonic and utilitarian literature (Khan et al., 2004; Shiv & Fedorikhin, 1999), we decided to use a fruit as a product of more utilitarian dimension, where people rationalize (regard as being a better option) more than a slice of cake. To test if the two products could be considered different in the utilitarian and hedonic dimensions and to define the prices we run a pretest, described below in this study.

After the participants filled out the consent form, they read the following instruction "Imagine you are walking in the city and you decide to eat something. You go to a coffee shop that you already been to and know they have good options. You see the following slices of cake (or fruits) options with the respective prices. Which one do you prefer to buy?" With the product pictures it was also presented the prices. Participants saw 4 different kinds of cakes or 4 different kinds of fruits at the same time. The Figure 2.2 shows the stimulus. The prices and the product presentation were randomized.

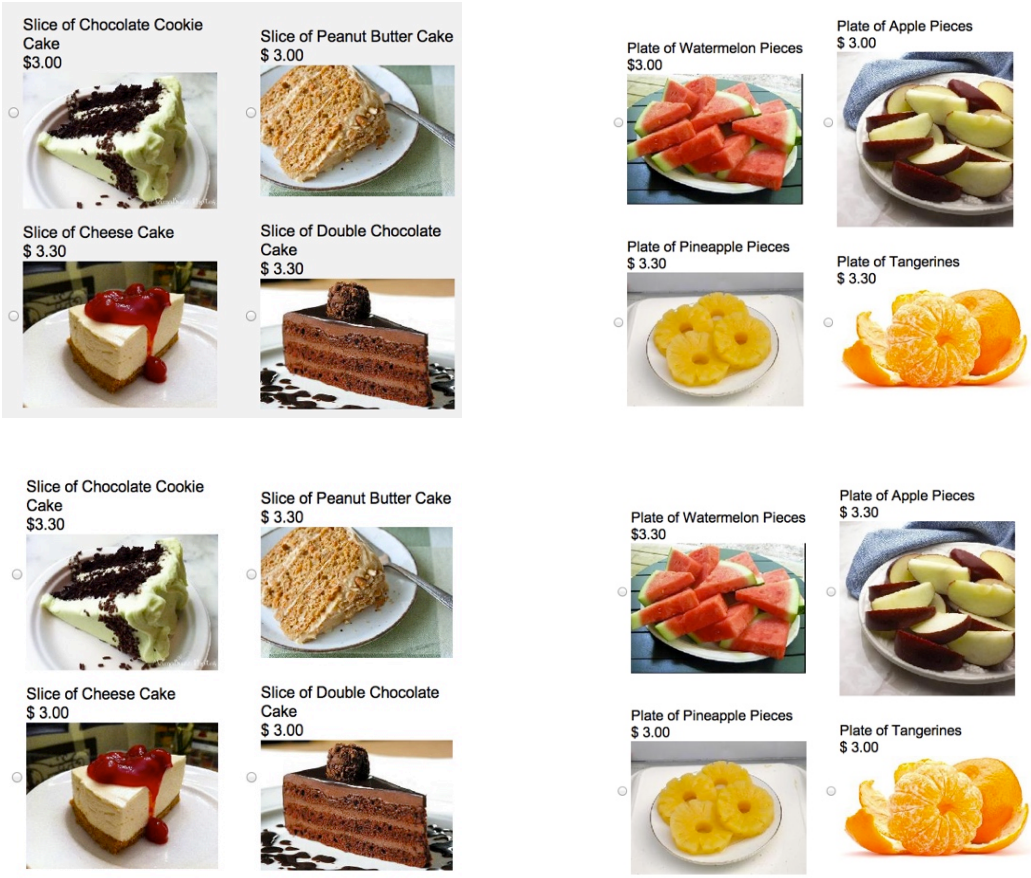

Figure 2.2 – Stimulus: Study Two

After the participants chose one product, half of them answered about how they feel (emotion questions) about their purchase; the other half saw the second stimulus (presented in the next paragraph) followed by the same emotions questions from the first group. We added guilt emotion to Richin's emotion scale because the literature shows that guilty can influence consumer decision to hedonic products (Curry, 2001; Palazon & Delgado-Ballester, 2013). We also asked participant to score the perception of price-level scale, before the price change.

The second stimulus was "After leaving the coffee shop, you see one of your friends walking on the street. Talking to her, you realize that she bought the same slice of cake or plate of fruit from initial price less 25% ($2.30 or $2.50 – depending on the price paid on the first page) in the same store two days ago". The participants answered the price fairness and the perception of justice scales. Then, the hedonic and utilitarian scale from the product that they chose to purchase was presented. At the end few questions for manipulation check and demographic were presented to participants. The data was collected online in an American Panel. The panel company gave credits to the participants.

2.3.1.1 Pretest I

We ran this pretest online through an American panel. We restricted the answers to natives and residents of the U.S. Thirty six people participated in the pretest, with 50% of them being male. The participant age ranged from 22 to 64 years old, without a concentration in a specific age. From the sample of participants, 46.9% said they purchase one of the products once a week and 28.1% said they purchase one of the products two or three times a week. The participants randomly evaluated the plates of salad and the slices of cake. The prices were not displayed.

Regarding the utilitarian and hedonic scale, we ran the factor analysis twice, first for the plate of fruit products and second for the cakes. In result, the products appear to have two dimentions (Cake: KMO = 0.73; Bartlett's Test of Sphericity = 182.55; Fruits: KMO = 0.74; Bartlett's Test of Sphericity = 141.17) explaining 67.2% and 58.7% of the variance, respectively. Table 2.3 shows the rotated components, communality, and the variance explained by each dimension and the Cronbach's Alpha.

Table 2.3 – Factor Analysis and Cronbach's Alpha: Study One

Rotated Component Matrix

Component	Slice of Cake			Plate of Fruit		
	1	2	Comm	1	2	Comm
Dull – Exciting	0.887		0.660	0.875		0.629
Not Fun – Fun	0.822		0.577	0.791		0.313
Not Delightful – Delightful	0.804		0.814	0.751		0.817
Unenjoyable – Enjoyable	0.774		0.769	0.735		0.631
Not Thrilling – Thrilling	0.766		0.460	0.555		0.591
Helpful – Unhelpful		0.881	0.690		0.819	0.641
Practical – Impractical		0.876	0.678		0.796	0.459
Functional – Not Functional		0.801	0.788		0.675	0.660
Effective – Ineffective		0.753	0.639		0.584	0.691
Necessary – Unnecessary		0.676	0.647		0.581	0.437
Eigenvalues %	42.7%	24.5%	67.2%	42.8%	15.9%	58.7%
Cronbach's Alpha	0.862	0.878		0.831	0.766	

Note: Rotation Method: Varimax with Kaiser Normalization.
(1) = Hedonic dimension / (2) = Utilitarian dimension / (Comm) = Communality

Using the Univariate Repeated Measure to compare the means of the perception of hedonic and utilitarian dimensions of each product, we note that the participants perceive the fruit salad ($\bar{x}$ = 2.53) as more utilitarian than the slice of cake ($\bar{x}$ = 4.38). Smaller scores means more utilitarian (Pillai's Trace F = 34.84; $p < .001$). The same occurs for the hedonic dimension, where participants perceive the slice of cake as more hedonic than the plate of fruits (Pillai's Trace F = 25.40; $p < .001$; $\bar{x}_{Cake} = 5.79$ and $\bar{x}_{Fruit} = 4.76$).

In this pretest we asked the participants to describe how much they usually pay for each product. The idea was to determine whether or not the participants pays a similar price for both products. In result, the cake had an average of $\bar{x}_{Cake} = 2.89$ and the fruit has an average of $\bar{x}_{Fruit} = 3.05$. Therefore, we determined that average consumers in the U.S. pay $3.00 for a piece of cake or a fruit salad. In effect, we opted to present two products that were $3.00 and two products that were $3.30 ($3.00*1.10). This situation was randomized in the conditions. Our idea to increase the price by 10% was based on the literature, which showed that hedonic products are usually sold with a higher price than utilitarian products. Note that we did not want to find the difference in the initial price; our goal was to create a cover story that people were going to purchase a product and, at the same time, control it. To conclude, we believed that people would choose products based on their emotions and not based on the price, since the cost of each product was low.

The pretest also helped determine if there were any products that people did not like. In both situations, cake and fruit, there were no rejections of one kind of product. In other words, all of the products were chosen, with the apple pieces chosen the least (3 times or 10% of the sample).

2.3.1.2 Analysis

Seventy people participated in the online study. 52.3% were men, 38.5% were single, and 35.4% were married. The age ranged from 21 to 72 years old. There was a little concentration in 40 to 45 year olds (19%). The majority of participants had a 4year college education (32.3%), followed by 26.2% who had some college education. 47.7% of the participants worked full time, 23.1% worked part time, 12.3% were unemplyed, and the remaining percentage were undergraduate students, homemakers, or retired. 20% of the participants had an income lower than $9,999 a year, followed by 20% who had an income of $10,000 to $19,999.

The manipulation, if the participants viewed the fruit salad differently from the slice of cake, showed results similar to the pretest. The scale had two dimensions (KMO = 0.78; Bartlett's Test of Sphericity = 429.38), which are called hedonic (variance explained = 41.3%; sd = 0.91) and utilitarian (variance explained = 31.3%; sd = 0.89).

When comparing the products, the participants evaluated the fruit salad ($\bar{x}_{Fruit} = 3.41$) with more utilitarian characteristics than the slice of cake ($\bar{x}_{Cake} = 4.30$) ($F(64,1) = 7.36$; $p = .009$). In the

hedonic dimension, in contrast to the pretest, the consumers perceived the slice of cake ($\bar{x}_{Cake}$ = 5.56) as more hedonic than the fruit salad ($\bar{x}_{Fruit}$ = 4.40) F(60,1) = 15.06; p < .001.

The manipulation check regarding price change (in comparison to your friend... the price I paid was... (higher (I paid more); lower (I paid less); the same (I paid the same)), was answered correctly by 65 of the 70 participants. Note that all the participants should have answered "The price I paid was higher (I paid more)" since the participant's friend paid 25% less than the others. Because five participants did not correctly answer the manipulation check, we excluded them from the analysis of this study. In the end, 30 people answered the study for the cake condition and 35 people answered the study for the fruit condition.

Normality and Homogeneity of Variances Test

We examined the normality test using the goodness of fit test, more specifically Kolmogorov-Smirnov and Shapiro-Wilk tests. We tested for the dependent variables: perception of justice ($\alpha_{(5\ items)}$ = 0.941) and price fairness ($\alpha_{(3\ items)}$ = 0.898).

The goodness of fit test, Kolmogorov-Smirnov and Shapiro-Wilk, are presented in Table 2.4. In result, we can say that price fairness or the perception of justice data are normally distributed because the significant results are higher than 0.05.

Table 2.4 – Normality Test for Dependent Variables

Test / Dependent Variables	Price Fairness		Perception of Justice	
	Statistic	Significance	Statistic	Significance
Kolmogorov-Smirnov	.089	.200	0.083	.200
Shapiro-Wilk	.969	.105	0.976	.247
Mean / Standard Desviation	$\bar{x}$ = 3.90, sd = 1.54		$\bar{x}$ = 4.14, sd = 1.49	

The results show the homogeneity variance for both scales, price fairness: Levene test (F = 1.07; p = .305) and perception of justice: Levene test (F = .01; p = .955). Using a 0.05 probability level to determine statistical significance, we conclude that there is no significantly different variance. Therefore, we consider the data as homogeneous (George & Mallery, 2003).

Price Fairness

We ran the GLM with one independent variable, the kind of products, and controlled the price as a covariate of the study. The General Linear Model (GLM) is a technique used to conduct an analysis of variance for an experiment with two or more factors. Since we aim to compare the means between groups, this test appears to be appropriate for this study. Since the Type I error (the p-value) of improvement fits with the GLM calculated from the chi-square distribution, the data should be homogenous, normal, and independent (Dobson, 2002). Therefore, we tested the normal distribution and homogeneity of variances.

As expected, the different prices ($3.00 or $3.30) were not significantly different ($F(1,65) = .88$; $p = .352$). In addition to this variable, we used the perception of price level ($\alpha_{(4\ items)} = 0.841$) as a covariate in accordance to the literature. The third covariate was the presentation of the emotion scale. Although the emotion scale was not a manipulation, we understood that asking people to think about their purchase before or after the price change could interfere with the study. In order to control this effect, we used the presentation questionnaire order as a covariate.

Using the price-level perception and the price stimuli as covariates, there was a significant difference in price fairness, after price change, between the products. ($F(1,65) = 4.58$; $p = .036$). The perception of price fairness scores for the slice of cake was 4.44 (std. error = 0.22) and the fruit salad 3.81 (std. error = 0.20). The covariate appears in the model with the price score of 1.52, price level perception of 3.70, and pre post emotion of 1.51. The R^2 from this model was 44.2% and the $R^2_{Adjusted}$ was 40.5%.

Perception of Justice

When we analyzed the perception of justice by controlling the price variable as a covariate, the data showed that the participants perceived the price change situation involving the slice of cake choice ($\bar{x}_{Cake} = 4.43$) as more fair than the situation involving the fruit salad choice ($\bar{x}_{Fruit} = 3.89$) ($F(1,65) = 4.65$; $p = .035$). The covariate appears in the model with the price score of 1.52, price level perception of 3.70, and pre post emotion of 1.51. The R^2 from this model was 57.1% and the $R^2_{Adjusted}$ was 54.2%.

Therefore, in unfair situations with controlled price-level perception, consumers perceive price changes as more unjust and unfair when purchasing utilitarian products compared to hedonic products, which supports the first hypothesis.

Anger

To verify fourth hypothesis, "In unfair situations, consumers feel more anger toward utilitarian products than toward hedonic ones", we used the anger score as a dependent variable. Because the emotion scale was presented in two diferent periods, before price change or after price change, we used the order of emotions as a second independent variable. Table 2.5 shows the average scores for each condition. Note that before the price change in the slice of cake, no one was angry. After the price change, all of the participants were more angry than before.

Table 2.5 – Average Score for Anger

Conditions	Pre_Post_Emotion	Mean	n
Cakes	Before_Change	1.00	15
	Post_Change	2.40	15
Fruits	Before_Change	1.71	17
	Post_Change	3.11	18

Running the GLM, we observed that the price change and the products were significantly different $F_{Products}(1,65) = 4.90$; $p = .031$ and $F_{Emotin\_order}(1,65) = 19.20$; $p < .001$. However, there were no interactions ($F_{Product*Emotion\_order}(3,63) < .001$; $p = .994$). The R^2 from this model was 28.7% and the $R^2_{Adjusted}$ was 25.2%.

Additional tests with the other emotions were done. In the surprise emotion, participants were surprised when the price changed ($F(1,65) = 5.99$; $p = .017$), but there were no differences in the products ($F(1,65) = .03$; $p = .860$). No interaction was found. Similar answers were found for sadness. After the price change ($\bar{x} = 1.92$), the participants became sadder than before ($\bar{x} = 1.33$) ($F(1,65) = 7.20$; $p = .009$), but there was no statistical significance in the product or in the interaction.

On the joy scale, a similar result was found, where participants became less happy after the price change ($\bar{x} = 1.47$) than before ($\bar{x} = 4.60$). It is important to note that in the cake purchase, the consumers felt happier ($\bar{x} = 3.38$) than in the fruit purchase ($\bar{x} = 2.71$). However, this situation is not significant with 95% confidence ($F(1,65) = 3.46$; $p = .068$). The interaction is

also not significant at the 0.05 level ($F(3,62) = 3.19$; $p = .079$). The R^2 from this model was 59.8% and the $R^2_{Adjusted}$ was 57.8%.

2.3.2 Study Two

The second study was done to verify the hypothesis H_{1A}, H_{1B} again, plus H_{2A}, H_{2B}, H_{3A}, H_{3B}. In this study, participants saw a different context, we manipulated the price change up and down and the emotion scale was presented twice (before price change and after price change).

2.3.2.1 Pretest I

To define the products, 20 products – 10 more hedonic products (e.g. songs, chocolate, art set) and 10 more utilitarian products (e.g. alkaline battery, paper toilet) – from Amazon's website were chosen by the author based on the literature (Chaudhuri, 2012; Hirschman & Holbrook, 1982; Okada, 2005; Voss et al., 2003) for a pretest. 31 Americans participated in the questionnaire that was created online using Qualtrics.

The participants saw all of the 20 items, one at a time, and responded to the Voss, Grohmann, and Spangenberg's adapted scale (2003). The full scale has 10 questions as described before, but because participants had to evaluate 20 products, we decided to ask them 6/10 questions (functional–not functional; necessary–unnecessary; practical–impractical) for the utility scale and (not fun–fun, not thrilling–thrilling and unenjoyable–enjoyable) for the hedonic dimension. In addition to these questions, the participants were asked how much they usually pay for each product.

Data were collected through an online panel. As a requested filter, only Central and Eastern United States residents participated in the study. Ten products (five from each extreme hedonic and utilitarian) were chosen. Appendix B illustrates graphically the means and the standard errors from each statement of the scale for all the products tested. As an additional test, the ANOVA with repeated measures and with a pairwise test was done with the ten products. The results show that although the products have both hedonic and utilitarian dimensions, they can be considered more hedonic than utilitarian, with statistical significance in both scales of the hedonic dimension and the utilitarian dimension. Appendix C presents a table with the means and standard deviation for each product on both scales. The pairwise test is also presented.

The utilitarian products were: Stainless Steel Scissor; 4 Pack AA – Pre-Charged Rechargeable Batteries; Charmin Toilet Paper – 6 Mega Rolls; Any Angle Broom; Bayer Aspirin 3325 Mg

Coated Tablet. The hedonic products were: 120 Piece Deluxe Art Set; Liberty School Cabernet Sauvingnon Wine – 750 ml; Pack of 4 KitKat Minis – Chocolate –11 Ounce Bags; Board Game – Wordplay; 6 iTunes Songs.

In order to understand how much consumers pay for each product, we asked them to say how much they usually pay for each product. Table 2.6 shows the average price responses.

Table 2.6 – Products and Average Price

Products	Average Price	Standard Deviation	Products	Average Price	Standard Deviation
Scissor	$5.70	$4.14	**Online Songs**	$8.27	$4.01
Battery	$9.22	$4.26	**Art Set**	$23.88	$10.71
Toilet Paper	$10.52	$1.97	**Board Game**	$18.30	$6.92
Broom	$11.62	$4.68	**Wine**	$12.00	$4.51
Medicine	$6.00	$3.07	**Chocolate**	$15.00	$3.07

2.3.2.2 Pretest II

Thirty eight consumers from an American online panel participated in the pretest. After the instructions, the participants saw the stimulus and ordered the products they wanted to purchase. Webpages, similar to Amazon, were created. In one webpage, five hedonic products were displayed. In a second webpage, five utilitarian products were presented (see Figure 2.3). We decided to give to participants some options, because low involvement could be a problem in the experiment. After that, the participants were asked to imagine that they bought the product ranked number one. To facilitate their imagination, the system showed them the product ranked number one again. To make the situation more realistic, the participants were asked to add the product to their cart and simulate a purchase situation. After that, the second stimulus was presented. The participants were asked to imagine that after they received the product at home, they decide to purchase something else online. Next, they saw the product they previously purchased with a different price. The new price was 25% lower than before. The different price was not presented with the percent discount, it only presented the new price in dollars. Based on this situation, the participants answered all of the dependent variable scales and the manipulation checks. In addition, at the end of the study, we asked the participants to say how much they usually pay for each product that they had seen in the beginning of the study. Since they had a reference price in the beginning, the standard deviation was lower and prices were close to the market price. To make the product a little bit more attractive to participants, we used prices 10% lower than the real price offered on Amazon's website. Table

2.7 presents how much participants usually pay for each product, along with the highest and the lowest price they had already paid. In addition, the real price (Amazon/Market price – August 2013) and the prices defined to be used in the study are listed.

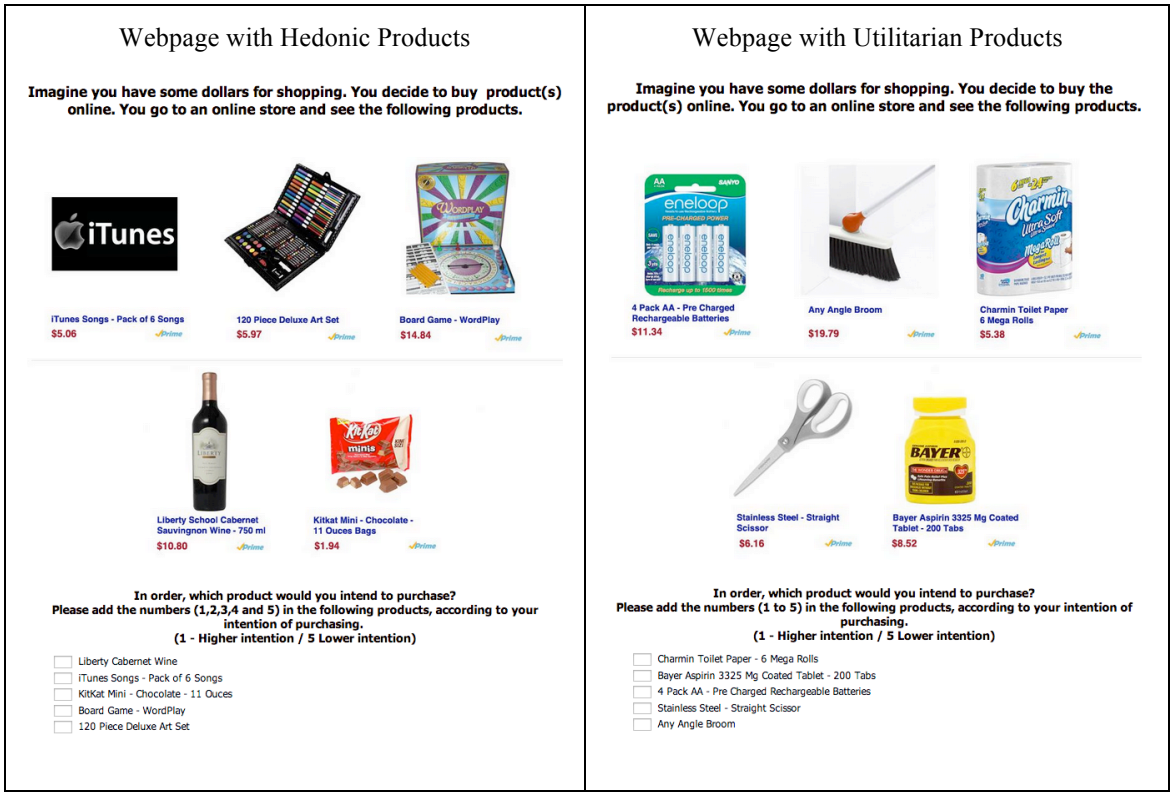

Figure 2.3 – Stimulus for Hedonic and Utilitarian Products

Table 2.7 – Defining Prices

Products	Average	Lowest	Highest	Real	Used
Scissor	$6.00	$5.00	$12.00	$6.84	$6.16
Battery	$9.13	$6.50	$13.75	$12.60	$11.34
Toilet Paper	$13.91	$10.29	$17.82	$11.95	$10.76
Broom	$20.00	$10.00	$30.00	$21.99	$19.79
Aspirin	$9.00	$7.00	$12.00	$9.47	$8.52
iTunes	$6.75	$5.25	$9.62	$7.50	$6.75
Art Set	$10.00	$8.00	$19.99	$8.85	$7.97
Board Game	$18.65	$14.75	$19.90	$21.99	$19.79
Wine	$13.11	$8.00	$36.84	$16.00	$14.40
Chocolate	$11.92	$7.92	$14.32	$11.52	$10.37

To verify if the manipulation was as expected, participants answered the full hedonic and utilitarian scale for the product chosen. As a result, it is clear that people perceive the hedonic products as more hedonic than utilitarian products and vice-versa. The factor analysis confirms

that the products have two different dimensions (hedonic and utilitarian). The test KMO was 0.84, with an approximate Chi Square of 290.43 (Bartlett's Test of Sphericity). The lowest communality was 0.67 and the highest 0.83. The two factors (dimensions) had a total of 76.8% of the variance explained. More details are presented in Table 2.8.

Table 2.8 – Factor Analysis and Cronbach's Alpha Hedonic and Utilitarian Scale

Rotated Component Matrix

Component	**1**	**2**	**Communality**
Practical:Impractical	0.900		0.834
Effective:Ineffective	0.871		0.771
Helpful:Unhelpful	0.854		0.770
Necessary:Unnecessary	0.818		0.829
Functional:Not Functional.	0.784		0.712
Dull:Exciting		0.834	0.813
Not Thrilling:Thrilling		0.828	0.687
Unenjoyable:Enjoyable		0.824	0.781
Not Fun:Fun		0.810	0.816
Not Delightful:Delightful		0.803	0.670
Eigenvalues %	39.8%	37.0%	76.8%
Cronbach's Alpha	0.917	0.906	0.915

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 3 iterations.
(1) = Utilitarian dimension
(2) = Hedonic dimension

As a result of the pretest, we decided to slightly change the description of the first stimulus, asking the participants to imagine having $20 instead of some dollars. A few words on the scales of the perception of justice and price fairness were adjusted to clarify that the questions were about the second price and not the first one. Regarding the prices, we decided to keep the 10% lower than the market price in order to be more realistic. To verify the emotion scale and if the literature was consistent (price change evokes emotion), a third pretest was developed.

2.3.2.3 Pretest III

The third pretest was similar to the second one. In this pretest, we tested the emotion scale from Richin (1997) and the negative emotions evoked from changing prices, in conformation with the literature. We tested happiness, sadness, anger, and surprised emotions. The participants answered 12 adjectives according to their price perception. These emotions were requested twice: before the price changes and after, as presented on the workflow in Figure 2.4. Another difference is that we tested the price change going 25% up and 25% down.

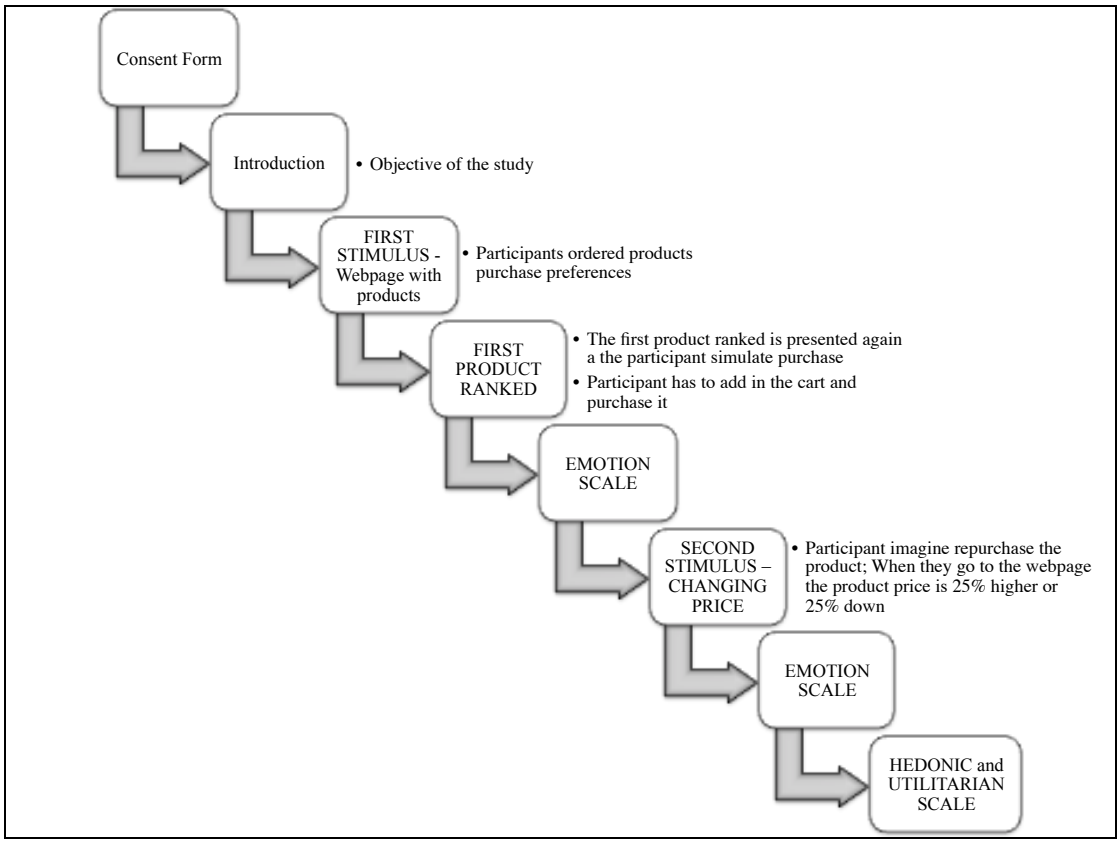

Figure 2.4 – Workflow from Pretest III

156 people participated in the pretest, where 36 people saw hedonic products and decreased price; 42 people saw hedonic products and increased price; 38 people saw utilitarian products and decreased price; and 40 people saw utilitarian products and decreased price. The number of people in each situation is not significantly different (Fisher's Exact Test = .44; $\chi^2 \geq .75$). For $\alpha = 0.05$, we have $p = .436 > \alpha$, thus there is evidence to accept H_0, which means in 5% of the significance level, there is no evidence that the number of people in each cell is different.

Consistent with the previous pretest, the factor analysis shows two product dimensions ($\alpha_{hedonic}$ = 0.875 and $\alpha_{utilitarian}$ = 0.924). The products used in the study were considered different on both scales. On the utilitarian scale, the utilitarian average score was 2.07 versus the hedonic average score of 3.65. In this scale, a lower score means more utilitarian characteristics. This difference was also statistically significant $F(156,1) = 73.96$; $p < .001$. On the hedonic scale, the hedonic average score for hedonic products was 6.55 versus 4.10 for utilitarian products. On this scale, a higher score means more hedonic characteristics.

The comparison of means, ANOVA, shows this difference $F(1,156) = 162.57$; $p < .001$. In other words, for $\alpha = 0.05$, we have $p = .001 < \alpha$, thus the H_0 is rejected, which means in 5% of the significance level, there is evidence that the products are evaluated differently on both scales.

Table 2.9 – Factor Analysis and Cronbach's Alpha – First Presentation

Rotated Component Matrix			
Component	**1**	**2**	**Communality**
BS_Irritated	0.906		0.821
BS _Depressed	0.903		0.817
BS_Angry	0.903		0.817
BS_Frustated	0.888		0.789
BS_Miserable	0.887		0.788
BS_Sad	0.873		0.767
BS_Amazed		0.779	0.678
BS_Joyful		0.745	0.607
BS_Happy		0.688	0.584
BS_Surprised		0.649	0.613
BS_Astonished		0.620	0.604
BS_Pleasead		0.589	0.545
Eigenvalues %	47.0%	24.0%	71.0%
Cronbach's Alpha	0.925	0.847	0.675

Rotation Method: Varimax with Kaiser Normalization.
Note: BS = Before Stimuli; (1) = Negative dimension; (2) = Positive dimension

In regards to the emotional questions, we ran the factor analysis twice, one for the emotion scale presented between the stimulus and a second for the emotion scale after the price change. The results of the analysis were very similar. In both cases, the factor analysis showed two groups of emotions, which we consider as negative emotions and positive emotions. The KMO in both cases were satisfactory ($KMO_{First\_Emotion\_Scale}$ = 0.89; Bartlett's Test of Sphericity = 1380.51) ($KMO_{Second\_Emotion\_Scale}$ = 0.87; Bartlett's Test of Sphericity = 1484.22). Table 2.9

shows the rotated components, the communality, the Eigenvalues, and the Cronbach's Alpha from the first emotion scale. Table 2.10 shows the data from the second emotion scale presentation.

Table 2.10 – Factor Analysis and Cronbach's Alpha – Second Presentation

Rotated Component Matrix			
Component	**1**	**2**	**Communality**
Frustrated	0.862		0.755
Sad	0.859		0.739
Angry	0.858		0.741
Irritated	0.854		0.801
Depressed	0.827		0.701
Miserable	0.814		0.689
Amazed		0.812	0.660
Astonished		0.786	0.685
Joyful		0.757	0.758
Happy		0.676	0.820
Pleased		0.667	0.795
Surprise		0.604	0.376
Eigenvalues %	47.0%	24.0%	71.0%
Cronbach's Alpha	0.925	0.847	0.675

Rotation Method: Varimax with Kaiser Normalization.
Note: (1) = Negative dimension; (2) = Positive dimension

When we analyzed the specific emotions, in both situations when the scale was presented, we had good Cronbach's Alpha validity with the lowest alpha iquals 0.767 and the highest alpha iquals 0.939. Table 2.11 shows each emotion calculated and the alpha.

Table 2.11 – Specific Emotions

Emotions	Adjective	First Presentation	Second Presentation
Anger	angry, irritated, frustrated	α = 0.914	α = 0.902
Sadness	sad, depressed, miserable	α = 0.900	α = 0.887
Joy	joyful, happy, pleased	α = 0.767	α = 0.939
Surprise	surprise, amazed, astonished	α = 0.821	α = 0.768

To verify that the participants perceived the price variation, one question was used as a manipulation check: "In this situation, in comparison to the initial price, the updated price was (higher, lower, the same)". As a result, 71 of the 74 participants in the decreased price stimuli and 78 of the 82 participants in the increased price stimuli answered the manipulation check correctly.

We also evaluated if price change could evoke emotion, as presented in the literature. To do this, we first deleted participants from the sample who did not correctly answer the manipulation check. Next, we ran ANOVA with emotion as the dependent variable and the price change stimulus as the independent variable. The results showed that when consumers imagined paying more than others for the same product ($\bar{x}$ = 3.13), they felt more anger compared to those who imagined paying less ($\bar{x}$ = 1.98). $F(1,149) = 39.30$; $p < .001$. They also felt sadder ($\bar{x}$ = 3.15) compared to those who imagined paying less ($\bar{x}$ = 2.40) $F(1,149) = 11.33$; $p < .001$. The opposite occurred with positive emotion. The participants felt happier when they thought they had paid less ($\bar{x}$ = 4.320) compared to those who imagined paying more ($\bar{x}$ = 2.89) ($F(1,149) = 30.12$; $p < .001$). The surprise emotion did not have any significant difference in both cases, which might be due to consumers feeling some surprise after seeing the price differences in the American economy, which is relatively stable $F(1,149) = 1.96$; $p = .163$.

2.3.2.4 Analysis

In a similar manner, small adjustments were made for running the experiment. First, we made the font size of the prices slightly bigger to make sure that all of the participants could see the prices. In addition, demographic questions were added in the questionnaire, such as gender, age, marital status, level of education, yearly income, employment status, and frequency of purchasing online.

Consistent with the pretests, we collected data from an American panel, focusing on Central and Eastern United States residents. According to the panel company, each participant received credits for participating in the study. The participants were randomly assigned to one of four between subject conditions as presented in Table 2.12.

Table 2.12 – Experiment Design

Product Type	Price Decreased (Customer paid more)	Price Increased (Customer paid less)	Total
Hedonic	32	33	65
Utilitarian	34	30	64
Total	66	63	129

The participant sample consisted of 79% Caucasians, 8.5% African Americans, and 5.4% Asians. 36.6% of the participants shop every week, while 19.8% of the participants shop two or three times a week. The majority of participants have a yearly income lower than $9,999 (22.9%), followed by 18.3% of participants with an income of $10,000 to $19,999; 12.2% with

an income of $20,000 to $29,999, 12.2% with an income of $30,000 to $39,999, 10.7% with an income of $40,000 to $49,999, and 23.5% with an income more than $50,000. The majority of participants were single (53.4%), followed by 33.3% of married participants.

The manipulation check regarding price change (in comparison to the initial price, the updated price was... (higher, lower, the same)) showed that all of the participants answered correctly. In other words, 66 participants said that the price was lower and they paid more that they should, 63 participants said that they paid less than another consumer, and no participant said that the price was the same.

Regarding the utilitarian and hedonic products, consistent with the pretest, the factor analysis showed that the products have two dimentions (KMO = 0.88; Bartlett's Test of Sphericity = 1031.25) explaining 77.3% of the variance. Table 2.13 shows the rotated components, communality, and variance explained by each dimension and Cronbach's Alpha.

Table 2.13 – Factor Analysis and Cronbach's Alpha for Study Two

Rotated Component Matrix			
Component	**1**	**2**	**Communality**
Dull – Exciting	0.920		0.723
Not Fun – Fun	0.906		0.754
Not Delightful − Delightful	0.896		0.743
Unenjoyable − Enjoyable	0.884		0.887
Not Thrilling − Thrilling	0.867		0.773
Helpful − Unhelpful		0.838	0.786
Practical − Impractical		0.834	0.679
Functional − Not Functional		0.826	0.705
Effective − Ineffective		0.824	0.883
Necessary − Unnecessary		0.82	0.810
Eigenvalues %	41.8%	35.7%	77.4%
Cronbach's Alpha	0.945	0.894	0.895

Rotation Method: Varimax with Kaiser Normalization.
(1) = Hedonic dimension / (2) = Utilitarian dimension

Using this scale as a manipulation check, we can assume that consumers perceived the products differently, where the "hedonic products" had more hedonic characteristics than the "utilitarian products". The ANOVA shows the statistical significance of these differences. Using the hedonic scale dimension, the hedonic products had an average score of 5.26 (sd = 0.99), while the utilitarian products had an average score of 3.04 (sd = 1.37). On this scale, a higher number means more hedonic attributes ($F(1,129) = 112.43$; $p < .001$). On the utilitarian scale, a lower

score means more utilitarian attributes. In this case, the utilitarian products had an average score of 1.82 (sd = 1.06), while hedonic products had an average score of 3.46 (sd = 1.10) $F(1,129) = 75.29$; $p < .001$. Figure 2.5 presents the same results in a graphic view.

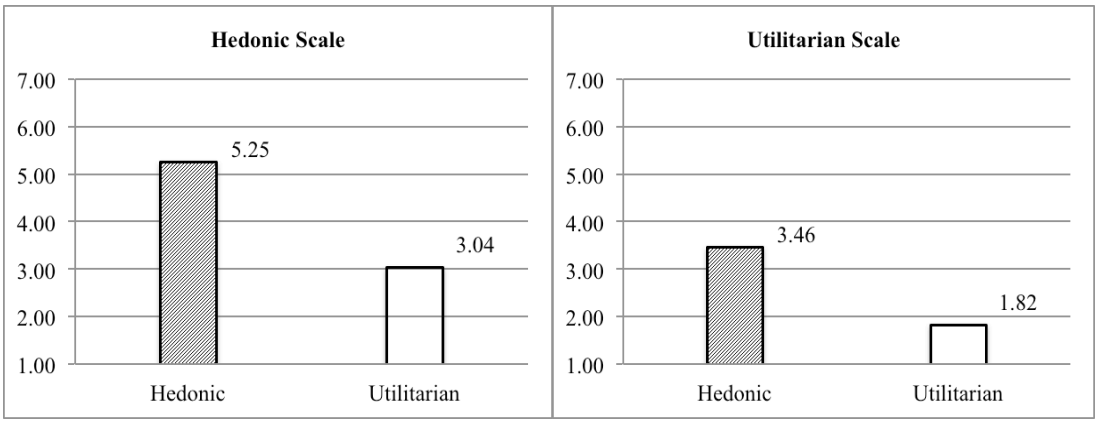

Figure 2.5 – Product Perception: Manipulation Check

Since the manipulation checks were consistent with our expectations, we analyzed the price perception scale. The Cronbach's Alpha for the Price Perception Scale showed an acceptable result $\alpha_{(4\ items)} = 0.771$ (George & Mallery, 2003). The univariate statistic test shows that with 95% confidence, there is no difference between hedonic ($\bar{x} = 4.63$, sd = 0.88) and utilitarian products ($\bar{x} = 4.34$, sd = 0.95) price perception ($F(1,129) = 3.04$; $p = .083$). It is important to remember that this scale was used before the price change and the participants answered this scale only for the product that they ranked with the highest interest of purchasing.

We present these test for the dependent variables: perception of justice ($\alpha_{(5\ items)} = 0.892$) and price fairness ($\alpha_{(3\ items)} = 0.844$).

Normality and Homogeneity of Variances Test

We tested the normality test using the goodness of fit test, more specifically Kolmogorov-Smirnov and Shapiro-Wilk tests. In result, we cannot say that the perception of justice or the price fairness data are normally distributed because the significant results are smaller than 0.05. Table 2.14 shows these statistics, along with the mean and standard deviation for this sample.

We used the Levene's test for analyzation. In result, the data shows a homogeneous variance on both scales for price fairness: Levene test ($F = 1.52$; $p = .214$) and the perception of justice: Levene test ($F = 0.89$; $p = .451$). The Levene's test verifies whether or not the variances of the

groups are statistically different. Using a 0.05 probability level to determine statistical significance, we conclude that there is no significantly different variance. Thus, the data shows homogeneity (George & Mallery, 2003).

Table 2.14 – Normality Test for Dependent Variables

Test / Dependent Variables	Price Fairness		Perception of Justice	
	Statistic	Significance	Statistic	Significance
Kolmogorov- Smirnov	0.145	< .001	0.144	< .001
Shapiro-Wilk	0.922	< .001	0.954	< .001
Mean / Standard Desviation	$\bar{x}$ = 5.13, sd = 1.26		$\bar{x}$ = 4.84, sd = 1.14	

Although the normality test was not ideal for running the GLM, this test is considered to be a robust test (George & Mallery, 2003). To make sure that we are not violating a Type I error, we used the GLM and the non-parametric analyses in the study to validate the parametric test. After all of these analyses, we were ready to test the hypotheses from this study.

To test the hypotheses, we ran the GLM using the products (hedonic and utilitarian) as the independent variable and the price fairness scales and the perception of justice as the dependent variable.

Price Fairness

In the situation where the consumer paid more than he or she could have paid, the participants in the hedonic purchase condition ($\bar{x}$ = 5.20, sd = 1.21) reported a greater inclination for fairness than the participants in the utilitarian purchase condition ($\bar{x}$ = 4.64, sd = 1.27). The same occured in the situation where the consumer realized that he or she paid less than the new price; the participants in the hedonic purchase condition ($\bar{x}$ = 5.62, sd = 0.92) perceived the price as more fair than the participants who only saw utilitarian products ($\bar{x}$ = 5.06, sd = 1.47) $F(1,129) = 6.63$; $p = .011$. However, this test does not show a significant difference with 95% confidence for the perception of price fairness when the price changed $F(1,129) = 3.68$; $p = .057$. While some authors would say that this result is marginally significant, we prefer not to consider any differences. One explanation for this is that the participants in both situations consider the price change as unfair. The interaction with these two variables is not significant $F(3,127) < 0.01$; $p = .991$. This model had a R^2 of 7.7% ($R^2_{Adjusted}$ = 5.5%).

When we ran the same model with the price perception level as a covariate, we came to a more accurate result. The covariates were measured before the stimulus and used in the statistical analysis to minimize the variance under these variables. Using the Price Level Perception as a covariate, the means in each cell were adjusted as presented in Table 2.15.

Table 2.15 – Results Price Fairness

Conditions	Price Change	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Hedonic	Price Decreased: Cust paid more	5.10	0.17	4.76	5.45
	Price Increased: Cust paid less	5.56	0.18	5.21	5.91
Utilitarian	Price Decreased: Cust paid more	4.74	0.17	4.39	5.08
	Price Increased: Cust paid less	5.12	0.18	4.76	5.47

Covariates appearing in the model are evaluated at the following values: PREPLP = 3.87
Cust = Customer

With the price-level perception construct as a covariate, in the situation where consumers paid more than they could have paid, the participants in the hedonic purchase condition ($\bar{x}$ = 5.10, std. error = 0.17) reported an inclination for fairness compared to the participants in the utilitarian purchasing condition ($\bar{x}$ = 4.74, std. error = 0.17). The same occurred in the situation where the consumers realized that they paid less than the new price. The participants in the hedonic purchase condition ($\bar{x}$ = 5.56, std. error = 0.18) perceived the price as more fair than participants who saw only utilitarian products ($\bar{x}$ = 5.06, std. error = 0.18) $F(1,129) = 7.66$; $p = .006$. The nonparametric test (Mann-Whitney test) confirms that the null hypothesis is rejected with 95% confidence.

The participants also perceived price fairness in the increased and decreased price situation. When customers paid less than the new price, they perceived the price as more fair compared to when they saw that they could have paid more for the same product. This difference is significant $F(1,129) = 4.45$; $p = .037$). The interaction between these two independent variables were not found ($F(3,127) < 0.01$; $p = .960$). This model had a R^2 of 8.9% ($R^2_{Adjusted} = 6.7\%$). The nonparametric test (Mann-Whitney test) confirms that the null hypothesis is rejected ($p = .008$).

Perception of Justice

Using the perception of justice as the dependent variable, we verify that when consumers perceive that they paid more than others for purchasing utilitarian products, they perceive it as less just than if the product was hedonic. Table 2.16 shows the means in each condition. In both

situations where the price increased or decreased, the perception of justice is higher for hedonic products. In other words, the consumer perceives the price change as less just for utilitarian products F(1,129) = 5.61; p = .019. The nonparametric test (Mann-Whitney test) confirms that the null hypothesis is rejected (p = .03) with 95% confidence.

Table 2.16 – Means, Std. Error, and CI for the Perception of Justice

Conditions	Price Change	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Hedonic	Price Decreased: Cust paid more	5.14	0.20	4.73	5.54
	Price Increased: Cust paid less	5.22	0.20	4.82	5.63
Utilitarian	Price Decreased: Cust paid more	4.57	0.20	4.18	4.97
	Price Increased: Cust paid less	4.82	0.21	4.40	5.23

Cust = Customer

The same result was not found for the perception of justice related to the price change, where the participants saw a different price (higher or lower than what they imagined they paid). Rather, the participants scored these situations very similarly. Therefore, we did not find statistical differences in the F test (F(1,129) = 0.66; p = .417). The nonparametric test (Mann-Whitney test) confirms that the null hypothesis is accepted (p = .382) and that there are no differences between the groups.

The perception of price level is not a covariate for the perception of justice, so it does not change the previous results.

One explanation for this situation is that in the price fairness questions, the participants focused more on the price change situation. Meanwhile, in the perception of justice questions, they focused more on the situation evaluation in the context of purchasing on the internet.

Based on these analyses we can say that the hypotheses "H_1: When consumers perceive that they paid more than others for purchasing utilitarian products, they perceive it as less just than if the product was hedonic" and "H_2: When consumers perceive that they paid less than others for purchasing utilitarian products, they perceive it as less just than if the product was hedonic" are accepted when we measure the perception of price fairness. However, for the perception of justice in general, participants perceive the situation differently when the price decreased and the participants imagined paying more than they could have paid.

Anger

As described in the methods, the participants evaluated their emotions before the price variation (called previous emotions) and after the price change. We did this to guarantee that the price is the responsible for changing the participants emotions. We first ran the previous emotions, followed by the second emotion scale.

Using the categories: sadness, joy, anger, and surprise, there was a significant difference in the past emotions in the joy dimension for hedonic versus utilitarian products. This was expected and consistent with the literature because hedonic products are more related to emotions compared to utilitarian products. Table 2.17 shows the means for hedonic and utilitarian products in each emotion. It also includes the F test and the respective p-value.

Table 2.17 – Previous Emotions before Price Change

Emotions Before Stimuli	Mean		F-test	Significance
	Hedonic	Utilitarian		
BS_Anger	2.04	2.17	0.46	= .501
BS_Joy	6.21	4.89	11.02	< .001
BS_Sad	1.96	1.99	0.05	= .828
BS_Surprise	3.44	2.93	2.17	= .143

Note: BS = Before Stimuli

The second step was to run the GLM with the independent variables (kinds of products and price change) and the dependent variables (emotions). In all of the emotions, no interaction between both variables were found.

For anger, when consumer perceived paying more than others for hedonic products, they scored (from 1 nothing – 7 very much) an average of 3.91 compared to utilitarian 4.87. When participants realized that they paid less than another consumer, their emotion was for hedonic products was 3.09 and 3.94 for utilitarian products. The means show that consumers become angry when the utilitarian product price changes, regardless if the price increased or decreased. The between subjects test confirms a significant difference with 95% confidence ($F(1,129) = 5.21$; $p = .024$). Unsurprisingly, there is also a significant difference between the price variation. When consumers imagine purchasing a more expensive product, they feel more anger than when they imagine paying less than other people ($F(1,129) = 4.79$; $p = .030$). This interaction was not significant ($F(3,127) = 0.02$; $p = .893$). The R^2 from this model was 7.5% and the $R^2_{Adjusted}$ as 5.3%. Figure 2.6 presents the means graphically.

Analyzing the joy after the price change, we could not find any statistically significant difference (F(1,129) = 3.24; p = .075). However, hedonic products had a higher score ($\bar{x}$ = 3.63) for this emotion compared to utilitarian products ($\bar{x}$ = 2.95).

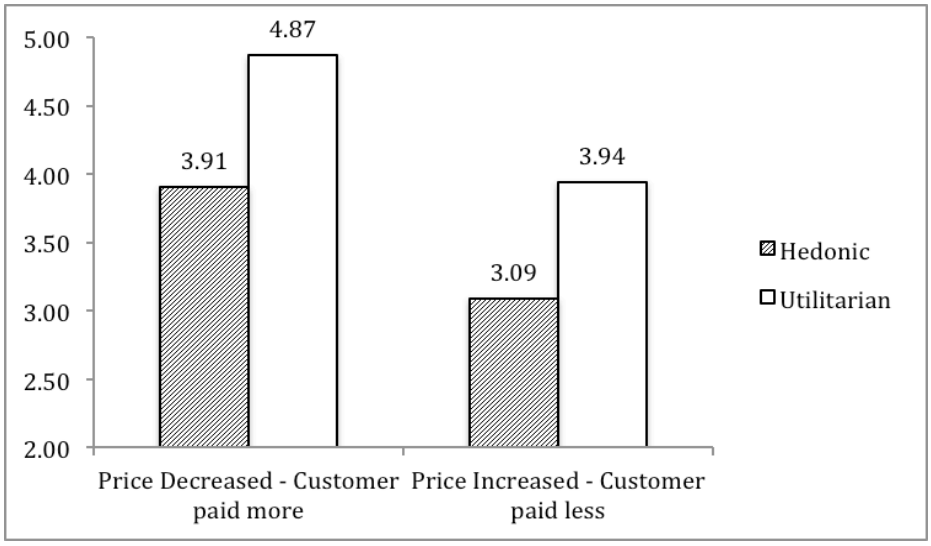

Figure 2.6 – Anger Average in Price Change of Hedonic and Utilitarian Products

Regarding sadness, the participants claimed to be more sad in situations where the price decreased (they paid more) and in utilitarian products. However, the average score in all of the conditions were very similar. In fact, there was no interaction or main effect with this emotion.

The same situation occured with surprise, where the participants evaluated the situation similarly. Since the average surprise score was 4.08, we could say that in all of the conditions, the participants received some surprise by the price change. Since these results are consistent with the literature and our hypothesis, we can say that the "H_4: In unfairness situations, consumers feel more anger to utilitarian products than hedonic ones" is accepted.

Mediator

To test the possible mediating of angry on perception of justice and price fairness, we used the PROCESS macro (Hayes, 2012) in SPSS21. Multiple regressions analysis using the Model 4 was ran. Mediation was tested using the bootstrapping method for the estimation of indirect effects (Preacher & Hayes, 2008; Shrout & Bolger, 2002).

As recommended it was used 5000 bootstrap resamples (Preacher & Hayes, 2008). Bootstrapping allows us to empirically estimate the sampling distribution on the indirect effect and generates a confidence interval (CI) for estimation and hypothesis testing. When the bias-

corrected bootstrap-confidence interval (CI) does not include zero means that an indirect effect is significant (Hayes, 2009; Preacher & Hayes, 2008).

The hypothesis H_{3A} – the relationship between price change perception and perception of justice will be mediated by anger was supported by the analysis. When consumers perceived that they paid more than others, the price change is positively associated with anger (β = .876, t(127) = 2.18, p = .031). That means, when the price was changed participants felt anger about it. We also found that anger was negative associated with perceive of justice (β= -.135, t(127) = 3.14, p = .002). That means when consumer felt anger less just the situation was perceived. The formal two-tailed significance test (assuming a normal distribution) demonstrated that the indirect effect was indeed significant with 90% of confidence (Sobel's $z = -1.73$, $p = .083$). However, with a bootstrapped 95% confidence interval (lower limit [LL] = −.014, upper limit [UL] = −.310), observe that the indirect effect do not contain the zero, what means that the indirect effect is significant. Thus, anger mediated the effect of price change on perception of justice, in support of Hypothesis 3_A.

Similary the hypothesis H_{3B} – the relationship between price change perception and price perception will be mediated by anger was supported by the boostrapping analysis. Again, when consumers perceived that they paid more than others, the price change is positively associated with anger (β = .876, t(127) = 2.18, p = .031). So, when the price was changed participants felt anger about it. We also found that anger was negative associated with price fairness (β = -.145, t(127) = 3.08, p = .003). That means when consumer felt anger less just the situation was perceived. The formal two-tailed significance test (assuming a normal distribution) demonstrated that the indirect effect was indeed significant with 90% of confidence (Sobel's $z = -1.720$, p = .085). Bootstrap results confirmed the Sobel's test results, with a bootstrapped 95% confidence interval around the indirect effect not containing zero (lower limit [LL] = −.014, upper limit [UL] = −.351). Thus, anger mediated the effect of price change on price fairness, in support of Hypothesis 3_B.

2.4 DISCUSSION OF RESULTS

Hedonic and utilitarian products had been explored in many contexts and in many theories. However, there was one gap regarding the exploration of the perception of justice after purchase. We used the perception of price fairness and the perception of justice separately, since one was specific to the price and the other was specific to the whole situation.

This paper aimed to show that the consumer's perception of justice and price fairness are different in purchase situations involving hedonic and utilitarian products. This was based on the assumption that emotional and rational attitudes are respectively associated with hedonic and utilitarian consumption (Alba & Williams, 2013; Kronrod & Danziger, 2013; Wertenbroch & Dhar, 2000).

Two experiments were done to verify how consumers reacted when they're aware that they paid less than others for purchasing utilitarian products, and also when they paid more than others for purchasing utilitarian products, when they perceived it as less just than if the product was hedonic. In addition, the experiments showed that consumers felt more anger to utilitarian products than hedonic ones, in unfairness situations.

This study contributed to managerial implications especially for pricing or promotion, which suggesting that strategy for marketing the products (hedonic as compared with utilitarian products) may be managed differently. The viability of online dynamic pricing or differential pricing for the same product from the same seller have been increasing especially in online retailing. The perception of unfairness may lead to negative outcomes to the retailing, including buyers leaving the exchange relationship, engaging to other consumers not to purchase in the same store, or trying to damage the company in some way (Campbell, 1999; Xia, Monroe & Cox, 2004) And we verified that consumers are much more sensitive to the price variation of utilitarian products than hedonic ones. It is important to say that the price fairness is not only important to online retailers, it is also a concern to consumers, to policy makers and politicians (Campbell, 2007b)

This study explored the perception of justice and price fairness in two different dimensions, using products presented by pictures. Future studies could explore additional dimensions of products, situations of choice, tradeoff, and other forms of stimulus presentations (e.g. words, movies, or real products). Other moderators and mediators could also be tested in the study.

3 DISCRIMINATORY PRICING, PRODUCT TYPE AND REPRESENTATION TYPE: THEIR IMPACTS ON PURCHASE INTENTION AND PRODUCT EVALUATION

3.1 INTRODUCTION

Psychology and, more recently, neuroscience studies have shown differences between words and pictures regarding information processing (Amit et al., 2009; Hinojosa et al., 2009; Knapp & Abrams, 2012; Miwa et al., 2014; Schlochtermeier et al., 2013).

The Stroop task is a test in which subjects are presented with words printed in different colors, and are instructed to name the colors as quickly as possible, ignoring the meaning of the printed word. When taking the Stroop test, participants usually tend to name more slowly information represented by words than by pictures (Glaser & Glaser, 1989; Lavy & van den Hout, 1993). Besides, there are evidences that pictures have privileged access to processing semantic and emotional information, as compared to words (Azizian, Watson, Parvaz & Squires, 2006; De Houwer & Hermans, 1994).

Words and pictures are two kinds of emotional stimuli heavily employed by marketing researchers, both in academia and in the marketplace. These stimuli are generally categorized as verbal, e.g. words or phrases, or pictorial, e.g. facial expressions, pictures or photos (Hinojosa et al., 2009). Online retail outlets, for example, may choose to show products on a list, using only words, or to include their photographs. Academic researchers, especially in experimental studies, often utilize pictorial and verbal stimuli to induce emotion (Schlochtermeier et al., 2013; Townsend & Kahn, 2014).

Closely related to the idea of words and pictures is the abstraction level from construal level theory. This theory proposes that individuals create interpretations for objects and events (Trope & Liberman, 2010). Researchers have shown that an event's or object's construal level can be high or low, being high when their representation is more abstract as compared to other events or objects (Trope, Liberman, & Wakslak, 2007; Trope & Liberman, 2003). Amit, Algom and Trope (2009) applied construal level theory to words and pictures and demonstrated, through eight studies, that objects represented by either words or images may have distinct abstraction levels, influencing the speed of their classification. The aim of this article is to go beyond response speed to analyze the influence of these types of representation on behavioral variables.

If there is a relationship between construal level and the type of object representation, and between the emotion conveyed by an item and the way it is presented, it may be assumed that the representation type (more abstract or more emotional) may exert a distinct influence on product evaluation. Thus, the aim in this chapter is to address the following questions: Could abstraction levels due to representation type influence product evaluation? Moreover, is this influence similar for emotional words or pictures? As emotional products represented either verbally or pictorially, we chose hedonic products, as they are more experiential and fantasy-related (Holbrook & Hirschman, 1982); and we compared them to utilitarian products, which may be perceived as more concrete (Botti & McGill, 2011).

To address the research questions, we chose the context of discriminatory pricing, a marketplace sales practice being increasingly employed (Jin et al., 2014; Weisstein et al., 2013; Xia & Monroe, 2010), thanks especially to new technologies. Discriminatory pricing means offering distinct prices according to the time of day, day of the week, month or year; it is related to supply and demand. Therefore, the price a customer is paying may be completely different from the one paid by another individual (Elmaghraby & Keskinocak, 2003). Discriminatory pricing is largely used in e-commerce and in areas such as entertainment, food and hospitality (Lii & Sy, 2009; Weisstein et al., 2013), which utilize both types of product representation (words and pictures). This pricing strategy may increase company profitability (Jin et al., 2014), but it may also entail negative consequences, such as a sense of unfairness.

So, in this study we aim to investigate perceptions of fairness and price unfairness, product perceived value, and repurchase intention in a post-purchase, post-choice situation, where the product (more emotional vs. less emotional) is presented either in a more abstract (verbal) or a more concrete way (pictures).

Three experiments were run. In the first study we verified the influence of representation type and product type on perception of justice, price unfairness and value, and repurchase intention. The second study was a replication of the first one, including new control variables and the emotions provoked by the situation as emotional variables. The third one confirmed results from studies 1 and 2 by verifying whether the differences found in situation and product evaluations occurred with diverse levels of discriminatory prices.

This study is relevant for marketing theory, as many academics utilize words and pictures as stimuli, but few address the differences due to representation types (Amit et al., 2009),

especially as they relate to consumers. It also contributes to understanding product evaluations in post-purchase situations, as opposed to during the choice process, which is mostly found in the literature (Aydinli et al., 2014; Shiv & Fedorikhin, 1999; Trope et al., 2007).

For practitioners, this study brings important contributions by showing how the way a product is exposed (with words or pictures) influences Perception of Justice, when consumers realize that discriminatory pricing is being practiced. For example, should a fast food restaurant menu describe offers with words or show pictures? How would customers perceive the use of dissimilar prices for various targeted audiences?

This article is organized as follows: first we present the theoretical background on which we based the formulation of hypotheses. Then, we described the three experiments, their analyzes and a discussion about the results. Finally, we present a general discussion, the study's limitations and suggestions for future research.

3.2 THEORETICAL BACKGROUND

3.2.1 Differences between Words and Pictures

In the famous "Stroop Task", created in 1935 by Stroop, subjects are presented with words printed in different colors and are instructed to name the colors as quickly as possible, ignoring the meaning of the printed word. For example, if the printed word reads "red", and the print color is red, the respondent must answer 'red'. But if the word reads "red" and is printed in green, the subject must answer 'green'. Often the words and colors do not match, so participants' performance slows down when they try to answer the color, because unconsciously they read and interpret the printed word. This test is very well-known in psychology and has other versions with non-linguistic or emotional stimuli. De Houwer and Hermans (1994) exploited stimulus valence by presenting words and pictures with either positive or negative valences. Their results confirmed the hypothesis that negative pictures are more quickly processed than positive ones; nevertheless, this difference was not found with word representations. That is, negative pictures have privileged access to semantic information, but there are no differences in the lexical process due to word valence. Similar results for automatic picture processing with word interference were found in Stenberg, Wiking and Dahl's (1998) study, in which negative images were processed more rapidly.

Information processing is different in the semantic and lexical systems, although they are connected. The semantic system controls the perception of objects and pictures and the execution of physical actions, whereas the lexical system provides perception of language and controls speech and writing. Such disparities between the information systems cause different response times and types with picture and word stimuli (Glaser & Glaser, 1989).

Some authors represent the semantic processing as a network of previous experiences, suggesting that individual experiences influence the process of interpreting an object (Kiefer & Pulvermüller, 2012). Therefore, the emotional meaning of a verbal stimulus can be considered, in general, to be learned, experienced, or mediated by culture (Hinojosa, Méndez-Bértolo & Pozo, 2010). This notion is appropriate, if we consider the emotional processing that some objects or words may provoke, such as a chocolate cake. The cake may bring memories of one´s grandmother, of a favorite bakery, or provoke a recollection of the smell of mother's baking. On the other hand, pictures may facilitate the semantic system by rendering this process automatic and influencing the emotional processing of a specific cake.

In order to understand whether words and pictures or photos may evoke emotions, several studies were done (Azizian et al., 2006; Hinojosa et al., 2009; Seifert, 1997) to show how pictures are superior to words in categorization speed and emotion arousal. However, the reasons why processing pictorial and verbal information differs are still obscure, leading researchers to discuss theories on: differences in information coding (Azizian et al., 2006), distinct brain areas where word and picture cognition happens (Pegna, Khateb, Michel & Landis, 2004), or similar brain areas, but with diverse response times (as suggested by Tempel et al., 2013), and so on.

Trying to understand why pictures and words exibit distinct response times in information processing, Schlochtermeir et al. (2013) ran a study using Magnetic Resonance Imaging (MRI). Twenty-one subjects inside a fMRI machine saw 84 items (40 neutral, 40 positive and 4 negative) represented by words, pictures and photographs. The results did not reveal any significant differences in the judgment valence of the several stimuli. In other words, regardless of representing stimuli by words, pictures or photos, the limbic and paralimbic regions associated with positive emotion processing, including the parahippocampal gyrus extending to the amygdala, the frontal pole and the anterior cingulate cortex, were activated. However, the emotional processing related to the complexity of the represented item turned out to be significantly different, arousing distinctly intense emotions. When subjects were presented

more complex stimuli, such as photos as compared to pictures, they got more detailed visual information that enhanced the neural activation of emotional processing. According to the authors, a theory of experience-based semantic representation might apply, in which concrete symbolic information is re-experienced from memory, while pictorial information is experienced more directly and may elicit a stronger emotional perception. The authors have also realized that, although emotional valence is accessed regardless of representation types, response times and intensity may be distinct.

Undoubtedly, many other articles still discuss why such disparities in emotional intensity exist, but the superiority in photo processing, as compared to words, is consensual. The most accepted explanation is that more detailed images have faster and more direct access to the identification process and, consequently, to emotional processing (Schlochtermeier et al., 2013; Townsend & Kahn, 2014). If we compare words to facial expression recognition, we can easily realize that images undergo automatic information processing, since recognition of the human face is practically instantaneous (Stenberg et al., 1998).

Tempel et al. (2013 p. 645) offer a good explanation on how words and pictures may be differentiated in terms of emotion: "While reading a concrete word, the imagination is evoked, activating a concept of the corresponding object. Thus, when reading the word "ROSE", one might imagine the most beautiful rose in the world or reactivate the memory of a particular rose given as a present to a beloved person. The word allows the imagination to run free. In contrast, while perceiving a pictogram or a picture, one is clearly more constrained by what is depicted. The pictogram of a rose also evokes the concept "ROSE", but holds our mental image on this particular flower, whether it appears beautiful or not." Within this concept of abstraction, we will now discuss construal level theory.

3.2.2 Construal Level Theory

Construal level theory is an account of how psychological distance of an item, object or event influences individuals' thoughts and behavior (Trope et al., 2007; Trope & Liberman, 2003). This theory assumes that different dimensions of psychological distance affect how an item is interpreted; such differences derive from the way the item is mentally construed, whether more abstractly or in more detail (Trope et al., 2007).

Although not only two levels exist, but a continuum, the authors define construal levels as high and low (Trope et al., 2007). Low-level construals are relatively unstructured, contextualized

representations that include subordinate and incidental features of events. Such features are details, definitions, and specific information. High-level construals are more structured representations of an item, belonging to a network, ranking or categorization; in other words, they are more schematic. In general, they are organized hierarchically and defined along object, trait and goal-directed action categorizations. High-level construals are more decontextualized, in an attempt to extract the gist from the available information (Trope et al., 2007).

According to Trope and Liberman (2010), as one event moves to higher levels in one categorical hierarchy, its representation is increasingly less specific and more abstract. Consider a 'ball', as an example. The ball may be considered a low-level construal, in contrast to "football". The representation for ball is more concrete, detailed and specific than for football, which is a more comprehensive and abstract word. In categorizing football, we imagine the players and objects necessary for playing. But even the ball could be represented as a high-level construal with a higher degree of abstractness, in comparison to a marble, for example, which is a more concrete, objective idea that does not necessarily need a context.

There is a relationship between an event's psychological distance and abstractness. Some authors posit that this occurs due to a likely connection with experience, information and knowledge regarding the event itself (Trope et al., 2007). The level of psychological distance may even interfere with individuals' evaluation, choice, prediction and behavior (Trope et al., 2007).

Psychological distance is being studied along several dimensions: time (Koehler, Breugelmans & Dellaert, 2011), space, and social distance (Trope et al., 2007). More recently, the notion of psychological distance in verbal (vs. pictorial) representations has been investigated (Amit et al., 2009).

According to Amit et al. (2009), there is a difference between verbal and pictorial representations related to their own psychological distance, be it temporal, spatial, or social. The authors posit that concepts are organized in the cognitive system; as words are concepts, consequently they are organized in a hierarchical structure of categories, similarly to higher-levels in construal level theory. In order to demonstrate that words are related to high-level construal, whereas pictures are examples of low-level construal, eight experiments were run (see Amit et al., 2009 for further information).

Pictures are more concrete, more detailed, and specific representations; i.e., they are particular as are objects in nature, whereas words are more abstract representations carrying the gist of the object. Words are not subjected to perceptual analysis. Usually, a wider set of references is needed to develop a mental image of the object. A word may represent a category, or be interpreted as such, whereas a picture can often form a singular representation (Amit et al., 2009).

Based on the previous discussion, we presente the hypotheses of this chapter.

3.2.3 Developing Hypotheses

Consumers evaluate differently hedonic and utilitarian products (Alba & Williams, 2013; Botti & McGill, 2011; Choi et al., 2014). Several authors have demonstrated that, when choosing between a hedonic and a utilitarian good, individuals are usually less sensitive to price when it comes to hedonic products (Alba & Williams, 2013; Chandon, Wansink, & Laurent, 2000; Khan et al., 2004; Khan & Dhar, 2010).

In Chapter 2 we developed two experiments with hedonic and utilitarian products represented by pictures. The results showed that Perception of Justice and perception of price unfairness are seen in distinct ways, depending on product type. With hedonic goods, consumers seem to place less importance on price and thus worry less about pricing discrepancies; this affects less perceptions of justice and of price unfairness. On the other hand, utilitarian products are less emotional and thus more related to cognitive issues. In situations with price changes, these products suffer a stronger emotional influence. The authors show that, in unfair situations, anger mediates perception of justice. So, utilitarian products are more influenced by anger and are perceived as more unfair in situations of price change, as compared to hedonic products. Based on this study and on product representation types, two hypotheses were formulated.

> **H_{1A}: With visual representations (pictures), when a consumer pays more than another individual for a utilitarian product, they perceive this situation as less just, as compared to similar situations with a hedonic product.**

> **H_{1B}: With visual representations (pictures), when a consumer pays more than another individual for a utilitarian product, they perceive the price paid as less fair, as compared to the price of a hedonic product.**

These hypotheses will be tested again in this article, adding the notion (subsequently discussed) that product representation type may influence results. Still, to complement the studies with hedonic and utilitarian products we included two extra constructs, besides perception of justice and price unfairness: value perception and repurchase intention.

There are several definitions for perceived value, as can be seen on Table 3.1. Yet, it is most commonly defined as the relationship, or trade-off, between quality and price.

Table 3.1 – Perceived Value Definitions

Definitions	Authors
"Value is the consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given."	(Zeithaml, 1988, p. 14)
"Perceived value, conceptualized as a cognitive trade-off between perceived quality and sacrifice."	(Dodds, Monroe & Grewal, 1991, p. 316)
"Value Perceptions [...] are based on perceptions of product quality (what consumers get from an exchange) and price (the monetary and non-monetary aspects of what consumers give up in an exchange)."	(Baker, Parasuraman, Grewal & Voss, 2002, p. 121)
"Price value image also reflects product quality and store attributes."	(Zielke, 2006, p. 300)
"The real price of things is related to the work and sacrifice required for their acquisition. If something is difficult or laborious to obtain, then it is expensive. Contrariwise, things that may be obtained easily or require little work to obtain are cheap."	(De Toni & Mazzon, 2013, p. 4)

Zeithaml (1988) defines perceived value as the global evaluation of a product's utility based on consumer perceptions of what is received and given. The idea of receiving is related to costs and benefits, that is, perceived value is conceptualized as the relation between the benefits a costumer perceives in comparison to perceived costs. Benefits may be understood as a product's concrete attributes, such as durability and appearance, or as its abstract attributes, e.g. convenience and security. This value is a subjective one, since it represents a judgment made by the consumer that involves mental, emotional and physical factors – a sort of estimate of product benefits and costs. Whittaker, Ledder and Kalafatis (2007) state that perceived value varies according to the situation in which the product is presented, and with time, experience and competition.

Dodds, Monroe and Grewal (1991) propose a pricing model in which product perceived value is related to its actual price, perceived price, perceived product quality, and the sacrifice incurred in purchasing it. Based on this model, when perceived benefits are constant, changes in perceived value are basically related to the sacrifices perceived by the consumer. In other words, when perceived benefits are constant, the price becomes an external product feature that is able to alter perceived value. It is worthy noticing that the price has a mental representation, defined as perceived price. Thus, even if a product has a definite monetary price, it may be judged distinctly by various individuals.

So, when the product is kept constant and its price is raised by the vendor, and the price raise is perceived by consumers, justifiably there will be interference in product value perception. Assuming that this perception of justice, mediated by anger, will exert a stronger impact on utilitarian products than on hedonic products, as mentioned before, we propose the following hypothesis:

> **H_{1C}: With visual representations (pictures), when a consumer pays more than another individual and realizes the price discrepancy, for a utilitarian product perceived value will be lower than for a hedonic product.**

The relationship between product perceived value and willingness to buy is no novelty in the marketing literature, as several studies have shown this connection (Baker et al., 2002; Dodds et al., 1991; Zielke, 2006). Perception of value is directly and positively related to purchase intention (De Toni & Mazzon, 2013). When a product's perceived benefits are constant, the higher the actual or perceived price, the lower the purchase intention. So, if price changes influence more heavily the perceived price of a utilitarian product represented by a picture, we may assume that, in discriminatory pricing situations, repurchase intention will be lower for this product than for a hedonic one.

> **H_{1D}: With visual representations (pictures), when a consumer pays more than another individual and realizes this unfair situation, they show lower intention to repurchase the same utilitarian product, as compared to the same situation involving hedonic products.**

But, what happens when the product is not represented by a picture, that is, by a tangible and highly emotional stimulus? Picture stimuli convey more emotion than words, and that product representation types produce distinct cognitive distances, therefor it may be assumed that different products will be unequally evaluated.

Hedonic products involve greater imagination and are bought in anticipation of a desire, an experience, or a fantasy (Hirschman & Holbrook, 1982; Holbrook & Hirschman, 1982), with the expectation of a pleasurable purchase and consumption experience (Alba & Williams, 2013). Hence, it can be said that such a product has a more abstract quality, as compared to utilitarian products, which are more practical and functional (Botti & McGill, 2011), and thus less imaginative and more concrete.

In choosing a hedonic product, customers expect it to be pleasurable and to produce an enjoyable sensation for a period, which is usually expected to be longer than it actually is. In order to define this sensation and its timing, individuals tend to measure and calibrate their expectations and predictions. Yet, several authors have already shown that, in affective predictions, individuals tend to overestimate the duration, intensity and reactions to a certain situation (Alba & Williams, 2013).

Consequently, we may suppose that, when consumers wish to buy a more imaginative, intangible product, with a lower construal level, they will have to create their expectations based on a more abstract conception, regardless of product representation type. In other words, the cognitive distance in the experience of shopping for a hedonic product will not be largely influenced by product representation type. But, when it comes to a concrete, well-defined product used for practical reasons, a more abstract representation type (verbal) or a more direct one (pictorial) could influence how this product is perceived.

This being so, if someone faces a discriminatory pricing situation seen as unfair when purchasing a utilitarian product represented by a word, their cognitive process is altered. According to Fujita, Trope, Liberman and Levin-Sagi (2006), when an individual is oriented toward a certain activity, this activity may become a cognitive priming and alter a subsequent action. When an individual imagines shopping for a utilitarian product, there is interference in the subsequent activity from the perception of justice and the pricing discrimination. Even if the price modifies consumer construal level, there will be an influence of the initial processing on product judgment. When there is a perception of price changes, we assume that both the

perception of justice in that situation and the perception of price unfairness will be altered. Therefore, two hypotheses are defined:

H_{5A}: Abstract representations (words) will decrease the perception of justice for utilitarian products compared to visual representation.

H_{5B}: Abstract representations (words) will increase the perception of price unfairness for utilitarian products compared to visual representation.

Using the same justification for H_{1C}, it is assumed that, when perceived benefits are constant, the price becomes a mental, external product attribute that may be able to alter perceived value. Thus, when product price is raised, perceived value changes. When products are represented by words, regardless of being hedonic or utilitarian, people need to imagine or mentally recreate them, i.e., there will be a cognitive distance between the mental image and the actual item. As compared to hedonic products, utilitarian products are more cognitive; therefore, we assume that their perceived value will suffer alterations due to representation type. So:

H_{5C}: Abstract representations (words) increase the perceived value for utilitarian products.

If the representation type may alter the value perception for utilitarian products, and if there is a relationship between perceived value and purchase intention (Baker et al., 2002; De Toni & Mazzon, 2013; Zielke, 2006), it seems reasonable to propose that the type of product representation will alter repurchase intention for utilitarian products.

H_{5D}: Abstract representations (words) increase repurchases intention for utilitarian products.

Everyone expects and claims to pay and receive the same amount as other customers, especially when they consider themselves equally deserving. A comparison among customers

who have purchased the same product from the same vendor and during the same time period may result in a situation sensed as highly unfair (Ashworth & McShane, 2012).

The mere knowledge that another customer paid less leads to perceived unfairness (Darke & Dahl, 2003). In the absence of specific information about how much a product should cost, the reference price becomes a simple baseline standard for consumers. Based on this reference price as the fair one, any change up, or even down, may be perceived as injust (Xia & Monroe, 2010).

Explicitly, price changes may elicit injustice in consumers who have paid more for a product, which they know other consumers have paid less for. Yet, it is not always clear if, in a situation where an individual is conscious of having paid less than other customers, he or she will feel fairly treated. As observed by Xia and Monroe (2010), a person may even feel happy for having paid a lower price relative to other consumers, but not necessarily will regard this situation as fair. Xia, Monroe and Cox (2004) indicate that price inequalities do not possess equivalent magnitudes. According to them, the degree of unfairness consumers feel may differ when they are in a situation of disadvantaged price inequity in comparison to their peers. But, what happens when the discrepancy among prices paid is very different from the reference price?

Usually, in order to test the motives, factors or dimensions related to price unfairness, studies utilize either a percentage or monetary price increase equivalent to 25 percent of the reference price (e.g. Campbell, 2007a; Weisstein et al., 2013; Xia et al., 2004). But what happens when the discrepancy is above 25 percent – something quite usual in retail, especially in discount situations?

When prices are perceived to have been modified excessively, the cognitive process is attenuated. Thus, we propose that the emotional processing will exert less influence on product judgment. With high cognitive processing, the impact exerted by the hedonic product or by a more abstract and imaginative representation type will be minimized in the judgment process; there may no longer exist a significant difference between representation types or between product types.

Consequently, in the case of very high discriminatory prices, consumers tend to judge products more rationally, and their product evaluations tend to be similar. Based on that, we sugest two hypotheses:

H_{6A}: In situations of high discrepancy among the prices paid by two consumers, the differences between the effects of product representation and type on perception of justice will disappear.

H_{6B}: In situations of high discrepancy among the prices paid by two consumers, the differences between the effects of product representation and type on perception of price unfairness will disappear.

In terms of product perceived value, as consumers will focus on the price paid rather than on the product itself in situations of great price changes / inequalities, we believe that differences in value will disappear, or become less intense. Thus the proposed hypothesis:

H_{6C}: In situations where the price paid by one consumer is highly distinct from the price paid by another, the differences between the effects of product representation and type on perceived value will disappear.

When there is a promotion, people will typically choose a hedonic product over a utilitarian one (Aydinli et al., 2014, O'Curry & Strahilevitz 2001). This happens for reasons like affect and mood (Aydinli et al., 2014). When the perception of justice influences judgments of product repurchase, the affective process is minimized in favor of a higher cognitive process. Besides, if perceived value does not differ among products, there is no reason why consumers should hold a stronger purchase intention for one product over another. Therefore, we propose that product repurchase intention will not differ significantly.

H_{6D}: In situations where the price paid by one consumer is highly distinct from the price paid by another, the differences between the effects of product representation and type on purchase intention will disappear.

Finally, we propose that different levels of price discrepancy would cause, in a direct and practically proportionate way, different levels of Perception of Justice, perception of price unfairness, perceived value, and purchase intention. Perceived discriminatory pricing will exert

a greater impact when the monetary value paid by a person is higher relative to other customers. Perception of price unfairness is stronger according to the size of the price inequality, i.e., a 50 percent difference will cause higher perceived unfairness than a 25 or 10 percent decrease. Even when a person has not paid a superior value to other customers (and so does not think he has been treated unfairly), knowing that discriminatory pricing is practiced may arouse a sense of unfairness. Therefore, their perception of unfairness will not be null.

H_{7A}: Perception of justice will be proportional to perceived discriminatory pricing.

H_{7B}: Perception of price unfairness will be proportional to perceived discriminatory pricing.

3.2.4 Summary of Hypotheses

The table 3.2 shows a summary of the hypotheses proposed before.

Table 3.2 – Hypothesis Summary of Chapter 3

Theories	Objective	Hypothesis	Variables
Hedonic and Utilitarian Effects on Product Evaluation	To identify whether different kinds of products have an effect on Perception of Justice, price unfairness, perceived value and repurchase intention.	H_{1A}: With visual representations (pictures), when a consumer pays more than another individual for a utilitarian product, they perceive this situation as less just, as compared to similar situations with a hedonic product. H_{1B}: With visual representations (pictures), when a consumer pays more than another individual for a utilitarian product, they perceive the price paid as less fair, as compared to the price of a hedonic product. H_{1C}: With visual representations (pictures), when a consumer pays more than another individual and realizes the price discrepancy, for a utilitarian product perceived value will be lower than for a hedonic product. H_{1D}: With visual representations (pictures), when a consumer pays more than another individual and realizes this unfair situation, they show lower intention to repurchase the same utilitarian product, as compared to the same situation involving hedonic products.	Independent Variable: Products (Hedonic and Utilitarian) Dependent Variable: Perception of Justice; Price Unfairness; Perceived Value and Repurchase Intention

Theories	Objective	Hypothesis	Variables
Effects of Word and Photo Represen-tation on Product Evaluation	To identify whether different product representations have an effect on perceived fairness, price unfairness, perceived value, and repurchase intention.	H_{5A}: Abstract representations (words) will decrease the perception of justice for utilitarian products compared to visual representation. H_{5B}: Abstract representations (words) will increase the perception of price unfairness for utilitarian products compared to visual representation. H_{5C}: Abstract representations (words) increase perceived value for utilitarian products. H_{5D}: Abstract representations (words) increase repurchase intention for utilitarian products.	Independent Variable: Representation type (Photo and Word) Dependent Variable: Perception of Justice; Price Unfairness; Perceived Value and Repurchase Intention
Levels of Pricing Change will cause different impacts on Product Evaluation	To identify whether different levels of pricing change have different results on perceived fairness, price unfairness, perceived value, and repurchase intention.	H_{6A}: In situations of high discrepancy among the prices paid by two consumers, the differences between the effects of product representation and type on perception of justice will disappear. H_{6B}: In situations of high discrepancy among the prices paid by two consumers, the differences between the effects of product representation and type on perception of price unfairness will disappear. H_{6C}: In situations where the price paid by one consumer is highly distinct from the price paid by another, the differences between the effects of product representation and type on perceived value will disappear. H_{6D}: In situations where the price paid by one consumer is highly distinct from the price paid by another, the differences between the effects of product representation and type on purchase intention will disappear.	Independent Variable: Level of Pricing Change Dependent Variable: Perception of Justice; Price Unfairness; Perceived Value, and Repurchase Intention
Impact of Levels of Discriminatory Pricing on Product Evaluation	Identify the Impact of Levels o Discriminatory Pricing on Product Evaluation	H_{7A}: Perception of justice will be proportional to perceived discriminatory pricing. H_{7B}: Perception of price unfairness will be proportional to perceived discriminatory pricing.	Independent Variable: Level of Pricing Change Dependent Variable: Perception of Justice; Price Unfairness

3.3 EMPIRICAL STUDY

Three experiments were conducted to test the proposed hypotheses. We run pretests to define the products and prices, and to validate the defined protocol. All the studies were approved by the ethics commission (Institutional Review Board) from Temple University, under Code 21561. Before starting any of the studies, subjects were presented a consent form, in online and print versions, explaining the research. Only those who gave their consent had access to the research. It should be stressed that none of the respondents participated in both pretests and studies. The Appendix A presents the online consent form. The Appendix D presents the printed consent form used in the laboratory study.

Studies 1 and 2 were run in the Qualtrics platform, so that the dependent and independent variables could be randomized.

3.3.1 Pretests for Study 1 and 2

We conducted two pretests to define the products and prices used in studies 1 and 2.

3.3.1.1 Pretest I

Thirty-one subjects participated in the first pretest, which was run online with help from a consumer panel company. Each participant saw a list of products and evaluated each one along Voss, Spangenber and Grohmann's (2003) scale, which is based on the concepts developed by Hischman and Holbrook (1982) to measure whether a product is more hedonic or utilitarian. Along a 7 point, semantic differential scale, subjects evaluated two dimensions: utilitarian (necessary–unnecessary; effective–ineffective; helpful–unhelpful; functional–not functional) and hedonic (not fun–fun; dull–exciting; not delightful–delightful; not thrilling–thrilling; enjoyable– unenjoyable). Lower scores indicate more utilitarian, less hedonic products. Among the products presented to the subjects, in color pictures and in random order, were a piece of cake and a fruit salad.

The cake scored an average of 4.47 (sd = 1.33, n = 31) and the fruit salad, 2.80 (sd = 0.79, n = 31) on the utilitarian dimension (α_{cake} = 0.800; α_{fruit} = 0.684). An ANOVA with repeated measures showed a statistical difference for both products along this dimension ($p < .001$, $\eta p^2 = .537$). For the hedonic dimension, ($\alpha_{cake} = .87$; $\alpha_{fruit} = .85$) statistical differences were also found ($p <. 001$, $\eta p^2 = .319$) with $M_{Cake} = 5.34$ (sd = 1.21, n = 31) and $\overline{x}_{fruit\ salad} = 4{,}24$ (sd = 1.01, n = 31).

In order to define product prices for the experiment, subjects were asked how much they would pay, in average, for each product in a fast food store or restaurant. The results were: for the piece of cake, $\bar{x}$ = \$3.63, Median = 3.00 and sd = 1.79; and for the fruit salad, $\bar{x}$ = 3.95, Median = 3.25 and sd = 1.66. We chose to utilize the median values of \$3.00 and \$3.25. A small adaptation was made on the second price, which was changed from \$3.25 to \$3.30 to avoid the effect of the price ending in the digit 5; this way, both product prices ended in zero. The goal in defining two prices was to support the cover story, which asked participants to imagine they were shopping for a product. We needed to check if these prices were really adequate to the target population, and whether they would be similarly perceived for both hedonic and utilitarian products; thus, a second pretest was run.

3.3.1.2 Pretest II

The second pretest was conducted online with 66 participants, using the same consumer panel as in pretest 1. Besides testing the prices, this pretest was used to define the pictures to be used in study 2. Therefore, participants saw four pictures: two with a piece of cake and two with a fruit salad. The prices (\$3.00 and \$3.30) were randomly assigned for each product, so that the pictures of same product, say the cake, never had the same price, but always were shown with different price points. This was done to avoid prices from influencing product choice. Next, subjects were asked to imagine they were on their lunch break and decided to buy a dessert. Coming to the store, they would find four product choices, but they should buy only one. After choosing the dessert, participants had to answer to what degree they agreed or disagreed, along a 7point scale, with four statements derived from Zielke's (2011) scale for measuring retail price images. The statements were: "This product price is cheap", "In this online store I pay less for the same quality than elsewhere", "This online store has product with accessible price" and "The price of this product is very high".

Results showed that 42 people chose a piece of cake and 24 picked the fruit salad. As for prices, 50 percent decided for the cheapest cake and 54 percent chose the pricier fruit salad. A Chi-square analysis showed no statistical difference among choices ($\chi^2(1,66) = 0.75$ $p > .05$). As for the product pictures, there was no common preference; product choice was evenly distributed (Cake 1 = 20, Cake 2 = 22, Fruit Salad 1 = 15 and Fruit Salad 2 = 9), with $\chi^2(3,66) = .18$ $p > .05$. In terms of retail price image ($\alpha = 0.88$) for the cake and the fruit salad, an ANOVA with two independent variables (price and product choice) showed no interaction or main effects in the model, meaning that the retail price image is equal for both products.

Regarding perceived product prices, no significant difference was found between the products, and no interference of price on product choice. Based on these results, the price and products to be used in studies 1 and 2 were confirmed.

3.3.2 Study 1

Study 1 is a 2 (product type: hedonic vs. utilitarian) × 2 (stimulus: pictures vs. words) between-subject design, with approximately 30 subjects per condition. Data collection was done via a consumer panel with American-born members, who were randomly invited to participate.

Procedures

Subjects read in the cover story that they were going to participate in a shopping situation. They were asked to imagine that they were on their lunch break and had decided to go out for a dessert. Entering a local store, they saw two products: a piece of cake and a fruit salad. The definition of the hedonic and utilitarian product was based on previous research (e.g. Shiv & Fedorikhin, 1999) and on the pretests. The selected prices ($3.00 and $3.30) were randomly assigned to each product. Next, subjects completed the retail price image scale (four items) and read the second research stimulus – price change. At this point, they were instructed to imagine that, soon after buying their dessert, they run into a friend on the street. Talking to this friend, they both realize that they had been to the same store and bought the same dessert. Then the friend remarks that he/she has paid $2.30 or $2.50 (depending on the initial condition); that is, if the initial purchase price was $3.00, the friend would have paid $2.30, and if it was $3.30, then the friend supposedly paid $2.50. The amount paid by the friend was always 25% lower than the original price. We chose to alter the price by 25% to follow the literature on manipulations of perceived price unfairness, as this figure is used for price increases or decreases (e.g Xia et al., 2004). After the manipulation, subjects were asked to complete the 7 point scales for the dependent variables: perception of justice (De Toni & Mazzon, 2014), perception of price unfairness (Darke & Dahl, 2003), perceived value (adaptado de Dodds et al., 1991), and repurchase intention (De Toni & Mazzon, 2014). Finally, subjects had to complete demographic data and the manipulation check. In this study, the emotions scale was not utilized.

3.3.2.1 Analysis – Study 1

Descriptive Analysis

The research design is considered quasi-experimental, since we decided to let respondents choose which product they desired to buy. This decision was made in order to get subjects more involved with the purchase situation. This way, the number of subjects in each condition was not completely balanced. The sample was comprised of American-born individuals (60% male), evenly distributed between 19 and 73 years-old. In terms of education, 37.4% of them had spent 4 years in college, 30% had spent some time (they were dropouts or undergraduates), 47% had a full time job, 15% a part-time job, 63% earned under $40,000 a year. Forty-nine percent of the subjects were single, whereas 39% were married.

From a total of 130 participants in the study, only 117 completed the research. But, in the descriptive analysis we decided to include all 130 respondents. Sixty-five of them read the manipulation instructions without product pictures, and 65 got the instructions together with the pictures. Their choices were as follows: 81 individuals selected the piece of cake and 49 the fruit salad. Prices were also balanced: 64 individuals picked the fruit salad when it cost $3.30, whereas 66 of them chose the cake when it was pricier. In order to verify whether the price influenced product choice, retail price image and Perception of Justice, three tests were conducted. Firstly, a Chi-square test indicated that the price had no influence on product choice ($\chi^2(1,130) = 3.44$ $p > .05$). Retail price image was analyzed by a generalized linear model using price, type of stimulus, and product choice as independent variables. As predicted, no interaction or main effect was found ($p > .10$), demonstrating that the price assigned to each stimulus did not interfere with perceived price. Thus, the price manipulation was taken out of the model. Table 3.3 shows the number of subjects in each cell, discarding the price stimulus, according to previous analyses.

Table 3.3 – Conditions and Sample Size from Study One

		Stimulus		Total
		Word	Photo	
Choice	Piece of Cake	41	40	81
	Fruit Salad	24	25	49
Total		65	65	130

A second Chi-square test was run to check if the number of subjects in each cell was unbalanced. This analysis ($\chi^2(1,130) = .03$ $p > .05$) yielded a number that may be considered as balanced.

Manipulation Check

Two manipulation checks were conducted to verify: (1) whether the cake is perceived as more hedonic than the fruit salad, and whether the fruit salad is perceived as more utilitarian than the cake; (2) whether subjects noticed the price change – the stimulus designed to influence perception of price unfairness. In the first manipulation check we used the scale developed by Voss, Spangenber and Grohmann (2003), as we did in the pretest ($\alpha_{hedonic} = .96$; $\alpha_{utilitarian} = .95$). In the hedonic dimension, the mean score for the piece of cake was 3.95 (sd = 1.77, n = 81), whereas for the fruit salad it was 2.44 (sd = 1.59, n = 49). An ANOVA confirmed a statistical difference between these means ($F(1,129) = 23.90$, $p < .001$). In the utilitarian dimension, the piece of cake had a 4.76 score (sd = 1.97, n = 81) and the fruit salad, 3.77 (sd = 2.03, n = 49). As expected, this difference was significant ($F(1,129) = 30.17$, $p <. 01$).

The second manipulation check was based on the following statement, developed especially for this study: "In this imaginary situation, as compared to your friend, did you pay a higher, lower or equal price?" As this question was asked at the end of the survey, not all 130 respondents answered the manipulation check. So, only the 117 subjects who completed the research were included in the second manipulation check and in the study analyses. Out of this group, 98.2% got the manipulation right; we decided to keep in the sample the two respondents who answered it inadequately, because their opinions do not alter the results.

Testing for Normality and Homogeneity of Error Variance

The hypotheses proposed in this study were verified through ANOVA/GLM analyses. To confirm if the sample presented homogenous variances between treatments, and errors with a normal distribution, we ran the Kolmogorov-Smirnov, Shapiro-Wilk, and Levene tests. Table 3.4 shows the results form the normality analyses. Note that the data for perception of justice and perceived value may be considered as normal. The Shapiro-Wilk test for the data for perception of price unfairness and repurchase intention was significant at a 99% confidence level, an indication of absence of normality.

The results from the Levene test for the homogeneity of error variance showed no statistical difference; therefore, these data could be used in the ANOVA analyses (Levene test: $F_{\text{Perception of Justice}} = .51$; $p = .677$; $F_{\text{Perception of Price Unfairness}} = .17$; $p = .917$; $F_{\text{Perceived Value}} = 0.13$; $p = .943$; $F_{\text{Repurchase Intention}} = 1.84$; $p = .144$).

Table 3.4 – Normality Tests

Test / Dependent Variables	Perception of Justice		Perception of Price Unfairness	
	Statistic	**Significance**	**Statistic**	**Significance**
Kolmogorov- Smirnov	.059	.200	.066	.200
Shapiro-Wilk	.981	.101	.972	.016
Mean, Standard Deviation	$\bar{x}$ = 3.54, sd = 1.37		$\bar{x}$ = 3.60, sd = 1.44	

Test / Dependent Variables	Perceived Value		Repurchase Intention	
	Statistic	Significance	Statistic	Significance
Kolmogorov- Smirnov	.077	.083	.107	.002
Shapiro-Wilk	.988	.375	.964	.003
Mean, Standard Deviation	$\bar{x}$ = 3.60, sd = 1.27		$\bar{x}$ = 3.12, sd = 1.36	

Reliability of the Scales

To assess reliability, we analyzed the Cronbach's Alpha for each dependent variable, which are presented in Table 3.5:

Table 3.5 – Reliability of the Scales

Dependent Variables	# Items	Alpha
Perception of Justice	5	0.912
Perception of Price Unfairness	3	0.858
Perceived Value	4	0.864
Repurchase Intention	3	0.900

Perception of Justice

The scores for Perception of Justice, in the word representation condition, were in average 3.37 (sd = 1.34, n = 38) for the cake, whereas the fruit salad had a mean score of 4.53 (sd = 1.12, n = 19). In the picture representation condition, mean scores for the cake were 3.65 (sd = 1.27, n = 37) and 2.80 for the fruit salad (sd = 1.33, n = 23). An analysis of variance revealed a significant interaction between the results ($F(3,117) = 16.08$, $p < .001$, $\eta p^2 = 0.125$). Figure 3.1 visually represents this interaction and shows the mean scores in each manipulated situation, indicating differences due to product type: words ($F(1,55) = 10.28$, $p = .002$) and pictures ($F(1,58) = 6.02$, $p = .017$). Such results reveal a significant difference in Perception of Justice, both for product type and for representation type. The data confirm hypotheses H_{1A} and H_{5A}.

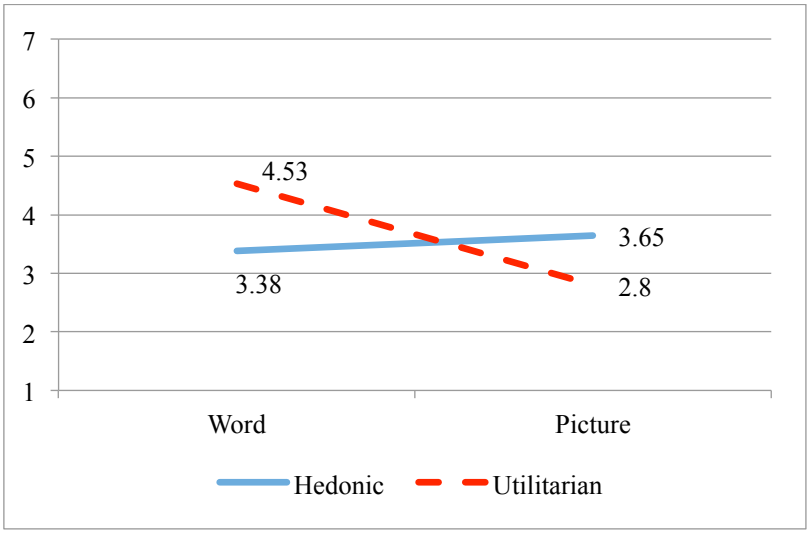

Figure 3.1 – Representation and Product Type in Perception of Justice

Perception of Price Unfairness

Similar results were found for perception of price unfairness. Subjects who were assigned the pictorial stimuli realized the price change and felt more unfairly treated when the product was utilitarian ($\bar{x}$ = 3.15, sd = 1.44, n = 23), than when it was hedonic ($\bar{x}$ = 3.69, sd = 1.45, n = 37). In the case of verbal stimuli, the scores are inverted, that is, people who chose the hedonic product showed lower mean scores for perception of price unfairness ($\bar{x}$ = 3.45, sd = 1.45, n = 38), than those who chose the utilitarian one ($\bar{x}$ = 4.23, sd = 1.23, n = 19). This means that, when subjects read and imagined the situation, they felt that the price change was more unfair for the cake than for the fruit salad.

Note that the higher the score, the higher the perception of price unfairness. An ANOVA indicated a statistically significant interaction ($F(3,117) = 5.67$, $p = .019$, $\eta p^2 = 0.048$). Thus, we may say that these results are consistent with the previous analyses of Perception of Justice and with results from previous studies using pictures (see Chapter 2). Figure 3.2 represents this interaction.

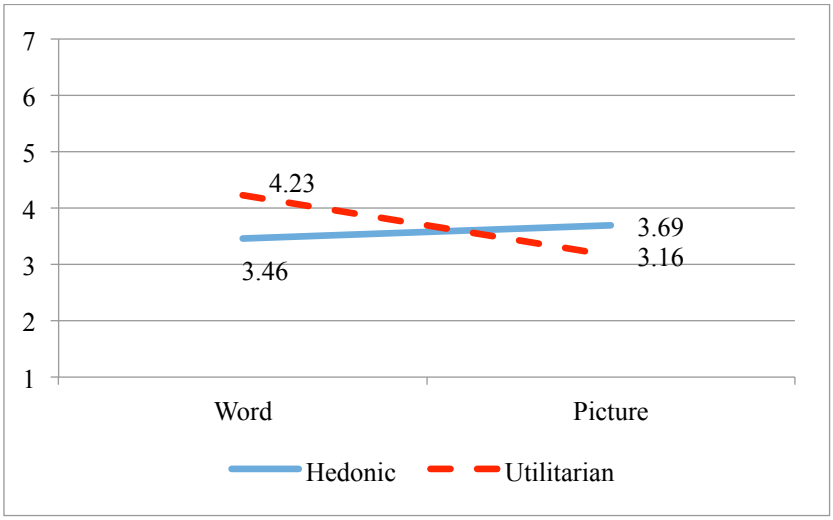

Figure 3.2 – Representation and Product Type in Perception of Price Unfairness

When we assessed the differences due to product type in the words (F(1,56) = 3.93, p = .052) and picture representation (F(1,59) = 1.93, p = .170) conditions, there was a marginally significant difference in the perception of price unfairness with the verbal representation, but not necessarily with pictures. Using the item 'which was the highest price you have ever paid for such a product' as a covariate, an analysis with the word representation revealed a significant difference between the products (F(54,1) = 4.43; p = .040), but not in the picture condition. Thus, hypothesis H_{1B} is not supported, but H_{5B} is.

Perceived Value

When the piece of cake was verbally represented, the mean score for perceived value was 3.56 (sd = 1.27, n = 38); when pictorially represented, the mean score was 3.53 (sd = 1.19, n = 37), i.e., both were practically equal. But, differences were found for the utilitarian product: when represented by words, perceived value was 4.36 (sd = 1.13, n = 19), and this score decreased with the picture representation to 3.14 (sd = 1.31, n = 23). By running a univariate analysis of variance with these means, we noticed an interaction between the dependent variables (F(3,127) = 6.266, p = .014, ηp^2= .053). In other words, perceived value is unequal for utilitarian and hedonic products, depending on representation type. At the same price point, the fruit salad was perceived as more valuable when verbally represented. Assessing the differences between product types, with word representations this difference is significant (F(1,55) = 5.515; p = .022), but not with picture representations (F(1,55) = 1.366; p = .247). Such results do not confirm $H_{1C,}$ but do confirm hypothesis $H_{5C.}$

Repurchase Intention

Repurchase intention for the hedonic product had mean scores of 2.98 when represented by words (sd = 1.33, n = 38) and 3.03 (sd = 1.33, n = 37) when represented by picture; this result is similar to perceived value. The utilitarian product yielded a mean score of 4.04 (sd = 1.09, n = 109) when verbally represented, with a lower 2.75 score (sd = 1.41, n = 23) in the case of pictorial representation. A mere look at these means shows a difference in repurchase intention for the utilitarian product, connected to representation type. A univariate analysis of variance confirmed the statistical difference ($F(1,117) = 7.02$; $p = .009$, $\eta p^2 = .058$). A pairwise comparison of the means showed a difference in purchase intention between hedonic and utilitarian products represented by words ($F(1,56) = 9.02$; $p = .004$), but such a difference was not found with the picture representation ($F(1, 58) = .615$; $p = .436$). The results do not support hypothesis H_{1D}, but they support hypothesis H_{5D}.

3.3.3 Study 2

This study is a 2 vs. 2 between-subject experiment, with the following independent variables: product type (hedonic vs. utilitarian) and price ($3.30 vs. $3.00). Data were collected from a consumer panel, restricted to American residents.

Procedures

Similarly to study 1, respondents were instructed to imagine that they were on their lunch break, and were looking for a dessert. A local store offers two kinds of product: a piece of cake and a fruit salad. Based on the previous pretests, the products are represented either verbally or pictorially, with prices of $3.00 and $3.30 randomly assigned. Having chosen their dessert, respondents are asked to imagine that they run into a friend after leaving the store. Then, they learn that this friend paid $2.30 or $2.50 (a price 25% lower than what the subject had paid). Next, participants answered several questions along the seven point, Likert-type scales for: Perception of Justice (De Toni & Mazzon, 2014), perception of price unfairness (Darke & Dahl, 2003), perceived value (adaptado de Dodds et al., 1991), repurchase intention (De Toni & Mazzon, 2014) and emotions (Richins, 1997).

Regarding the emotions scale (joy, sadness, anger, and surprise), we decided to collect data in two separate moments: after choosing the product and after running into the friend, similarly to a study in Chapter 2. However, to avoid the halo effect, subjects answered this scale in only one of those moments. This scale was used to assess perception of unfairness and to check

whether the product type would convey some sort of emotion when represented by words. Next, respondents completed demographics and the manipulation checks.

3.3.3.1 Analysis – Study 2

Descriptive Analysis

In all, 206 people participated in the study, although three did not fill out the demographics questions. Table 3.6 shows the number of subjects in each cell.

Table 3.6 – Number of Participants in Each Condition

Product Types	Prices	Emotions Scale Before the New Price	Emotions Scale After the New Price	Total
Piece of Cake	$3.00	31	25	56
	$3.30	18	32	50
Fruit Salad	$3.00	29	25	54
	$3.30	24	22	46
				206

The sample (51% male) was comprised of 48.5% single and 35.9% married individuals, with ages ranging between 19 and 70, with a slight concentration in the 28–32 bracket (roughly 20% of the sample). In terms of education, 14.1% had finished high school, 21.8% were undergrads, and 37.5% were graduates. Regarding occupation, 47.6% had full-time jobs, 18.9% part-time jobs, 5.8% worked from home, and 5.3% were undergraduate students. In terms of income, 19.9% earned up to $9,900 a year; 12.6% earned between $10,000 and $19,999; 16.5% earned between $19,999 and $29,999 a year; the remaining 50% earned over $30,000 yearly.

When we asked them how often they used to buy cake, 25.2% of the subjects answered they normally buy a piece every month, followed by 16.5% of the respondents, who buy it every 3 months. As for the fruit salad, 16.5% answered they buy it monthly, and 14.6% every three months.

Manipulation Check

Four manipulation checks were run: (1) to confirm that participants were paying attention to the research; (2) to assess if the piece of cake represented by a picture was considered as hedonic, and the fruit salad as utilitarian; (3) to verify if subjects remembered the prices they paid; and (4) to confirm whether participants realized that the friend had paid a lower price.

In the first manipulation check, respondents were asked which product they imagined they had purchased. All participants answered this question correctly.

The second manipulation check consisted of an ANOVA with the product type (piece of cake and fruit salad) and the two scales for hedonic and utilitarian features as dependent variables. The results were: (1) for the utilitarian features, $\bar{x}_{\text{Piece of Cake}} = 4.39$ (sd = 1.23) and $\bar{x}_{\text{Fruit Salad}} = 3.31$ (sd = 1.18), where a lower score corresponds to more utilitarian characteristics, with statistical significance ($F(1,204) = 40.66$, $p < .001$) and, (2) for the hedonic features, $\bar{x}_{\text{Piece of Cake}} = 5.26$ (sd = 1.07) and $\bar{x}_{\text{Fruit Salad}} = 4.35$ (sd = 1.19), where again a lower score corresponds to more utilitarian characteristics, with a significant difference between the products ($F(1,204) = 32.84$, $p < .001$). Such results support that the products are perceived differently, according to our expectations.

In the third manipulation check, we used an ANOVA to verify if the respondent recalled the price paid. We compared the product types and the two prices to check whether they were recalled in a distinct way. To that effect, an open question was used at the end of the questionnaire. As a result, the average price for the fruit salad presented with the price point of $3.30 was $3.26, and the average price recalled for the $3.00 price point was $3.09. The piece of cake presented at the $3.30 price was in average recalled at $3.23, and when presented at $3.00, the average recalled price was $3.16. Thus, as expected, there is a significant interaction between product type and price ($F(3,203) = 5.86$ $p = .016$).

It is important to stress that, although participants recalled the prices in the imaginary situation, the price difference of only 10% was not sufficient to influence product choice. This can be seen in Table 3.6: the number of subjects in each cell indicates an almost homogenous distribution in product choice.

The final manipulation check was meant to confirm whether subjects realized that they had paid more than their friend. To that effect, they were asked how much the friend had paid. Out of the 206 respondents, 95.1% informed prices between $2.00 and $2.70; 30.7% of them answered $2.30, and 44.9% stated $2.50 (these values were exactly the ones that subjects were presented). Only 6 people recalled prices above $3.00, but these were not higher than the prices they had (imaginarily) paid. Thus, we kept all the cases for further analysis.

Testing for Normality and Homogeneity of Error Variance

In order to confirm if the sample presented homogenous variances between treatments, and errors with a normal distribution, we ran the Kolmogorov-Smirnov, Shapiro-Wilk, and Levene tests.

Table 3.7 presents the results from the normality tests, showing that the data are not normal; consequently, we must consider with caution data from the ANOVA and GLM analyses.

Table 3.7 – Normality Tests from Study 2

Test / Dependent Variables	Perception of Justice		Perception of Price Unfairness	
	Statistic	Significance	Statistic	Significance
Kolmogorov- Smirnov	0.079	.003	0.082	.002
Shapiro-Wilk	0.977	.002	0.981	.008
Mean / Standard Deviation	$\bar{x}$ = 3.64, sd = 1.30		$\bar{x}$ = 3.72, sd = 1.36	

Test / Dependent Variables	Perceived Value		Repurchase Intention	
	Statistic	Significance	Statistic	Significance
Kolmogorov- Smirnov	0.089	<.001	0.091	<.001
Shapiro-Wilk	0.969	<.001	0.974	.001
Mean / Standard Deviation	$\bar{x}$ = 3.68, sd = 1.21		$\bar{x}$ = 3.26, sd = 1.32	

Test / Dependent Variables	Emotion: Joy		Emotion: Sadness	
	Statistic	Significance	Statistic	Significance
Kolmogorov- Smirnov	0.181	<.001	0.276	<.001
Shapiro-Wilk	0.868	<.001	0.681	.001
Mean / Standard Deviation	$\bar{x}$ = 3.00, sd = 1.94		$\bar{x}$ = 1.66, sd = 1.07	

Test / Dependent Variables	Emotion: Anger		Emotion: Surprise	
	Statistic	Significance	Statistic	Significance
Kolmogorov- Smirnov	0.222	<.001	0.168	<.001
Shapiro-Wilk	0.819	<.001	0.886	<.001
Mean / Standard Deviation	$\bar{x}$ = 3.55, sd = 1.81		$\bar{x}$ = 2.56, sd = 1.56	

The results of the Levene test for the homogeneity of error variance showed no statistical difference for any of the dependent variables (Levene test: $F_{\text{Perception of Justice}} = 1.65$; $p = .123$; $F_{\text{Perception of Price Unfairness}} = 1.581$; $p = .14$; $F_{\text{Perceived Value}} = 1.26$; $p = .272$; $F_{\text{Repurchase Intention}} = .712$; $p = .662$). Regarding the emotions scale, as feelings were quite dissimilar in each situation where the scale was used, variances also differed ($F_{\text{Joy}} = 4.41$; $p < .001$; $F_{\text{Sadness}} = 2.88$; $p = .007$; $F_{\text{Anger}} = 12.55$; $p = < .001$), with the exception of Surprise ($F_{\text{Surprise}} = 1.71$; $p = .110$). Because of these results, in the second study we used, besides general linear models (GLM), the Kruskal-Wallis non-parametric analysis for comparison of means.

Reliability of the Scales

We analyzed the Cronbach's Alpha for each dependent variable to confirm scale reliability, as seen in Table 3.8.

Table 3.8 – Reliability of the Scales

Dependent Variables	# Items	Alpha	N
Perception of Justice	5	0.891	206
Perception of Price Unfairness	3	0.874	206
Perceived Value	4	0.849	206
Repurchase Intention	3	0.855	206
Joy	3	0.950	206
Sadness	3	0.861	206
Anger	3	0.937	206
Surprise	3	0.842	206

Data Analysis

Data analysis comprised GLM and the Kruskal-Wallis non-parametric analysis. Firstly, all four dependent variables – Perception of Justice, perception of price unfairness, perceived value and repurchase intention – were assessed in the complete model (independent variables: product type, position along the emotions scale, and prices). As there seemed to be no statistical difference regarding the position on the emotions scale for the dependent variables, we chose to drop it from the model. The same occurred with the prices of $3.00 and $3.30, which showed no influence on any of the dependent variables. Thus, the samples could be joined. However, in order to assess if these two items could act as moderators and interfere with the differences among products in the four variables, we ran the analyses using both as covariates in the model. As the results from the complete model with covariates were quite similar to a simpler model (using only product type as the independent variable), we decided to report only the results from this simplified model.

Note that the two price points in this study were used to create a cover story and to control for perceived product price, so as to avoid a direct effect on Perception of Justice and of price unfairness for either the hedonic or utilitarian product. As for the order of presentation of the scales, we created only two separate moments to avoid a halo effect on the process of analysis.

Perception of Justice

For the word representation, the mean score for Perception of Justice in the condition with disparate prices between the respondent and the friend was 3.44 for the piece of cake (sd = 1.41, n = 106) and 3.85 for the fruit salad (sd = 1.16, n = 100). An ANOVA yielded the following results: F(1,205) = 4.94 and p = .027, confirmed by the Kruskal-Wallis test (p = .033). Findings from study 1 are thus confirmed: the Perception of Justice with verbal representations is affected by cognitive distance, decreasing the perception of justice in utilitarian products compared to visual representation (H_{5A}). The averages demonstrated that the situation involving the fruit salad was perceived as more fair than with the piece of cake.

Perception of Price Unfairness

A similar result was found with perception of price unfairness. Respondents judged the price paid for the fruit salad as more fair ($\bar{x}$ = 3.90, sd = 1.18, n = 100) than for the piece of cake ($\bar{x}$ = 3.54, sd = 1.50, n = 106). An analysis of variance run with the means showed a marginal difference (F(1,205) = 3.68; p = .056). When we ran the same analysis using price and the position on the emotions scale as covariates, results were F(1,205) = 4.12, p = .044. The Kruskal-Wallis test supports this analysis (p = .035). Again, these results confirm findings from study 1, demonstrating that representation type interferes on price perceived unfairness, supporting hypothesis $H_{5B.}$

Perceived Value

The means of subjects' evaluations of perceived value for the hedonic and utilitarian product were, respectively, 3.51 (sd = 1.29, n = 106) and 3.87 (sd = 1.11, n = 100), indicating an inferior perceived value for the cake. These data are consistent with the findings for Perception of Justice and of price unfairness. The ANOVA and non-parametric tests yielded a significant difference between the products' perceived value (F(1,205) = 4.41, p = .037; Kruskal-Wallis = .49). Such results contradict study 1, when the product is verbally or pictorially represented, and support hypothesis $H_{5C.}$

Repurchase Intention

Repurchase intention is also dissimilar depending on product type (F(1,205) = 3.92; p = .049). The means indicate a lower repurchase intention for the cake ($\bar{x}$ = 3.08, sd = 1.40, n = 106), than for the fruit salad ($\bar{x}$ = 3.45, sd = 1.22, n = 100). The Kruskal-Wallis test was marginally significant (p = .051). Such results, thus, corroborate findings from study 1: when the choice is

made based only on words, consumers would be more inclined to repurchase the fruit salad than the cake. Hypothesis H_{5D} is supported.

Analysis of Emotions

In order to validate whether perception of discriminatory pricing evoked more negative emotions with products represented by words, as compared to a picture, we ran an analysis of variance with the means in each condition. Recall that one part of the sample filled out the emotions scale before learning that a friend had bought the same good for a lower price. Consequently, 102 individuals completed the scale before manipulation and 104 individuals afterwards.

In relation to anger, the mean before the price manipulation was 1.08 (sd = 0.27, n = 49) for the piece of cake and 1.51 (sd = 1.17, n = 53) for the fruit salad. However, the means increased considerably after the price manipulation ($\bar{x}_{\text{Piece of cake}}$ = 3.42, sd = 1.82, n = 57 and $\bar{x}_{\text{Fruit Salad}}$ = 3.11, sd = 1.85, n = 47), showing that people felt angry because the price was changed. No interaction between representation type and product type was found, only a change in emotion related to the perception of discriminatory pricing ($F(3,203) = 95.59$, $p<.001$; $\bar{x}_{\text{Before learning price paid by friend}}$ = 1.30 (sd = .88 , n = 102) and $\bar{x}_{\text{After learning price paid by friend}}$ = 3.28 (sd = 1.83, n = 104).

In terms of sadness, no interaction or main effect of product type was found. The analysis demonstrated only an effect of price change on this emotion. Before learning about the discriminatory pricing practices, subjects' level of sadness was 1.22 (sd = 0.78, n = 49) for the piece of cake and 1.48 (sd = 0.95, n = 53) for the fruit; these means are not significantly different (p = .217). After learning about the price paid by the friend, sadness scores became 1.92 for the cake (sd = 1.15, n = 57) and 2.01 for the fruit salad (sd = 1.18, n = 47); they are significantly different as compared to initial values ($F(1,206) = 18.45$, p = .000).

As for joy, it would not be surprising to find higher values with hedonic than with utilitarian products. However, although joy averages are higher for the hedonic than for the utilitarian product before learning about price changes, neither a main effect nor an interaction between product type and price change was found, only a change in the emotion related to the perception of discriminatory pricing ($F(1, 205) = 264.30$, p = .000; $\bar{x}_{\text{Before learning price paid by friend}}$ = 1.56 (sd = 1.00, n = 102) and $\bar{x}_{\text{After learning price paid by friend}}$ = 4.47 (sd = 1.54, n = 104).

Finally, we analyzed the aspect of surprise in perception of discriminatory pricing. As expected, we did not find a main effect or interaction between the variables and the product type, only a main effect of surprise ($F(1, 205) = 59.80$, $p = .000$; $\bar{x}_{\text{Before learning price paid by friend}} = 1.82$ (sd = 1.18, n = 102) and $\bar{x}_{\text{After learning price paid by friend}} = 3.27$ (sd = 1.46, n = 104).

3.3.4 Study 3

We conducted a third study to confirm previous results and to verify whether differences in the Perception of Justice related to forms of product and representation types happen only when the situation is perceived as unfair (an unfavorable 25% price inequality).

Data collection was done in the *Center of Neural Decision Making* lab at Temple University. Subjects were recruited by leaflets spread throughout the campus and the city of Philadelphia; each one received $20,00 for joining in the study. A within-subjects, laboratory experiment tested 4 product types (2 hedonic and 2 utilitarian) vs. 2 stimuli (pictures vs. words) vs. 4 price changes (+50%, +25%, -25%, -50%). The prices were randomly presented at each stimulus.

3.3.4.1 Pretest III

We ran a pretest to define the products/services to be used in the study. In exchange for credit, students from Temple University registered to participate in the research; thirty students completed the online survey in Qualtrics. They assessed several products along the hedonic/utilitarian scale suggested by Voss, Spangenber and Grohmann (2003). Stimuli were randomly represented by pictures with verbal descriptions. The products included a home alarm system, a TV set, an apartment with a seaside view, but far from the workplace, and an apartment overlooking a parking lot, but close to work. Besides being pretested for this study, all the products were suggested by the literature (Barsky, Kaplan & Beal, 2010; Khan et al., 2004).

Results showed that the alarm system is more utilitarian in nature than the TV set, which is more hedonic in comparison. As for the apartments, respondents saw the one with the seaside view as more hedonic than the one close to the workplace, which is more utilitarian. Table 3.9 presents the means and standard deviations for each product.

An ANOVA with repeated measures showed statistical differences among the products. As the objective was to use products with similar prices, so that retail price image did not influence Perception of Justice, we compared both the apartments, and then the durable goods.

A statistically significant difference at a 99.9% confidence level was found between the apartments along the hedonic and utilitarian dimensions; so, the apartment with a seaside view is more hedonic in character and the one close to the workplace is more utilitarian. The durable goods also presented a statistical difference at a 99.9% confidence level, the TV set being seen as more hedonic, and the alarm system as more utilitarian.

Table 3.9 – Product Definition

Conditions	Mean Hedonic Dimension	Stand. Deviation	Alpha Hedonic Dimension	Mean Utilitarian Dimension	Stand. Deviation	Alpha Utilitarian Dimension
Apt. with Sunset View	6.17	0.85	0.867	3.43	1.25	0.851
Apt. close to Workplace	4.81	1.26	0.946	2.20	1.11	0.894
Alarm System	3.59	1.04	0.804	2.19	1.09	0.893
Television	5.55	1.01	0.919	3.01	1.02	0.770

Procedures

Subjects came to the study center at scheduled times and, after signing the consent form, were placed in front of a computer. We used the E-Prime software in the research. After reading on the front page how to operate the computer, subjects were assigned the conditions quasi-randomly. As in study 1, the manipulations were instructional: respondents were asked to imagine themselves shopping for a product or looking for a place to rent. Next, they saw the product and its price. Further instructions asked subjects to imagine that a friend was offered a distinct price, which was informed in each one of the four conditions. After the price manipulation, subjects were asked to evaluate, along a 7-point scale, how much they agreed or disagreed with four statements on: perception of price unfairness, Perception of Justice, perceived value and repurchase intention. The four statements derived from the scales used in study 1. We decided not to use the whole scales to avoid a long, repetitive study. The statements were presented at random to prevent subjects from trying to memorize the answers. After the 8 manipulations, the respondents completed questions about demographics and the manipulation checks. Note that the conditions were not completely randomized, as each one of the four products was presented only with words at first, and then with pictures. The four statements, though, were the same in the 8 conditions.

Figure 3.3 illustrates how the pages were presented to subjects. The pages with manipulation instructions froze for 25" to give subjects enough time to imagine themselves in the situation, before moving on to the next page.

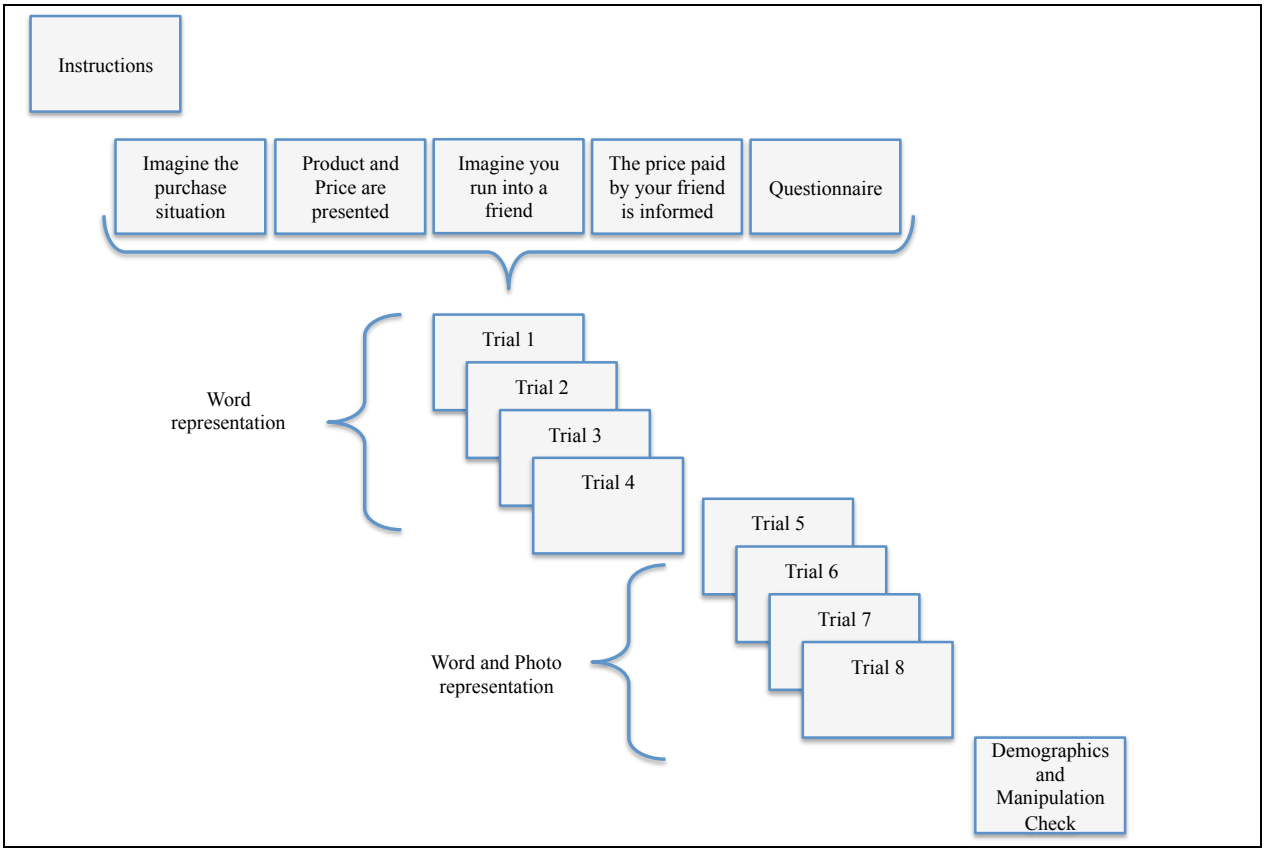

Figure 3.3 – Presentation of the Protocol for Study Three

In order to define product prices, we evaluated local ads to use the average market price (dated September, 2013). Thus, we defined 2-bedroom apartments with a $750.00 monthly rent and a television and alarm system priced at $260.00 each.

All pictures were in color and had the same size. Figure 3.4 shows the pictures and respective texts (stimuli were comprised of only text, or picture and text). The screen background was grey to avoid colors from interfering or highlighting an individual product.

	**HEDONIC PRODUCT** Apartment to Rent – Breathtaking view of sunset – About 1 hour driving from your work/school
	**UTILITARIAN PRODUCT** Apartment to Rent – Overlooking a large parking lot – About a 15 minutes walking to your work/school
	**HEDONIC PRODUCT** Television Set – 32L 135U – 32 inch – 720p 120 Hz Led HDTV
	**UTILITARIAN PRODUCT** Security Alarm System – PS203 M12 Professional Wireless Kit with Auto Dial”

Figure 3.4 – Stimuli in Study 3

3.3.4.2 Analysis – Study 3

Descriptive Analysis

The sample was comprised of 93 individuals (45.2% male) between 18 and 66, mostly in the 18 – 21 bracket (54%), since the research ads were placed at Temple University and its surroundings. Out of them, 86% were single and 7.5% married; 73% had finished high school or had dropped out of college; 47.3% were undergraduate students and 23% had part-time jobs. In terms of income: 68.8% earned up to $9,900 a year; 8.6% earned between $10,000 and $19,999; and 8.6% between $19,999 and $29,999 a year.

All the analyses employed 93 cases in a total of 742 (93*8) processed cases; 371 representations of hedonic products and 371 of utilitarian ones; 370 word representations and 371 picture representations. Price changes were done as follows: the consumer paid 50% more than the friend in 169 cases; 25% more in 199 cases; 25% less in 178 cases and 50% less in 196 cases.

Data Analysis

A Generalized Estimating Equation (GEE) was used to assess data from study 3. GEE is a longitudinal study with n individuals, in which each individual is measured at different n_i time points in relation to a response variable y and a vector of p explanatory variables x. Thus, we analyzed 93 cases, each one observed 8 times, resulting in a total of 742 observations (two of them were not collected due to a data collection error), with 4 types of response variables (Perception of Justice, perception of price unfairness, perceived value and repurchase intention). The vectors, i.e., the explanatory variables, are those manipulated by the representation type, product type and price manipulations. GEE permits analyzing a within-subject correlation, because the same variable is measured for the same individual in different time points and situations. This analysis takes into consideration a possible correlation among the various conditions undergone by the same individual. Differently from repeated measure ANOVA, this model allows including subjects, who did not participate in all the manipulated conditions. Although every subject viewed all four products in both representation types (verbal and pictorial), the prices (a 50% and a 25% increase/decrease) in the fairness manipulation were not presented to them equally, but at random. Therefore, although the final results from the analysis are similar, the most adequate way to analyze these data is by GEE. This method was developed by Zeger and Liang (1986) based on the well-known GLM; it

includes a structure of correlations among observations to minimize the halo effect (biased estimates). GEE works with data in panels through repeated measurements, whose correlation is not fully known by the researcher. In longitudinal analysis, GEE is the most recommended method when the goal is to study differences between the mean responses from two groups – as compared to random coefficient analysis (Twisk, 2004). While still rarely used in marketing journals, more complex studies have been employing it (e.g. Kashmiri & Mahajan, 2010; Nath & Mahajan, 2008). Note that, in all the analyses we chose to use unstructured correlation, since this is generally the best correlation structure for a GEE analysis; besides, it is not much different from more robust analyses with other kinds of correlation (Twisk, 2004). As the very name says, in unstructured correlation no particular correlation structure is assumed. A distinction between GEE and ANOVA or GLM is that dependent variables do not need to have a normal distribution and data do not need to be necessarily independent.

Perception of Justice

The model for Perception of Justice contains the intercept, the variables and their interactions. The model had 1641.71 as Quasi Likelihood under Independence Model Criterion (QIC) of and a Corrected Quasi Likelihood under Independence Model Criterion (QICC) of 1645.27. An analysis of the model showed an interaction effect among the three variables. Table 3.10 presents the Wald Chi-Square, the degrees of freedom and their significances.

Table 3.10 – Main Effects and Interactions for Perception of Justice

Model	Wald Chi-Square	df	Sig
Intercept	3369.33	1	0.000***
Hedonic and Utilitarian	1.87	1	0.171
Text and Photo	0.07	1	0.792
Price Change	409.52	3	0.000***
Hedonic and Utilitarian vs. Text and Photo	2.98	1	0.084
Hedonic and Utilitarian vs. Price	1.41	3	0.702
Text and Photo vs. Price Change	0.88	3	0.830
Hedonic and Utilitarian vs. Text and Photo vs. Price Change	8.52	3	0.036**

Table 3.11 shows the means in each condition, as well as standard deviations and confidence intervals.

Table 3.11 – Variable Means in the Model for Perception of Justice

Price paid by friend	Hedonic Vs. Utilitarian	Text vs. Photo	Mean	Std. Error	95% Wald Confidence Interval	
					Lower	Upper
1.5	Hedonic	Text	5.79	0.188	5.43	6.16
		Photo	5.65	0.204	5.25	6.05
	Utilitarian	Text	5.74	0.19	5.37	6.12
		Photo	5.86	0.139	5.59	6.13
1.25	Hedonic	Text	5.00	0.192	4.63	5.38
		Photo	5.74	0.201	5.34	6.13
	Utilitarian	Text	5.70	0.145	5.42	5.99
		Photo	5.33	0.208	4.93	5.74
0.75	Hedonic	Text	2.55	0.198	2.16	2.94
		Photo	2.78	0.213	2.36	3.20
	Utilitarian	Text	3.14	0.252	2.64	3.63
		Photo	2.85	0.217	2.43	3.28
0.5	Hedonic	Text	2.34	0.213	1.92	2.76
		Photo	2.31	0.237	1.84	2.77
	Utilitarian	Text	2.35	0.233	1.90	2.81
		Photo	2.30	0.203	1.90	2.70

In Appendix E, we graphically present the means by product price to illustrate the interactions. Data in Table 3.11 show that Perception of Justice decreased as consumers realized that they paid more for the product. When the friend paid a price 50% higher, there was no interference from representation type or product type; in this situation, respondents perceived their purchase as fair in comparison to the other. But, when the price surplus is less significant, i.e., in the 25% range, there seems to be an interaction between representation and product type in the Perception of Justice. Although people feel a stronger sense of fairness than when they paid more than the friend, the Perception of Justice is higher with a utilitarian product represented by text, than with a hedonic product. However, with the picture representation, the price change is perceived as more fair for a hedonic product than for a utilitarian one. When the informed price meant that the subject had paid more than their friend, Perception of Justice dropped from a level of 6–5 to 2–3, regardless of product type or representation, thus confirming hypothesis $H_{7A.}$ When the price inequality was 50% higher, perception of unfairness was so strong that results were practically constant for the remaining stimuli, supporting hypothesis H_{6A}.

The general model for Perception of Justice also revealed a marginally significant interaction at a 90% confidence level between product type and representation type (Wald Chi-Square = 2.98; $p<0.10$).

Perception of Price Unfairness

Similarly to the previous model, the model for perception of price unfairness was evaluated taking into account the three independent variables. We assessed both the QIC and QICC to analyze the adjustment level of covariances and the possibility of errors due to data temporal correlation, since individuals completed the same questionnaire for various stimuli. The model had a QIC of 2112.48 and a QICC of 2116.09.

Table 3.12 presents the interactions and main effects in the model. Again, an interaction effect was found among product types, representation types and price change (Wald Chi-Square = 10.81; $p < 0.05$), confirming results from study 2. Table 3.13 shows the means in each condition.

Once more, the price change produced a noticeable effect on perception of price unfairness, in accordance with the literature. Interestingly, when the price is altered by 50% (higher or lower), there is practically no interference with the other variables (representation type and product type), as stated in hypothesis $H_{6B.}$ But, when prices are altered by 25%, the change in the perception of price unfairness is smaller, and the differences are noticed in relation to the representation type and the interactions. In Appendix F, we graphically present these results for a better understanding.

Table 3.12 – Main Effects and Interactions for Price Unfairness

Model	Wald Chi-Square	df	Sig
Intercept	2209.37	1	0.000***
Hedonic and Utilitarian	0.12	1	0.732
Text and Photo	2.17	1	0.141
Price Change	293.29	3	0.000***
Hedonic and Utilitarian vs. Text and Photo	6.37	1	0.012**
Hedonic and Utilitarian vs. Price	1.28	3	0.735
Text and Photo vs. Price Change	0.47	3	0.926
Hedonic and Utilitarian vs. Text and Photo vs. Price Change	10.81	3	0.013**

Table 3.13 – Variable Means in the Model for Perception of Price Unfairness

Price paid by friend	Hedonic Vs. Utilitarian	Text vs. Photo	Mean	Std. Error	95% Wald Confidence Interval	
					Lower	Upper
1.5	Hedonic	Text	5.64	0.222	5.2	6.07
		Photo	5.23	0.233	4.78	5.69
	Utilitarian	Text	5.57	0.193	5.2	5.95
		Photo	5.65	0.18	5.29	6.00
1.25	Hedonic	Text	5.19	0.216	4.76	5.61
		Photo	5.81	0.225	5.37	6.25
	Utilitarian	Text	5.82	0.194	5.44	6.2
		Photo	4.99	0.248	4.5	5.48
0.75	Hedonic	Text	2.82	0.229	2.38	3.27
		Photo	3.1	0.233	2.64	3.56
	Utilitarian	Text	3.29	0.289	2.72	3.85
		Photo	2.74	0.268	2.22	3.27
0.5	Hedonic	Text	2.3	0.245	1.82	2.79
		Photo	2.21	0.26	1.7	2.72
	Utilitarian	Text	2.51	0.249	2.02	3.00
		Photo	2.04	0.199	1.65	2.43

The means also showed an increase in perception of price unfairness corresponding to changes between the prices paid by the subject and friend. Such data confirm hypothesis H_{7B}.

Perceived Value

The three independent variables were also included in the model of analysis for Perceived Value. This model had a QIC of 1869.78 and a QICC of 1872.47. Results from main effects and interactions testing are represented by the values of Wald Chi-Square and their significance (see Table 3.14).

Table 3.14 – Main Effects and Interactions for Perceived Value

Model	Wald Chi-Square	df	Sig
Intercept	2801.832	1	0.000***
Hedonic and Utilitarian	16.574	1	0.000***
Text and Photo	2.798	1	0.094
Price	211.068	3	0.000***
Hedonic and Utilitarian vs. Text and Photo	17.225	1	0.000***
Hedonic and Utilitarian vs. Price	11.202	3	0.011**
Text and Photo vs. Price Change	2.662	3	0.447
Hedonic and Utilitarian vs. Text and Photo vs. Price Change	1.954	3	0.582

Distinctly from Perception of Justice and perception of price unfairness, this model did not reveal an interaction among the three variables. However, we must highlight the two interactions found in the model.

The first one consists of an interaction at a 99.9% confidence level between product type and representation type. This result is consistent with data from the previous research, and with the literature. When the product was hedonic and represented by words, the mean score for product perceived value was 4.14 (sd = 0.11), but the picture representation increased the mean to 4.68 (sd = 0.13). With utilitarian products, a picture representation seemed to diminish perceived value. When the products were represented by words, the mean score was 4.95 (sd = 0.12), but with pictures the means decreased to 4.75 (sd = 0.12). In order to verify whether these means are significantly different, we used the Bonferroni pair-wise comparison, which showed that the perceived value for hedonic products verbally represented is different from all the other means, with $p < .001$. This validates that a hedonic product's mental image influences directly on its perceived value; but, as utilitarian goods' images are closer to reality, their perceived value does not change according to representation types.

The second interaction yielded in the model is between product type and price change, with a Wald Chi-Square of 11.202 ($p < .010$). This means that, although the comparison with the price paid by the friend did influence product perceived value, this did not occur identically with both product types.

Figure 3.5 illustrates what happened to perceived value, as subjects realized that they were paying more for the product than others. When individuals felt that they paid a fair price, their perception of product value was practically the same (1.5 and 1.25); but, when they learned that they paid more than their friend, the drop in perceived value was steeper for the hedonic than for the utilitarian product. Nevertheless, this drop leveled when respondents paid 50% more than their friend. These data support hypothesis $H_{6C.}$

The model also showed significant main effects: hedonic and utilitarian products had a Wald Chi-Square of 16.57 ($p < .001$); price changes had a Wald Chi-Square of 211.06 ($p < .001$); and representation type had a Wald Chi-Square of 2.80 ($p < .10$).

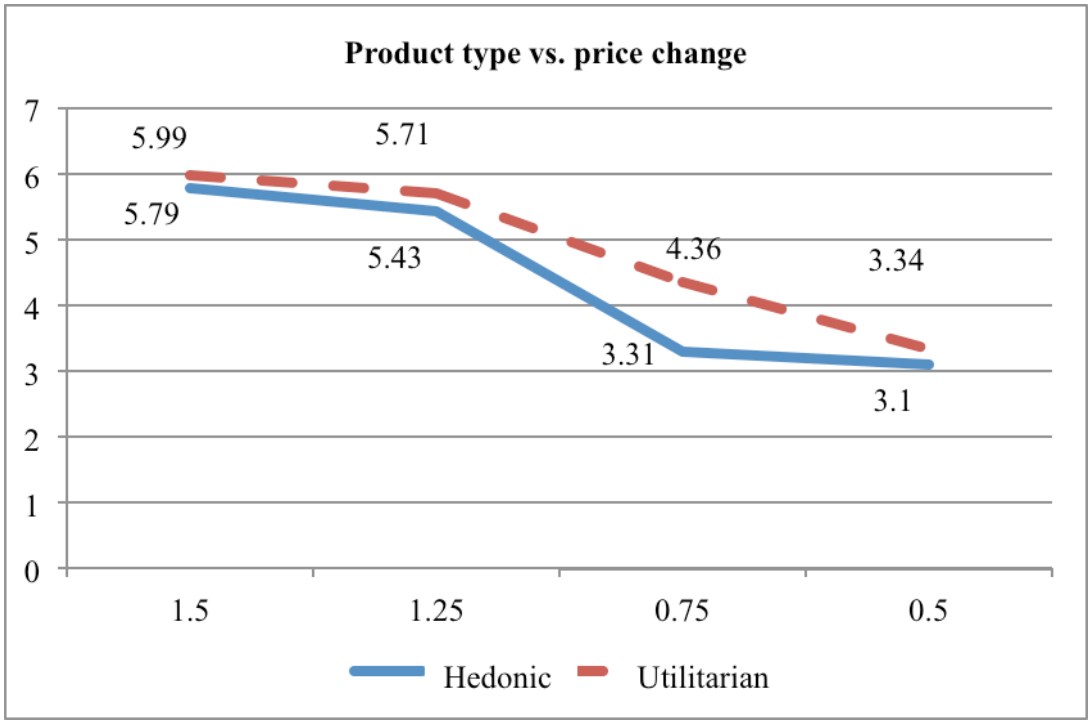

Figure 3.5 – Perceived Value: Interaction Product Type vs. Price Change

Repurchase Intention

For repurchase intention, when we again applied the GEE model with three independent variables, QIC was 1980.80 and QICC was 1983.61. No interaction was found among price, representation type and product type, neither between product type and price, nor between representation type and price. However, once again interactions were found in product type vs. representation type (Wald Chi Square = 8.25, $p < .01$).

Table 3.15 shows the values of Wald Chi-Square and their significance. Note that price had a significant main effect and that price changes also influenced consumer repurchase intention.

Table 3.15 – Main Effects and Interactions for Repurchase Intention

Model	Wald Chi-Square	df	Sig
Intercept	2363.644	1	0.000***
Hedonic and Utilitarian	2.69	1	0.101
Text and Photo	1.048	1	0.306
Price	274.001	3	0.000***
Hedonic and Utilitarian vs. Text and Photo	8.252	1	0.004**
Hedonic and Utilitarian vs. Price	5.01	3	0.171
Text and Photo vs. Price Change	0.705	3	0.872
Hedonic and Utilitarian vs. Text and Photo vs. Price Change	2.863	3	0.413

The interaction between product type and representation type is consistent with the literature and with results previously reported. Again, a hedonic product represented by words had the lowest mean score: 3.55 (sd = 0.10); when also represented by a picture, the mean for purchase intention increased to 3.95 (sd = 0.12). In the case of utilitarian products, the mean score for the text representation was 4.03 (sd = 0.14), decreasing to 3.83 (sd = 0.12) with a pictorial representation. A pairwise comparison confirmed that the mean for the hedonic product represented by words was significantly different from the picture representation ($p < .05$) and from a utilitarian product represented by words ($p < .05$). Price changes seem to influence directly on repurchase intention: when consumers realized that they had paid less than the friend, their repurchase intention was higher than when they paid a higher price, and proportional to the price difference. Figure 3.6 illustrates the drop in repurchase intention, as price increases became clear to respondents. Note that the figures 1.5, 1.25, 0.75, and 0.5 represent the percentage paid by the friend and informed to respondents in monetary form (dollars).

Figure 3.6 – Influence of Price Change on Repurchase Intention

3.4 DISCUSSION OF RESULTS

In this chapter we aimed to verify the influence of product and representation type on Perception of Justice, perception of price unfairness, perceived value and repurchase intention, in a context of discriminatory pricing – a widely-employed market practice nowadays (Jin et al., 2014; Weisstein et al., 2013; Xia & Monroe, 2010). We also assessed the impact exerted on those variables by various levels of price changes, in both directions. Based on construal level theory, we developed four hypotheses to demonstrate that, just as a hedonic product's emotional level induces fantasies, expectations, and abstractions, its representation type may influence consumer behavior.

Results showed an interaction between product and representation types. When products are represented only by words, consumers have to use their imagination; this lowers construal level and makes people less sensitive to utilitarian products. Such a result is not seen when products are represented by pictures.

According to previous studies, see Chapter 2, when a product is pictorially represented within a discriminatory pricing situation, consumers are usually more price-sensitive in relation to the utilitarian than the hedonic product. However, in the present study we did not see results consistent with previous studies, which would support hypotheses H_{1B}, H_{1C}, and H_{1D}. Although some interactions were found, the pairwise comparisons did not support the hypothesis that utilitarian products pictorially represented are lower in perception of price unfairness, perceived value or repurchase intention, than hedonic products. A possible explanation is that consumers were permitted to choose between two hedonic and utilitarian products before imagining the price change situation, thus becoming more satisfied with their choice and less prone to suffer an emotional effect caused by the product itself.

As for discriminatory price levels, although people felt angrier when they realized that others were paying 25% less, as compared to when they paid 25% more, in both cases the situation is perceived as unfair. The study has shown that, the higher the financial loss, the stronger the sense of unfairness and anger felt by customers. But, even in advantageous situations, e.g. when they paid less than others, subjects still judge the situation as unfair.

Our findings are interesting for marketing academia, as many studies use picture and word stimuli, however few reseachers have investigated thre representation differences (Amit et al., 2009), especially as referred to consumer behavior. It is not clear whether results from previous

studies suffered an influence of product representation type. This study also contributes by trying to understand product evaluations in a post-purchase situation, and not during the choice process, as is more usual in the literature (Aydinli et al., 2014; Shiv & Fedorikhin, 1999; Trope et al., 2007). Our main contribution for marketing practice is by testing the best way to represent products (either by words or pictures) when companies use a discriminatory pricing strategy.

This study was limited to an exploration of discriminatory pricing strategies; it would be interesting to test consumer perceptions of different products and prices in a common shopping situation. It was also limited in terms of product types; future research could explore differences in consumer behavior referring to other product categories. In this study, we used only two representation types – words and color pictures. Future endeavors could focus on distinct representation types and situations, such as drawings, movies, commercials, and the physical exposure of products in the point of purchase or consumption. This chapter opted to use 25%, 50% up and down, but different percentage of price change could be explored to investigate if the behavior is constant among price changes. The format of price presentation can also be different, we opted to use the monetary numbers, but percentage or other format of discount (extra product, buy one get two) could be studied. To conclude, just as we exploited Construal Level Theory, other theories such as Dual Process Theory could be tested. Thus, we believe that future studies could complement our findings from this initial research.

4 INTEGRATING NEW METHODS IN MARKETING RESEARCH

4.1 INTRODUCTION

Interdisciplinary research is one of the most notable aspects of modern scientific endeavors (Huettel & Payne, 2009). In its earliest days, scientific endeavors were often driven by scholarships that integrated various scientific disciplines. However, this integration of different disciplines often led to controversies and heated debates (Fisher, Chin, & Klitzman, 2010). Despite past issues, within the past few decades, advances in scientific and technical knowledge have led to the realization that research should not be limited to the scope of any single discipline. Such realizations have prompted researchers from many disciplines to join forces to tackle complex research questions, resulting in a generation of novel ideas and innovations that have accelerated and advanced scientific discoveries (Camerer, Loewenstein, & Prelec, 2005).

Many phenomena can and should be approached through interdisciplinary methods (Banich & Compton, 2011). For instance, classical consumer behavior research has traditionally drawn insights from social sciences like economics, psychology, and anthropology. However, given recent technological improvements and a desire to accelerate research beyond macro-level observations of consumer behavior, social scientists have begun to look to disciplines, such as neuroscience and biomedical engineering, to further explore both the underlying biological foundations of behavior (Achrol & Kotler, 2011) as well as the driving forces behind everyday decisions made by consumers. In the past, primate studies were often used as proxies for this type of research. In order to associate behavior with a given hypothesized biological process or construct, scientists utilized pharmacology, electrophysiology, and lesion studies (Murphy, Nimmo-smith, & Lawrence, 2003). These methods of research were labor intensive, required many years of experience, and were largely infeasible for social scientists. However, within the past few decades, similar research questions have been explored in humans using non- or less-invasive methods like electrocardiogram (ECG), electrodermal responses (EDA), facial electromyography (fEMG), pupillary responses, electroencephalography (EEG), positron emission tomography (PET), and functional magnetic resonance imaging (fMRI). These methods, borrowed from psychophysiology, medicine, and neuroscience, allow social scientists, in collaboration with researchers from other disciplines, to start looking at the nuances and underlying the biological foundations of behavior (Lee & Broderick, 2007).

Social scientists can also apply the aforementioned methods to the broader level of marketing research. Emergent paradigms employing neurophysiological approaches are inextricably associated with the progress of research in consumer behavior and consumption experiences (Fisher et al., 2010). This is evidenced by the increasing presence of studies that integrate psychophysiology, neuroscience, and marketing in many top-tier marketing journals abroad, such as Journal of Marketing (e.g. Pieters, Wedel, & Batra, 2010), Journal of Marketing Research (e.g. Yoon, Gonzalez, & Bettman, 2008), Journal of Consumer Research (e.g. Hui, Huang, Suher, & Inman, 2013), or Journal of Marketing Communication (e.g. Mostafa, 2013). The UK's Journal of Consumer Behavior, for instance, devoted a special issue in 2008 to "neuromarketing." (Achrol & Kotler, 2011).

Given the growing number of marketing papers detailing studies that employ neuroscience methodologies, we believe there is space for this type of research. This belief was the motivation behind our current endeavor: to introduce novel methodologies integrating marketing and neuroscience.

Therefore, the purpose of this paper is threefold. First, we review each method and present some examples of its application from selected academic or industry research. In addition to this, we present the strengths and weaknesses of each method in marketing. This section is by no means an exhaustive review of these methods and their associated literature; as such a task is not within the scope of this paper. Second, we present the origins of "neuromarketing concept" and a suggestion for the concept name. Finally, we present how psychophysiology and neuroscience applications can be used in consumer behavior.

Neurophysiology methods will be presented in the next section, divided into physiological and neuroscience methods. Some research topics mixing neurophysiology methods and consumer behavior are then presented. A final discussion concludes the paper.

4.2 NEUROPHYSIOLOGY METHODS IN MARKETING

Neurophysiological tools usually measure the autonomic nervous system that controls the "autonomic functions" of the body; these are functions for which there is no direct, conscious control, such as blood distribution, heart rate (HR), digestive processes, sweating, etc. There are many neurophysiological measurements that the field of marketing could use, such as heart rate, skin conductance response, eye movements, pupil diameter, positron emission tomography (PET), facial electromyography, magnetoencephalogram, electroencephalogram,

or functional magnetic resonance imaging (Chamberlain & Broderick, 2007; Kenning & Linzmajer, 2011; Wu, Jiang, & Yang, 2012).

4.2.1 Physiological Methods

One simple and traditional technique is heart rate (Camerer et al., 2005; Wu et al., 2012). This is a type of cardiovascular analysis and can be measured by electrocardiogram (EKG) (Wang & Minor, 2008). An electrocardiogram non-invasively captures electrical discharges associated with heart muscle contraction via electrodes placed on defined locations on the chest, arms, and legs (Wiles & Cornwell, 1991). Heart rate responses are real-time measurements of physiological responses (Camerer et al., 2005). Wu et al. (2012) explain that by using mathematical tools, it is possible to describe the emotional state of physiological features extracted from the EKG signals. According to Wang and Minor's (2008) review, some studies have used heart rate response to measure pleasant or unpleasant responses and to predict recall, memory, or attention mechanisms. Kenning and Linzmajer (2011) note that heart rate responses can be also used to detect cognitive attention. Interpreting heart rate response data can be challenging, however, because the heart is regulated by both the sympathetic and parasympathetic nervous systems (Mundorf, Zillmann, & Drew, 1991; Wang & Minor, 2008). The former is responsible for increasing heart rate (proxy for arousal), while the latter is responsible for the slow and rhythmic responses of a heart at rest (proxy for attention). Thus, in order to use heart rate responses as proxies for either arousal or attention, a researcher must understand the different physiological processes that affect these measures.

Related to heart rate, another physiological measure is vascular activity. Measuring vascular activity entails recording changes in blood pressure, blood volume, or pulse volume (Wang & Minor, 2008). According to Mundorf et al. (1991) blood pressure can be used to measure arousal. Russell (1980) created the theory of the Circumplex Model of Affect, where affect has an evaluation of pleasantness and unpleasantness and an evaluation of arousal and sleepiness activity (also known as high/low arousal). Therefore, in general terms, arousal refers to a state of being alert and ready for action. In physiological terms, arousal is defined as an autonomic nervous system that is marked by dominance of sympathetic over parasympathetic activity (Mundorf et al., 1991). Wang and Minor (2008) highlight in their paper that future marketing research need to address validity and reliability issues when using vascular activity to measure arousal or other psychological processes because this activity may come from a number of psychological processes, not just one.

Another widely used physiological measure is electrodermal activity (EDA). This method measures the electrical conductance of the skin using a galvanometer (Wiles & Cornwell, 1991). Unlike heart rate responses, skin conductance activity (SCA) is a slower measure of physiological response and is only affected by the sympathetic nervous system. According to Wang and Minor (2008), the electrodermal activities can be monitored through skin conductance response (SCR) and also through galvanic skin response (GSR). The SCR is essentially a measurement of the amount of perspiration in response to a stimulus, which often indicates physiological arousal (Kenning & Linzmajer, 2011). Electrodermal activity can also be used to measure attention and affective processes (Wang & Minor, 2008). One minor setback of using this method is that electrodermal activity cannot offer any indication of valence.

In order to measure valence, researchers often use facial electromyography (fEMG) by attaching electrodes to the participant's face muscles, usually to the two key muscle groups: the *corrugator supercilii* and the *zygomaticus major* muscle. The electromyography detects electrical signals from muscle contractions (Barocci, 2011; Camerer et al., 2005; Kenning & Linzmajer, 2011; Wiles & Cornwell, 1991), which, for instance, are involved in frowning (*corrugator supercilii*) and smiling (*zygomaticus major* muscle). Facial electromyography is often a good supplementary method if either skin conductance or heart rate responses are used, because fEMG can provide measures of valence such a positive affective responses (Wang & Minor, 2008). Examples of the practical uses of fEMG include measuring surface electromyography signals to understand the acceptability for assessing texture characteristics in food (González, Montoya, & Cárcel, 2001), which is important to the food industry; to measure pleasure and displeasure of consumer watching commercials on TV, or to view printed ads (Isabella, 2011).

In addition to facial measures, there are also measures of voice pitch. According to Klebba (1985), the voice pitch analysis (VOPAN) measures the fluctuations generated by vocal cords in human speech. The analysis is independent of the volume, content, or speed of the speech (Klebba, 1985). The recorded voice can be analyzed to interpret the attitude of the consumer in relation to some brand, or product, and the emotion in the speech (Nighswonger & Martin, 1981). The measurement of the pitch changes requires only a recorded vocal response, which is easily recorded today via cellphones, mp3 players, and iPod recording devices.

In the consumer behavior field, Chattopadhyay, Dahl, Ritchie, and Shahin (2003) explored how the voice of an announcer can change the cognitive responses of consumers, relating to brands and ad attitudes. They found that when the announcer spoke with a faster-than-normal syllable speed and low pitch, there were less negative advertisement-directed cognitive responses and more favorable ad and brand attitudes. Bartsch (2009) showed that vocal attractiveness impacts customers' pre and post encounter attribution and evaluation on call center. In addition, VOPAN can indicate a specific affective dimension and measure the consumers' attitude change (Wang & Minor, 2008).

Another option for physiological measurements is the pupillary response. This methodology consists of measuring the changes in the individual's pupil size at the time of focus and in the temporary dilation of pupils in response to visual stimuli (Wang & Minor, 2008). Related to pupillary response, the eye movement analysis relating to the pupillary response has been widely used in marketing studies since the '70s (Wang & Minor, 2008). According to Stewart and Furse (1982), it is possible to analyze eye movement based on the number of fixation or dwell times of the eyes during an individual's exposure to external stimuli. Eye movement analysis has been used to identify the elements of complex stimuli, such as voluntary or involuntary attention, or consumer memory and information processing (Wang & Minor, 2008). With technological advancements, eye-tracking systems have been developed.

The eye trackers have become more accessible in the forms of hardware and software that can perform automated analyses. These systems have been used in psychology, advertising, and communication studies. Today, eye trackers can be integrated with goggle systems that permit subjects to move freely with the instrument and record what they are looking and focusing on. In general, an eye-tracking machine works by measuring corneal reflection using infrared light emitting diodes (LED) (Cooke, 2005). Most eye trackers require calibration in order to provide precise measurements (Cooke, 2005), which will differ from system to system. Eye tracking systems usually record pupil diameter, fixations, and saccades. Fixations occur when the participant focus on a particular point (Lorigo et al., 2008). The fixations are measured by duration and frequency. Saccades are faster and represent when people move the eye from one fixation to the other (Cooke, 2005). This tool is usually employed to collect the number of eye fixations and dwell time. But, this can also be used to metric the scan-path, which is the order or sequence of the fixation (Lorigo et al., 2008).

Usually, researchers use eye-trackers to evaluate the effectiveness of advertisements, the valence or pleasure of some stimulus, attention, memory, and information processing (Wang & Minor, 2008). There are two variants of eye-tracking systems: one that is fixed on the subject's head and the other is a remote system where a camera is mounted on a computer monitor. Eye tracking is a versatile method, providing both measures of arousal and attention. The Table 4.1 summaries the physiological methodologies presented.

Table 4.1 – Physiological Methodologies

Methodologies	Definition	References
Heart rate	It measures the electrical discharges associated with the muscle contraction of the heart.	(Wiles & Cornwell, 1991)
Vascular Activity	It measures the vascular activity by recording changes in blood pressure, blood volume, or pulse volume.	(Wang & Minor, 2008)
Electrodermal Activities	It measures the skin conductance response (SCR) and the galvanic skin response (GSR).	(Wiles & Cornwell, 1991)
Facial Electromyography	It measures the facial expression muscle activities.	(Kenning & Linzmajer, 2011)
Voice pitch analysis	It measures the fluctuations generated by vocal cords in human speech.	(Klebba, 1985)
Pupillary response	It measures the individual pupil size and temporary dilation of the pupil.	(Wang & Minor, 2008)
Eye Movements	It is measured by the number of fixation or dwell times of the eyes, during an individual's exposure to external stimuli.	(Cooke, 2005; Lorigo et al., 2008)

4.2.2 Neuroscience Methods

"Neuroscience uses imaging of brain activity and other techniques to infer details about how the brain works" (Camerer et al., 2005, p. 9). The brain imaging is the most popular neuroscientific tool nowadays (Camerer et al., 2005). Neural imaging methods rely on paradigms with at least two conditions: an experimental task condition and a control condition. The differential activation between the two indicates neural regions involved with performing a certain task (Kenning & Linzmajer, 2011). Neuroscience methods allow researchers to investigate brain structures, such the area functions (Camerer et al., 2005; Kenning & Plassmann, 2005).

Different neuroscience methods that have been used to capture the neural foundations of behavior are functional magnetic resonance imaging (fMRI) (Camerer et al., 2005; Dimoka et

al., 2012; Morin, 2011), positron emission tomography (PET) (Camerer et al., 2005; Wang & Minor, 2008), magnetoencephalography (MEG) (Wang & Minor, 2008), and electroencephalograph (EEG) (Camerer et al., 2005; Kenning & Plassmann, 2005). According to Camerer et al. (2005), using neuroimaging, such as fMRI or PET, allows us to understand the relationship between mind and action.

In general, neuroscience techniques can measure the presence or absence of pleasure and arousal, information processing patterns, and memory (Wang & Minor, 2008).

Although fMRI is a newer method compared to the other methods, it is currently the most frequently used method (Kenning & Plassmann, 2005; Suomala et al., 2012). Thus, marketing researchers are focusing more on fMRI, given the large library of studies that have focused on topics relatable to marketing. Functional magnetic resonance imaging works by tracking blood oxygenation level in the brain (Dimoka, 2012). The machine exploits the different magnetic properties of oxygenated and deoxygenated blood (Kwong, Belliveau, Chesler, Goldberg, Weisskoff, Poncelet, ... Rosen, 1992). This difference reflects the parameters of neural activity in the brain. It is important to highlight that fMRI does not capture absolute levels of blood oxygenation but the relative intensity of the blood's magnetic level signals across conditions (Suomala et al., 2012). Although fMRI provides a good spatial resolution (Dimoka, 2012; Kenning & Linzmajer, 2011), it does not provide the best temporal solution due to the nature of this signal. Marketing researchers have been using fMRI to investigate product preferences, advertising effectiveness, brandy loyalty (e.g. Plassman, Kenning, & Ahlert, 2007), trade-offs (e.g. Hedgcock & Rao, 2009), reward processing (e.g. Perrachione & Perrachione, 2008), and pleasure and displeasure (Suomala et al., 2012).

Despite the prominence of fMRI, there is value in using positron emission tomography. Unlike fMRI, PET works with the aid of a tracer such as fludeoxyglucose (FDG), which is an analogue of glucose. Using FDG as a tracer, researchers can observe the regional glucose uptake in regions more metabolically active. Thus, researchers can use PET to validate results from fMRI. Like fMRI, PET has high spatial resolution, about 3–6 mm, but low temporal resolution, which is determined by the speed of metabolic processing of any given tracer. Because the PET requires an injection of radioactive material, this method is restricted to a healthy person (Kenning & Plassmann, 2005). According to Camerer et al. (2005), PET is an old technique, but is still being used.

The magnetoencephalography is a technique which collects the electrical brain activity (Kenning & Linzmajer, 2011). "MEG is sensitive to changes of magnetic fields that are induced by the electrical brain activity" (Kenning & Plassmann, 2005, p. 344). With MEG, it is possible to collect the temporal sequence of different cortical processing stages. This tool has a good temporal resolution. This technique is similar to EEG that will be described below. One relevant difference between MEG and EEG is that this MEG depicts activity in deeper brain structures (Braeutigam, Rose, Swithenby, & Ambler, 2004). One weakness is that the source location depends on a valid assumption (Kenning & Plassmann, 2005). This methodology has been used in analyzing cognitive and affective advertisements (Kenning & Linzmajer, 2011).

Another neuroscience methodology is the electroencephalograph (EEG). Wang and Minor (Wang & Minor, 2008) reviewed sixty-seven marketing studies, published between 1960 and 2006, and detected that the electroencephalograph was one of the most popular measurement device for brain wave analysis in marketing research during that time. The electroencephalography measures the voltage fluctuation on the scalp (Morin, 2011). More specifically, it detects electrical potentials produced by neurons (Kenning & Linzmajer, 2011). The brain wave analysis examines different types of waves in the human brain, such as alpha waves and betas waves (Wang & Minor, 2008; Young, 2002). The idea is to measure variations in the frequency of electrical brain activities (Camerer et al., 2005). "An electrode on the skin virtually 'sees' the summed potentials generated by a large number of neurons" (Kenning & Plassmann, 2005, p. 344). Unlike fMRI, EEG is a good technique to collect temporal data (Morin, 2011), because it allows the researcher to identify the sequence of brain activity (Camerer et al., 2005; Chamberlain & Broderick, 2007). Although EEG has a high temporal resolution, its spatial resolution is limited (Camerer et al., 2005; Kenning & Linzmajer, 2011). This methodology has been used to analyze the consumer responses to different advertisements (Young, 2002) and to collect data from cognitive information processing (Chamberlain & Broderick, 2007). This methodology might not be the best one to measure a particular affective response such as arousal. The difficulty in using this method is distinguishing between evoked potential and spontaneous potential (Kenning & Linzmajer, 2011; Kenning & Plassmann, 2005). To measure affect with EEG might be unclear in terms of its validity and reliability (Wang & Minor, 2008). Therefore, some cognitive scientists consider EEG a weak method to understand and predict the effects of advertising (Morin, 2011).

In order to validate functional areas found by fMRI, some researchers have been using the transcranial magnetic stimulation (TMS). The TMS stimulates areas from the brain sending electromagnetic impulse through skulls. Researchers place an electromagnetic coil directly over a specific location on the participant's head and introduce a transient high intensity current (Kenning & Linzmajer, 2011). This action activates the nerve cells that temporarily disrupt brain function in the activated area (Camerer et al., 2005). The concerns from this method are: (1) limits to the stimulated region, (2) limits to the cortical area close to the skull, and (3) researchers still not knowing how long the activation will occur. The TMS may have a long lasting effect on neural tissue. Because of that, the research has been used mainly in the Biomedicine field. Table 4.2 – summaries the neuroscience methodologies.

Table 4.2 – Neuroscience Methodologies

Methodologies	Definition	Author
Functional Magnetic Resonance Imaging	It measures the different magnetic properties of oxygenated and deoxygenated blood.	(Dimoka, 2012; Kwong, Belliveau, Chesler, Goldberg, Weisskoff, Poncelet, ... Rosen, 1992)
Positron Emission Tomography	It measures a modified glucose or neurotransmitter spatial distribution.	(Kenning & Linzmajer, 2011; Kenning & Plassmann, 2005)
Magnetoencephalo-graphy	It measures changes of magnetic fields that are induced by the electrical brain activity.	(Kenning & Plassmann, 2005)
Electroencephalograph	It measures variations in the frequency of electrical brain activities.	(Camerer et al., 2005; Young, 2002)
Transcranial Magnetic Stimulation	It measures the reaction of the behavior when some part of the skull is stimulated.	(Kenning & Linzmajer, 2011)

Technology has improved rapidly and will continue improving (Wu et al., 2012), creating new kinds of tools and joining different methods of equipment. This section did not have the goal of being an exhaustive and in-deep review, but only to present an overview of the possible methods that can be used in marketing.

4.2.3 Strengths and Weakness of Neurophysiological Tools in Marketing

According to Achrol and Kotler (2011, p. 37), "the fundamental process in marketing is consumption, and the elemental concepts in consumption are satisfaction, value and utility". This process and elements form the consumer experiences. As described before, neurophysiological tools can easily collect emotional experiences, arousal, valence, and

cognitive information processing. So, to finalize this topic, we summarized in Table 4.3 the strengths and weakness of the tools for marketing research.

Compared to self-reports, many neurophysiological methods have the advantage of measuring engagement, personal relevance, and emotional engagement (Barocci, 2011). It is important to mention that because of the constrains of each method, some researchers have used hybrid techniques that combine the strengths of different methods (Camerer et al., 2005).

Table 4.3 – Strengths and Weakness of Neurophysiological Tools in Marketing

Methodologies	Strengths	Weakness
Heart rate	Heart rate can measure pleasant or unpleasant responses, predict recall, memory, or attention mechanisms (Bolls, Lang, & Potter, 2001; Kenning & Linzmajer, 2011). Emotional experiences or anxious arousal can be collected by this method (Banich & Compton, 2011).	Interpreting heart rate response data can be challenging (Mundorf et al., 1991; Wang & Minor, 2008). Electrodes need to be attached to participants to collect the data, requiring little interferences with the subject (Poels & Dewitte, 2006).
Vascular Activity	Vascular activity can measure arousal, pleasure, and memory in response to external stimuli (Wang & Minor, 2008). It is easy to monitor and report.	There is a validity and reliability issues when using vascular activity to measure arousal and other physiological process (Wang & Minor, 2008).
Electrodermal Activities	Changes in electrodermal activities means changes in the sympathetic nervous system, which might result from arousal (Bolls et al., 2001), affective processes (Vanden Abeele & MacLachlan, 1994), or attention.	Some studies have shown that this methods is better in measuring emotional responses than self reports. However, some researchers do not agree with this, so validation on this method is necessary (Poels & Dewitte, 2006). It cannot determine the direction or the valence of the emotional reaction.
Facial Electromyography (fEMG)	Because of the rapidity of the facial reactions, unconscious and automatically controlled processes can be collected (U. Dimberg, Thunberg, & Elmehed, 2000). It is an accurate and valid method to collect emotions and emotional valence (Barocci, 2011; Bolls et al., 2001).	Facial EMG has to be completed in unnatural lab settings. The placement of electrodes on the face can make the subject draw the conclusion that their facial expressions are under measure, therefore they might try to express themselves more during the stimulus. Facial EMG is also susceptible to movements (Poels & Dewitte, 2006).

Methodologies	Strengths	Weakness
Voice pitch analysis (VOPAN)	Permit to analysis arousal. The data is collected in fractional seconds (Perrachione & Perrachione, 2008) so it is possible to be exact when the emotions are changed. The apparatus used to collect the voice data can "hide" from the consumer, permitting natural and real responses (Wang & Minor, 2008).	There are few studies using this technique. However, the method can be considered more valid, reliable, and sensitive than verbal measure. The database and parameter to compare the results in marketing research is small (Wang & Minor, 2008).
Pupillary response	It is great to analyze spatial attention (Perrachione & Perrachione, 2008). The data can be fragmented in seconds, since it is recorded by millisecond. It is considered useful and practical in measuring affective responses in marketing stimuli.	It is difficult to understand exactly which process is hiding the pupillary response (attention, arousal, pleasure, memory, or information process). In marketing, there is no previous marketing research involving this method yet (Wang & Minor, 2008).
Eye Movements	Eye trackers can help researchers explore attention and visual process, such as identifying semantic category on shelves or understanding how people perceive spatial layout or the level of clutter (Pierre Chandon, Hutchinson, Bradlow, & Young, 2009). It can also be used to identify the levels of detail for a given object. Many researches have already been done in this field (Teixeira, Wedel, & Pieters, 2012).	Many studies are done in the laboratory, facing the problem of simulation designs, without considering outside (real) distractions (Pierre Chandon et al., 2009).
Electroencephalograph (EEG)	It can be used to investigate consumers' immediate responses to variations in advertising, packaging, and branding. It is a good method for immediate responses to a variety of stimulus (Wang & Minor, 2008).	Non-hemispheric brain wave analysis remains somewhat unclear in terms of its validity and reliability (Wang & Minor, 2008). It has a very limited potential for location brain areas which are responsible for voltage fluctuation (Kenning, Plassmann, & Ahlert, 2007).
Positron Emission Tomography (PET)	It has a good spacial resolution (Kenning et al., 2007).	There is an ethical barrier such as invasion of privacy. Another barrier is high cost (Wang & Minor, 2008). Because this tool exposes subjects to radiation, it is usually restricted to healthy subjects by Institutional Review Board (IRB) (Kenning & Linzmajer, 2011).

Methodologies	Strengths	Weakness
Magnetoencephalo-graphy (MEG)	It has a good temporal resolution (Kenning et al., 2007).	It is a relatively new tool in marketing research. There is also an ethical barrier such as invasion of privacy (Wang & Minor, 2008). Another barrier is high cost. It has a complex data analysis (Kenning et al., 2007).
Transcranial Magnetic Stimulation (TMS)	The TMS can be used to understand decision-making and its heuristics. Researchers who have used TMS found outcomes that can be implied to consumer research (Kenning & Linzmajer, 2011). TMS is a good technique that tests brain functions and have external validity (Camerer et al., 2005).	TMS is limited to areas close to skull. The effect of the stimulus is limited to the stimulated brain region and it can have longer-lasting effects on neural tissue (Kenning & Linzmajer, 2011). It has not been used in marketing yet.
Functional Magnetic Resonance Imaging (fMRI)	Responses to experimental stimuli, such as visual, auditory, or tactile, can be collected without asking the subject (Dimoka, 2012). Together with the cognitive neuroscience field, fMRI can help understand mechanisms underlying decision making, emotion, arousal (Wang & Minor, 2008), informational process (Zaltman, 1997), memory, brand loyalty, consumer responses to marketing strategies, positioning, hierarchy of effects, object representation, etc (Perrachione & Perrachione, 2008). The information is accurate since the BOLD signal is recorded in approximately two-seconds interval. FMRI can be used to explore why some experimental effects occur, helping researchers understand the mechanisms of the classical relationship between one stimulus and its response (Perrachione & Perrachione, 2008).	The participant is not in a real purchase situation or environment; they have to lie still in the machine (Dimoka, 2012; Wang & Minor, 2008). Direct testing of hypotheses based on neuroscience has been limited (Poels & Dewitte, 2006). Another barrier is high cost and the complex data analysis (Kenning et al., 2007). There is an ethical barrier such as invasion of privacy. Another barrier is high cost (Wang & Minor, 2008)

4.2.4 "Neuromarketing" Concept

The term "neuromarketing" have been employed in marketing research, more specifically in interdisciplinary approaches to explain buying-decision (Hubert, 2010). The neuromarketing is the application of neuroimaging techniques to understand the human behavior in relation to market and marketing exchanges. In other words, neuromarketing is the science that employs

brain image researches using neuroscience technologies to investigate individuals' brain activities in response to marketing and advertising stimuli (Wang & Minor, 2008).

The term "neuromarketing" seems to have been used for the first time by Professor Ale Smidts in 2002, although professor Gerald Zaltman, from Harvard, had already commented about using fMRI in marketing in 1999 (Lewis & Bridger, 2005). It seems that the denomination "neuromarketing" had spread out after a conference called Neuromarketing in 2004 at Baylor College of Medicine in Houston. Everything indicates that the interested in the neuroscience started with neuroscientists looking for answers in advertising fields. Newspaper and magazine from 2003 to nowadays shows the "neuromarketing" idea and how the neuroscience field has been used. The Table 4.4 presents some of theses news.

Table 4.4 – "Neuromarketing" Concepts

"Neuromarketing" Concept	Reference
"An institute in Atlanta scan the brains of representative sample of its client's prospective customers, assess their reactions to the company's products and advertising and tweak the corporate image accordingly."	The New York Times (Thompson, 2003)
"Some corporations have teamed up with neuroscientists to find out. Recent experiments in so-called neuromarketing have explored reactions to movie trailers, choices about automobiles, the appeal of a pretty face and gut reactions to political campaign advertising, as well as the power of brand loyalty."	The New York Times (Blakeslee, 2004)
"The scientific dream of being able to peer into the human brain is possible today through new brain scanning technologies. Brain wave recording devices have been available for decades but now they can pinpoint more precisely which regions are active as people respond to products or make brand choices or are exposed to advertisements. Marketing's use of these new devices has been called 'neuromarketing'."	Max Sutherland's Weblog (Sutherland, 2004)
"Of the three brain-imaging techniques currently used in Neuromarketing – fMRI (Functional magnetic resonance imaging), QEEG (Quantitative electroencephalography) and MEG (magnetoencephalography) – it is fMRI which has captured the greatest interest among market researchers and enjoyed the widest publicity in the general and marketing trade press."	Advances in Clinical Neuroscience and Rehabilitation (Lewis & Bridger, 2005)
"An emerging technique called neuromarketing that uses brain scans to measure human response to promotional messages is starting to catch on in Europe" [...] "Neuromarketing uses state-of-the-art technologies such as functional magnetic resonance imaging (fMRI), magnet encephalography, and more conventional electroencephalograms (EEGs) to observe which areas of the brain 'light up' when test subjects view, hear, or even smell products or promos"	Business Week (Haq, 2007)
"Neuromarketing is an applied extension of neuroscience. The application of brain scan technology to marketing, especially the use of fMRI, gave rise to the term."	Max Sutherland's Weblog (Sutherland, 2007)

Lee et al. (2007) advice in their paper that the “neuromarketing” should not only research in the commercial interest, but also explores many other marketing research literature. Although the “neuromarketing” concept has been utilized in academia and in industry (Hubert, 2010), the term is still a controversy (Lee, Broderick, & Chamberlain, 2007). According to Lee et al. (2007) “neuromarketing” is wrongly conceptualized as the application of neuroimaging to consumer behavior. To present that misconception, they compare the neuromarketing concept with the neuroeconomics one. Kenning and Plassmann (2005 p. 344) complement – neuroeconomics means “the application of neuroscientific methods to analyze and understand economically relevant behavior”. Camerer et al. (2005) in their paper also explain that neuroeconomics is a “branded” area that brought neuroscientists and economists together. Based on that, neuromarketing should be “the application of neuroscientific methods to analyze and understand human behavior in relation to markets and marketing exchanges” (N. Lee et al., 2007, p. 200).

Dimoka et al. (2012) explain that the concept of “NeuroIS” is applied to the idea of using cognitive neuroscience theories, methods and tools in Information Systems. So based in this idea, neuromarketing should not be limited to neuroimaging.

Concerns of using only neuroimaging as the methodology into neuromarketing concept is only “the tip of the iceberg”. Hubert (2010) is one of the researches that do not agree with this label. She explains that marketing describes the idea of market-orientated corporate management. Accordingly, the term retail marketing denotes the concept of market-orientated management of retailers. Furthermore, the branch of service in marketing is concerned with the market-orientated management of service companies. Given these examples employed in the marketing field, “the notion of ‘‘neuromarketing’’ poses an impractical ambiguity” (Hubert, 2010, p. 813).

Some researchers have cautions in using the term “neuroeconomics” or “neuromarketing”, sometimes they avoid the word, or they used them in between commas. For instance Camerer et al. (2005) explain that a new area joining neuroscience and economic is being exploring using the denomination of “neuroeconomics”.

In my point of view, marketing borrowed the neuroscience’s methods to investigate customer behavior as it has been doing with other fields. Marketing has been borrowing methods from many others fields such as anthropology, philosophy, sociology.

Hubert (2010) suggests the term “consumer neuroscience”, explaining that the new concept means “the new research area that uses neuroscientific methods and findings to better understand the (neuro-)physiological fundamentals of consumer behavior”(Hubert, 2010, p. 813). The researcher idea is clear, the new concept blend not only neuro knowledge but also other physiological methods, differently from what neuromarketing concept proposes. But why not to use simply consumer marketing or customer marketing? Does “animal neuroscience” exist? So why consumer neuroscience should exist? The concept seems to emphasize neuroscience, however, if the study is in marketing this situation is not necessary.

I am not saying that neuroscience should not be used, on the contrary, the brain has many “automatic” processes, which are faster than conscious deliberations and which occur with little or no awareness or feeling of effort (Camerer et al., 2005), and the neuroscience can help in this investigation. In addition, our behavior is strongly influenced by the “affection” system (emotions, feelings, mood), and neuroscience is an area that has the knowledge and different tolls to explore this field in marketing. Neuroscience should be used to study consumer or customers, but it is just another view of the customer research.

Therefore, in my opinion, the most adequate concept is simply customer research. Neuroscience and psychology are complementary knowledge fields to research in marketing more specifically about customer behavior. Customer research can be used in different studies in marketing such as distribution, price, advertising, promotion, and employ different tools from the many sciences.

4.3 STUDYING CONSUMER BEHAVIOR WITH NEUROPHYSIOLOGY

Research in the field of retail marketing is important not only for the retail market, but also for other industries. For manufacturers, for instance, retailing research could be used to select the best marketing strategy, distribution channels, price policy, and the best retailers. One subtopic of retailing that can benefit from the techniques of neurophysiology is the consumer behavior. Consumer behavior is defined as the processes and activities people engage in when searching for, selecting, purchasing, using, evaluating, and disposing of products/services (Kardes, Cronley, & Cline, 2010). Specific elements of consumer behavior such as goals, schema, information processing, memory, involvement, attitudes, affective processing, atmosphere, consumer attributions and choices can play significant roles in various stages of the consumer decision making process (Puccinelli et al., 2009). Since emotional and cognitive process are

involved during consumer buying behavior, some researchers have been exploring the consumer decision making process with neurophysiology tools. In addition to emotion, attention and memory can also be more thoroughly explored with the neurophysiology tools since they are related to the human cognition system and therefore directly connected to the human brain (LeDoux, 1998). For example, the visual system allows for rapid brand and product identification. Plassmann, Ramsøy, & Milosavljevic (2012) exposed consumers to a number of rapidly identified choice alternatives (i.e., brands) to better understand how they pay attention (e.g. focus) on the products. According to Wilson (2004), our senses take approximately 11 million bits of information every second of which only 40 bits is part of the conscious process. Given the massive amount of information being processed unconsciously, neurophysiological tools offer a way to more holistically understand consumer's reactions to different marketing stimuli (Morin, 2011).

According to Puccinelli et al. (2009), in terms of perception of need, goals, schemas, information processing, involvement and affect influence consumer behavior. The perception of needs has a cognitive and an emotional approach. Therefore understanding how the consumers process information and how emotion influences consumer behavior are two main topics that can be explored via neurophysiological tools, especially since consumers have difficulty expressing thoughts and feelings by words (Dimoka et al., 2012).

Everyday companies launch new products in the market, trying to better satisfy the consumer needs. However, how do managers know which product will be the most successful? Neurophysiological studies can be used to explore which product better meets the consumer's needs. For instance, if you ask the consumer which changes they want in a product or category of product, usually they do not know the exact answer, and many of them respond with an innovation that they have already seen (Ulwick, 2002). Alternatively, if you present the consumers with different prototypes, and measure the level of pleasure indicated by fMRI, EEG, fEMG, heart rate, skin conduction, and/or monitoring their attention by eye-tracking, product managers could have a more nuanced and objective insight into which product to develop and launch.

The searching step is also related to the goal, schema, information processing, involvement, affection, but also to memory (Puccinelli et al., 2009). Long and short term memory can be tested to verify why and how people remember brands, ads, or products. Eye tracking can be also used to understand how people search for products on the supermarket shelves, and also

inform about effective product placement (how high on the shelf the products should be displayed and how many products should be in a row).

Brands studies have gained popularity in the academic and corporate world (Plassmann et al., 2012). Understanding how consumers see the value of a product is powerful. Therefore, some studies have tried to understand how consumers evaluate predicted values. Current research indicates that three brain structures might be of particular importance to this topic: the striatum, the ventral medial prefrontal cortex, and the dorsolateral prefrontal cortex (Plassmann et al., 2012). However, neuroscientists cannot accurately make a "reverse inference" because one brain area is usually involved in more than one mental process. Still, knowing the neural correlates could guide the direction for further studies in this area.

Many researchers have focused on advertising since it is an easy stimulus that can be used in laboratory. For instance, using fEMG, EEG and skin conduction, Ohme, Wiener, Reykowska and Choromanska (2009) explored why consumers had different product perception responses to two similar ads. The difference between the two TV ads was the slightly different angle of the female model face and a particular gesture lasting for 1.5 seconds. And while consumers could not articulate why they preferred one product to the other, the researchers observed significant differences in the consumer's neurophysiological reactions to the altered scene. That is, the difference was not consciously felt by the consumers, but their brains processed the information sufficiently different to alter their perception.

Nonverbal communication changes according the consumer's situation, expressivity, social status, display rules (Puccinelli, Motyka, & Grewal, 2010), leaving room for many studies to be done in this area. In addition, marketing communication involves much more than TV ads, so different stimuli can be used, such as face-to-face interaction, online interaction, print flyer, merchandising, posters, etc.

In the evaluation process, consumer attitude toward the product or brand and the retailing atmosphere are also elements that should be considered (Puccinelli et al., 2009). Indeed, a famous marketing study using neuroimaging found that attitude toward a product or brand can be so strong that it can alter the perception of pleasure. McClure et al. (2004) studied the neural activity of consumers who were drinking either Coca-Cola or Pepsi. Using fMRI, they found a higher preference for Coke over Pepsi when participants thought that they were drinking Coke. In this instance, the hippocampus and dorsolateral prefrontal cortex were implicated as possible

drivers of this effect. However, when blind testing was used, there was no effect, highlighting the importance of brand and information resources in the perception of pleasure.

The perception of price can also influence the evaluation process. For instance, Plassmann, O'Doherty, Shiv and Rangel (2008), using fMRI, showed that if they increased the wine's price, consumers reported an increase in the pleasantness of the flavors well as the higher activation in the medial orbitofrontal cortex, an area thought to be related to pleasantness. Few neuroscience studies have explored the idea of price, although there have been many price studies by economists. Economists have been exploring personal choice and decision making in situations such as risk-seeking or risk-averse (e.g. Glimcher & Rustichini, 2004), trust and cooperation (e.g. Fehr, Fischbacher, & Kosfeld, 2005), reward or loss (e.g. Aharon et al., 2001), fairness (e.g. Wright, He, Shapira, Goodman, & Liu, 2004) or game theory (e.g. Camerer et al., 2005). Although the primate prefrontal cortex has been linked to many high-level cognitive processes, its role in decision-making remains poorly understood in humans, and many studies could still explore this area.

Despite economist's exploration of the price field, many questions regarding consumer behavior remain unanswered. For instance how do people perceive discount? Which kind of discount is the most valuable? Which strategy (e.g. skimming market or market penetration) is better perceived by the customers? How do consumers perceive the pain of the cost and is this pain perceived with the same intensity as benefits? How do consumers perceive payment deadlines? Is there less pain in this kind of buying? How do consumers respond to different payment methods?

Also with regard to the evaluation process, according to Suomala et al. (2012), few studies have explored in-store shopping experiences. Therefore, this is an opportunity for researchers to explore stimuli such as sound (music, voice, noise), smells, pictures (black and white, colorful, unknown person, situation), text (letter size, words) and video (commercial) (Wu et al., 2012). Furthermore, crowding perception can be tested in retail atmosphere, in order to explore the unconscious responses and processes of each stimulus. These results could then be used to improve the retail setting in order to increase sales.

The third step in the process is purchasing. According to Puccinelli et al. (2009) in purchasing part of the process the memory is not involved; however all the other elements, such as goals, schema, information processing, involvement, attitudes or affective processing are included. In

choice process, different choice criteria, such as compensatory, lexicographic, conjunctive, affect as information or simple heuristics (more information at Kardes et al. 2010) could be explored. Companies can explore the attraction affect and the compromise affect (more information at Simonson, 1989). Familiarity behavior, cognition, and attitude may prevail when choices are made. Time available to make decisions or involvement with the brand or product is important in the decision-making. Therefore, neurophysiological tools can help researchers to understand how consumers process the information and how, and which kind of, emotions are involved in the choice process.

For an impulse purchase, the consumer usually skips the other steps of the process, and jumps from need perception straight to purchase. The retail industry has been using high-traffic locations such as checkout areas to try to induce impulse purchases. Many psychology processes can help the managers to make a better decide which product to present in this area and how to present it. For instance, eye trackers can help to understand what is priming the shoppers, where the people are looking, where signs should be placed, and how people move in a retail environment. EEG can provide insights into how to make the consumer more psychologically comfortable.

Typically people use the product after purchasing it. However, there are stores that now have interactive stations or some set-up that allows consumers to use the product prior to purchasing it. Neurophysiological studies can help to understand how people process information, how consumers learn how to use the products, and the relationship to sales

Another later step of the buying process is the post purchase phase. In this step, constructs such as satisfaction, intention of repurchase or change in behaviors can be explored. Studies about attributions, associations with some event surrounding their purchase (more information at Koschate-Fischer, Stefan, Hoyer, 2012), are related to emotion and can therefore be better understood by neurophysiology. For instance, if you buy a frozen pizza and it tastes bad, you can attribute this to the manufacturer for making a low quality product, to the retailer for not conserving the product correctly, or to yourself for preparing it incorrectly. How this information is processed? Which one yields the stronger negative emotion? How can this emotion change your product perception? These are all questions that can be explored with neuroimaging techniques.

Besides the processes previously discussed, other marketing elements could be explored such as segmentation, brand position, and brand image. However different populations should be explored since each of them has their importance in retail. For example, older consumers have become a major force in the marketplace and are as of yet an under-studied group (Eastman & Iyer, 2004). This population may not react the same as young people and could, for example, feel a different level of emotional intensity or of an entirely different valence. Jonides et al. (2000) tested verbal working memory task in older adults and younger subjects, with a type of conflict-resolution task, using PET. They confirmed that older adults show more behavioral interference than did younger participants. In terms of the neuroimaging results, older subjects had no reliable activation in the lateral prefrontal site, being one of the explanations of why they react differently. Understanding the different behavioral reactions and neural activations in the different demographics can help researchers to predict how consumers behave.

Another group that could be explored using neurophysiological tools is the low-income or less educated consumers. Since many of them are not able to read or express themselves in self-report questionnaires, neurophysiological tools could give researchers an accurate response about feeling and reactions to different stimulus. Tapping into this unstudied group of consumers could be very valuable to the industry.

Consumer groupings are related to the concept of market segmentation. By purchasing and using a particular product, consumers are trying to meet their needs. However needs are beyond just acquiring a product, there is also a personal and social motivation involved (Puccinelli et al., 2009). Because those needs are unique, they also be influenced by the environment; from this, researchers can create consumers cluster. Using these methods it is possible to cluster consumers without asking them about their behaviors, resulting in a more precise consumer classification.

Before we conclude, one question should be asked: are consumer's responses similar to a given stimulus across cultures? According to Chiao et al. (2008) the human amygdala is strongly activated when a "fear face" (face of someone feeling scare) is presented as a stimulus. The amygdala refers to a highly differentiated region in the brain near the temporal pole of the mammalian cerebral hemisphere. This region has at least four functional systems: accessory olfactory, main olfactory, autonomic and frontotemporal cortical (Swanson & Petrovich, 1998). Chio et al. (2008) showed that there is culture differentiation in brain activation. Employing fMRI, they found evidence of greater amygdala activation when the fear face is expressed by a

face belonging to a member of the participant's cultural group. Given that, many studies could be done to explore not only different ages or education's consumers, but also people from different cultures.

To conclude, even though neurophysiological studies are new in Latin America, some companies and a few universities have already created a 2D or 3D retail contexts using computer simulation technology, enabling laboratory study in retailing. Studying retail with neurophysiological techniques does not necessarily need to be carried out in laboratories or in virtual stores; nowadays many of the neuroscience technologies are portable, permitting consumers to use them onsite in a real store (Cooke, 2005).

4.4 FINAL CONSIDERATION

In summary, this paper reviewed neurophysiological techniques that have been used in marketing studies. Then, we presented how neuromarketing concept appeared. We concluded the paper by presenting some insights about what research might be conducted to study consumer behavior.

Neuroscience techniques will not solve all the marketing or retailing issues as there is no "buy button" in the consumer's brain (Suomala et al., 2012), but these tools can bring a new perspective of how studies in consumer behavior can be done. Studies with neurophysiological tools can reduce biases in the data collection, minimize rationality in situations involving difficult answers (Dimoka et al., 2012) and reveal "camouflaged" information or lies from the customers (Lee, Broderick, & Chamberlain, 2007). Therefore, neurophysiological measures seem to be an objective supplement to subjective, declarative data. When combined, the methodologies may enable marketers to portray both conscious and subconscious consumer reactions (LeDoux, 1998). It is important to say that numerous research techniques such as fMRI remain in their infancy (Garcia & Saad, 2008), at least in terms of their application in marketing research, and further basic research will be necessary to facilitate the confident application of these techniques to marketing.

We presented some directions for consumer behavior studies utilizing neurophysiological methods. Marketing field is enormous, and many subtopics can be explored in informations system, pricing, product management, advertising, brand, customer service, layout store, online shopping, environment and sustainability.

We hope this chapter can draw attention to the less-used marketing tools, which measure neurophysiology, as well as to expand the scope of debate and discussion regarding new studies in consumer behavior and retailing. Given that this paper covered topics and research from multiple disciplines, it cannot be considered an exhaustive review of the neurophysiological methods, nor their all their possible applications.

5 PRODUCTS, PRICE, AND PRESENTATION FORMAT: A PHYSIOLOGICAL STUDY

Currently, it is not difficult to find marketing papers using physiological methodologies such as heart rate, skin conductance response, facial electromyography, functional magnetic resonance imaging (fMRI) (Boucsein et al., 2012; Chamberlain & Broderick, 2007; Kenning & Linzmajer, 2011) in the top-tier marketing journals (Atalay, Bodur, & Rasolofoarison, 2012; Hinojosa et al., 2009; Pieters et al., 2010; Somervuori & Ravaja, 2013).

Theoretical models are better developed when expected results from empirical researches have been analyzed (Fields, Lys, & Vincent, 2001), especially using different methods. Scientifc tools and methods enable us to investigate consumer behavior in a new and more objective way (Kenning & Plassmann, 2005). Studies have applied neurophysiological methods to explore emotions (e.g. Johnstone, van Reekum, Oakes, & Davidson, 2006; Larsen, Norris, & Cacioppo, 2003; Tan et al., 2011), including pleasure, arousal, and dominance.

Emotions can be produced by pricing (Neill & Lambert, 2001) and products (Okada, 2005), therefore, this paper aims to explore the emotions and unconscious reactions to these factors. Little attention has been paid to the role of emotions in people's responses to prices and price information (Somervuori & Ravaja, 2013; Zielke, 2011). Understanding how price influences emotion and consumer behavior is particularly valuable. Price is involved in all purchase situations and it is one of the 4P's that can be easily modified. Companies employ price information for many strategies, for instance, retailers can measure their price positioning relative to competitors to ensure that they have a good position in the market (Zielke, 2011). The concept of perceived price can also help to understand how consumers judge products and brands. When consumers believe that the price is too high, and it is unfair, they will avoid conducting business with the firm that they believe is overpricing (Campbell, 2007a). One difficulty in studying the relationship between emotion and pricing is that researchers "rely on respondents' ability to describe and reconstruct emotions and thoughts, or on observers' ability to identify the emotions" (Somervuori & Ravaja, 2013, p. 479) using self-reported data and this method can be biased because of the process required to recall the emotion. According to Lee, Broderick and Chamberlain (2007), pricing seems to be a good construct to be explored with psychophysiological techniques since the perception of price is not exclusively rational. In terms of product types, many researchers have examined emotions associated with purchasing hedonic products (e.g. Khan & Dhar, 2010; Okada, 2005; Palazon & Delgado-Ballester, 2013;

Voss et al., 2003) but few has considered exploring this topic with neurophysiological tools (Karmarkar, 2011). The emotions about and the perceptions of different products can change consumer evaluations (Alba & Williams, 2013; Botti & McGill, 2011; J. Choi et al., 2014); therefore it is important to understand if emotions are in fact the main factors of consumer's evaluation.

In addition to these two important components from marketing, we are going to explore the form that products are presented in. Can the presentation of the products change the consumer's emotions? Marketing researchers use verbal or pictorial products and purchases situations in their research, but can the presentation form change consumers' emotions, physiological responses?

To explore the attention, arousal and emotion from presentation format, hedonic and utilitarian purchase and price, three physiological tools will be used: an electrocardiogram, skin conductance, and facial electromyography. The heart rate analysis can help measure pleasant or unpleasant responses to external stimulus (Wang & Minor, 2008), and this measure is considered valid, reliable, and sensitive. As a complement to the heart rate measurement, skin conductance responses are highly correlated with arousal and reveal the participant's state (under awake or over awake) (Boucsein, 2012). The fEMG is the third method, since it is considered to be one of the most adequate methods to collect physiological data on emotions (Barocci, 2011; Boxtel, 2010; Larsen, Berntson, Poehlmann, Ito & Cacioppo, 2008).

This research is relevant to the marketing field because: (1) it improves the link between psychological measures and marketing; (2) it integrates the price and emotion constructs in a single study; (3) it tests different methodologies using the same model; (4) it helps to understand how consumers process price information, which has important implications for price perception research; (5) it also may encourage the development of more comprehensive models that apply price and emotion as construct; and (6) findings of this study may help managers in the retail sector to understand consumers' responses.

This chapter is divided into the theoretical background with details on the three methods used on this paper. The following section describes the hypothesis that will be tested with the three methods, followed by the description of the methodology and analysis. The chapter concludes with a discussion of the results and the limitations of this study.

5.1 THEORETICAL BACKGROUND

One common way to classify products is as hedonic or utilitarian. Many researchers consider it a bi-dimensional scale with no purely hedonic or utilitarian product or purchase (Okada, 2005; Voss et al., 2003). The hedonic dimension is related to an expectation of pleasure (Alba & Williams, 2013) and involves the multisensory system and emotional arousal (Holbrook & Hirschman, 1982). The hedonic characteristic of a product is not always perceived as necessary (Sela & Berger, 2012), but the product is valued for its pleasing properties (Mano & Oliver, 1993). A utilitarian product is considered functional and usable (Botti & McGill, 2011), accomplishing functional and practical tasks. Utilitarian products are more instrumental and goal oriented (Wertenbroch & Dhar, 2000) and their benefits are perceived as tangible and concrete (Sela & Berger, 2012). Consequently, consumers consider utilitarian products to be more necessary (Choi et al., 2014).

Some researchers have explored the notion that shopping can provide hedonic and utilitarian value. Similar to the products' characteristics, the hedonic shopping value "reflects the value received from the multisensory, fantasy and emotive aspects of the shopping experience, while utilitarian shopping value reflects the acquisition of products and/or information in an efficient manner and can be viewed as reflecting a more task-oriented, cognitive, and non-emotional outcome of shopping" (Jones, Reynolds, & Arnold, 2006, p. 974).

Studies on hedonic and utilitarian products, services, purchases, goals, and contexts have been explored since the 1980s (Alba & Williams, 2013), however, few studies have examined the products using physiological tools. For instance, Larsen and Norris (2009) analyzed the hedonic treadmill and affective contrast using fEMG, Vecchiato et al. (2011) in their overview of EEG and MEG methods described a hedonic evaluation logo study, and Karmakar's (2011) dissertation explored price primacy in hedonic and utilitarian purchases using fMRI. All of these studies used pictures or photos as stimuli.

Self-reporting has limitations that should be considered in research studies. Some limitations are related to how to collect emotions from self-reports. First, some terms used in the emotional scales are not familiar to many consumers, for instance, brooding or sheepish (Chamberlain & Broderick, 2007; Richin, 1997). The translations of these words to other languages can also be complicated. Second, using a bi-dimensional scale with two emotions presupposes that the emotions involved in the questions are opposites, but this opposition of emotions has not been

validated (Richins, 1997). Chamberlain and Broderick (2007) offer an example based in the Pleasure Arousal Dominance (PAD) scale: bored and relaxed, and cared for and in control. Are they opposites? Third, emotions "are context specific, and the emotions that arise in the context of intimate personal relationships are likely to differ in intensity and quality from the emotions experienced" during a stimulus (Chamberlain & Broderick, 2007, p. 202). Fourth, can people describe their emotions' valence and arousal using scales? Many researchers who rely on self-reporting use valence and arousal, however, it is a challenge to ensure the validity of these measures. Other limitations relate to the following questions: Are the self-reported answers a reflection of people's beliefs? Can people's conscious reporting of a feeling change their true feeling? Chamberlain and Broderick (2007) state that if there is lack of symmetry between the verbal report and the behavior, then we can assume that the verbal reports are invalid. To address these difficulties, some researchers have used other methods that focus on physiological responses such as electrodermal responses, heart rate, brain activity, action tendencies, and overt actions as equally valid measures of emotional responses (Chamberlain & Broderick, 2007; Larsen & Norris, 2009).

Emotional processes are associated with some peripheral processes in the form of autonomic (i.e., visceral) and somatic events (i.e., motor, expressive) (Kreibig, 2010; Larsen et al., 2008). According to Stemmler (2008), emotions have distinct goals, and therefore automatic activities occur to prepare humans to act. For instance, emotion can create a tachycardia, increase the blood flow through limb muscles and decrease the blood flow through the face to prepare a person for a fight. The heartbeat is correlated with the intensity of emotion (Agrafioti, Hatzinakos, Member, & Anderson, 2012; Wan-Hui, Yu-Hui, & Guang-Yuan, 2009). Biometric and neurological methods can help to identify unconscious processes that are difficult to collect, validate, and trust using self-reported data (Barocci, 2011; Dimoka et al., 2012; Larsen & Norris, 2009; Somervuori & Ravaja, 2013). In addition, physiological signals are involuntary reactions of the body.

In the follow section, we will present the methodologies used in this paper, adding our hypotheses based on previous research (Chapters 2 and 3) and behavior results in a physiological perspective.

5.2 NEUROPHYSIOLOGICAL DATA COLLECTION

5.2.1 Heart Rate

The central nervous system (brain and spinal cord) is connected to the peripheral nervous system, which is composed of the automatic nervous system (ANS) and the somatic nervous system (SoNS). The somatic nervous system is the voluntary control of body movement. The ANS includes the sympathetic nervous system (SNS), parasympathetic nervous system (psNS), and enteric nervous system (ENS) (BIOPAC, 2014).

The myocardium muscle (heart) is rhythmic and considered part of the ANS. Electrical propagation causes the myocardium contraction or heartbeat (Clifford, Azuaje, & McSharry, 2006), and because myocardium cells produce electrical activity that flows within the body and can be collected on the surface of the skin, an electrocardiogram can be used to monitor the electrical discharges associated with heart muscle contraction. The ECG is not intrusive and shows three waves of a beat: the P wave, the WRS complex, and the T wave (Wan-Hui et al., 2009). Table 5.1 shows the approximate duration of each wave observed in the heart of a healthy person in a neutral situation. The waves consist of the sequential depolarization and repolarizations that occur in the myocardium (Agrafioti et al., 2012).

Table 5.1 – Wave and Timing Duration and Frequency

Wave	Duration	Frequency
P Wave	80 ms	8–10 Hz
QRS complex	80–120 ms	10–40 Hz
T Wave	300 ms	5–8Hz

Adapted from Agrafioti et al. (2012)

The heart rate signal is similar to the one presented in Figure 5.1, which was created using BIOPAC System and Software, adapted for a PowerPoint slide with wave information.

Heart rate variability can occur because of age, gender, health problems, medications, or drugs. In medical studies, doctors try to control all for these confounding factors (Clifford et al., 2006). One additional factor that could influence the heart rate measurement is the environment where the data is collected. Replacing or repositioning electrodes during the study can increase the noise and decrease the reliability of the data. In contrast, wireless data transmission modules can increase power consumption and consequently the data's validity. It is important to note that ECG is strongly related to respiratory and blood pressure signals (Clifford et al., 2006).

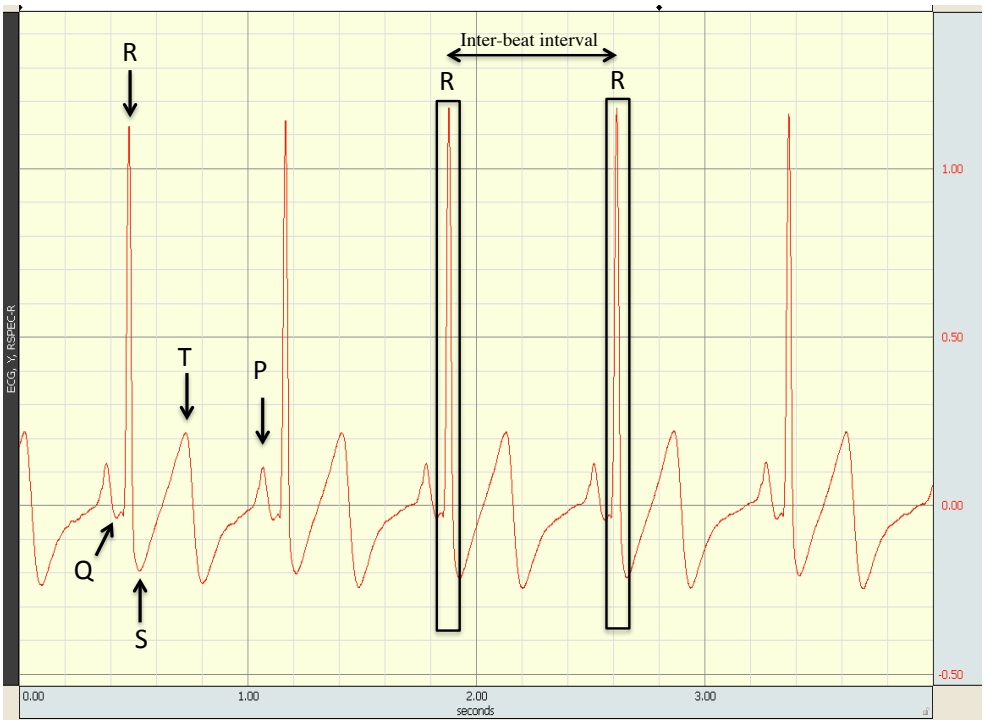

Figure 5.1 – Waves of Cardiac Cycle
Reference: Waveform above is from one of our participants

To record the heart's electrical activity, electrodes may be placed on the study participant's skin with conductive gel to reduce skin-electrode impedance. To collect very detailed medical information about the heart, a 12-lead ECG is necessary, however three electrodes are enough to collect data for one differential signal from the participant (one is the ground electrode). "The (millivolt) fluctuations in potential difference (PD) between the differential ECG leads on the skin's surface (or sometimes inside the body) are amplified with an optically isolated instrumentation amplifier" (Clifford et al., 2006, p. 41). Some researchers have found that too many leads increase the signal noise and create redundancy in the gathered information.

The ECG can capture subject-dependent emotion from the instantaneous variability of signals compared to its homeostatic baseline (Agrafioti et al., 2012). According to Wang & Minor's (2008) review, psychophysiology and marketing studies employed heart rate response to measure pleasant or unpleasant responses, and to detect recall, memory, or attention mechanisms. Kenning and Linzmajer (2011) complemented that the heart rate response measure can also be used to detect cognitive attention.

Although ECG can detect emotions using physiological signals of involuntary reactions in marketing and psychology studies, challenges in interpreting the results can still remain. For instance, the heart rate can increase in situations of either fear or excitement (Agrafioti et al., 2012).

Another way to study emotions with ECG is to explore the affective dimension (arousal and valence). Arousal is the emotional intensity that varies between low and high. Valence is the positive and negative connotation of the emotion, related to the pleasantness of the emotion. Agrafioti et al. (2012) explored the ECG signal of five emotions (gore, fear, disgust, erotic arousal, and excitement) displayed by visual stimuli (International Affective Picture System, IAPS). The study could differentiate negative emotions from positive ones and demonstrated that the ECG waveform depends on the activeness of the emotional experience; therefore active stimuli compared to passive stimuli can produce higher arousal, and consequently ECG can better detect the former.

Anger was chosen for the present research, since they are related to the perception of price fairness. Negative emotions such as anger can reveal price perception and whether it is deemed fair. Surprise could also be involved in the data collection since consumers do not usually expect a price change. Besides these two emotions from price, this research also aims to explore positive emotions from hedonic versus utilitarian products.

Kreibig (2010) reviewed 134 publications reporting the effects of emotions on peripheral physiological responses from journals published in the databases PsycINFO, PsycARTICLES, and PubMed. She did not consider any kind of medical research and excluded studies that tested only valences of discrete emotions. Six negative emotions (anger, anxiety, disgust, embarrassment, fear, and sadness), eight positive emotions (affection, amusement, contentment, happiness, joy, anticipatory pleasure, pride, and relief) and two neutral emotions (surprise and suspense) were explored in Kreibig's study. Although she did not create a quantitative study with sample, size, mean, or standard deviation, her review offers important insights for this study. For instance, in experiments related to anger, participants' heart rate increased, but heart rate variability decreased. The same results were found for anticipatory sadness, which could also be involved in a perception of price fairness. In happiness and joy, the heart rate also increased, however, the heart rate variability tentatively exhibited a decrease (this finding was not completely supported). For surprise, only 3 studies were done, showing a tendency toward heart rate decrease, which is counterintuitive.

5.2.2 Skin Conductance

The skin conductance response (SCR), also known as electrodermal activity (EDA), galvanic skin response, or skin conductance level (SCL) is well known outside the medical field (Boucsein, 2012; Boucsein et al., 2012). Electrodermal activities can be monitored through SCR (Wang & Minor, 2008) measuring the electrical conductance, which varies depending on the amount of sweat-induced moisture on the skin. Electrical conductance can be measured on the surface of the skin, usually the hands or the soles of the feet, and can occur by either external or internal stimuli. Since SCR essentially measures perspiration (Kenning & Linzmajer, 2011), and the hands and feet have a high density of the eccrine sweat glands, researchers have placed two electrodes next to the skin to measure the electric charge between these two points. When there is no external current applied, the method is called an endosomatic method, and when a direct current or alternating current is applied via electrodes on the skin the method is called exosomatic (Boucsein, 2012; Boucsein et al., 2012). The endosomatic EDA is not obtrusive and does not require an amplifying system, what means that it can be used with other measurements such as fEMG because it will not interfere with other measurements.

The SCR measures sweat secretion resulting from activation of the sympathetic nervous system, for instance, an arousal situation increases heat in the body and consequently perspiration, which increases the electrical conductance on the skin, as measured by the electrodes (BIOPAC, 2014). The eccrine glands receive their only activation signal from the SNS, therefore, increased EDA means arousal has increased.

The EDA is divided into two phenomena: the tonic (EDL = electrodermal level) and phasic (EDR = electrodermal response or reaction). The EDR is shown with the frequency (number of EDRs in a given time window), amplitude (height of a sing response), and latency (time from stimulus onset to response onset) (Boucsein, 2012). The EDA signal at the time when the stimulus is presented can be measured by resistance in ohms (Ω) or siemens or microsiemens. One ohm is the same as one siemens while one microohm is the same as microsiemens (1/1000000 ohms). The amplitude is "the height of the corresponding SCR as determined by the change in the tonic EDA amplitude from the time of SCR onset to the maximum tonic EDA amplitude achieved during the SCA: $|EDA(t_{max}) - EDA(t_{onset})|$" (AcqKnowledge Software Guide). Usually, the reaction to galvanic skin responses is delayed from 1 to 3 seconds. See

Figure 5.2 for one example of endosomatic changes in one of the participants of this study captured by a BIOPAC System.

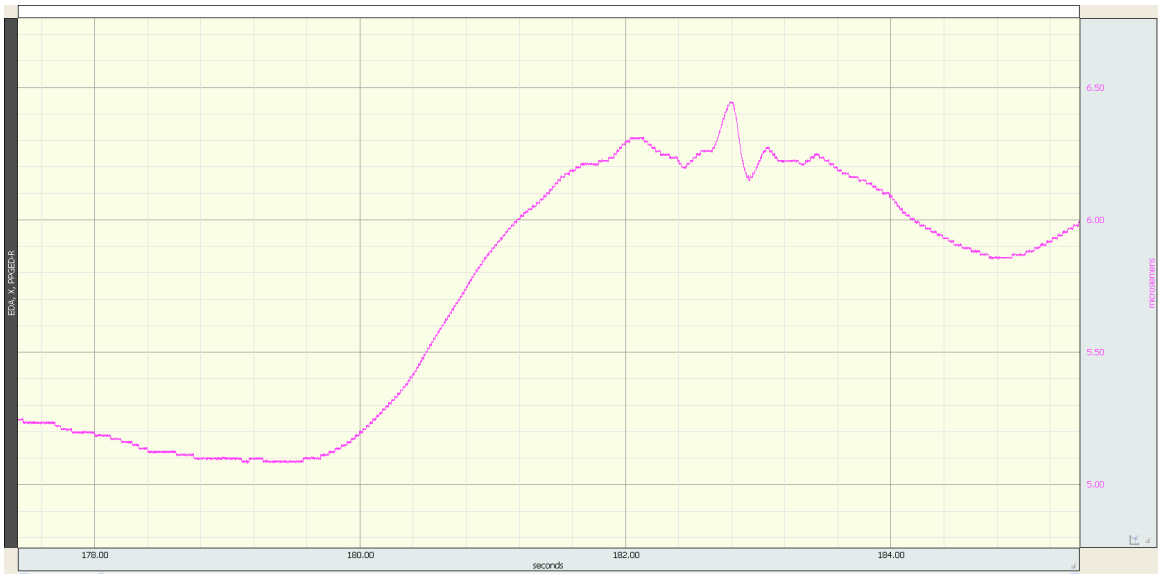

Figure 5.2 – EDA – BIOPAC

Reference: Waveform above is from one of our participants

It is also important to use a person's baseline measurements to compare changes in the body, since baseline body temperature can be different from person to person. There are other external and internal factors that can change EDA measurements such as humidity, medications, age, gender, or clothing (Boucsein et al., 2012). Other reasons why a skin conduction machine might not collect accurate data are poor contact with the electrodes and the machine, the electrodes may be dry, the person's skin may react to the gel (Boucsein et al., 2012). When correctly placed and well calibrated by the galvanic machines, the EDA device can measure subtle electrical differences.

EDA has been used to measure attention, arousal, affective processes (Wang & Minor, 2008), habituation processes, autonomic conditionings, biofeedback, psychophysiological detection of concealed information, personality, and the role of emotions in decision making (Boucsein et al., 2012).

EDA has been tested in different contexts. For instance, Öhman, Dimberg, and Esteves (1989) combined emotional properties of stimuli with the role of EDA during information processing. According to their research, the physiological responses immediately after a quick emotion stimulus can be detected even when the stimulus is blocked from entering consciousness. Simon, Detenber, Roedema, and Reiss (1999) tested 27 images extracted from movies and images, and by measuring heart rate and the peaks in EDA data, they found that picture

presentation versus movie presentation result in different effects on arousal, but not on valence. Carbonnell, Vidal, Sequeira and Caverni (2006) studied individual expectation based on detecting a set of rules in pairs of cards (with geometric figures). Collecting EDA data, Silvestrini and Gendolla (2007) explored mood states (negative, neutral, and positive) using movie clips, with the idea of better understanding mood regulation. They found a significant difference between negative emotions and neutral or positive, and they found a reaction related to mood regulation and mood induction.

In marketing, the EDA have been used to study orienting responses (increased or decreased reactions to a stimuli) (Boucsein et al., 2012). The orienting response is measured by the skin conductance amplitude, although other phasic response parameters (e.g. latency) can be applied. Because in marketing and psychology it is common to have a repeated measure, researchers have measured habituation to a stimulus. To do that, they have two options: "(a) measures of the slope of the habituation curve, either by function fitting or by simply looking at differences in EDR amplitude between different points of the habituation series, and (b) measures of the completion of the habituation process, typically reflected by the number of trials until no responses are observed" (Boucsein et al., 2012, p. 1027).

Kreibig's (2010) review notes that electrodermal activity increases when participants become angry; anger also boosts the nonspecific skin conductance response rate and skin conductance level. Negative emotions such as anger raise the skin conductance level and response, but happiness produces a similar response, in that the skin conductance level and response also rise compared to neutral or homeostatic conditions. Surprise can also be associated with increased skin conductance, however, this emotion has a rapid increase and a very fast return and needs more testing because the few studies addressing it have been contradictory. Researchers have found differences between emotion and arousal, although sometimes different emotions may elicit the same amount of general arousal (Boucsein, 2012), and therefore it is common for researchers to use subjective variables (questionnaires) to correlate their findings.

In terms of the presentation modality (word versus picture), one study on memory explored pictures and words presented on slides (3 seconds each) versus frequency versus non-frequently recall. In studying the orientation response, the researchers found that the SCR amplitude was significantly higher in the group with pictures (Stelmack, Plouffe, & Falkenberg, 1983). This result is similar to the results of the picture versus the movie (Simons et al., 1999).

This review of physiological and neurological methodologies reveals that some measurements such as skin conductivity and electrocardiograms are better for collecting data on visual attention and arousal or emotional intensity (Barocci, 2011; Dimoka et al., 2012). For valence facial electromyography will be used.

5.2.3 Facial Electromyography

Electromyography is a technique to collect electrical activity from skeletal muscle (Raez, Hussain, & Mohd-Yasin, 2006; Türker, 1993). Facial electromyography is considered a traditional method to collect emotions from facial expressions (Barocci, 2011). Using attached sensors in different parts of the face, fEMG detects electrical impulses generated in the muscles when facial expressions change (Barocci, 2011; Camerer et al., 2005; Raez et al., 2006). Because facial expressions can be considered an emotional response to a stimulus (Paul Ekman & Friesen, 1978; Paul Ekman, 1992; Neta, Norris, & Whalen, 2009; Wang & Minor, 2008), fEMG can collect emotional responses.

The surface facial EMG is not invasive; electrodes attached to different parts of the face (Kenning & Linzmajer, 2011) are sensitive enough to collect information from facial muscle contractions during an ongoing psychological process in which observation is either not possible, ambiguous, or time consuming (Neta et al., 2009). Figure 5.3 shows an example of how to use fEMG. Note that in this picture, the researchers are collecting data from *zygomaticus major* and *temporalis muscles*.

To use the fEMG methodology, as with ECG and EDA, many decisions need to be made including where to locate the electrodes, how higher will be the amplifiers, filter, and how to solve equipment noise. Researchers have to be careful about interference from electrical artifacts, mechanical artifacts, and the activity of other muscles (Raez et al., 2006; Türker, 1993). When properly applied, this method can result in reliable data, as seen in a study of the use of fEMG, in which the data was validated for the measurement of the directions of affective responses (i.e., valence and pleasure) or to complex stimuli (Bolls, Lang, & Potter, 2001; Wang & Minor, 2008).

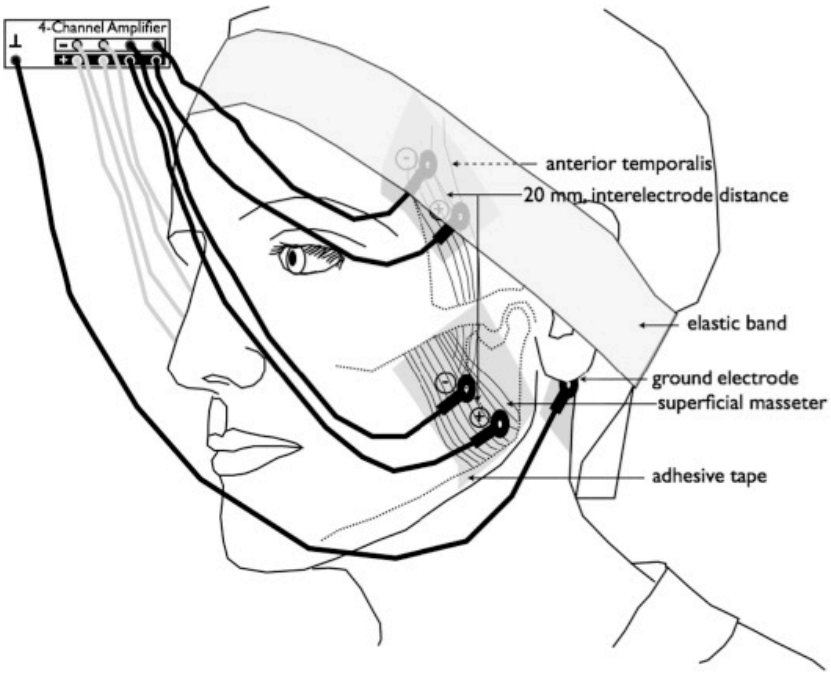

Figure 5.3 – fEMG Data Collection Example
Reference: Santana-Mora et al. (2009)

Of the many muscles in the face (see Figure 5.4 for the superficial muscles and their names), researchers collected emotional responses from *corrugator supercilii* and *zygomaticus major* (Fridlund & Cacioppo, 1986).

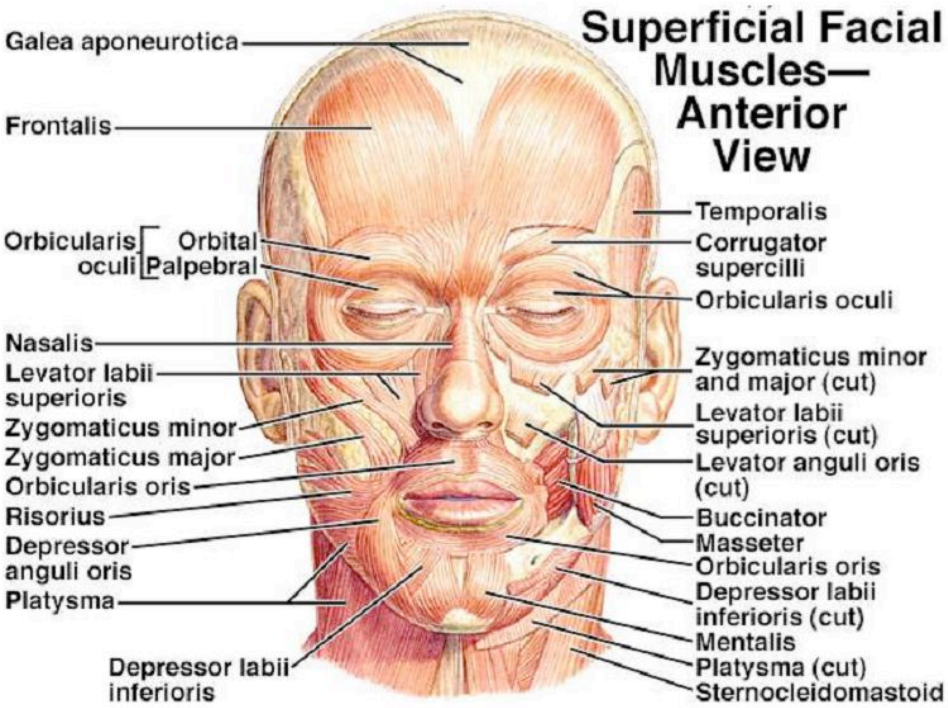

Figure 5.4 – Superficial Facial Muscles
Reference: http://dentallecnotes.blogspot.com/2011/07/lecture-notes-for-muscles-of-head-and.html

The *zygomaticus major* is a muscle that pulls the lip corner up and back (Fridlund & Cacioppo, 1986). This muscle lies in proximity to other muscles such as the *buccinator, masseter*, and *zygomaticus minor* (Larsen & Norris, 2009). Activation of this muscle is usually caused by positive stimuli (BIOPAC, 2014). Another important muscle is the *corrugator supercilii*, considered one of the muscles that responds to negative valence (e.g. anger) (BIOPAC, 2014; Neta et al., 2009). Measures of the activity of *zygomaticus major*, which pulls the corners of the mouth back and up into a smile, and *corrugator supercilii*, which draws the brow down, are examples of muscles that reflect human emotions (Larsen et al., 2003)

According to Neta et al. (2009), facial EMG has often been used to measure emotional responses in the negative and positive effect dimensions (Larsen et al., 2003), especially in response to visual stimuli. In the following paragraphs, we describe some research that has applied fEMG to collect data on emotions.

Lang, Greenwald, Bradley, and Hamm (1993) explored the valence (a range from pleasant to unpleasant) and arousal (a range from excited to calm) in people's responses to colored photographs. Their study showed that the *corrugator supercilii* response is inversely related to pleasure intensity, but the activities of the zygomatic muscles are not linear. The zygomatic major muscle responses "were greatest for pleasant ranks, smallest for more neutral ranks, and slightly larger again at the lowest valence ranks" (Lang et al., 1993, p. 265).

Larsen et al. (2003) studied positive and negative affective reactions to stimuli (affective pictures, sounds, and words) using self-reported and facial EMG data. Their study found that there is a stronger linear effect of valence on the activity of *corrugator supercilii* compared to *zygomaticus major*: The "positive and negative affect ratings indicated that positive and negative affect have reciprocal effects on activity over *corrugator supercilii*" (Larsen et al., 2003, p. 776).

Larsen and Norris (2009) investigated how the number of response options can effect affection (i.e., showing pleasure and displeasure) and supported the idea that *zygomaticus major* activation has the tendency to be a U-shape. According to Larsen and Norris (2009), however, the activity of this muscle is insensitive to small differences when the affect level is moderate. Sato, Fujimura, Kochiyama and Suzuki (2013) found a similar result in which no significant difference was found in the *zygomaticus major* in a condition of low arousal. Although in low-arousal conditions we may not perceive the muscles' activation, fEMG is much better for

detecting muscles' responses compared to visual detection, and fEMG has a good time resolution.

The challenging part is to distinguish the muscles' changes in accordance with elementary emotions based on the pattern of EMG responses without knowing exactly which emotion we are expecting (Chamberlain & Broderick, 2007).

According to Ekman and Friesen (1978), anger, disgust, fear, happiness, sadness, and surprise have specific configurations of facial actions. Ekman and Friesen determined how the contraction of each facial muscle (singly and in combination with other muscles) changes the appearance of the face and it's related to emotion, relating those with emotions years later. They called their technique the facial action coding system (FACS) (Paul Ekman & Friesen, 1978). Table 5.2 shows the facial muscles involved in each emotion.

Table 5.2 – Facial Muscles Involved in Emotions

Emotion	Muscles	
Anger	*Corrugator supercilii Orbicularis oculi* *Pars Medialis* *Orbicularis oris*	Eyebrows down Upper eyelids up Lower eyelids up Lips rolled in or tight
Disgust	*Levator labii superioris*	Nose wrinkle and upper lip raise
Fear	*Frontalis medialis* *Lateralis and Corrugator Risorius*	Eyebrows up (together) Upper eyelids up and Mouth stretched
Happy	*Zygomatic major* *Orbicularis oculi and pars lateralis*	Pulling mouth corners up Eyes crinkled
Sadness	*Frontalis medialis* *Orbicularis oculi, par lateralis and medialis* *Triangularis* *Mentalis*	Eyebrows up in the middle Eyes crinkled Lip Corners down Sometimes chin boss up
Surprise	*Frontalis medialis and lateralis*	Eyebrowns up mouth open

Reference: Adapted from Frank (2003) p. 268

Brown and Schwartz (1980) studied how emotions of happiness, sadness, anger, and fear activate facial expression muscles (*zygomatic, corrugator supercilii, masseter and lateral frontalis*). The *zygomatic major* and the *corrugator supercilii* showed significant differences in EMG activity for the four different types of emotions, but the *masseter* and *lateral frontalis* muscles did not show significant differences in EMG activity. Table 5.3 displays the results.

Table 5.3 – Facial Expression Muscles Activation in Emotions

Muscle	Happy	Sad	Angry	Fearful	Significance
Zygomatic	4.47 (R= 0.19)	0.17 (R= -0.12)	2.29 (R= -0.07)	4.13 (R= -0.04)	p<0.001
Corrugator supercilii	1.43 (R= -0.24)	8.45 (R= 0.24)	8.31 (R= 0.19)	5.93 (R= 0.11)	p<0.001
Masseter	-2.26 (R= 0.06)	-2.53 (R= -0.04)	-1.99 (R= 0.01)	-2.08 (R= -0.01)	ns
Lateral Frontalis	-1.39 (R= -0.08)	-0.83 (R= 0.06)	-0.76 (R= 0.06)	-0.55 (R= 0.06)	ns

Reference: Adapted from Brown and Schwartz (1980, p. 54)

Dimberg and Thunberg (2012) examined discrete emotions and found that participants who saw angry faces had decreased electromyography activity in the *zygomatic* muscle and increased *corrugator supercilii* activity compared to when they saw happy faces, confirming the valence studies described previously. It can be difficult to measure discrete emotions, but along with self-reporting or other physiological measures these emotions can be accurately measured.

Stimuli to fEMG can occur in different forms: pictures of unpleasant scenes (Lang et al., 1993), imagining emotional events (Witvliet & Vrana, 1995), sounds (Larsen et al., 2003), and picture with facial expression (Fujimura, Sato, & Suzuki, 2010), but can price evoke emotion and be a stimulus? Only one study using neurophysiological data to date has used pricing to evoke emotion. Somervuori and Ravaja (2013) explored emotions from the purchasing situation of 14 products (national versus private label brands) with different prices. The results showed that "low price level and national brand products elicit greater positive emotions compared to a high price level and private label products as indexed by *zygomatic* EMG activity", and the positive emotion increased the purchase intent (Somervuori & Ravaja, 2013, p. 486) According to the authors, emotional arousal was not found by measuring EDA, perhaps because low-value items may not produce changes in EDA.

5.3 DEVELOPING HYPOTHESES

Researchers have used music, films, commercials (e.g. Wan-Hui et al., 2009), pictures from IAPS (e.g. Agrafioti et al., 2012), and imaginary situations (e.g. Sinha, Lovallo, & Parsons, 1992) to explore emotions using ECG; however, there is a lack of research using ECG in marketing studies or using ECG to measure emotional responses to prices or products in particular. This paper aims to address this lack of studies.

People purchase a hedonic product to anticipate an experience or fantasy (Hirschman & Holbrook, 1982; Holbrook & Hirschman, 1982), and this anticipation is based on what they expect to be a pleasure (Alba & Williams, 2013). The hedonic approach to consumer behavior has the role of being a mental construct, involving the multisensory system and emotional arousal (Hirschman & Holbrook, 1982; Holbrook & Hirschman, 1982). Knowing the differences between hedonic and utilitarian products, and knowing that hedonic products can produce more pleasure and positive experiences than utilitarian products, this study will use physiological measures to illustrate these differences.

5.3.1 Product and Price

5.3.1.1 Heart Rate

Although some researchers have supported the idea that the heart rate can respond to pleasant and unpleasant situations (Wang & Minor, 2008), and ECG has been shown to detect emotions using physiological signals in involuntary reactions in marketing and psychology studies, challenges remain in interpreting the meaning of the physiological responses (Agrafioti et al., 2012). For instance, heart rate can increase in situations of fear and excitement (Agrafioti et al., 2012). Our heart rate increases when we face a threat to our well-being because our body starts to prepare to escape the situation (Reeve, 2009). Several emotions may evoke similar reactions in the body, although there are distinctions that can be made between certain emotions. For anger, fear, sadness, and joy, Ekman, Levenson, and Friesen (1983) showed in a study of professional actors that in a state of anger the heart rate increases, whereas in joy the heart rate remains stable (Reeve, 2009).

Similarly to Ekman et al. (1983), Sinha, Lovallo, and Parsons (1992) explored discrete emotions and revealed that imagery evoking anger as opposed to neutral, sad, fearful, or joyful imagery produced the largest effect on the cardiovascular system. According to Sinha et al. (1992), fear increases heart rate, blood pressure, and muscular blood flow while peripheral vascular resistance decreases, maybe because the body perceives fear as leading to bodily harm. In contrast, anger increases heart rate, blood pressure, and peripheral vascular resistance. Joy and sadness can also increase the heart rate compared to a neutral state, but not with the same intensity as the other emotions studied.

Some researchers have been using heart rate acceleration and slowdown to evaluate arousal (intensity) in response to a situation (e.g. Agrafioti et al., 2012; Teixeira-Silva, Prado, Ribeiro & Leite, 2004) and using measured arousal to define the intensity of a determinant emotion or to define the discrete emotions involved in response to stimuli. The most valid measures from studies using ECG relate to valence or arousal. According to Ekman et al. (1983), there is a differentiation between positive and negative emotions. For positive emotions such as happiness, the heart rate decreases, whereas for negative emotions such as anger or fear the heart rate increases. Similarly, Larsen et al.'s (2008) meta-analysis concluded that anger, fear, and sadness were associated with greater heart rate acceleration.

Based on the previous studies, we believe that an image of a hedonic product will evoke a positive emotion and will cause a lower heart rate compared to utilitarian products that produce more neutral responses. With this in mind, our first hypothesis is:

> **H_{8A} – When participants imagine purchasing a hedonic product they will have a lower HR activity compared to when they imagine purchasing an utilitarian product.**

The previous chapters showed that people have negative emotions when they sense unfairness in a discriminatory price situation, especially when they pay more than their friends, but also when they pay less than other people. The goal of our study is to confirm this, and so we propose that participants will feel negative emotions after discovering that others paid a different price for the same product. Since images or pictures that evoke anger rather than a neutral emotion, sadness, joy, or fear produce a large effect on cardiovascular system (Agrafioti et al., 2012; Kreibig, 2010; Sinha et al., 1992) we believe that in both cases (when the participants felt the price was unfair to themselves and when the participants felt that the price was unfair to others) the heart rate will increase. When we compare the situation of consumers perceiving injustice toward themselves versus others, the anger will be more highly activated in the former situation, and the heart rate activity will be higher when consumers perceive that they paid more than others did. This leads to three other hypotheses related to heart rate:

> **H_{9A} – When consumers know that they paid more than others their heart rate activity will increase compared to the baseline.**

H_{9B} – When consumers know that they paid less than others their heart rate activity will decrease compared to the baseline.

H_{9C} – The heart rate activity will increase more when consumers know that they paid more than others, compared to when consumers paid less.

5.3.1.2 EDA

As mentioned, the sweat secretion measure via skin conductance arises from activation of the sympathetic nervous system (BIOPAC, 2014). The eccrine glands receive an activation signal from the SNS, and increased EDA means arousal has increased. EDA is not the best method to measure valence (Venkatraman et al., 2015), but it is a good method to measure arousal. Electrodermal activities can be monitored through SCR (Wang & Minor, 2008). SCR is essentially a measurement of the amount of perspiration in response to a stimulus, which often indicates physiological arousal (Kenning & Linzmajer, 2011). SCR is good way to measure objective arousal in response to emotionally-relevant stimuli (Banks, Bellerose, Douglas, & Jones-Gotman, 2012). Therefore, we used SCR to investigate arousal responses to stimuli.

Among the studies that have been done with EDA, Silvestrini, and Gendolla (2007) explored mood states (negative, neutral, and positive) using movie clips to better understand mood regulation. They found a significant difference between negative emotions and neutral or positive ones, but they did not find a difference between neutral or positive. This shows that negative emotions in movie clips can evoke more EDA responses than positive ones.

Kreibig (2010) found that electrodermal activity increased when participants became angry, confirming the Silvestrini, and Gendolla (2007) study; however, in happiness situations, the skin conductance level and response also rose compared to the neutral condition.

Based on the previous studies, we have two main hypotheses when comparing hedonic and utilitarian products. If we consider buying a utilitarian product to be a neutral purchase situation, maybe (1) we can find a significant difference in EDA when purchasing one versus the other, as Kreibig (2010) found (2) we won't be able to find a significant difference in EDA between the products, similar to Silvestrini, and Gendolla's (2007) study.

The present study uses the imaginary situation of purchasing or renting an apartment, so there is a chance that the arousal produced by the body will not be strong enough to exhibit a difference. In addition, since we are not comparing negative purchasing situations, but only a hedonic versus a utilitarian purchase, we believe that no difference will be found in arousal between those situations.

H_{8B} – Imagining the purchase of a hedonic product will cause similar EDA activity as imagining the purchase of a utilitarian product.

In terms of pricing, when the perception of unfairness occurs, previous studies have shown that people feel negative emotions, more specifically anger. According to Silvestrini, and Gendolla (2007) and Kreibig (2010), negative emotions can evoke higher arousal compared to neutral or positive ones. In addition, Banks, Bellerose, Douglas, and Jones-Gotman's (2012) study exploring SCR in brain lateralization showed that EDA is significantly higher when negative emotions are involved, compared to neutral ones.

Based on that, we believe that EDA activity will be higher when consumers perceive price unfairness, in other words, when the price increases, which leads to the hypothesis:

H_{9D} – EDA activity will increase more when consumers know that they paid more than others did, compared to when the consumers paid less.

We cannot assume that the increasing EDA activity comes from anger, since surprise can also be involved. Although surprise is associated with a rapid increase and very fast return, it is difficult to prove that the changes come from a specific emotion. However, we believe that the main reason for a change in EDA will come from anger, since participants will see different stimuli (price increase or decrease). After participants have been exposed to a few stimuli, they will realize in advance that the price will change, removing any element of surprise.

5.3.1.3 fEMG

fEMG is used to collect emotions from facial expressions (Barocci, 2011; Paul Ekman, 1992; Neta et al., 2009; Wang & Minor, 2008). fEMG has been used for valence (pleasure versus

displeasure), arousal (excited versus calm), and for discrete emotions (e.g. happiness or anger). In low-arousal situations, previous researchers have not found a significant difference in fEMG activities when comparing emotions (e.g. Larsen & Norris, 2009; Sato et al., 2013).

As previously explained, *zygomaticus major* muscle activity indicates pleasure, and *corrugator supercilii* indicates displeasure, usually (Lang et al., 1993; Larsen et al., 2003). In 1978, Ekman and Friesen found that specific muscles change to reveal different emotions (as presented before). Many researchers built upon this idea in different studies and contexts (e.g. Brown & Schwartz, 1980; Ulf Dimberg & Thunberg, 2012; Somervuori & Ravaja, 2013).

Based on the idea that a hedonic purchase can evoke a positive sensation compared to a utilitarian purchase (more natural and neutral), we believe that *zygomaticus major* activity will occur when participants imagine a hedonic purchase. On the other hand, we do not expect any difference in the *corrugator supercilii*, since no negative emotion is involved in purchasing a hedonic or utilitarian product, leading to two more hypotheses:

H_{8C} – Imagining a hedonic purchase will increase the *zygomaticus major* activity compared to imagining the utilitarian purchase.

H_{8D} – Imagining a hedonic purchase will have the same *corrugator supercilii* activity compared to when participants imagined purchasing an utilitarian product.

Since *corrugator supercilii* response is inversely related to pleasure intensity, and the muscle reacts to negative stimuli (such as pictures, sounds, and words) (Larsen et al., 2003), we believe that this muscle will react when the price perception is changed by a perception of injustice. In other words, we believe that *corrugator supercilii* will activate more when the consumer knows that he or she paid a higher price. This situation occurs because they will tend to constrain the eyes muscles making an anger face, compared to baseline where the face is in relaxation.

H_{9E} – When consumers know that they paid more than others, *corrugator supercilii* activity will increase compared to the baseline.

When a consumer pays less than their friends, they might feel happy or simply comfortable for not paying more than others. In addition, they could feel that the price change is not fair, and because of that they might react negatively. Based on our previous behavioral results, we believe that participants will feel anger or be uncomfortable with the pricing difference, even when they had an advantage over their friends. In this case, compared to baseline, *corrugator supercilii* will show higher activity during the price stimuli.

H_{9F} – When consumers know that they paid less than others, *corrugator supercilii* activity will increase compared to the baseline.

However, we believe that when a consumer pays more than others do, the effects of their anger will be higher, and therefore *corrugator supercilii* muscle activity will be higher than when they pay less than others.

H_{9G} – *Corrugator supercilii* activity will be higher when consumers pay more than others compared to when they pay less.

The *zygomaticus major* muscle is usually used to measure happiness and in price unfairness there is no positive emotion involved. We believe that no difference will be observed in *zygomaticus major* activity when prices change.

H_{9H} – There will be no difference on *zygomaticus major* when the prices change

5.3.2 Presentation Type (Word versus Figure)

In addition to the product analysis and the emotions involved in discriminatory price changes, this study aims to verify whether the presentation mode of the products in a purchase situation changes the neurophysiological reactions.

Several psychology studies have been conducted to understand how words and pictures/photos can incite excitement (Citron, 2012; De Houwer & Hermans, 1994; Glaser & Glaser, 1989;

Hinojosa et al., 2009; Seifert, 1997). Those studies showed that images are superior to words in terms of the speed of categorization, recognition memory, focus and attention, the time period of process evaluation, and the production of emotion/affective information.

De-Houwer and Hermans (1994) showed that distractors influence the affective categorization of words but not pictures. In other words, pictures have privileged access to emotional information, as Hinojosa et al. (2009, p. 173) concluded: "pictures have a privileged access to all nodes of the semantic system, because language perception comprises additional processing before accessing the semantic system." Therefore, pictures would facilitate access to participants' emotions.

Using EEG and IAPS pictures, Hinojosa et al. (2009) showed that emotional images are capable of inducing higher arousal than words. In contrast, Tempel et al. (2013) found a different result in their study exploring the reasons why pictures could have an advantage in terms of provoking more emotional valence than a symbolic stimulus such as a word. Using EEG and 120 concrete objects, presented in words and pictures, Tempel et al. (2013) showed that both types of stimuli elicited significant and comparable emotion valences of around 240–300 ms post-stimuli, but different brain areas were activated before and after this period. The EEG revealed that processing of abstractions such as words very early (60–100 ms) and late (after 340 ms) evoke more widespread scalp distribution "possibly due to their heightened potential to exalt imagination," while pictures trigger activity in the posterior regions, suggesting that the processing of pictures requires more cognitive capacity, limiting the emotion's effect. It is important to say that in behavioral study no different emotional valence was found (Tempel et al., 2013).

Ambach, Bursch, and Vaitl's (2010) study on the context of concealed information tests (informally known as lie detector tests) investigated the presentation modality (verbal versus pictorial presentation) of objects related to an investigation of a mock crime and did not find a difference between the presentation modes. In their study, 31 health students participated in the SCR and EEG study. Among 8 mock-crime objects, and 3 neutral objects it was expected that participants would react differently to the objects. In this study, the students were not informed about which objects could be related to a crime, but before the computer lab research began, the students held some of the objects (similar to the idea that a robber would hold products) and placed them inside a suitcase (similar to the idea of hiding an object). In addition to the different objects (known versus unknown) presented to the participants, they were presented in

different forms (word versus picture). As a result, researchers found significant differences between how students reacted to the objects from the crime and the other objects, but they did not find physiological differences between the presentation modes. This paper is related to the present dissertation, since it is one of the studies that explores presentation format in measuring physiological data.

The previous research was mainly conducted using EEG, which shows conflicting results. Our study, instead, will apply ECG, EDA, and fEMG, and we will base our hypotheses in the following assumptions: We do not believe that ECG (heart rate) will exhibit different reactions according to the presentation mode, because the valences of the products are the same. The difference may arise from the cognitive areas, which are not being measured in this study.

H_{10A} – Heart rate activity during the presentation of an image of a product will be the same as it is when the product is presented in words.

Simon et al. (1999) found that the effect on arousal is different for pictures versus movies. In Stelmack, Plouffe, & Falkenberg's (1983) study about memory, participants explored pictures and words presented on slides (3 seconds each) to measure frequency versus non-frequently recall. Exploring orientation response, the researchers found that the SCR amplitude was significantly higher in the group with pictures (Stelmack, Plouffe, & Falkenberg, 1983), similar to the Simon et al. (1999) study. From the pool of physiological and neurological methodologies, some measures such as skin conductivity are better for collecting data on visual attention and arousal/emotional intensity (Barocci, 2011; Dimoka et al., 2012). Based on the previous studies and the assumptions from Barocci and Dimoka, we hypothesize that:

H_{10B} – EDA activity during a presentation of an image of a hedonic product will be higher than when products are presented using words.

fEMG activity reflects facial displays that accompany emotional processing, and affective stimuli such as emotional words, scenes, or facial expressions can elicit emotional responses in people's faces. Suess and Ragman (2015) explored internal mental events such as thoughts, memories, and imagination, measuring their scalps with an EEG and their faces with an fEMG. During the procedure, the researchers asked participants to view familiar or unfamiliar faces

and then imagine emotional or neutral expressions. Suess and Ragman (2015) found an interactive effect between emotion and familiarity in the imaginative situation and during the face stimulus. There was diminished *corrugator supercilii* activity for happy expressions on familiar and unfamiliar faces, and this effect was greater for familiar faces compared to unfamiliar ones. When an imagined situation was compared to visually observation of the faces, the authors suggest that common early processes are associated with emotional perception and imagination. In other word, according to Suess and Ragman (2015), the difference occurred in the timing. In the imaginary condition, the reaction came around 100ms later than in the real face expression visual observation. Therefore, their findings underscore the similarity of the brain's responses to internally generate and external sources of emotions.

Similar to Ambach, Bursch and Vaitl (2010) study of verbal versus pictorial presentation of the mock-crime objects and the Suess and Ragman (2015) study, we believe that *zygomaticus major* or *corrugator supercilli* will not change depending on the presentation type. Based on that, the last two hypothesis are:

H_{10C} – *Zygomaticus major* activity during the presentation of an image of a hedonic product will be the same as it is when the object is described in words.

H_{10D} – *Corrugator supercilii* activity during the presentation of an image of a product will be the same as it is when the object is described in words.

5.3.3 Hypothesis Summary

The Table 5.4 shows a summary of the hypotheses proposed before.

Table 5.4 – Hypothesis Summary

Theoretical Model	Hypothesis	Variables
Electrocardiogram	H_{8A} – When participants imagine purchasing a hedonic product they will have a lower HR activity compared to when they imagine purchasing an utilitarian product. H_{9A} – When consumers know that they paid more than others their heart rate activity will increase compared to the baseline. H_{9B} – When consumers know that they paid less than others their heart rate activity will increase compared to the baseline. H_{9C} – The heart rate activity will increase more when consumers know that they paid more than others, compared to when consumers paid less.	Independent Variable: Products (Hedonic and Utilitarian) Or Price Change Dependent Variable: pHR and BPM
Electrodermal	H_{8B} – Imagining the purchase of a hedonic product will cause similar EDA activity as imagining the purchase of a utilitarian product. H_{9D} – EDA activity will increase more when consumers know that they paid more than others did, compared to when the consumers paid less.	Independent Variable: Products (Hedonic and Utilitarian) Or Price Change Dependent Variable: EDA
Facial Electromyography	H_{8C} – Imagining a hedonic purchase will increase the *zygomaticus major* activity compared to imagining the utilitarian purchase. H_{8D} – Imagining a hedonic purchase will have the same *corrugator supercilii* activity compared to when participants imagined purchasing an utilitarian product. H_{9E} – When consumers know that they paid more than others, *corrugator supercilii* activity will increase compared to the baseline. H_{9F} – When consumers know that they paid less than others, *corrugator supercilii* activity will increase compared to the baseline. H_{9G} – *Corrugator supercilii* activity will be higher when consumers pay more than others compared to when they pay less. H_{9H} – There will be no difference on *zygomaticus major* when the prices change.	Independent Variable: Products (Hedonic and Utilitarian) Or Price Change Dependent Variable: RMS – fEMG for *zygomaticus major* and *corrugator supercilii*

Theoretical Model	Hypothesis	Variables
Presentation Type	H_{10A} – Heart rate activity during the presentation of an image of a product will be the same as it is when the product is presented in words. H_{10B} – EDA activity during a presentation of an image of a hedonic product will be higher than when products are presented using words. H_{10C} – *Zygomaticus major* activity during the presentation of an image of a hedonic product will be the same as it is when the object is described in words. H_{10D} – *Corrugator supercilii* activity during the presentation of an image of a product will be the same as it is when the object is described in words.	Independent Variable: Presentation Type (picture vs words) Dependent Variable: pHR, BPM, EDA, RMS – fEMG for *zygomaticus major* and *corrugator supercilii*

5.4 EMPIRICAL STUDY

5.4.1 Methodology

The study was performed to test the hypotheses proposed. The Institutional Review Board (Code: 21561) at Temple University approved the protocol before the data collection. Fliers were posted around campus, in various places, to invite participants who had no health conditions to participate in the study. Male participants were asked to shave their faces before arriving at the lab. Appendix G includes a flyer used to invite participants to the physiological study and Appendix H includes the physiological consent form.

Participants were contacted by email to participate in the study at the Center of Decision Making; 66 people were scheduled (maximum 6 per day) to participate in the study, and they received an explanation of how the study would be conducted, its timing, and expectations for participation. The biometric protocol took around 50 minutes, since the participants were part of more than one study. This particular study was the first one of three studies, all of which were related each other.

When the participants arrived in the lab, we explained to them the study procedures, benefits, and risks and asked them to sign a consent form. After that, we asked the participants to go to the restroom, wash their hands with soap, and dry them with paper towels. Of the 66 scheduled

participants, 54 came to the lab. They received around $20 to $30 plus a gift for participating in the three studies or $5 to $10, course credit of 1.5, and a gift if they were Temple students. The difference in financial compensation occurred because in one of the studies participants had to purchase the product.

5.4.2 Design

Similar to the last study from Chapter 3, the laboratory experiment tested 4 product types (2 hedonic and 2 utilitarian) vs. 2 stimuli (photo vs. words) vs. 4 price changes (+50%, +25%, -25%, -50%). The products and prices were randomly presented at each stimulus. In total there were 8 trials—the four products twice—in words and then pictures. We always used the word presentation first to not influence the participants' imagination of the product. The price was completely random, so it is possible that some people saw only price increases and others only decreases. The conditions were not completely randomized, as each one of the four products was presented only with words at first, and then with photos.

Stimuli were randomly represented by pictures with verbal descriptions. The products included a home alarm system, a TV set, an apartment with a seaside view, and an apartment overlooking a parking lot. In addition to being pretested for this study, as presented in Chapter 3, all of the products were suggested by the literature (Barsky et al., 2010; Khan et al., 2004).

As presented in Chapter 3, a pretest showed that the alarm system is more utilitarian ($\bar{x} = 2.19$) in nature than the TV set ($\bar{x} = 3.01$), which is more hedonic in comparison ($\bar{x}_{AlarmSystem} = 3.59$; $\bar{x}_{Television} = 5.55$). A lower score indicates that a product is more utilitarian, a higher score indicates it is more hedonic. As for the apartments, respondents saw the one with the seaside view as more hedonic ($\bar{x} = 6.17$) than the one with a parking lot view ($\bar{x} = 4.18$), which is more utilitarian ($\bar{x}_{Parking\ Lot\ View} = 2.20$; $\bar{x}_{Seaside\ view} = 3.43$). An ANOVA with repeated measures showed statistical differences among the products.

5.4.3 Procedures

After reading the instructions on how to operate the software program, subjects were assigned the conditions quasi-randomly. Respondents were asked to imagine themselves shopping for a product or looking for a place to rent. Next, they saw the product and its price. Further instructions asked subjects to imagine that a friend was offered a different price for each of the four products. After the price manipulation, subjects were asked to use a 7-point scale to

evaluate how much they agreed or disagreed with four statements on perception of price unfairness, perception of fairness, perceived value, and repurchase intention. The statements were presented at random to prevent subjects from trying to memorize the answers. After the 8 manipulations, the respondents completed questions about the other two studies, and then questions on demographics and the manipulation checks were completed.

To define product prices, we evaluated local ads to use the average market price (as of September, 2013). We defined 2-bedroom apartments with a $750.00 monthly rent and a television and alarm system were priced at $260.00 each. All pictures were in color and were the same size.

Since we were collecting physiological data, it was important to define the timeline during all the stimuli. So, after the instructions, we controlled the time for each slide. For the imagined purchase situation, participants viewed the same screen for 4 seconds, then the same screen was used to present the product and its price (at the same time), which lasted for more than 8 seconds. Then, half of the participants answered 7 statements about how they felt about the purchase situation. After that, they saw the second part of the stimulus, in which they were asked to imagine meeting a friend who paid a different price for the same product—this screen lasted for 4 seconds. Similar to the first part of the stimuli, the same screen presented the price a friend paid for more 9 seconds. The screen was paused for one more second to allow a little more time for the participant to calculate the price difference. Similar to the third study in Chapter 3, we did not indicate whether the price was 25%, or 50% more or less, we only displayed the price the friend paid in a dollar amount. After this second stimulus, the other half of the participants who had not answered the previous emotion questionnaire answered the exact same statements about emotions that the other half of the participants had already completed. To conclude one trial, all of the participants answered how much they agreed or disagreed with the perception of price unfairness, perception of justice, perceived value, and repurchase intention. Figure 5.5 illustrates how the screens were presented to the participants.

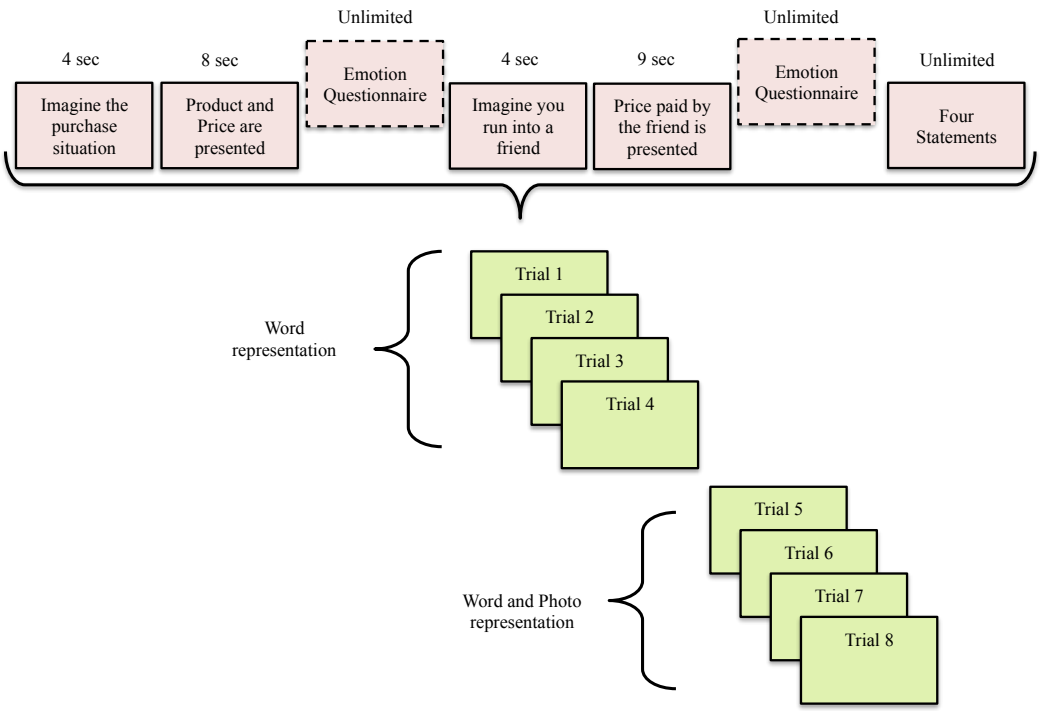

Figure 5.5 – Protocol of Stimuli Screens

5.4.4 System and Electrodes

This study used a multichannel physical signal-recording machine from BIOPAC Systems, the MP150 system. Electrodes on body surface (hand, chest, face, and neck) were used simultaneously to collect data for ECG, SCL, and fEMG. The signals collected were recorded by a microcomputer. The stimuli were presented by E-Prime, linked to the BIOPAC MP150 system, registering marks on different channels when the stimuli started and finished.

To avoid noise, we used disposable electrodes for each subject for both the ECG and EDA. Disposable electrodes are hygienic, usually hypoallergenic, and antiseptic. They have uniform electrical characteristics. The metal-electrolyte interface is stabilized and easy to use (Boucsein et al., 2012). In EMG data collection the electrodes were reusable and they were cleaned before and after each person with alcohol and damp paper. At the end of the day we also cleaned each electrode with water and soap. The contact electrolytes from the disposable electrodes had NaCL and KCl added in form of wet gel, and we added more gel to facilitate the signal (Boucsein et al., 2012). We also added gel to the EMG electrodes. Before applying the electrodes on the participant's skin, we cleaned and softly abraded the electrode site. After we placed them, we connected the electrode leads to the extension cables that led to the amplifier.

Then, we checked the signal. When one or more electrodes did not have a good signal, we replaced them with a new or clean one. In some cases, even after trying more than three times, we did not have a good signal. In these cases, we ran the study with only the channels that were working well. The electrodes settled for about 5 minutes before we began to record the data.

To obtain a sufficient signal-to-noise ratio, with few noises, the participants were asked to not move, talk, or chew gum during the experiment

5.4.5 Data Collection

5.4.5.1 ECG

Using three electrodes placed as shown in Figure 5.6, we collected the ECG data. One electrode was placed on the left side of the body about around two finger lengths above the lowest ribcage; a second electrode was placed on the right side symmetrically to the first one; and a third electrode was placed on the right side about one palm length below the shoulder. Electrodes were connected by extension cables to a receptor placed at the participant's waist. This receptor sends the information to the amplifier system through a wireless system and is recorded in the software.

The BIOPAC MP150 system allows the collection of multiple data, using different channels at the same time, so for ECG data we used Channel 16. The electrodes used were EL503 Series by BIOPAC. Those electrodes are adhesive and adhere easily to the skin's surface. They have a high conductivity and biopotential. The gel is composed of a 7% of chloride salt. The electrode has an 11 mm diameter, with a 9.5 mm^2 conductive contact area mounted on 3.5 mm diameter.

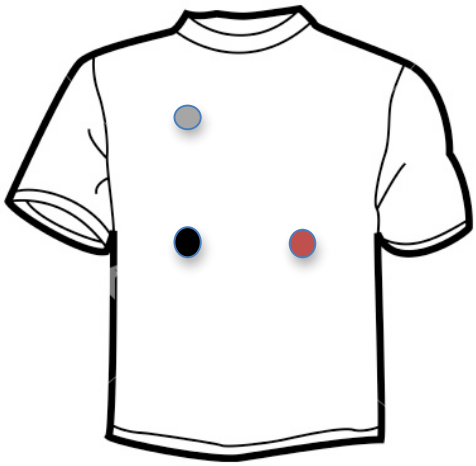

Figure 5.6 – ECG Electrodes Placement

The BIOPAC MP150 system collected the heart rate data, in other words, beat-to-beat data, as presented in Figure 5.1 – Waves of Cardiac Cycle. The system digitized the signal at 1000 Hz. The BIOPAC MP150 system automatically calibrated the signals.

5.4.5.2 ECG Measurement

Sine waves such as those in an ECG can be measured by amplitude, frequency, and phase. The amplitude is the magnitude of a signal. Frequency is the rate of the repetition of a signal. Phase is the "delay" before a signal begins. Based on these measures, from the ECG data we extrapolated the measures of pHR and mean BPM.

pHR: The electrocardiogram is the electrical activity detected and collected between a pair of electrodes (one positive, one negative) with respect to a third electrode (the ground). ECG is collected in millivolt (mV), or 1/1000 of a volt. ($1V = 10^6 \mu V = 1000000 \mu V$). The pHR means the difference between the heart rate during the stimuli and the heart rate in the baseline. The baseline is defined as a mean of 30 seconds of signal before the study began on the computer (before instructions). This analysis was not used for H_{9A} and H_{9B} because these hypotheses compare the stimulus data with the baseline.

BPM average: BPM equals the beats per minute measured from the start to the endpoint of a selected area, calculated as the difference in time between the first and last point selected divided into 60 seconds (1 minute). To obtain the mean, we calculated the BPM in each R-R interval and then we calculated the average. We opted to use the positive peak detected to define the R-R interval. The auto threshold was used and a peak interval from 40 to 180 was considered to be missing data. Lower frequency harmonics have higher amplitudes, and higher frequency harmonics have lower amplitude. So, opposite results from the heart rate and BPM are expected.

5.4.5.3 EDA

Skin conductance was measured directly using two electrodes, arrangement involving the medial phalanx of the third and fourth fingers on the participants' non-dominant hand. We used the non-dominant hand because participants used the other hand to answer questions using a mouse on the screen. After each stimulus the questions were presented, and keeping their dominant hands on the mouse we minimized their movements.

Figure 5.7 shows the location where we placed the electrodes. Electrodes were connected by extension cables to a wi fi receptor placed in their wrist.

Figure 5.7 – EDA Electrode Placement

Before we attached the electrodes to participants' hands, we asked them to wash their hands with soap and dry them with paper towels. However, it is not clear in the literature what the best procedure is before attaching the electrodes (e.g. to use soap or not), so it is important that all participants use the same protocol. Therefore, all the participants washed their hands after reading and signing the consent form.

EDA data was collected using Channel 9. The electrodes used were EL507 Series from BIOPAC, which adhere easily to the skin and have a strong adhesive that supports movement. The electrodes have a rectangular shape and are specific to electrodermal activity measurement. To establish physiological ionic equivalency to the skin's surface, isotonic gel composed of 0.5% chloride salt was added before placing the electrode on the participant's hand. The electrode had an 11 mm contact diameter, 9.5 mm^2 conductive contact area mounted on 1.6 mm diameter, with 1.5 mm depth for additional gel.

The BIOPAC MP 150 system with a sampling rate of 1000 Hz automatically calibrated the signals. The system digitizes and stores the data. However, to test the system, I asked participants to take a deep breath after the calibration and before they began the study. The longitudinal data was collected continually; critical events were marked with flags.

5.4.5.4 EDA Measurement

The EDA signal is tonic and phasic and can be measured by mean amplitude rate, conductance responses, rate of skin conductance, mean of absolute values of first differences, and the mean rise duration of skin conduction. For this study, following the procedures from Schiller et al.

(2010) and Zuccolo (2014), the raw amplitude data from the skin conduction was transformed into the square root. In addition, the frequency of the occurrences of specific SCRs was counted. The SCR is the individual localized change in the tonic EDA signal (BIOPAC, 2014). To explore a response to a certain stimulus, studies extract EDA measures that are linked to a specific stimulus from a tonic EDA signal. Therefore, the response to a stimulus or sometimes to an unidentified stimulus that occurs after stimuli were counted to check how many times the stimulus changes the participant skin conductance.

The detection of EDA was made using the detected SCRs with amplitudes smaller than 10% of the maximum SCR amplitude. This procedure has an advantage compared to the researcher's visual inspection who arbitrarily determines the threshold level. The SCR signal size typically ranges between 0.1 and 1.0μS.

Skin Conductance Responses Amplitude: The SCR is calculated by the height of the corresponding SCR minus the EDA amplitude achieved during the SCA. The unit of this calculation is umho.

5.4.5.5 fEMG

The fEMG data was collected following the instructions of Fridlund and Cacioppo (1986). From the *corrugator supercilii*, one electrode was affixed above the eyebrow on an imaginary vertical line that traverses the inner corner of the eye where the upper and lower eyelids meet. A second electrode was positioned 1 cm diagonally above the first electrode (De Luca, 1997), permitting a more compressed frequency spectrum (De Luca, Gilmore, Kuznetsov, & Roy, 2010). For *zygomaticus major* activation, one electrode was added "midway along an imaginary line joining the *cheilion* (lateral most point at the angle of the lips) and the preauricular depression (the bony dimple above the posterior edge of the *zygomatic arch*) and the second electrode was placed 1 cm inferior and medial to the first (i.e., toward the mouth) along the same imaginary line)" (Fridlund & Cacioppo, 1986, p. 571). The EMG electrodes were placed on the left side of the face since spontaneous emotional facial reactions originate in the right brain hemisphere (Fujimura et al., 2010). In addition, in right-handed people, the left side of the face transmits higher activity during emotional responses (Banich & Compton, 2011). Figure 5.8 shows the electrode placement.

After cleaning and lightly abrading the skin, two pairs of Ag–AgCl electrodes were placed on the *corrugator supercilii* and *zygomaticus major*. A single electrode (neutral) was placed on the

participant's neck. Using three electrodes per muscle (two plus a neutral one that was used for both muscles) it was possible to reduce and sometimes eliminate crosstalk (the mix of muscle energy) in the fEMG signal detection (De Luca, 1997).

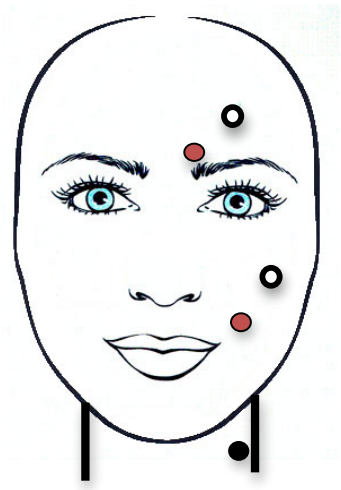

Figure5.8 – fEMG Electrode Placement

We used EL654 electrodes from BIOPAC. These electrodes are reusable with a 4 mm diameter and a housing diameter of 13mm. The 2 mm cavity was filled with gel. We used ADD204 double-faced adhesive collars to place the electrodes on the participant's face. We also added silver tape to prevent them from falling off.

The BIOPAC system with a sampling rate of 1000 Hz was used to collect the data. The raw EMG data was recorded in two channels, one for each muscle. The amplitude range of the EMG signal is 0–10 mV (+5 to -5) prior to amplification (Raez et al., 2006) and the frequency spectrum sensor usually ranges from 0 to 400 Hz (De Luca et al., 2010).

5.4.5.6 fEMG Measurement

EMG signals produce two main signals that can be analyzed: amplitude (RMS/ARV) and spectral variables (median/mean frequency). The interpretation of amplitude allows an understanding of muscle force (force-net torque) and muscle activation (on/off), in addition to the interpretation of spectral variables to verify muscle fatigue and muscle biochemistry (De Luca, 1997). For the present study, we are interested in exploring muscle activation (on/off) in specific situations. Therefore, an amplitude analysis will be done.

The amplitude analysis does not measure the force of a muscle; it is simply a function of muscle usage. It is difficult to find a muscle in a state of total relaxation; therefore, to create the functions it is important to define a threshold high enough to avoid false "on" conditions. The amplitude was calculated using root mean square processing (RMS), which is defined as the time-windowed RMS value of the raw EMG. RMS is the most often used measure of the magnitude of an EMG signal because it is a measure of the signal's power that has a clear physical meaning. RMS allows the researcher to minimize the noisy, nonperiodic, nonsinusoidal signals and reveals more relevant information than the measures of the mean rectified or integrated. Many researchers have used the RMS score (Bedaf, Heesink, & Geuze, 2014; Lang et al., 1993; Nitzken et al., 2013). Therefore, EMG signals were filtered and rectified, and then they were smoothed by means of the RMS technique with a 125 ms sliding average. We calculated the mean amplitude of facial EMG for each second in the period of stimuli viewing (8s). The statistical analyses were conducted using the means of RMS.

5.4.6 Filters

Because of interference from electrical and mechanical equipment or the activity of other muscles (Raez et al., 2006; Türker, 1993; Zschorlich, 1989), many researchers apply filters and perform data transformation (Agrafioti et al., 2012). There are four types of commonly used filters: low-pass filter, high-pass filter, band-pass filter, and notch filter (also called band stop filter). The low-pass filters are used to "inhibit frequency components in a signal above a chosen cut-off frequency but allow frequency components below this cut-off frequency to pass with the least possible distortion" (Zschorlich, 1989, p. 82). The high-pass filter is the opposite, in that it inhibits frequency components in a signal below a chosen cutoff frequency, allowing components above this cutoff. The band pass is the combination of these two filter types. The notch filter suppresses a particular frequency band in a signal.

There are two kinds of filters that can be used: the finite impulse response (FIR) and the infinite impulse response (IRR) (Zschorlich, 1989). The FIR can function with a limited amount of data, and the IRR functions with an infinite amount of data. FIR filters have a particular and work with linear phases, whereas IRR filters have limited cycles and make polyphase implementation possible. IRR filters are used for applications that are not linear, while FIR filters require linear phases. All filters used in the study were run separately for each waveform channel, according to the data tool collected. The filters were run using AcqKnowledge version 4.3 software.

5.4.6.1 ECG

Respiration is a common source of noise in ECGs (0.12 to 0.5 Hz or 8 to 30 BPM), as are external electrical devices (e.g. electricity of 50 to 60 Hz) (Agrafioti et al., 2012). There are a number of techniques available for de-noising ECG signals (Padmanabhan, Lin, Ong, Ser, & Huang, 2007). In this study, we first removed low frequency noise using a filter of frequency of 1 Hz, which could result in a false positive at the QRS detection stage and then we removed higher frequency noise using a filter of 35 Hz. We used the IIR filter because this was not a linear phase. "The IIR filters are useful for approaching the results of standard biquadratic filter" (BIOPAC Manual). Next, we ran a QRS detector to verify anomalies, and when anomalies were found we removed the participant from our analysis, since heart anomalies can drastically influence the results. We used the filtered ECG data to analyze pHR. For peak to peak and BPM, we continued the process by generating R-R intervals and BPM rates from ECG data, and in those analyses we used a filter with a cutoff at 0.666–3 Hz (40–180 BPM).

We concluded the organization of the data by checking for outliers and reviewing some abnormalities; for instance, a change from 60 BPM to 160 BPM may be considered an outlier. Figure 5.9 illustrates the data flow during the generation of the pHR, peak to peak, and BPM data.

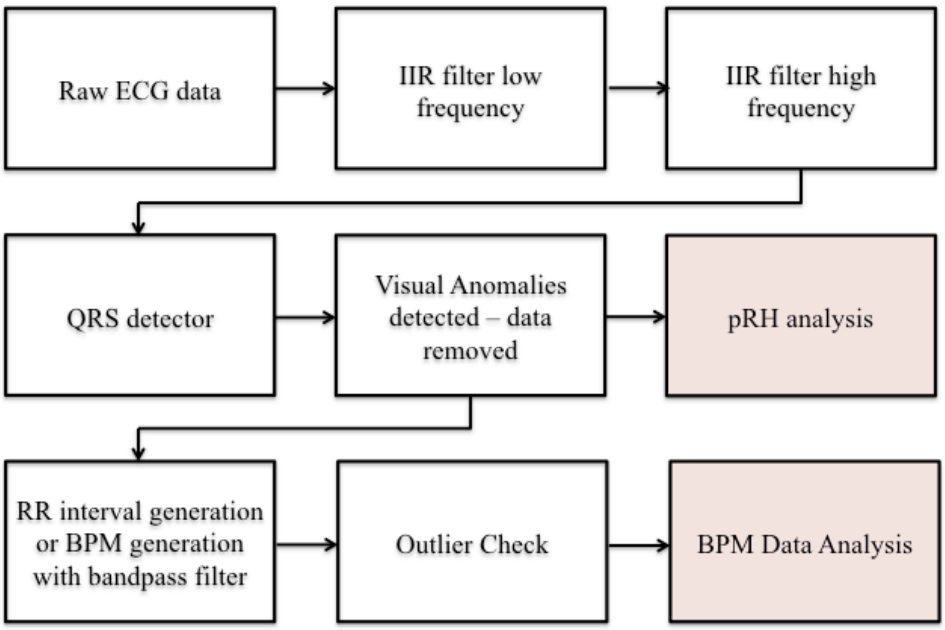

Figure 5.9 – Describing ECG Filters Process

Figure 5.10 presents the waveforms during each steps of the filters used to clean the data.

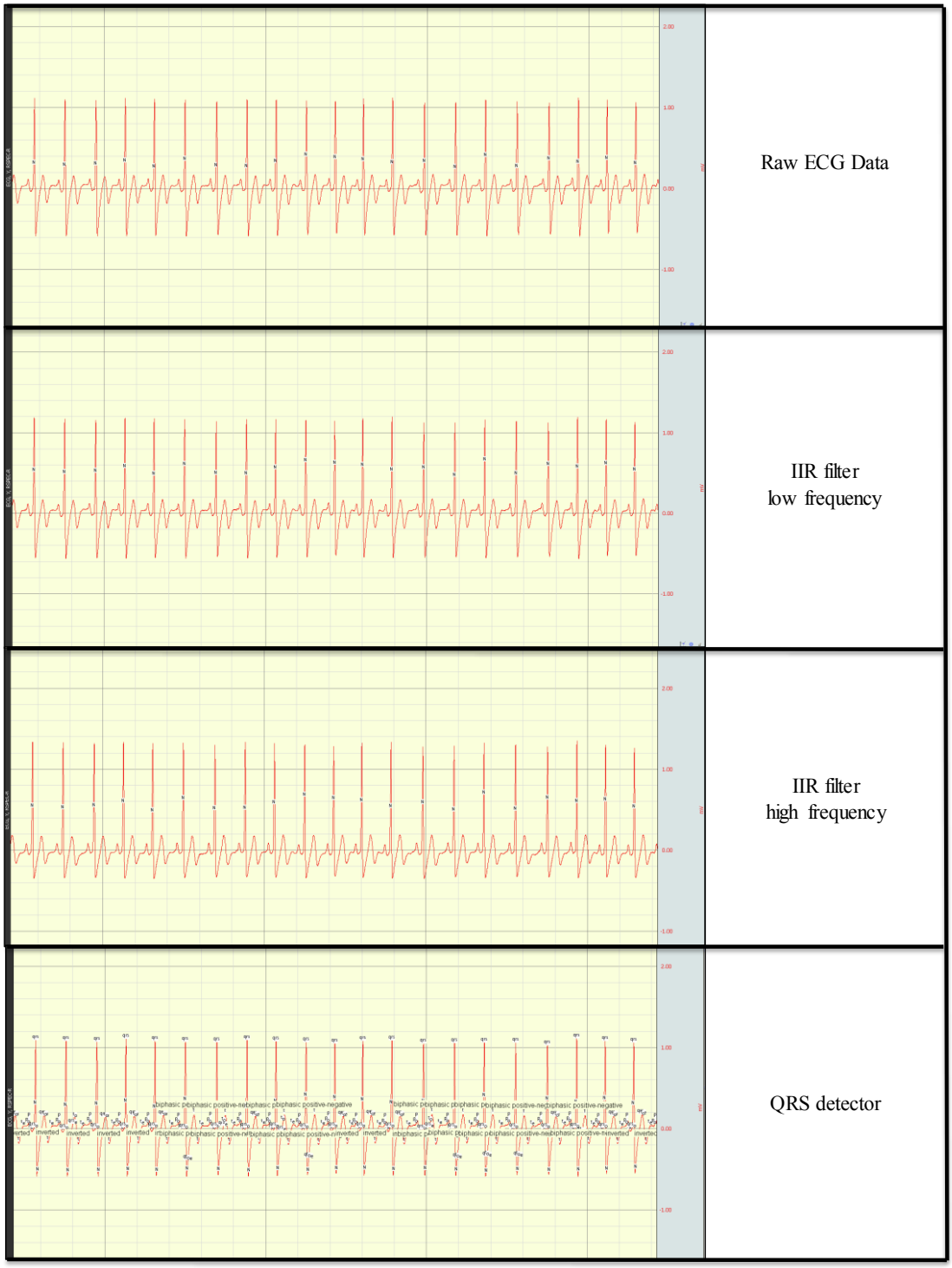

Figure 5.10 – Waveform During Transformation and Analysis

Reference: Waveform above is from one of our participants

5.4.6.2 EDA

During the data collection process, automatic calibration from BIOPAC was used. Using AcqKnowledge Software, a low pass FIR with a cutoff fixed at 25.000.000 and a sampling rate of 8.0.000.000 was used. The number of coefficients was optimized for the sample rate, and the threshold used was -61 bB. Then, the data was smoothed, using the mean value for smoothing with a factor of 500 samples. This helped the system to clear the noise and minimize the time spent on running the SCR locations. Figure 5.11 shows the smoothing transformation; the raw and the smoothed data follow the same curves and format.

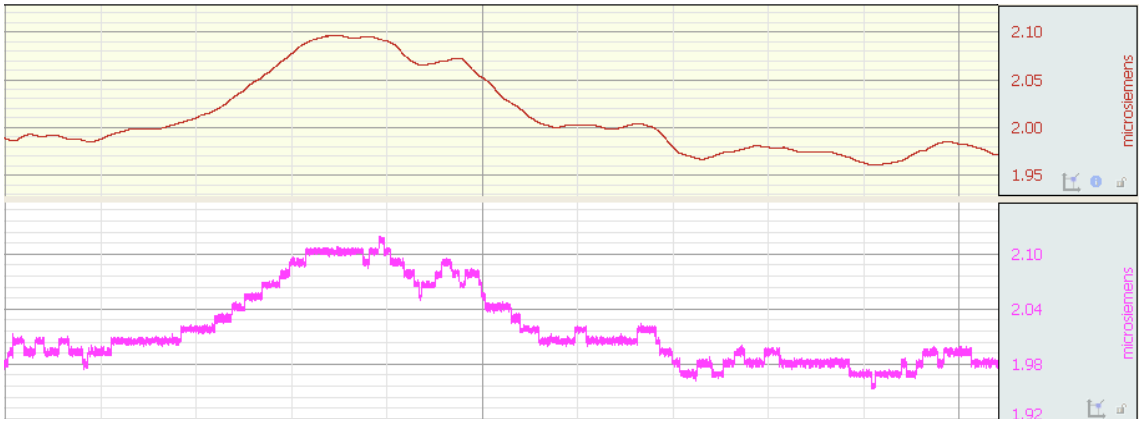

Figure 5.11 – Smoothing the EDA Data.

Next, using the E-prime digital information of event in and off, we marked the physiological data with flags when the events occurred. The events are the moment when the participant saw the stimulus. The first 4 seconds of the experiment were the presentation of a sentence asking participants to imagine a situation, and the SCR has a delay of 1 to 3 seconds; thus, we calculated the SCR starting 5 seconds after the stimulus began, concentrating the analysis on the product or price presentation. Figure 5.12 shows the smoothed EDA data, followed by the raw data and the stimuli duration (12 seconds = 4 for text presentation + 8 for product or price presentation).

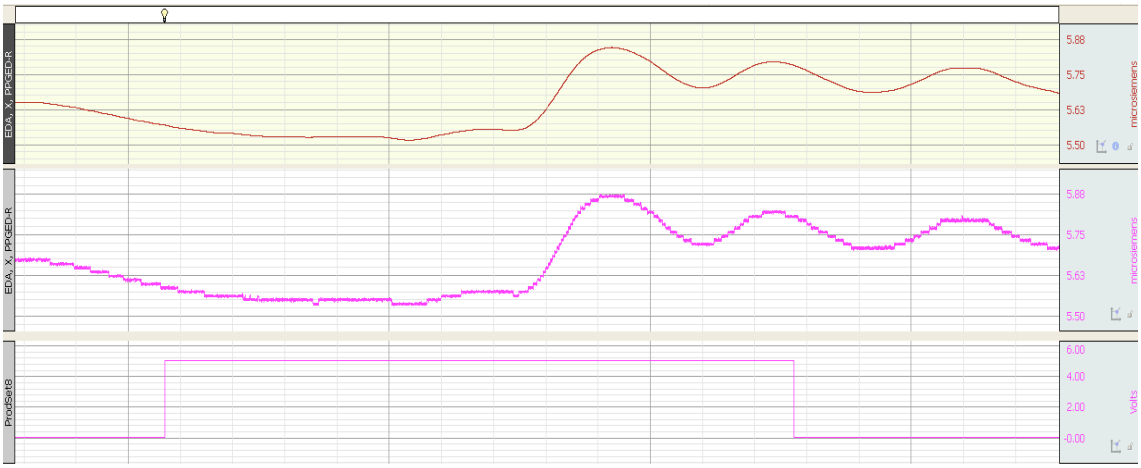

Figure 5.12 – Reaction to a Stimulus

The system localizes all potential SCR occurrences that are large enough to be considered as a SCR. The potential SCR occurrence is detected by performing threshold positive peak detection on the phasic EDA signal. Detailed information about how the system localizes the SCR and constructs the phasic EDA can be found in the guidelines for EDA (Braithwaite, Watson, Jones, & Rowe, 2013).

5.4.6.3 fEMG

The fEMG data is very sensitive and vulnerable to noise contamination, so it needs to be filtered to minimize noise (Raez et al., 2006; Zschorlich, 1989). According to De Luca et al. (2010), modern technology can minimize or eliminate skin electrode interference and amplifier noises, however, baseline noises and movement artifact noises can still be problematic. As in ECG, researchers use a number of techniques to filter the fEMG data (Bedaf et al., 2014). Appendix I includes 25 papers in which researchers used filters in fEMG. The appendix shows that pre-1990, researchers used band-pass filters of 50–90 to 1000 Hz. From the year 2000 onward, band-pass filters have been used that range from 16 to 400 Hz; 30 to 400 Hz; 10 to 500 Hz; 20 to 500 Hz; 30 to 500 Hz; 40 to 500 Hz; and 50 to 500 Hz. Some researchers have also used band-stop filters of 50 Hz and others 60 Hz. So, what it the best filter to be used?

According to De Luca et al.'s (2010) study of low frequencies in fEMG, most of the power is between 20 to 200 Hz and movement artifact signals are usually lower frequency. Testing 10 Hz, 20 Hz and 30 Hz filters, De Luca et al. (2010) explain that the 30 Hz filter can be successfully applied for movement artifacts, but it may remove a portion of the lower frequency components that can be important to the study, while 10 Hz or 20 Hz are not sufficient to fix the noise. Therefore, based on De Luca et al. (2010) and Franklin, Lee, Hanna,

and Prinstein (2013), I chose the FIR band-pass filter of 28 to 500 Hz (1001 coefficient tapered with Hamming window). With this frequency range it is possible to suppress artifacts and retain the true EMG signal.

After this filter, we ran an IIR band-stop filter (frequency 60 Hz) following the recommendation for deleting electrical noise (Zschorlich, 1989). The Q = 30.59 was used to keep the discarded bandwidth as low as possible. Although it was not often used in the past, recently researchers have followed this recommendation (Boxtel, 2010; Cannon, Hayes, & Tipper, 2010; Fujimura et al., 2010; Urry, 2009, 2010).

Figure 5.13 shows a spectrum analysis from one of our participants, before filters. Observe that the main power is, at 60 Hz, consistent with the noise from electricity. The spectrum range of this participant was from 1 Hz to 500 Hz. Figure 5.14 presents the spectrum analysis after filters.

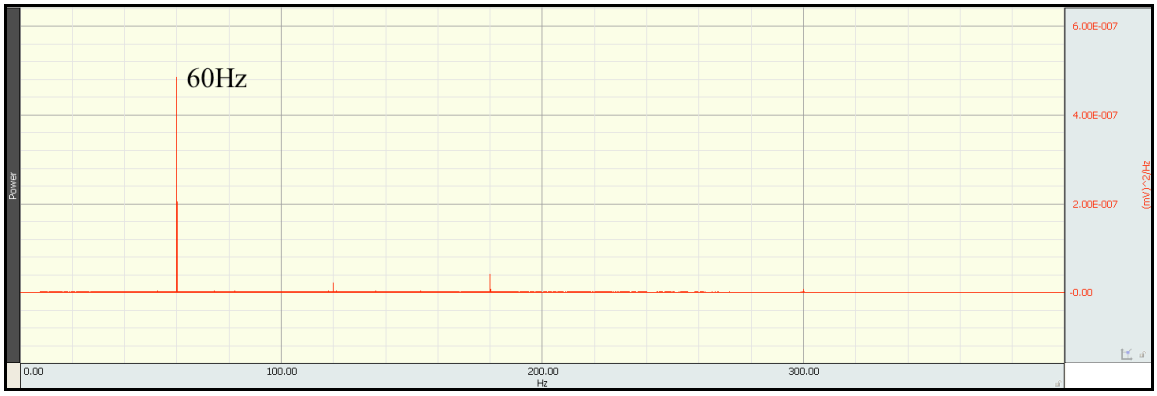

Figure 5.13 – EMG Zygomaticus: Power Spectrum Density, Before Filter

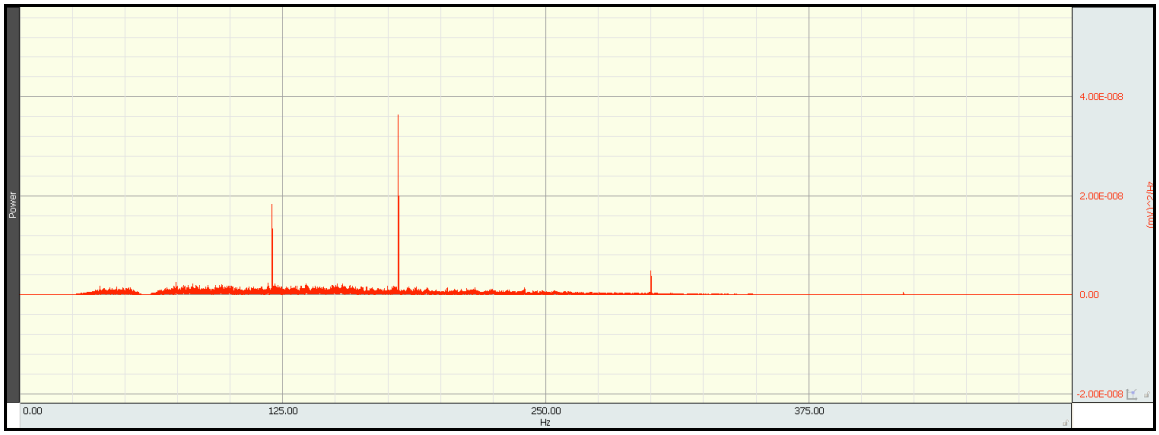

Figure 5.14 – EMG Zygomaticus: Power Spectrum Density, After Filters

Next, the data was visually inspected; discarding participants that still had artifacts that could influence the data. The EMG signal sometimes presents non-stimuli-related artifacts caused by

coughs, for instance. This check is necessary because the EMG signal is low in amplitude compared to other ambient signals (De Luca, 1997).

EMG signals are non-stationary, which means that the frequency of the signals continuously change over time (Raez et al., 2006). There are two classified myoelectric signals: the slow and the fast. The slow signal is created by "the accumulation of metabolites that causes electrical manifestation of muscle fatigue. The fast non-stationary are mainly related to the biomechanics of the task" (Raez et al., 2006, p. 18). Since this study investigates the reactions from stimuli, fast reactions are the focus in this study. Therefore, to correct for the positive skew inherent to EMG data, we calculated the RSM. The RSM is appropriate and provides useful measurements of signal amplitude. RSM represents the signal power and has a clear physical meaning (De Luca, 1997).

Following standard practice (e.g. Lang et al., 1993), facial EMG reactivity was measured as change scores representing the difference between activity during each second of the 8-s stimulus period, with the baseline being an average of 1 s immediately preceding stimulus onset (Lang et al., 1993). Figure 5.15 summarizes the fEMG pre-processing.

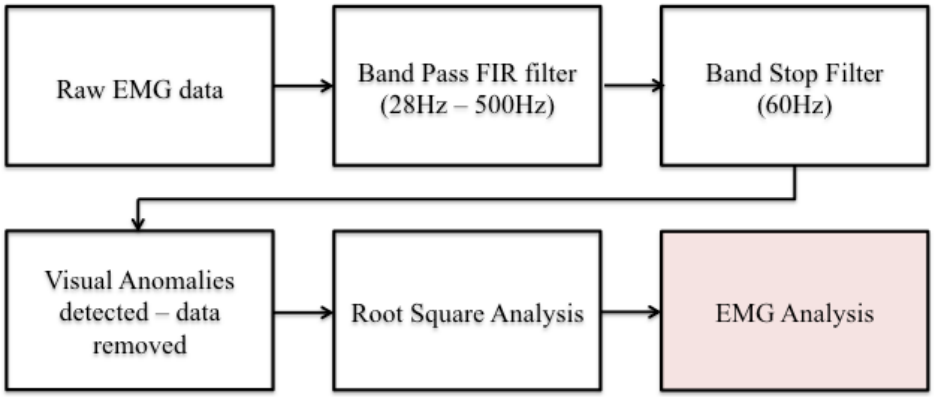

Figure 5.15 – Describing EMG filters

5.4.7 Descriptive Analysis

We collected data from 54 participants, but one participant's demographic data was lost. Of the remaining 53 participants, 35 were female and 18 were male. The age range was from 18 to 66 years old, and 50% were 18–25 years old. Dividing the participants in two age groups, 51.9% were 18–26 and 48.1% were 27–66 years old. As for marriage status, 18% were married or divorced, 79.2% were single, and 3.8% were widows. In terms of education, 59.3% had attended some college, 20.4% had completed college, 9.4% had a master's degree, 7.4% had

completed high school, and 1.9% had a doctoral degree. For employment, 32.1% were undergraduate students, 26.4% held part-time jobs, 20.8% held full-time jobs, 15.1% were looking for a job, 3.8% were graduate students, and 1.9% were retired. As for annual income, 54.7% earned less than $9,999 (probably because of the higher number of undergraduate students), 9.4% earned $10,000–$19,999, 13.2% earned $20,000–$29,999, and 23.6% earned more than $30,000.

Of the 54 participants, three could not be analyzed because the computer recorded only part of the study. To be consistent in the analysis, we deleted these three participants from the data.

5.4.8 Physiological Analysis

The following analysis is divided into two steps: first, we analyzed Hypotheses H_1 and H_3, which are related to the product; second, we ran the analysis based on H_2, which is related to the price change perception. ANOVAs with repetitive measures were used for H_1 and H_3 analyses. In some cases we used covariates such as income, age, or gender, since those variables can affect the physiological analysis (Boucsein et al., 2012; Clifford et al., 2006).

For the product analysis we used eight stimuli, two hedonic and two utilitarian repeated twice (with words and with pictures), and the products' prices were not always the same. There was one price range for the television and alarm system and a second price for the rental house (with hedonic or utilitarian attributes).

Based on that, we decided to not combine the product stimuli in one analysis to explore H_1, instead opting to analyze the product in pairs (hedonic vs. utilitarian) for those products of the same price presented in words and products of the same price presented in pictures.

For all pricing change stimuli described in this paper, the data were analyzed using the generalized estimating equations (GEE) procedure, similar to Chapter 3. The model in GEE is an extension of a generalized linear model (GLM) that allows repeated measurement and other correlated observations and allows the dependent variable to have a non-normal distribution. GEE is for a longitudinal study with n individuals, in which each individual is measured at different n_i time points in relation to a response variable y and a vector of p explanatory variables x. Therefore, in this case we analyzed a maximum of 54 cases, each one observed 8 times, resulting in a total of 432 observations (depending on the physiological measure and the missing data), with the physiological mean being the response variables (e.g., mean of BPM).

The vectors (i.e., the explanatory variables) are those manipulated by the representation type, in this case the price manipulations. In all the data analyses of the pricing changes, we chose to use unstructured correlation, since this is generally the best correlation structure for a GEE analysis, and it is not much different from more robust analyses with other kinds of correlations (Twisk, 2004). As the name implies, in unstructured correlation no particular correlation structure is assumed. We opted to use this analysis because although participants saw the same products, they did not see the same pricing change stimulus, which varied in 50% up and down and 25% up and down (0.50, 0.75, 1.25, and 1.50) among products and participants. Therefore, GEE is the best method to verify H_2.

5.4.8.1 ECG Analysis

For the ECG analysis, we acquired data from 46 healthy people. Although we used the filter to correct possible noise, we decided to exclude some unexpected participants who had tachycardia or arrhythmia since these situations affect the average data.

pHR: Comparing the television ($\bar{x}$ = -0.02 μV, sd = 1.56 μV) versus alarm system ($\bar{x}$ = 0.09 μV, sd = 1.38 μV) for pHR means when the product was presented using words, we ran an ANOVA with repetitive measure and education as covariate. The results showed that there is a statistical significance with a more than 95% confidence interval ($F(1,45) = 4.70$; $p = .036$ $\eta^2p = .10$). In other words, the presentation of the television had a lower electrical discharge compared to the alarm system, giving support to H_{8A}: Imagining purchasing a hedonic product will increase the pHR activity compared to purchasing a utilitarian product.

For the apartments with a sunset view ($\bar{x}$ = 0.34 μV, s =1.43 μV) or close to work ($\bar{x}$ = 0.20 μV, sd = 1.32 μV), another ANOVA was run and we did not find a statistical difference with a 95% confidence interval ($F(1,45) = .16$, $p > .10$). This result shows that there is no difference in the electrical discharge between both groups, which does not support H_{8A}.

To analyze H_{10A}, whether pHR activity would be the same when a product was presented in words or pictures, we ran four ANOVAs comparing words to pictures for each product. As predicted, there was no statistical difference. Table 5.5 shows the results. Covariates were used in different models but the results were consistent and did not change. The within-subject effects tests (sphericity assumed, Greenhouse-Geisser, Huynh-Feldt and lower-bound) had the same results as all the previous analyses of heart rate.

Table 5.5 – pHR Activity for Picture versus Word Presentation

Products	Presentation Form	HR Mean (μV)	SD	ANOVAs with repetitive measure
Alarm Service	Word	0.09	1.38	F(1,45) = 0.03 p>0.10
	Picture	-0.03	1.42	
Television	Word	0.02	1.56	F(1,45) = 0.05 p>0.10
	Picture	0.05	1.65	
Apartment Sunset View	Word	0.33	1.43	F(1,45) = 3.82 p>0.05
	Picture	-0.40	1.96	
Apartment Close to Work	Word	0.20	1.32	F(1,45) = 1.21 p>0.10
	Picture	-0.14	1.93	

To analyze H_{9C}, whether heart rate activity will increase when consumers know that they paid more than others versus when the consumer paid less, we ran GEEs using the 46 cases, each one observed 8 times, resulting in a total of 368 observations with the pHR as the response variable. The model for pHR in price changes had 8.11 as quasi-likelihood under independence model criterion (QIC) and a corrected quasi-likelihood under independence model criterion (QICC) of 8.01. An analysis of the model showed that the electrical discharge did not differ when the price changed. Table 5.6 presents the Wald Chi-Square, the degrees of freedom, and their significances.

Table 5.6 – GEE Results for pHR Model

Model	Wald Chi-Square	df	Sig
Intercept	1.22	1	.270
Pricing Changing	3.41	3	.332

BPM Average: The ANOVA was run twice: first to compare the television versus the alarm system, second to compare the apartment with a sunset view versus a parking lot view. The results reveal that hedonic products ($\bar{x}_{television}$ = 82.36, sd = 16.20 and $\bar{x}_{RentingSunset}$ = 81.25, sd = 13.51) have a higher BPM average compared to utilitarian products ($\bar{x}_{Alarm\ System}$ = 80.90, sd = 13.62 and $\bar{x}_{RentingParkingLot}$ = 80.68, sd = 13.76), when those are presented in words. For the television and alarm system comparison, we added age as a covariate, and as a result the main effect occurred between the hedonic and the utilitarian products (F(1,45) = 5.00, p = .031). When we analyzed the renting houses groups with gender as a covariate, we found the main effect (F(1,45) = 6.70, p = .013), and the main effect occurred for all the within-subject effects tests (sphericity assumed, Greenhouse-Geisser, Huynh-Feldt and lower-bound). Therefore, the hedonic products seem to produce a higher BPM average compared to the utilitarian products, supporting H_{8A}.

To verify H_{9A}, when consumers know that they paid more than others their heart rate activity will increase compared to the baseline; and H_{9B}, when consumers know that they paid less than others their heart rate activity will decrease compared to the baseline, we first created an average of BPM for situations in which participants saw a lower price paid by a friend (meaning the participant paid more) and for situations in which participants saw a higher price paid by a friend (meaning the participant paid less). The analysis was conducted using a repetitive measure ANOVA.

To calculate the baseline, we used an average of all 1 s BPM before stimulus and per participant. Because participants were exposed to 8 stimuli, the baseline was an average of these 8 seconds. Analyzing the BPM with the age as a covariate, in the period when the participant saw a lower price compared to the baseline (paid more), a significant difference was found ($F(1,46) = 4.29$ $p = .044$). The baseline average BPM was 81.32 and when participants believed they paid more BPM was 81.41. This means that the BMP increased when participants believed that they had paid more than their friends.

In the situation in which participants paid less than their friends, the analyses showed a statistical difference in the BPM. Using the age as a covariate, we found $F(1,45) = 4.19$, $p = .047$. However, in this case, the BPM was weaker in the baseline at 81.32 than during the stimuli at 80.42. Although the results are significant, the means seem to be very close, probably because of the covariate (age). Because of the small number of participants, we could not split all the data into 25% and 50% up and down (less than 10 people per cell). However, to verify the consistency of the findings, we ran the same analysis, dividing the data into hedonic and utilitarian. The word and picture stimuli did not have a statistical difference, so we combined them.

After running the repetitive measures univariate analysis four times (utilitarian product high price, utilitarian product low price, hedonic product high price, and hedonic product low price, compared to baseline) we had the following results (presented in Table 5.7).

Table 5.7 – Comparing Hedonic and Utilitarian Products with Baseline

Stimuli	Mean	Mean Baseline	F-test	Significance
Hedonic – consumer paid more	81.20	81.30	$F(1,44) = 0.67$	> .100
Hedonic – consumer paid less	80.52	81.82	$F(1,42) = 7.07$	= .011**
Utilitarian – consumer paid more	82.24	81.66	$F(1,40) = 5.89$	= .020**
Utilitarian – consumer paid less	80.82	81.60	$F(1.43) = 3.54$	> .050

The means and the F-test presented show that in a hedonic products situation when the consumer paid more than others, their heartbeat did not change compared to the baseline. Yet, when they paid less than their friends, their heart beat was slower. For the utilitarian products, when the consumer paid more, their heart rate increased compared to the baseline, but when they paid less, although their heartbeat seemed to be slower, it was not statistically significant.

To analyze BPM in H_{9C}, we ran GEEs using the 46 complete cases, each one observed 8 times, resulting in a total of 368 observations. The price was presented to consumers as 50% more expensive in 82 presentations, 75% more expensive in 100 presentations, 25% cheaper in 83 presentations, and 50% cheaper in 103 presentations. The mean in the 7 seconds average of BPM measurement after the price presentation for all 368 presentations is 80.78. The model for BPM when prices changed had a QIC of 73195.12 and a QICC of 73195.15. As a result, both the intercept and the pricing change construct from the model were significant. The Wald Chi-Square for the intercept was 12006.23 ($df = 1$, $p < .001$) and the Price Change was 8.70 ($df = 3$, $p = .034$). Table 5.8 shows the β, std error, Wald Chi-Square, and p-value. The BPM means for each price presentation reveal that the BPM was higher in situations when consumers imagined paying more than their friends (consumer paid -50% = 78.42 BPM, -25% = 78.83 BPM, +25% = 83.56 BPM and +50% = 82.30 BPM).

Table 5.8 – GEE Analyses with BMP in Price Change Situations

Model	β	Std. Error	Wald Chi-Square	p-value
Intercept	82.30	1.4479	3230.55	<0.001***
Price_Change=.50	-3.87	2.0815	3.46	0.063
Price_Change=.75	-3.47	1.9945	3.03	0.082
Price_Change=1.25	1.26	2.1396	0.35	0.555
(Scale)	201.06			

Price_Change=1.50 is not presented in the model because the parameter is redundant

To analyze the H_{10A} we ran four ANOVAs comparing words and pictures for each product. As predicted; the results did not reveal any statistical difference in the BPM average during the stimulus. The results are presented in Table 5.9. We also tried to control possible bias using gender, income, or age covariates, but the results were consistent with Table 5.9.

Table 5.9 – Comparing BMP in Different Presentation Forms

Products	Presentation Form	BPM Mean	SD	ANOVAs with repetitive measure
Alarm Service	Word	80.87	13.47	F(1,45) = .073 p > 0.10
	Picture	80.72	13.73	
Television	Word	82.27	16.03	F(1,45) = .019 p > 0.10
	Picture	82.59	15.53	
Apartment Sunset View	Word	81.25	13.51	F(1,45) = .764 p > 0.10
	Picture	80.51	13.38	
Apartment Close to Work	Word	80.68	13.76	F(1,45) = .151 p > 0.10
	Picture	80.36	13.31	

5.4.8.2 EDA Analysis

For the EDA analysis, we acquired data from 49 participants. When the participant had a skin conductance response as a reaction to a stimulus, we calculated the amplitude of this stimulus and added "zero" to all the other situations in which any skin response reaction had occurred. If the participant did not have any reaction from any stimuli, we did not consider the participant in the sample. In other words, this sample included only participants who had at least one reaction to the 8 stimuli presented, resulting in EDA data for 39 participants.

To investigate H_{8B}, whether hedonic products will increase the EDA activity compared to utilitarian products, we first compared the television versus alarm system using the ANOVA repetitive measure, and then we repeated the analysis for apartments with a sunset view compared to apartments with a parking lot view. In both cases, we used the written product description because that was presented first. Table 5.10 shows the means score of each situation, the standard deviation, and the F-test.

Table 5.10 – Comparing Hedonic and Utilitarian Products with EDA

Presentation Form	Mean	Std Error	ANOVAs with repetitive measure
Alarm Service	0.32	0.07	F(1,38) = 2.46 p = .125
Television	0.17	0.05	
Apartment Sunset View	0.30	0.08	F(1,38)= 0.232 p = .63
Apartment with Parking Lot view	0.24	0.07	

When we ran the same analysis with gender as a covariate, we found a significant difference between the skin conductance responses between an apartment with a sunset view compared to apartment with a parking lot view. In this case, the F-test was F(38,1) = 6.11 p = .018. This result shows that there is an interaction between gender and the skin conduction response to

hedonic and utilitarian stimuli: males imagining the sunset view apartment ($\bar{x}$ = 0.50) had a higher skin conductance response than a close-to-work apartment with a parking lot view ($\bar{x}$ = 0.12), whereas, for females the SCR was higher for the apartment close to work ($\bar{x}$ = 0.31) than for the sunset view ($\bar{x}$ = 0.20). We did not find the same results (gender interaction) for the alarm system and television. Perhaps those products provoke less of an emotional response and more of a cognitive response, compared to renting an apartment, thus the products are perceived in the same way by both genders. Splitting the data showed that males and females had more skin conducting responses to the alarm system ($\bar{x}_{Male}$= 0.36, $\bar{x}_{Female}$ = 0.30) than to television ($\bar{x}_{Male}$= 0.09, $\bar{x}_{Female}$ = 0.22), according to the means, but not significantly. Therefore, we cannot completely support H_{8B}.

To analyze H_{10B}, whether EDA activity when seeing a picture of the product would be the same as seeing the written presentation, we first ran four ANOVAs comparing words to pictures for each product. We did not find any statistical difference between the SCRs from the products presented in words versus pictures. We also tried to adjust the model with covariates but the results did not change. Table 5.11 presents the mean, standard deviation, and the ANOVA repetitive measure. Within-subjects effects tests (sphericity assumed, Greenhouse-Geisser, Huynh-Feldt and lower-bound) showed similar results without any statistical difference.

Table 5.11 – Comparing Word versus Picture Presentation with EDA

Product	Presentation Form	SCR Mean	SD	ANOVAs with repetitive measure
Alarm Service	Word	0.32	0.46	F(1,38) = 2.55 p = .119
	Picture	0.18	0.31	
Television	Word	0.17	0.32	F(1,38) = 0.20 p = .657
	Picture	0.15	0.28	
Apartment Sunset View	Word	0.30	0.48	F(1,38) = 0.35 p = .561
	Picture	0.23	0.47	
Apartment Close to Work	Word	0.25	0.42	F(1,38) = 0.32 p = .577
	Picture	0.19	0.52	

Since the written stimuli had higher SCR amplitude mean scores for all the products, we combined these SCR scores to compare them to the SCR amplitude scores for picture-based stimuli and verify the previous results. The ANOVA repetitive measure confirms that there is no statistical difference between the SCR amplitude for written stimuli ($\bar{x}$ = 0.40, sd = 0.30) or pictures ($\bar{x}$ = 0.28, sd = 0.35). The F-test score was 2.79, the p-value = .103, and ηp^2 = .068.

To verify the hypothesis about price, H_{9D}, if EDA activity increases when consumers know that they paid more than others, compared to when consumer paid less, as in the other methodologies, we ran the GEE. For this analysis, we had data for 36 participants, observed 8 times, for a total of 288 observations. The products had 64 price changes of 0.50; 73 of 0.75; 64 of 1.25 and 79 of 1.50.

In our first analysis we ran the GEE with the four prices changes (0.50, 0.75, 1.25, 1.5) as the independent variables and the SCR amplitude as the dependent. We used the unstructured working correlation matrix with an adjustment estimator according to the number of non-redundant parameters. The model effect analysis was a Type III with a 95% confidence interval. The QIC was 47.82 and the QICC was 47.72. The minimum SCR reaction was zero (no reaction) and the maximum root square SCR amplitude was 2.44. The results from this model showed that the price change was not significant, although the model had an intercept of $p < .001$ (Wald Chi-Square = 88.57).

Since age had been a variable for adjusting the data, we ran the analysis again with age as a covariate. The model with age as a covariate had a QIC of 49.09 and a QICC of 51.96. Table 5.12 presents the B, standard error, Wald Chi-Square test, and their significances.

Table 5.12 – GEE Analyses with EDA in Price Change Situations

Parameter	β	Std. Error	Wald Chi-Square	p-value
Intercept	0.191	0.077	6.084	0.014
Price_Change=.50	0.195	0.123	2.501	0.114
Price_Change=.75	0.278	0.137	4.120	0.042*
Price_Change=1.25	0.046	0.150	0.095	0.758
Price_Change=1.50	(Parameter)			
Age	-0.002	0.002	0.447	0.504
Price_Change=.50*Age	-0.005	0.003	2.501	0.114
Price_Change=.75*Age	-0.006	0.003	3.029	0.082
Price_Change=1.25*Age	0.001	0.004	0.118	0.731
Price_Change=1.50*Age	(Parameter)			
(Scale)	0.136			

Price_Change=1.50 is not presented in the model because the parameter is redundant

Running the EEG with the covariate revealed that the interaction of the price change and age is marginally significant at the 0.75 price change with a p-value of 0.08, and it is significant if analyzed as only the main effect. In this case, the 0.75 price change had a p-value of 0.04. The mean scores of the root square SCR amplitude show how participants responded to the stimulus: the SCR for a 0.50 change was 0.202; for 0.75 it was 0.251; for 1.25 it was 0.233; and for 1.50 it was 0.145. The covariates appearing in the model were fixed at 28.73.

Because the hypothesis aims to verify the differences between prices increasing and decreasing, we combined the data for the 0.50 and 0.75 price changes in one group and the data for the 1.25 and 1.50 price changes in a second group. With these two groups we ran the GEE again. The root square amplitude was the dependent variable. Similar to the previous analysis, age was added as a covariate. We found a goodness of fit of QIC = 42.96 and QICC = 44.31. The model effect test showed a significant interaction between the first price and the new price presented with a Wald Chi-square of 4.50 and a p-value = .034. The main effects of both age and price change were also statistically significant with a 95% confidence interval ($p < 0.05$). The means reveal how the difference occurred in the price change: $\bar{x}_{PriceIncrease} = 0.23$, sd = 0.74 and $\bar{x}_{PriceDecrease} = 0.18$, sd = 0.80. In other words, when the price increases the participants experienced higher stress and a higher reaction of skin conductance.

5.4.8.3 fEMG Analysis

For the fEMG analysis, we acquired *zygomaticus major* data from 47 participants and 44 for *corrugator supercilii*. The participant's exclusion was defined when the participant did not have any response to any stimuli or the noise was too high. We looked for these reactions after running all the filters. Some participants coughed, scratched their heads, or talked during the procedure, and when one of these situations occurred we deleted the participant from the sample.

To investigate H_{8C}: Imagining purchasing a hedonic product will increase the *zygomaticus major* activity compared to a utilitarian product, we first compared the television versus alarm system using the ANOVA repetitive measure, and then we repeated the analysis comparing apartments with a sunset view versus apartments with a parking lot view. The analysis revealed a marginal main effect on facial EMG activities in valence for *zygomaticus major* ($F(1,45) = 3.59$, $p = .065$) between the television and alarm system, presented in words, and a statistical difference when these products where presented in pictures ($F(1,45) = 5.41$, $p = .024$). However, no difference was found between renting an apartment close to work compared to renting an apartment with a beautiful sunset view, either in words ($F(1,46) = .33$, $p = .568$) or pictures ($F(1,46) = .017$, $p = .896$). Analyzing the difference in voltages between the security alarm and TV, we observed that the TV ($\bar{x}_{word} = .55$; $\bar{x}_{picture} = .61$) compared to the alarm system ($\bar{x}_{word} = .64$; $\bar{x}_{picture} = .71$) had a higher square root means.

Because of the different results in both products, we averaged both hedonic products (apartment with sunset and the TV) and both utilitarian products (apartment with parking lot view and the alarm system). Then we ran ANOVAs again and found statistical differences between hedonic and utilitarian products ($F(1,46) = 14.90$, $p < .001$), wherein the hedonic products had a RMS of .633 (sd = 0.319) and the utilitarian .574 (sd = 0.307). With these results, we can support the H_{8C}.

Since *corrugator supercilii* is a muscle often used when experiencing anger or negative emotions, we believed that there would be no *corrugator supercilii* activation differences in products (H_{8D}: Imagining a hedonic purchase will have the same *corrugator supercilii* activity compared to when participants imagined purchasing an utilitarian product). To investigate if this hypothesis is supported, the ANOVA with repeated measures was done. As predicted, no main effects on facial EMG *corrugator supercilii* activity in valence were found. Table 5.13 shows all the ANOVAs and the means of hedonic and utilitarian products.

Table 5.13 – Hedonic and Utilitarian Products with fEMG: *Corrugator Supercilii*

Presentation Form: Word	Mean	Std Error	ANOVAs with repetitive measure
Alarm Service	1.04	0.59	$F(1,43) = .151$, $p = .699$
Television	1.05	0.60	
Apartment Sunset View	1.08	0.77	$F(1,43) = 1.829$, $p = .184$
Apartment with Parking Lot view	1.02	0.59	
Presentation Form: Picture			
Alarm Service	1.07	0.67	$F(1,43) = .334$, $p = .566$
Television	1.06	0.69	
Apartment Sunset View	1.16	0.90	$F(1,43) = .974$, $p = .329$
Apartment with Parking Lot view	1.07	0.71	

Similar to the previous analysis, we combined the hedonic products (average of apartment with a sunset and TV) and the utilitarian products (average of apartment with a parking lot view and alarm system). Consistent with the previous results and the hypothesis developed, no main effect was found ($\bar{x}_{utilitarian} = 1.08$, sd = 0.70 versus $\bar{x}_{hedonic} = 1.05$, sd = 0.62) $F(1,44) = .750$, $p = .391$.

To investigate the differences between presenting products in words versus pictures (H_{10C} – *Zygomaticus major* activity during the presentation of an image of a hedonic product will be the same as it is when the object is described in words, and H_{10D} – *Corrugator supercilii* activity during the presentation of an image of a product will be the same as it is when the object is described in words), ANOVAs were done to compare the products according to

presentation type in the fEMG data collection. Table 5.14 shows the results from *zygomaticus major* and Table 5.15 from *corrugator supercilii*.

Table 5.14 – Word and Picture Presentations with fEMG: *Zygomaticus Major*

Product	Presentation Form	RMS Mean	SD	ANOVAs with repetitive measure
Alarm Service	Word	0.55	0.29	F(1,45) = 1.67, p = .203
	Picture	0.61	0.42	
Television	Word	0.64	0.39	F(1,45) = 0.96, p = .334
	Picture	0.71	0.45	
Apartment Sunset View	Word	0.59	0.43	F(1,45) = 0.08, p = .783
	Picture	0.61	0.36	
Apartment Close to Work	Word	0.56	0.34	F(1,45) = 0.89, p = .350
	Picture	0.60	0.38	

Table 5.15 – Word and Picture Presentations with fEMG: *Corrugator supercilli*

Product	Presentation Form	RMS Mean	SD	ANOVAs with repetitive measure
Alarm Service	Word	1.04	0.59	F(1,43) = .913, p = .345
	Picture	1.07	0.68	
Television	Word	1.05	0.60	F(1,43) = .094, p = .761
	Picture	1.06	0.69	
Apartment Sunset View	Word	1.08	0.77	F(1,42) = 2.768, p = .104
	Picture	1.17	0.92	
Apartment Close to Work	Word	1.02	0.59	F(1,42) = 1.034 , p = .315
	Picture	1.07	0.73	

Based on this result, we support the hypothesis showing that there is no difference between the valences for words compared to images.

To analyze whether consumers reacted to the pricing change, we ran a general linear model (GLM) between the baseline and price presentation stimuli. For the *corrugator supercilii*, a statistical difference was found when the participant paid 25% more than their friends and when they paid 25% and 50% less than their friends. No difference was found when their friends had paid 50% less. The RMS means, Sd, and F-tests are presented in Table 5.16.

Because this occurred only for an increase of 25%, the results only partially support H_{9E}: When consumers know that they paid more than others, *corrugator supercilii* activity will increase compared to the baseline. However, the data completely support H_{9F}: When consumers know that they paid less than others, *corrugator supercilii* activity will decrease compared to the baseline. In both cases, when the price was increased by 25% and by 50% the *corrugator supercilii* was activated, as presented in Table 5.16.

Table 5.16 – Price Change vs. Baseline: *Corrugator Supercilli*

Presentation Form	RMS Mean	SD	ANOVAs with repetitive measure
Baseline	1.10	0.57	F(1,79) = .431, p = .514
0.50 Price Change	1.07	0.73	
Baseline	1.17	0.64	F(1,95) = 5.325, p = .023*
0.75 Price Change	1.10	0.72	
Baseline	1.03	0.51	F(1,76) = 5.592, p = .021*
1.25 Price Change	0.97	0.52	
Baseline	1.25	0.74	F(1,92) = 9.446 , p = .003**
1.50 Price Change	1.17	0.78	

To analyze whether the *corrugator supercilii* activity was higher when consumers paid more than others compared to when they paid less than others (H_{9G}), the GEE was run. A 50% higher price was presented to 75 participants, 75% more expensive for 93 participants, 25% cheaper for 75 people, and 50% cheaper for 87 people. The model for RMS *corrugator supercilii* and price changes had 7.89 as a QIC and a QICC of 8.02. As a result, only the intercept was significant. The Wald Chi-Square for the intercept was 852.75 (df = 1, p < .001), however the price change had a Wald Chi-square of 4.65 (df = 3, p = .199). Table 5.17 shows the β, std error, Wald Chi-Square, df, and p-value for each price.

The RSM means for each price presentation show that only when participants saw that their friends paid 25% less did their facial expressions become more relaxed. There was no difference in the RSM means when participants paid more (25% or 50% more) than their friends or paid 50% less than their friends. With this result, the H_{9G} is not supported by the data.

Table 5.171 – GEE Analyses with *Corrugator Supercilli* in Price Change Situations

Parameter	β	Std. Error	Wald Chi-Square	p-value
Intercept	1.174	0.080	214.28	0.000***
Pric_Chang=.50	-0.103	0.114	.81	0.368
Pric_Chang=.75	-0.072	0.108	.44	0.507
Pric_Chang=1.25	-0.203	0.099	4.16	0.041*
(Scale)	201.064			

Pric_Chang=1.50 is not presented in the model because the parameter is redundant

For hypothesis H_{9H} about there being no difference in *zygomaticus major* activity when prices change, a statistical difference was observed only when participants saw that their friends paid 50% less than they did, in other words, when participants paid 50% more for the same item. Table 5.18 presents the RMS mean, standard deviation, and the F-test for each price compared to baseline.

Table 5.18 – Price Change vs. Baseline – *Zygomaticus Major*

Presentation Form	RMS Mean	SD	ANOVAs with repetitive measure
Baseline	0.60	0.29	F(1,82) = 4.478, p = .037*
0.50 Price Change	0.55	0.31	
Baseline	0.65	0.32	F(1,104) = .610, p = .437
0.75 Price Change	0.68	0.46	
Baseline	0.59	0.31	F(1,74) = .191, p = .663
1.25 Price Change	0.58	0.38	
Baseline	0.65	0.33	F(1,98) = 3.574, p = .062
1.50 Price Change	0.60	0.37	

Although we were not expecting any difference when prices changed, a significant difference was found when the participant paid 50% more than others. Perhaps this situation occurred because participants had tense smiles or maybe they perceived the price to be so high that it could be a joke. Other than this situation, no other difference was found; therefore, H_{2H} was marginally supported.

5.5 DISCUSSION OF RESULTS

This paper aimed to verify hypotheses related to participants' unconscious reactions to product presentation and pricing changes, in order to address the lack of attention to the role emotions play in how people respond to prices and price information (Somervuori & Ravaja, 2013; Zielke, 2011). We used physiological tools to separate consumers' cognition from emotions (Somervuori & Ravaja, 2013), a problem usually related to self-reported data collection (Dimoka, 2012; Venkatraman et al., 2015). In specific, this study used ECG, EDA, and facial EMG (*corrugator supercilii* and *zygomaticus major*).

In addition to price changes and product types, this paper studied the presentation type (picture versus words), testing participants' arousal and valence reaction in product presentations. The study tested three main hypotheses. A summary of the results is presented in Table 5.19, and then the results are discussed, with explanations for the hypotheses that were not supported.

The ECG reaction is an expression of the parasympathetic and sympathetic nervous system (Mundorf et al., 1991; Wang & Minor, 2008). Because of the difficulty of understanding the meaning of the two systems, it is important to know the context. Usually, researchers use the frequency of heart rate to understand fear or reactions to threats. When the heart rate frequency decreases, it can mean that the stimulus is familiar or does not cause fear; when the situation evokes fear, the heart rate increases. In addition, heart rate is often used to verify attention. In

psychology many researchers have shown that the increase of heart rate is related to attention. Thus, using these two primary explanations, we will analyze the ECG results of this research.

Table 5.19 – Summary of the results

ECG: Product and Pricing	
H_{8A} – When participants imagine purchasing a hedonic product they will have a lower pHR activity compared to when they imagine purchasing an utilitarian product.	Supported
H_{9A} – When consumers know that they paid more than others their heart rate activity will increase compared to the baseline.	Supported
H_{9B} – When consumers know that they paid less than others their heart rate activity will increase compared to the baseline.	Supported
H_{9C} – The heart rate activity will increase more when consumers know that they paid more than others, compared to when consumers paid less.	Marginally Supported
EDA: Product and Pricing	
H_{8B} – Imagining the purchase of a hedonic product will cause similar EDA activity as imagining the purchase of a utilitarian product.	Partially Supported
H_{9D} – EDA activity will increase more when consumers know that they paid more than others did, compared to when the consumers paid less.	Supported
fEMG: Product and Pricing	
H_{8C} – Imagining a hedonic purchase will increase the *zygomaticus major* activity compared to imagining the utilitarian purchase.	Supported
H_{8D} – Imagining a hedonic purchase will have the same *corrugator supercilii* activity compared to when participants imagined purchasing an utilitarian product.	Supported
H_{9E} – When consumers know that they paid more than others, *corrugator supercilii* activity will increase compared to the baseline.	Partially Supported
H_{9F} – When consumers know that they paid less than others, *corrugator supercilii* activity will increase compared to the baseline.	Supported
H_{9G} – *Corrugator supercilii* activity will be higher when consumers pay more than others compared to when they pay less.	Not Supported
H_{9H} – There will be no difference on *zygomaticus major* when the prices change.	Partially Supported
Presentation Type	
H_{10A} – Heart rate activity during the presentation of an image of a product will be the same as it is when the product is presented in words.	Supported
H_{10B} – EDA activity during a presentation of an image of a hedonic product will be higher than when products are presented using words	Supported
H_{10C} – *Zygomaticus major* activity during the presentation of an image of a hedonic product will be the same as it is when the object is described in words.	Supported
H_{10D} – *Corrugator supercilii* activity during the presentation of an image of a product will be the same as it is when the object is described in words.	Supported

The EDA, more specifically SCR, measures only the sympathetic system, and it is very useful for measuring arousal. The level of sweat increases, allowing electrical conduction that it is measured by the EDA. Although sympathetic activity is highly correlated to fight responses (high arousal), positive emotions can also be measured because the EDA is strongly related to the orienting response.

The fEMG usually shows emotions or valence reactions. Many researchers have shown that participants seeing positive pictures have *zygomaticus major* activity and a decrease in *corrugator supercilii* activity, while a negative picture has the opposite effect. Studies have also shown that sometimes there is *corrugator supercilii* activity resulting from the effort to focus on a stimulus.

Based on the above information, we will analyze the results of our study. Our first hypothesis was to test if hedonic or utilitarian purchases could have physiological differences and the study verified that these products provoke reactions in the heart, in the skin conductance, or in the facial expression. We could not find a difference in frequency measured in Hz when participants imagined purchasing a hedonic product or a utilitarian product; however analyzing the BPM when participants imagined renting an apartment with a beautiful view or purchasing a television (hedonic purchase) revealed a lower BPM than when they imagined renting an apartment in the city with a parking lot view or purchasing an alarm system. Therefore, we may infer that the task of imagining an apartment with a beautiful view or a TV made people more relaxed and more contemplative than imagining an apartment in the city or purchasing an alarm system. Each participant spent 8 seconds in each stimulus, enough time to imagine a situation.

For the EDA we had the hypothesis that imagining purchasing a hedonic product will have similar EDA activity compared to a utilitarian product, which was not completely supported because when we verified whether there was a difference in arousal between the apartment with a parking lot view and the apartment with a beautiful view, using gender as a covariate, we found a statistical difference. Our data showed that comparing hedonic and utilitarian products in a general way does not reveal an arousal difference, confirming our hypothesis; however when we used gender as a covariate there was a difference. Our assumption is that the difference in the way that women and men imagine the apartments may evoke different arousals.

Related to the valence, the fEMG confirmed that the hedonic products evoke a more positive feeling than the utilitarian; in other words, imagining purchasing a hedonic product increased the *zygomaticus major* muscle activity. The analysis of *corrugator supercilii* showed that there was no difference between the two products, which is consistent with the literature, since this muscle is active for negative emotions and those products should not provoke negative emotions.

Our second main hypothesis was related to price perception. Using ECG we tested whether participants' heart rate activity increased compared to the baseline when they know that they paid more than others. if when consumers know that they paid less than others their heart rate activity will increase compared to the baseline; if the heart rate activity will increase more when consumers know that they paid more than others, compared to when consumer paid less. As a result we had a higher attention during the price change stimulus, since there was an activation of ECG compared to baseline. However, when we tested if the heart rate activity increased more when consumers knew that they paid more than others, compared to when consumer paid less, we could not find statistical difference in pHR. When the participants perceived that they paid 25% or 50% more than a friend, the BPM increased marginally ($p > 0.10$) with a 90% confidence interval. Our data was not significant in terms of the 95% confidence interval, and we believe that this discrepancy would be higher if participants had actually bought the product and not only imagined it.

Our data showed that EDA activity increased when consumers knew that they paid more than others, compared to when the consumer paid less, supporting the idea that negative feelings and higher prices can evoke higher arousal or the instinct to fight. For the fEMG, we expected that when consumers knew that they had paid more than others, the *corrugator supercilii* activity would increase compared to the baseline. However, this hypothesis was supported only when the price was 25% higher, whereas when we increased the price by 50%, no statistical difference was found. A possible explanation is that when the price is increased by too much, it could change the perception of trust. When we increased the price by 50%, perhaps the participant questioned whether it is possible for a product's price to change by that much.

As expected, participants can feel uncomfortable with the situation of a changing price, even when they gained an advantage of a better price compared to their friends. In our study when the *corrugator supercilii* activity was compared to baseline (relax time) we found difference showing that even when the person gets advantage of the price they have negative physical reactions.

An unexpected result was that the *corrugator supercilii* did not show higher activation when consumers paid more compared to when they paid less. This might have happened because the 50% pricing change was too high to maintain their belief in the study, or perhaps consumers feel uncomfortable when they know that other people paid a different price. The last hypothesis was partially supported because we found a statistical difference between the baseline and

when participants knew that they paid 50% more than their friends. Maybe the *zygomaticus major* activation occurred because of the trust, similar to when we smile in a disapproving way.

As for the presentation type, as predicted we could not find any difference in attention or valence. Heart rate activity during the presentation of the product was the same when the product was presented using words or pictures. The *zygomaticus major* and *corrugator supercilii* activity were also the same when the purchasing situations were presented in words or pictures. However, a difference in arousal was found, confirming our hypothesis that the pictures that are more detailed could provoke a higher arousal than imagining a product, as shown when we combined the hedonic and utilitarian products.

This study has some limitations that should be noted. The first limitation is that maybe the alarm system, chosen as the utilitarian product and very commonly used in the literature, was not the best product to use in the physiological study. The reason is that the alarm system could remind the participant that a future robbery or a bad situation could happen, provoking some fear that interferes with the data. A second limitation is that participants only imagined the purchase situations instead of acting on the purchase and experiencing the post-purchase situation. Last, we focused this study on ECG, EDA, and EMG; however, EEG or fMRI could also add information that could better explain the differences in the interactions between product type and presentation type.

6 CONCLUSIONS

This dissertation showed that different product and presentation types can affect the consumers' perception of justice in price change situations otherwise, supporting the idea that the construal level can change consumer behavior.

In the Chapter 2 (A study of the perception of justice and price fairness in hedonic and utilitarian purchases) the following hypothesis were supported: in picture presentations, when consumers pay more than others to purchase utilitarian products, they perceive the situation as less just and having higher price unfairness perception compared to when the product is hedonic; and a similar situation occurs when consumers pay less than others to purchase utilitarian products, they perceive it as less just and more price unfairness compared to when the product is hedonic.

In this behavioral study, by self-reporting, people declare their emotion in the situations of price changing. As a result, emotions were found to be a mediator of the perception of price fairness and the perception of justice. In addition, it was found that in unfair situations, the consumer felt more anger when buying utilitarian products than when buying hedonic products. These results are consistent with the previous researchers that shows that utilitarian purchase is related to instrumental and hedonic is related to affective reactions. In the hedonic purchases it seems that people are less aware with details or price (Alba & Williams, 2013; Millar & Tesser, 1986; van den Berg et al., 2006).

In the Chapter 3 (Discriminatory pricing, product type, and representation type: Their impacts on purchase intention and product evaluation) it was shown that the perceptions of justice, price fairness, perception of value, and the intention to repurchase, are smaller when utilitarian products are presented abstractly (word presentation) compared to hedonic products. In other words, perceptions of insensitivity that seem to appear when hedonic products are presented with pictures also occur when utilitarian products are presented in an abstract manner (words). In addition, the price changes affect utilitarian purchases much less than hedonic purchases.

When a high discrepancy in the price was evaluated in both presentation types (words or pictures), this difference in the perception of justice or price fairness between hedonic and utilitarian products disappeared. The same occurred to the perception of value and purchase intention. High discrepancy price changing seems to evoke negative emotions for both the product and an up level its cancels the significant iteration between product and presentation

type previously found. In studying whether the perception of justice and price unfairness would be proportional to perceived discriminatory pricing, it was found that an increase in the perception of price unfairness corresponded to changes between the prices paid by the subject and a friend.

In the Chapter 4 (Integrating new methods in marketing research) an overview of neurophysiological methods was presented. . After that, the strengths and weakness of each method was described followed by the "neuromarketing" concept. This chapter concluded with a presentation of consumer behavior studies that applied neurophysiological tools. This chapter was used to introduce the readers to the next chapter, where three physiological methods were used.

In the Chapter 5 (Products, price, and presentation format: a physiological study) hypotheses related to physiological behaviors, the variables presented in this dissertation previously (product and presentation type), and price discrepancy were developed. Those hypotheses tested heart rate reaction, skin conductance reaction, and facial expression reactions using ECG, EDA, and fEMG. Three main hypotheses were divided into sub items, investigating the product, presentation type, and pricing change. The main results were that when the participants imagined purchasing a hedonic product, they had lower pHR activity compared to when they imagined purchasing a utilitarian product; however, when consumers paid more or less than their friends compared to their "normal" states–baseline they had a higher pHR. The arousal, collected by EDA, showed that when consumers perceived that they paid more than others there was an increase in skin conductance. In terms of the valence, positive or negative, it was observed that imagining purchasing a hedonic product increases the *zygomaticus major* activity compared to a utilitarian product, supporting the previous research that hedonic products evoke positive emotions. Also, it was supported that when consumers know that they paid less than others, the *corrugator supercilii* activity increases compared to the baseline, showing negative emotions. In terms of presentation type, no differences were found between the word or picture presentations in the heart, skin conductance, or facial expression. The changes seem to be more cognitive than emotional.

6.1 THEORETICAL IMPLICATIONS

This dissertation advances the marketing literature in several ways. First, the first chapter supported previous studies that have shown that people are less sensitive to price in hedonic purchase situations (Okada, 2005; Palazon & Delgado-Ballester, 2013; Shiv & Fedorikhin, 1999). The results of the post-purchase evaluation showed that consumers who purchased hedonic products experienced both affective and cognitive levels when there was an increasing price, however, the consumers had a lower perception of injustice or price fairness in hedonic purchase situations compared to utilitarian products.

Second, the present study complements the previous hedonic and utilitarian research that compared their results in situations when the consumer chose a product between both types of products or imagined the situations without having a choice. This study found the same results in the perception of justice and price fairness in both situations. This result shows that even if the consumer chooses the product, which could involve other emotions, such as guilt or pride, consumers feel less just or price fairness for utilitarian products compared to hedonic products.

Third, presentation types, which were not previously studied in a marketing context, were investigated. Using construal level theory, this dissertation supported the idea that a mental image can affect a consumer's evaluation experience. When a high construal level was involved by using a word presentation, the perceptions of justice and price fairness were smaller in utilitarian purchases than in hedonic, exactly the opposite than when using a picture presentation. Our prediction of this interaction came from the idea that the construal level can influence more aspects of the evaluation of a product than the product type can, and imagining an abstract product (such as a hedonic product) evokes more cognitive reactions, influencing the perception of price and consequently the perception of justice or price fairness.

Fourth, this dissertation also tested the behavioral study, more specifically, whether anger was a mediator of the perception of justice and price fairness. According to some researchers, emotions have not been part of the manner in which price has been studied (Campbell, 2007b; Neill & Lambert, 2001; Xia & Monroe, 2010; Zielke, 2011). Therefore, this dissertation also contributes to this field, in terms of product and pricing studies.

Fifth, following the tendency of interdisciplinary studies, this dissertation also contributes to the literature on neuroscience or physiological methods in marketing. Using three different methods (ECG, EDA, and fEMG), physiological measures were collected to evaluate the

consumer's reactions to product type and presentation type in discriminatory situations. The results from this study are also relevant for the theoretical implications of hedonic and utilitarian products and presentation type, because they support the idea that some products can evoke more positive valence than other products, even when people are imagining purchasing a product, and the results show that no differences were found in valence, attention, or arousal when we compared the presentation type. Although no other study in marketing was found that compares the presentation type (pictures versus words), these results are consistent with psychology studies (Ambach et al., 2010; Tempel et al., 2013).

Finally, though not less important, this dissertation extends the marketing literature in the price discrimination context, by including the situation of decreasing price, an aspect that is not very common in the literature, which focuses on increasing price (Xia et al., 2004). The results in this context showed that there is a limited of decreasing price that is perceived as just or satisfactory by consumers, therefore different levels of increasing and decreasing price should be tested.

6.2 MANAGEMENT IMPLICATIONS

Industries such as consumer goods, chemicals, manufacturing, banking, retail, and wholesale distribution are experiencing high levels of competition, the findings from this dissertation offer practical implications for improving pricing or communication strategies. Since hedonic and utilitarian purchase experiences can produce different levels of reactions in the perceptions of justice, price fairness, or value, and the intention to purchase according to presentation type, managers may want to use different strategies for different types of products.

This study contributed by trying to understand product evaluations in a post-purchase situation, and not during the choice process, as is more usual in the literature (Aydinli et al., 2014; Shiv & Fedorikhin, 1999; Trope et al., 2007). Our main contribution for marketing practice is by testing the best way to represent products (either by words or pictures) when companies use a discriminatory pricing strategy. Observes that depending on the product type, the representation type has different reactions.

The viability of online dynamic pricing or differential pricing for the same product from the same seller has been increasing, especially in online retailing. Therefore, the results from this dissertation can be easily used in this context.

In addition, it is important to comment that the perception of unfairness may lead to negative outcomes for the retailers, including buyers leaving the exchange relationship, engaging other consumers in not purchasing from that store, or trying to damage the company in some way. Therefore, understanding consumers' behavior and physiological feelings can help managers to understand their reactions better.

6.3 FUTURE RESEARCH

This dissertation has limitations. It did not use an exhaustive number of products, prices, or presentation formats to generalize the results. Behavioral studies should be used to test other product categories, verify different presentation formats such as words, videos, or real products, and distinctive prices format such as monetary values or percentage, should be demonstrated to confirm the findings in this study.

Individual differences in price sensitivity could also be explored. Price consciousness, payment format (e.g. in cash or digital money), or purchase frequency may also influence consumers' responses to price, consequently leading to a perception of price fairness. Limited time pressure or scarcity may also influence consumer behavior and could be tested in post-purchase evaluations after changing the price. Based on self-reporting, it is also important to better understand the consumer's reactions to perception of justice when the product is for the purchaser or to give to someone as a gift.

The discussion in this dissertation is related to price changing, but not directly associated with discounts or sales promotions. Moreover, different price discount formats, such as percentage versus dollars, were not explored. The ending numbers were not completed, controlled, or manipulated in this study. Therefore, future studies could test different numbers or ending-number in price discrimination. In addition, other kind of benefits not only monetary could be explored, for instance, sometimes some consumers receives more conveniences than others. These benefits could be free delivery, a better seat on an airplane, or an extra gift. We also controlled the price presentation format, presenting only one price, the final price; however, special in retail, prices can be shown in different manners such as with a reference price (e.g. before $xx, now $xx; now xx% discount). Personality traits were not investigated, but this may be a great moderator of the perception of justice and price fairness in discriminatory pricing or in the reactions to presentation format. For instance, the need for cognition or need for advertising may be a great moderator of the perception of justice or price fairness in the

discriminatory pricing context. In addition, it is important to say that other dependent variables could be applied to investigate the purchase experience, for instance, satisfaction, word of mouth, or loyalty.

In addition, this dissertation concentrated the emotion analysis in the valence more specifically on negative emotions. However, specific emotions besides anger can be explored. For instance, guilt is sometimes associated with hedonic purchases, happiness can be related to a discounted price, and sadness can be involved with a high price (Curry, 2001; Dahl et al., 2003; Khan et al., 2004; Palazon & Delgado-Ballester, 2013). For these aspects, new behavioral and physiological studies could be done.

In terms of physiological studies, the investigation of this dissertation was limited to heart rate, skin conductance, and facial electromyography. Other measures, such as EEG or fMRI, should be used to better understand the construal level theory involved in the process of imagining hedonic or utilitarian products presented with pictures or words. It is probable that the level of cognition is different according to the emotions involved in the products and the presentation format. The fMRI could also bring more insights to each area involved in this process, for instance, the hippocampus, which is usually used to measure memory, might be involved at different levels depending on the products or presentations. Prices could evoke activation in the amygdala, representing negative emotions.

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8 APPENDIX

8.1 Appendix A – Collaborative Institutional Training Initiative

CITI – Giuliana Isabella

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COURSEWORK REQUIREMENTS REPORT*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Giuliana Isabella (ID: 3550873)
- **Email:** tuf09989@temple.edu
- **Institution Affiliation:** Temple University (ID: 926)
- **Phone:** 2152045274

- **Curriculum Group:** Human Research
- **Course Learner Group:** Social/Behavioral Research Course
- **Stage:** Stage 1 - Basic Course
- **Description:** Choose this group to satisfy CITI training requirements for Investigators and staff involved primarily in Social/Behavioral Research with human subjects.

- **Report ID:** 10489950
- **Completion Date:** 06/19/2013
- **Expiration Date:** 06/19/2015
- **Minimum Passing:** 75
- **Reported Score*:** 84

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Belmont Report and CITI Course Introduction (ID:1127)	06/02/13	3/3 (100%)
Students in Research (ID:1321)	06/02/13	7/10 (70%)
History and Ethical Principles - SBE (ID:490)	06/19/13	4/5 (80%)
Defining Research with Human Subjects - SBE (ID:491)	06/19/13	4/5 (80%)
The Federal Regulations - SBE (ID:502)	06/19/13	5/5 (100%)
Assessing Risk - SBE (ID:503)	06/19/13	5/5 (100%)
Informed Consent - SBE (ID:504)	06/19/13	5/5 (100%)
Privacy and Confidentiality - SBE (ID:505)	06/19/13	5/5 (100%)
Research with Prisoners - SBE (ID:506)	06/19/13	4/4 (100%)
Research with Children - SBE (ID:507)	06/19/13	2/4 (50%)
Research in Public Elementary and Secondary Schools - SBE (ID:508)	06/19/13	4/4 (100%)
International Research - SBE (ID:509)	06/19/13	2/3 (67%)
Internet-Based Research - SBE (ID:510)	06/19/13	4/5 (80%)
Research and HIPAA Privacy Protections (ID:14)	06/19/13	4/5 (80%)
Vulnerable Subjects - Research Involving Workers/Employees (ID:483)	06/19/13	3/4 (75%)
Conflicts of Interest in Research Involving Human Subjects (ID:488)	06/19/13	3/5 (60%)
Unanticipated Problems and Reporting Requirements in Social and Behavioral Research (ID:14928)	06/19/13	3/3 (100%)
Temple University (ID:1758)	06/19/13	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

CITI Program
Email: citisupport@miami.edu
Phone: 305-243-7970
Web: https://www.citiprogram.org

Online Consent Form

CONSENT FORM TO PARTICIPATE IN THIS STUDY
This consent form may contain words that you do not understand. If you any words or information is not clear for you, be free to contact the investigators for more explanations. You may download unsigned copy of this consent form to think about or discuss with family or friends before making your decision in participating in this study. The participation in this study is volunteer.

PURPOSE OF THE STUDY
The purpose of the research is to better understand how people evaluate products in communication messages. To help us gain further insights into the uses of these tools, the first think is to define the products that we will use. So the purpose of the study is to answer some questions about some products. There is no right or wrong answer in these decisions. You are free to choose whatever best matches your preferences. The total participation time will be approximately 30 minutes.

WHAT YOU SHOULD KNOW ABOUT A RESEARCH STUDY

- You volunteer to be in a research study.
- Whether you take part is up to you.
- You can choose not to take part in the research study.
- You can agree to take part now and later change your mind.
- Whatever you decide, it will not be held against you.
- Feel free to ask all the questions you want before and after you decide.

BENEFITS
There is no direct benefit for you to participate in this study. This study will help the society by enhancing our understanding about the effects of music on memory recollection.

COSTS
You will not be required to pay for research related procedures.

RISKS AND DISCOMFORTS
There are no significant risks associated with this study. Your data will be kept confidential and will be accessible to the investigators of this project. Your data will be coded by an arbitrary subject number.

PAYMENT FOR PARTICIPATION
Your compensation will vary based on the terms and conditions of the panel company you are participating for. The researchers of this project are not responsible for how or when the panel compensation is administered. Please contact your panel service's Customer Service for more details regarding this matter.

CONFIDENTIALITY
All documents and information pertaining to this research study will be kept confidential in accordance with all applicable federal, state, and local laws and regulations. You understand that the results of this study may be published. If any data is published, it will not be identified by name.

QUESTIONS

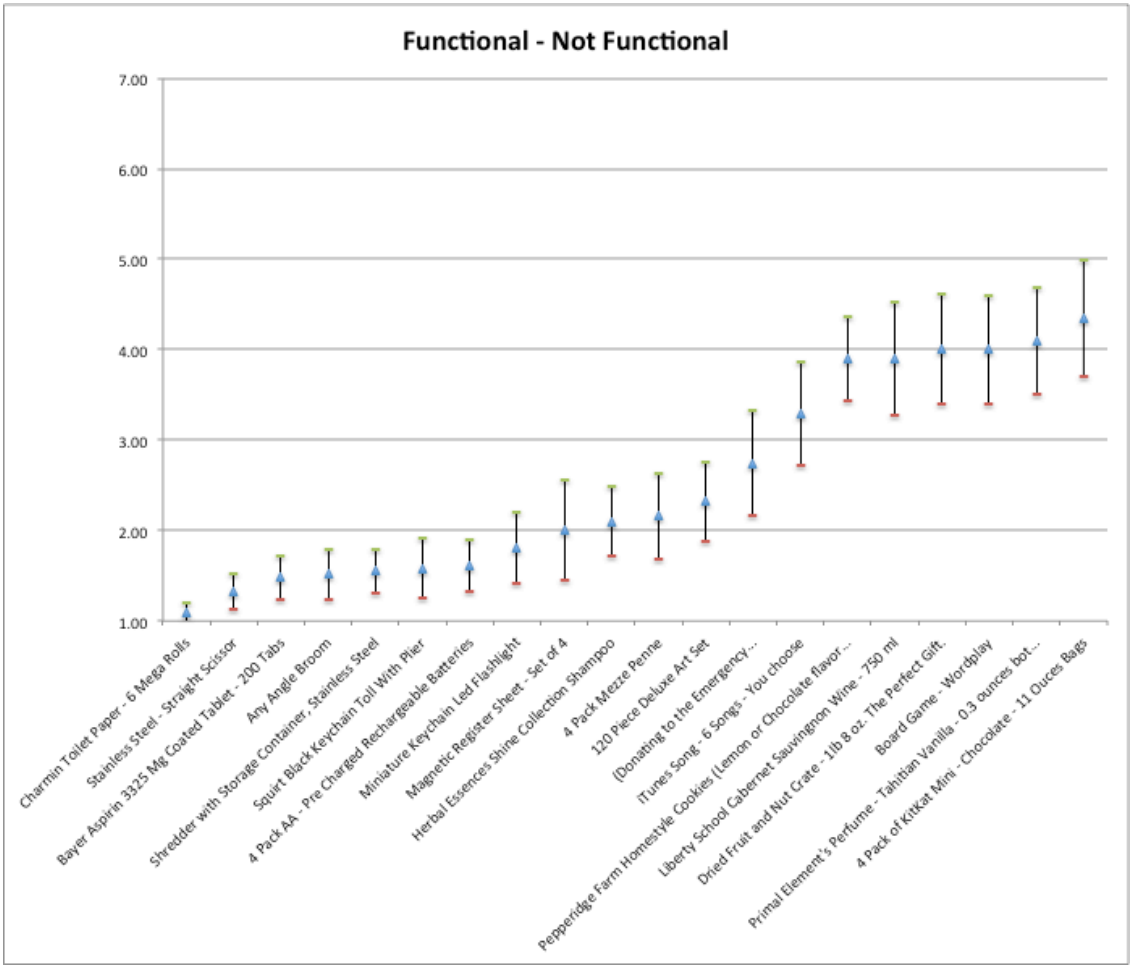
This research has been reviewed and approved by the Temple University Institutional Review Board. Please contact them at (215) 707-3390 or e-mail them at: irb@temple.edu for any of the following: questions, concerns, or complaints about the research; questions about your rights; to obtain information; or to offer input.

If you agree to participate of this study, please click the button: **"AGREE (I want to participate)"**

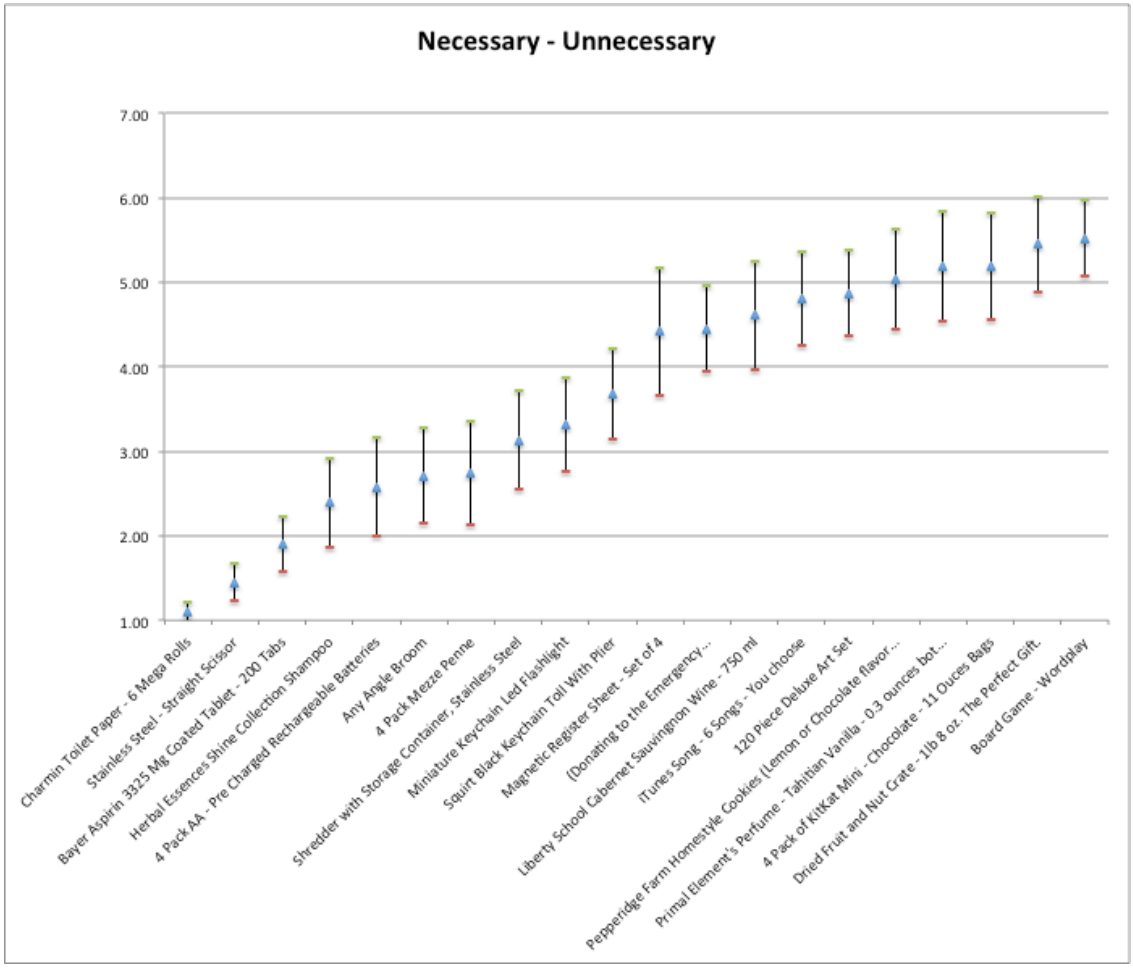
If you do not agree to participate in this study, please click the button: **"DO NOT AGREE (I will not participate)"**

8.2 Appendix B – Defining Products

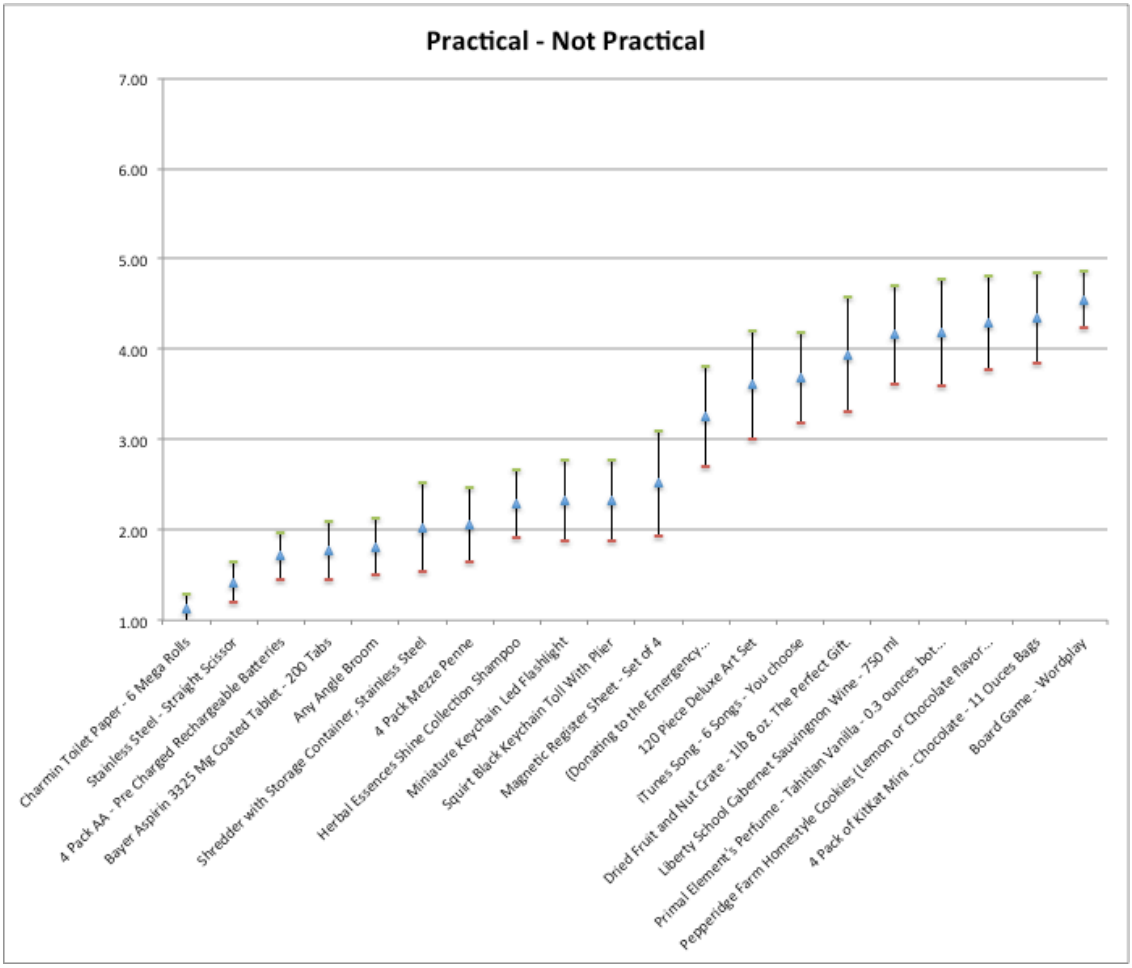
y = Utilitarian Dimension Scale: Functional (1) – Not Functional (7)



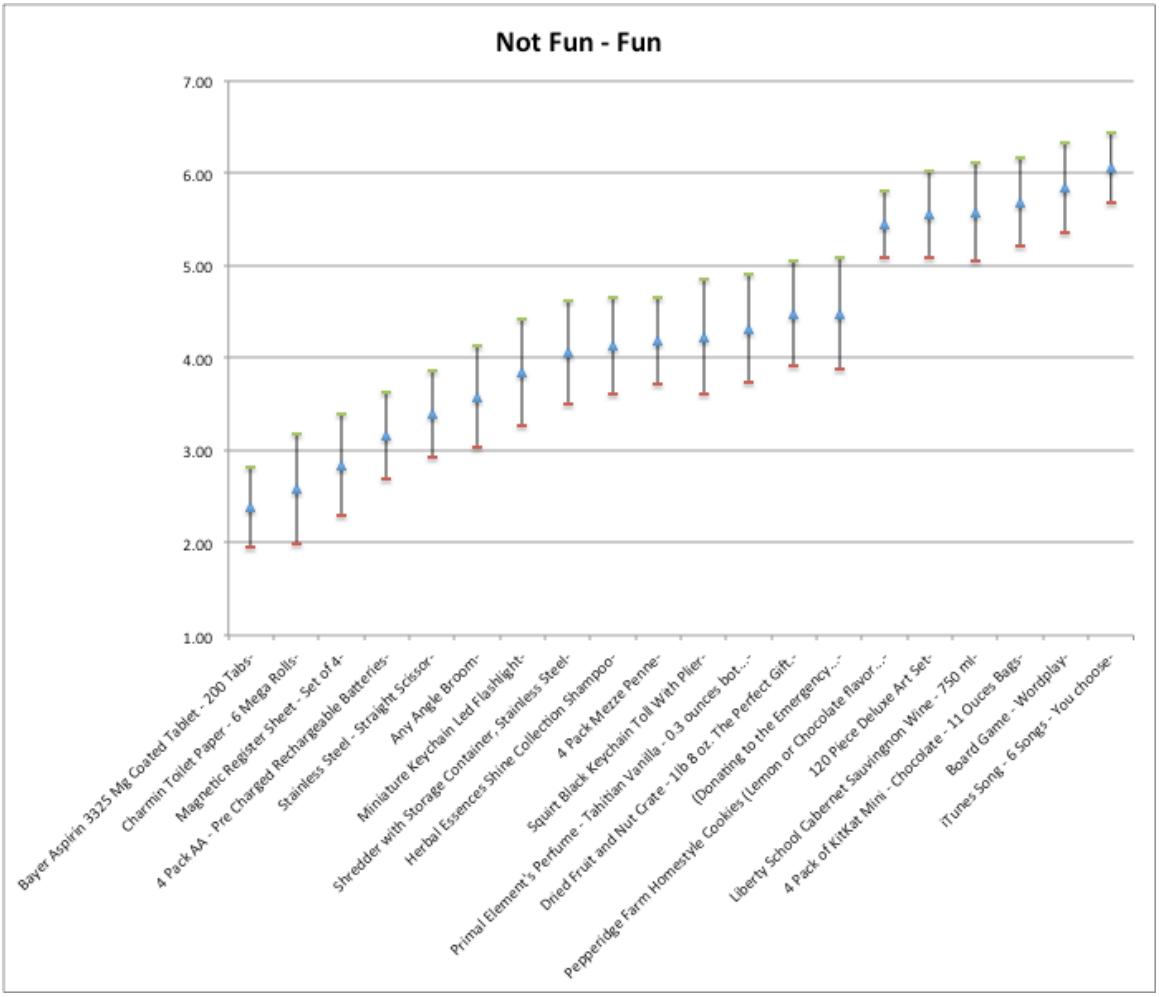
y = Utilitarian Dimension: Necessary (1) – Unnecessary (7)



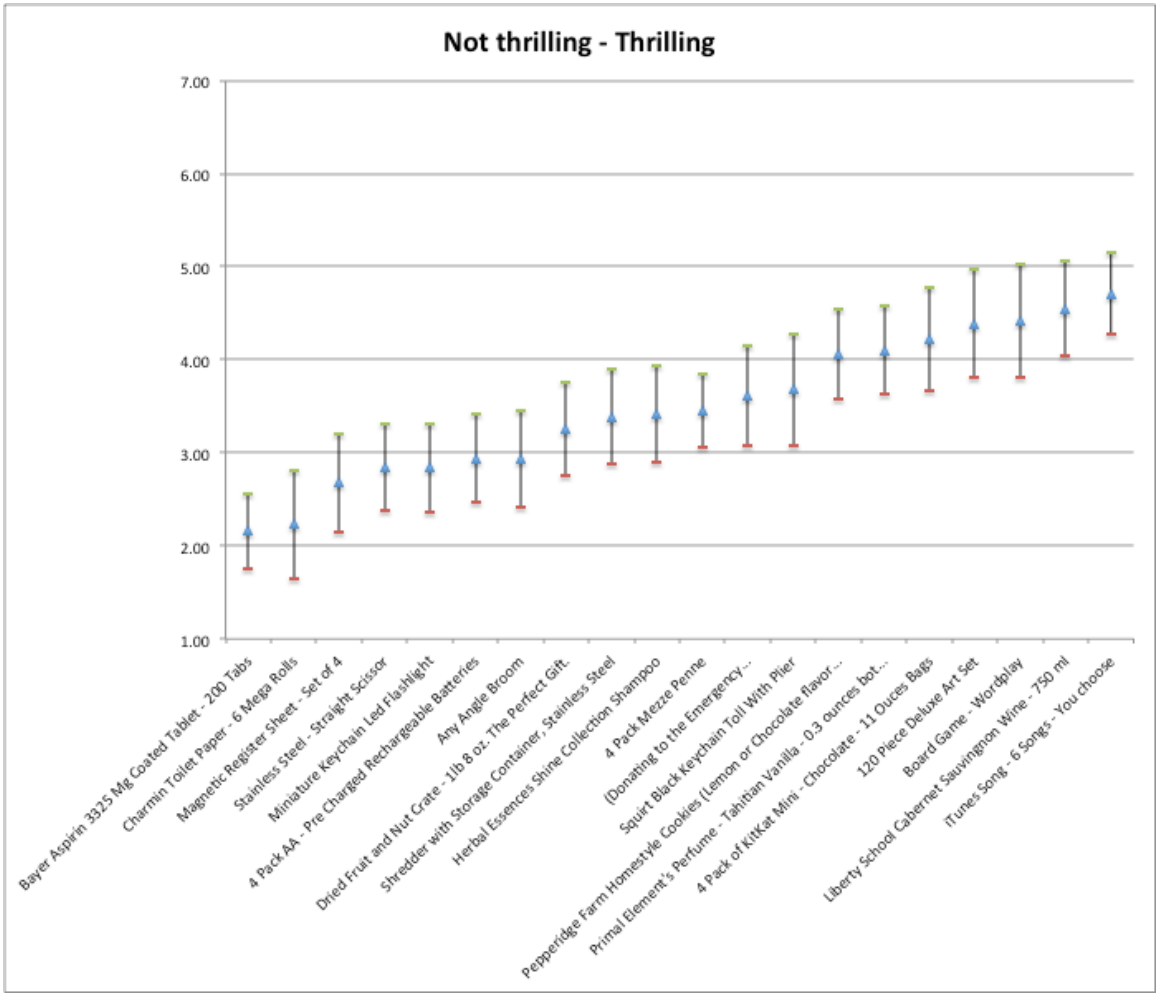
y = Utilitarian Dimension: Practical (1) – Not Practical (7)



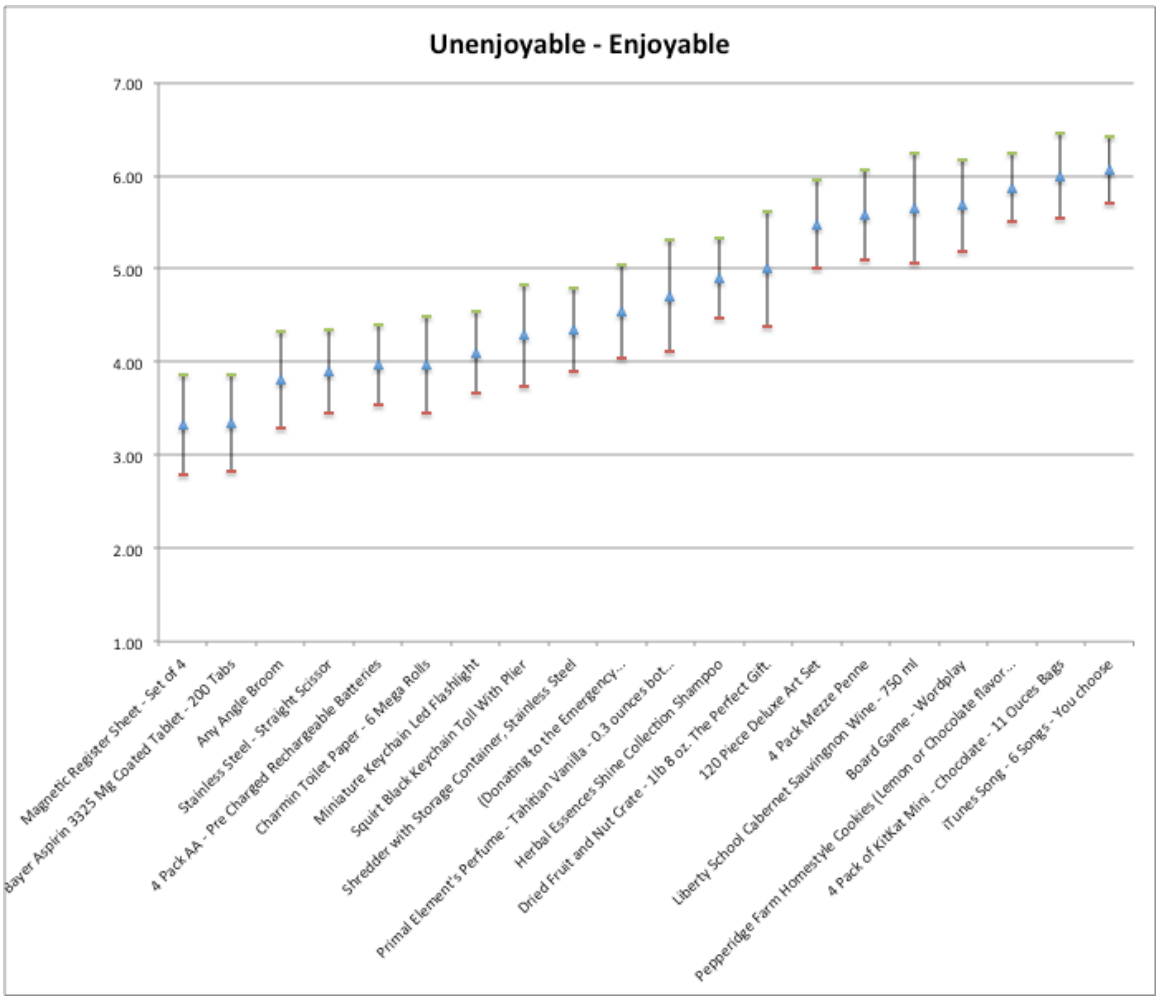
y = Hedonic Dimension: Not Fun (1) – Fun (7)



y = Hedonic Dimension: Not Thrilling (1) – Thrilling (7)



y = Hedonic Dimension: Unenjoyable (1) – Enjoyable (7)



8.3 Appendix C – Utilitarian and Hedonic Dimension

Utilitarian Dimension

Descriptive Statistics	Mean	Std. Deviation	N	95% Confidence Interval	
				Lower Bound	Upper Bound
iTunes Song	3.9247	1.16971	31	3.496	4.354
Chocolate	4.6344	1.2453	31	4.178	5.091
Wine	4.2258	1.43343	31	3.7	4.752
Art Set	3.6022	1.1334	31	3.186	4.018
Board Game	4.6882	0.96584	31	4.334	5.042
Scissor	1.3978	0.52648	31	1.205	1.591
Batteries	1.9677	0.87498	31	1.647	2.289
Toilet Paper	1.1075	0.33761	31	0.984	1.231
Broom	2.0108	0.87553	31	1.69	2.332
Aspirin	1.7204	0.60306	31	1.499	1.942

Comparing the Products in the Utilitarian Dimension

Products	Products	Mean Difference	Std. Error	Sig.	95% Confidence Interval for Difference (lower and high bound)	
iTunes Song	Chocolate	-.710*	0.228	0.004	-1.174	-0.245
	Wine	-0.301	0.236	0.212	-0.783	0.181
	Art Set	0.323	0.284	0.266	-0.258	0.903
	Board Game	-.763*	0.249	0.005	-1.272	-0.255
	Scissor	2.527*	0.223	0.000	2.072	2.982
	Batteries	1.957*	0.243	0.000	1.46	2.454
	Toilet Paper	2.817*	0.217	0.000	2.373	3.261
	Broom	1.914*	0.264	0.000	1.375	2.452
	Aspirin	2.204*	0.222	0.000	1.752	2.657
Chocolate	iTunes Song	.710*	0.228	0.004	0.245	1.174
	Wine	0.409	0.261	0.128	-0.124	0.941
	Art Set	1.032*	0.286	0.001	0.447	1.617
	Board Game	-0.054	0.29	0.854	-0.646	0.539
	Scissor	3.237*	0.224	0.000	2.779	3.694
	Batteries	2.667*	0.285	0.000	2.084	3.25
	Toilet Paper	3.527*	0.224	0.000	3.069	3.985
	Broom	2.624*	0.23	0.000	2.155	3.093
	Aspirin	2.914*	0.22	0.000	2.465	3.363
Wine	iTunes Song	0.301	0.236	0.212	-0.181	0.783
	Chocolate	-0.409	0.261	0.128	-0.941	0.124
	Art Set	0.624	0.379	0.110	-0.149	1.397
	Board Game	-0.462	0.299	0.132	-1.073	0.148
	Scissor	2.828*	0.268	0.000	2.281	3.375
	Batteries	2.258*	0.289	0.000	1.668	2.848
	Toilet Paper	3.118*	0.261	0.000	2.585	3.652
	Broom	2.215*	0.305	0.000	1.591	2.839
	Aspirin	2.505*	0.268	0.000	1.959	3.052

Products	Products	Mean Difference	Std. Error	Sig.	95% Confidence Interval for Difference (lower and high bound)	
Art Set	iTunes Song	-0.323	0.284	0.266	-0.903	0.258
	Chocolate	-1.032*	0.286	0.001	-1.617	-0.447
	Wine	-0.624	0.379	0.110	-1.397	0.149
	Board Game	-1.086*	0.262	0.000	-1.621	-0.551
	Scissor	2.204*	0.205	0.000	1.786	2.623
	Batteries	1.634*	0.236	0.000	1.152	2.117
	Toilet Paper	2.495*	0.221	0.000	2.044	2.945
	Broom	1.591*	0.213	0.000	1.155	2.027
	Aspirin	1.882*	0.21	0.000	1.453	2.311
Board Game	iTunes Song	.763*	0.249	0.005	0.255	1.272
	Chocolate	0.054	0.29	0.854	-0.539	0.646
	Wine	0.462	0.299	0.132	-0.148	1.073
	Art Set	1.086*	0.262	0.000	0.551	1.621
	Scissor	3.290*	0.188	0.000	2.907	3.674
	Batteries	2.720*	0.221	0.000	2.269	3.171
	Toilet Paper	3.581*	0.167	0.000	3.239	3.922
	Broom	2.677*	0.198	0.000	2.273	3.082
	Aspirin	2.968*	0.205	0.000	2.549	3.387
Scissor	iTunes Song	-2.527*	0.223	0.000	-2.982	-2.072
	Chocolate	-3.237*	0.224	0.000	-3.694	-2.779
	Wine	-2.828*	0.268	0.000	-3.375	-2.281
	Art Set	-2.204*	0.205	0.000	-2.623	-1.786
	Board Game	-3.290*	0.188	0.000	-3.674	-2.907
	Batteries	-.570*	0.161	0.001	-0.898	-0.242
	Toilet Paper	.290*	0.091	0.003	0.104	0.476
	Broom	-.613*	0.142	0.000	-0.902	-0.323
	Aspirin	-.323*	0.081	0.000	-0.488	-0.157
Batteries	iTunes Song	-1.957*	0.243	0.000	-2.454	-1.46
	Chocolate	-2.667*	0.285	0.000	-3.25	-2.084
	Wine	-2.258*	0.289	0.000	-2.848	-1.668
	Art Set	-1.634*	0.236	0.000	-2.117	-1.152
	Board Game	-2.720*	0.221	0.000	-3.171	-2.269
	Scissor	.570*	0.161	0.001	0.242	0.898
	Toilet Paper	.860*	0.154	0.000	0.545	1.176
	Broom	-0.043	0.197	0.828	-0.445	0.358
	Aspirin	0.247	0.165	0.144	-0.09	0.584
Toilet Paper	iTunes Song	-2.817*	0.217	0.000	-3.261	-2.373
	Chocolate	-3.527*	0.224	0.000	-3.985	-3.069
	Wine	-3.118*	0.261	0.000	-3.652	-2.585
	Art Set	-2.495*	0.221	0.000	-2.945	-2.044
	Board Game	-3.581*	0.167	0.000	-3.922	-3.239
	Scissor	-.290*	0.091	0.003	-0.476	-0.104
	Batteries	-.860*	0.154	0.000	-1.176	-0.545
	Broom	-.903*	0.16	0.000	-1.23	-0.576

Products	Products	Mean Difference	Std. Error	Sig.	95% Confidence Interval for Difference (lower and high bound)	
	Aspirin	-.613*	0.097	0.000	-0.81	-0.416
Broom	iTunes Song	-1.914*	0.264	0.000	-2.452	-1.375
	Chocolate	-2.624*	0.23	0.000	-3.093	-2.155
	Wine	-2.215*	0.305	0.000	-2.839	-1.591
	Art Set	-1.591*	0.213	0.000	-2.027	-1.155
	Board Game	-2.677*	0.198	0.000	-3.082	-2.273
	Scissor	.613*	0.142	0.000	0.323	0.902
	Batteries	0.043	0.197	0.828	-0.358	0.445
	Toilet Paper	.903*	0.16	0.000	0.576	1.23
	Aspirin	0.29	0.162	0.083	-0.04	0.621
Aspirin	iTunes Song	-2.204*	0.222	0.000	-2.657	-1.752
	Chocolate	-2.914*	0.22	0.000	-3.363	-2.465
	Wine	-2.505*	0.268	0.000	-3.052	-1.959
	Art Set	-1.882*	0.21	0.000	-2.311	-1.453
	Board Game	-2.968*	0.205	0.000	-3.387	-2.549
	Scissor	.323*	0.081	0.000	0.157	0.488
	Batteries	-0.247	0.165	0.144	-0.584	0.09
	Toilet Paper	.613*	0.097	0.000	0.416	0.81
	Broom	-0.29	0.162	0.083	-0.621	0.04

Hedonic Dimension

Descriptive Statistics	Mean	Std. Deviation	N	95% Confidence Interval	
				Lower Bound	Upper Bound
iTunes Song	5.6129	0.83487	31	5.307	5.919
Chocolate	5.3011	1.15584	31	4.877	5.725
Wine	5.2581	1.37897	31	4.752	5.764
Art Set	5.1398	1.2701	31	4.674	5.606
Board Game	5.3118	1.28217	31	4.842	5.782
Scissor	3.3763	1.04613	31	2.993	3.76
Batteries	3.3548	1.12854	31	2.941	3.769
Toilet Paper	2.9247	1.31574	31	2.442	3.407
Broom	3.4409	1.28059	31	2.971	3.911
Aspirin	2.6344	1.06928	31	2.242	3.027

Comparing the Products in the Hedonic Dimension

Products	Products	Mean Difference	Std. Error	Sig.	95% Confidence Interval for Difference (lower and high bound)	
iTunes Song	Chocolate	0.312	0.214	0.155	-0.124	0.748
	Wine	0.355	0.253	0.171	-0.162	0.872
	Art Set	0.473	0.257	0.075	-0.051	0.997
	Board Game	0.301	0.188	0.120	-0.083	0.686
	Scissor	2.237*	0.258	0.000	1.709	2.764
	Batteries	2.258*	0.223	0.000	1.803	2.713
	Toilet Paper	2.688*	0.274	0.000	2.128	3.248

Products	Products	Mean Difference	Std. Error	Sig.	95% Confidence Interval for Difference (lower and high bound)	
	Broom	2.172*	0.286	0.000	1.588	2.756
	Aspirin	2.978*	0.248	0.000	2.472	3.485
Chocolate	iTunes Song	-0.312	0.214	0.155	-0.748	0.124
	Wine	0.043	0.336	0.899	-0.644	0.73
	Art Set	0.161	0.243	0.513	-0.336	0.658
	Board Game	-0.011	0.285	0.970	-0.593	0.572
	Scissor	1.925*	0.231	0.000	1.454	2.396
	Batteries	1.946*	0.241	0.000	1.454	2.438
	Toilet Paper	2.376*	0.321	0.000	1.72	3.032
	Broom	1.860*	0.241	0.000	1.367	2.353
	Aspirin	2.667*	0.254	0.000	2.149	3.184
Wine	iTunes Song	-0.355	0.253	0.171	-0.872	0.162
	Chocolate	-0.043	0.336	0.899	-0.73	0.644
	Art Set	0.118	0.342	0.732	-0.58	0.817
	Board Game	-0.054	0.266	0.841	-0.597	0.489
	Scissor	1.882*	0.37	0.000	1.126	2.637
	Batteries	1.903*	0.314	0.000	1.262	2.544
	Toilet Paper	2.333*	0.327	0.000	1.666	3.001
	Broom	1.817*	0.355	0.000	1.092	2.543
	Aspirin	2.624*	0.311	0.000	1.988	3.26
Art Set	iTunes Song	-0.473	0.257	0.075	-0.997	0.051
	Chocolate	-0.161	0.243	0.513	-0.658	0.336
	Wine	-0.118	0.342	0.732	-0.817	0.58
	Board Game	-0.172	0.276	0.538	-0.737	0.393
	Scissor	1.763*	0.208	0.000	1.34	2.187
	Batteries	1.785*	0.321	0.000	1.128	2.442
	Toilet Paper	2.215*	0.31	0.000	1.582	2.848
	Broom	1.699*	0.306	0.000	1.074	2.323
	Aspirin	2.505*	0.313	0.000	1.865	3.145
Board Game	iTunes Song	-0.301	0.188	0.120	-0.686	0.083
	Chocolate	0.011	0.285	0.970	-0.572	0.593
	Wine	0.054	0.266	0.841	-0.489	0.597
	Art Set	0.172	0.276	0.538	-0.393	0.737
	Scissor	1.935*	0.31	0.000	1.303	2.568
	Batteries	1.957*	0.275	0.000	1.395	2.519
	Toilet Paper	2.387*	0.301	0.000	1.772	3.002
	Broom	1.871*	0.327	0.000	1.204	2.538
	Aspirin	2.677*	0.306	0.000	2.053	3.302
Scissor	iTunes Song	-2.237*	0.258	0.000	-2.764	-1.709
	Chocolate	-1.925*	0.231	0.000	-2.396	-1.454
	Wine	-1.882*	0.37	0.000	-2.637	-1.126
	Art Set	-1.763*	0.208	0.000	-2.187	-1.34
	Board Game	-1.935*	0.31	0.000	-2.568	-1.303
	Batteries	0.022	0.231	0.926	-0.45	0.493

Products	Products	Mean Difference	Std. Error	Sig.	95% Confidence Interval for Difference (lower and high bound)	
	Toilet Paper	0.452	0.316	0.164	-0.194	1.097
	Broom	-0.065	0.238	0.788	-0.55	0.421
	Aspirin	.742*	0.221	0.002	0.291	1.193
Batteries	iTunes Song	-2.258*	0.223	0.000	-2.713	-1.803
	Chocolate	-1.946*	0.241	0.000	-2.438	-1.454
	Wine	-1.903*	0.314	0.000	-2.544	-1.262
	Art Set	-1.785*	0.321	0.000	-2.442	-1.128
	Board Game	-1.957*	0.275	0.000	-2.519	-1.395
	Scissor	-0.022	0.231	0.926	-0.493	0.45
	Toilet Paper	0.43	0.323	0.193	-0.229	1.089
	Broom	-0.086	0.257	0.740	-0.611	0.439
	Aspirin	.720*	0.213	0.002	0.286	1.155
Toilet Paper	iTunes Song	-2.688*	0.274	0.000	-3.248	-2.128
	Chocolate	-2.376*	0.321	0.000	-3.032	-1.72
	Wine	-2.333*	0.327	0.000	-3.001	-1.666
	Art Set	-2.215*	0.31	0.000	-2.848	-1.582
	Board Game	-2.387*	0.301	0.000	-3.002	-1.772
	Scissor	-0.452	0.316	0.164	-1.097	0.194
	Batteries	-0.43	0.323	0.193	-1.089	0.229
	Broom	-0.516	0.292	0.088	-1.113	0.081
	Aspirin	0.29	0.259	0.272	-0.24	0.82
Broom	iTunes Song	-2.172*	0.286	0.000	-2.756	-1.588
	Chocolate	-1.860*	0.241	0.000	-2.353	-1.367
	Wine	-1.817*	0.355	0.000	-2.543	-1.092
	Art Set	-1.699*	0.306	0.000	-2.323	-1.074
	Board Game	-1.871*	0.327	0.000	-2.538	-1.204
	Scissor	0.065	0.238	0.788	-0.421	0.55
	Batteries	0.086	0.257	0.740	-0.439	0.611
	Toilet Paper	0.516	0.292	0.088	-0.081	1.113
	Aspirin	.806*	0.241	0.002	0.315	1.298
Aspirin	iTunes Song	-2.978*	0.248	0.000	-3.485	-2.472
	Chocolate	-2.667*	0.254	0.000	-3.184	-2.149
	Wine	-2.624*	0.311	0.000	-3.26	-1.988
	Art Set	-2.505*	0.313	0.000	-3.145	-1.865
	Board Game	-2.677*	0.306	0.000	-3.302	-2.053
	Scissor	-.742*	0.221	0.002	-1.193	-0.291
	Batteries	-.720*	0.213	0.002	-1.155	-0.286
	Toilet Paper	-0.29	0.259	0.272	-0.82	0.24
	Broom	-.806*	0.241	0.002	-1.298	-0.315

8.4 Appendix D – Behavioral Consent Form

BEHAVIORAL CONSENT FORM

TITLE: The Use of Neurophysiological Tools to Understand Price-Emotion Relationship

INVESTIGATOR: *Angelika Dimoka, PhD*
Assistant Professor, Marketing Department
Fox School of Business, Temple University
Alter Hall, A510; 1801 Liacouras Walk
Philadelphia, PA 19122
Tel: (215) 204-5672

RESEARCH: *Giuliana Isabella*
PhD Student, Marketing Department
Fox School of Business, Temple University
Alter Hall, A510; 1801 Liacouras Walk
Philadelphia, PA 19122
Tel: (215) 204-5672

SITE(S): *Fox School of Business*
Temple University
Philadelphia, PA 19122

SPONSOR: *Center for Neural Decision Making*
Fox School of Business, Temple University
Philadelphia, PA 19122

GENERAL DISCLAIMER

This consent form may contain words that you do not understand. Please ask the study staff to explain any words or information that you do not clearly understand. You may take home an unsigned copy of this consent form to think about or discuss participation with family or friends before making your decision. You have volunteered to participate in this study. Temple University is not being compensated for performing this study.

What you should know about a research study:

- Someone will explain this research study to you.
- You volunteer to be in a research study.
- Whether you take part is up to you.
- You can choose not to take part in the research study.
- You can agree to take part now and later change your mind.

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APPROVED TO: 8/25/14

Subject Initials: _____
Date: _____

- Whatever you decide, it will not be held against you.
- Feel free to ask all the questions you want before and after you decide.

PURPOSE

The purpose of the research is to better understand how neurophysiological tools may be used to evaluate perception of products and prices in communication messages (advertisement, flyer). To help us gain further insights into the uses of these tools, you will be asked to see communication messages and answer some questions about them. The research will be conducted on a computer and your decisions will be recorded using a keyboard and mouse. There is no right or wrong answer in these decisions. You are free to choose whatever best matches your preferences. The estimated duration of your participation will not exceed 2 hours.

RISKS AND DISCOMFORTS

There are no health risks associated with this study. Participating in this study is no more risky than using a computer in day-to-day life. None of the communication messages used in this research will be threatening, offensive, or stressful. In order to protect your confidentiality, your data will be kept on password-protected computers and in locked file cabinets, each of which will only be accessible investigators on this project. Your data will be coded by an arbitrary subject number. We will collect your name and mailing address for accounting purposes only. This information will never be connected to your study data.

BENEFITS

This research study will provide you no direct benefit. However, the data you provide may help improve the scientific understanding of how people make decisions. Benefits are expected to accrue to research in the fields of Consumer Psychology, Marketing, Judgments and Decision making.

COSTS

You will not be required to pay for research related procedures.

COMPENSATION

You will select to receive class credit or payment in the form of gift certificate or cash for this study. For monetary compensation, you will be guaranteed $10 for the participation in this study. If you stop participating voluntarily, you will be compensated at a pro-rated rate of $5 for the time completed.

COMPENSATION FOR INJURY

If you sustain an injury as a result of your participation in this study, your hospital and medical care will be provided at Temple University Hospital at no cost to you. Other financial compensation (such as lost wages or pain and suffering) for such injuries is not routinely available. By signing this consent form you are not waiving any of the legal rights that you otherwise would have as a participant in a research study.

CONFIDENTIALITY

Only the principal investigator and approved members of the research team will have access to the data (identified with a randomly assigned subject number) for analysis purposes. Efforts will be made to limit the disclosure of your personal information, including research study records, to people who have a need to review this information. However, the study team cannot promise complete secrecy. For

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example, although the study team has put in safeguards to protect your information, there is always a potential risk of loss of confidentiality. There are several organizations that may inspect and copy your information to make sure that the study team is following the rules and regulations regarding research and the protection of human subjects. These organizations include the IRB, Temple University, its affiliates and agents, Temple University Health System, Inc., its affiliates and agents, and the Office for Human Research Protections. Thus, you understand the records and data generated by the study may be reviewed by Temple University and its agents, the study sponsor or the sponsor's agents (if applicable), and/or governmental agencies to assure proper conduct of the study and compliance with regulations. You understand that the results of this study may be published. If any data is published, you will not be identified by name.

VOLUNTARY PARTICIPATION AND WITHDRAWAL

Your participation in this study is entirely voluntary, and refusal to participate will involve no penalty or loss of benefits to you. You may discontinue your participation at any time without penalty or loss of benefits. Withdrawal from study or failure to participate will not have any academic consequences to you. If you are a student, there are no risks to your student career.

REASONS FOR REMOVAL FROM THE STUDY

Your participation in this study may be stopped at any time by the investigator or the sponsor without your consent. This might occur if you become very uncomfortable or upset during the experiment.

ALTERNATIVE TREATMENT

This is not a treatment study. Your alternative is to not participate in this study.

PARTICIPATION IN FUTURE RESEARCH EXPERIMENTS

Research is ongoing and there may be future research experiments conducted at this institution that may be of interest to you. With your permission, we will store your contact information (name, email address (if applicable), and phone number) in a password-protected file accessible only by the investigators so that we can contact you in the future regarding experiments of interest to you. The information will not be used for any other commercial purposes. You may withdraw your interest to be contacted in the future and have your contact information removed at any given time by contacting the investigators listed above. If you do not wish to be contacted about future experiments, please indicate below.

QUESTIONS

This research has been reviewed and approved by the Temple University Institutional Review Board. Please contact them at (215) 707-3390 or e-mail them at: irb@temple.edu for any of the following: questions, concerns, or complaints about the research; questions about your rights; to obtain information; or to offer input.

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APPROVED TO: 8/25/14

Subject Initials: _____

Date: _____

SIGNATURE BLOCK

Signing your name below indicates that you have read and understand the contents of this Consent Form and that you agree to take part in this study.

Are you willing to be contacted about future research experiments? ☐ Yes ☐ No

DO NOT SIGN THIS FORM AFTER THIS DATE →

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APPROVED TO: 8/25/14

Signature of subject Date

Printed name of subject

Signature of person obtaining consent Date

Printed name of person obtaining consent

Subject Initials: _____

Date: _____

8.5 Appendix E – Graphic Illustrations of Mean Differences in Price Changes and Product Representation - Perception of Justice

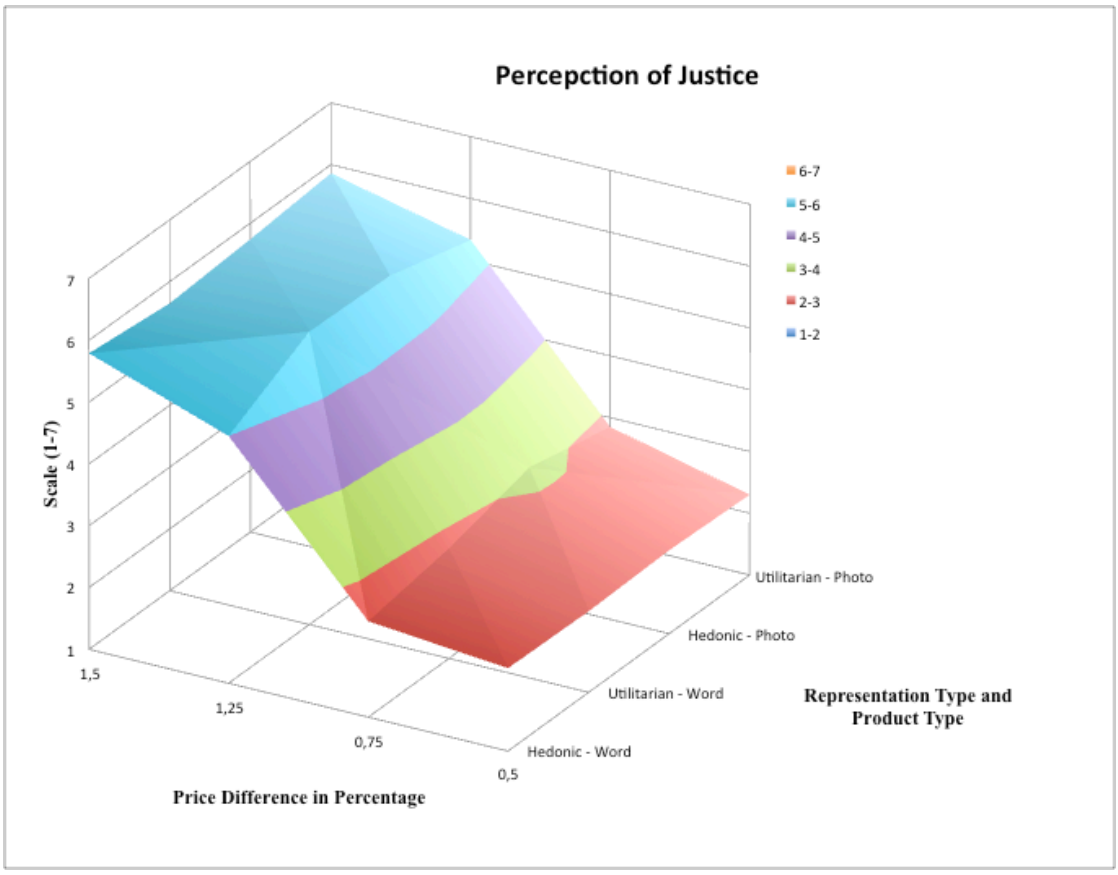
y = Perception of Justice (scale 1-7)

References: the red, dotted line represents the means for the utilitarian product, and the blue line stands for the hedonic product.

y = Perception of Justice

Price Differences in Percentage

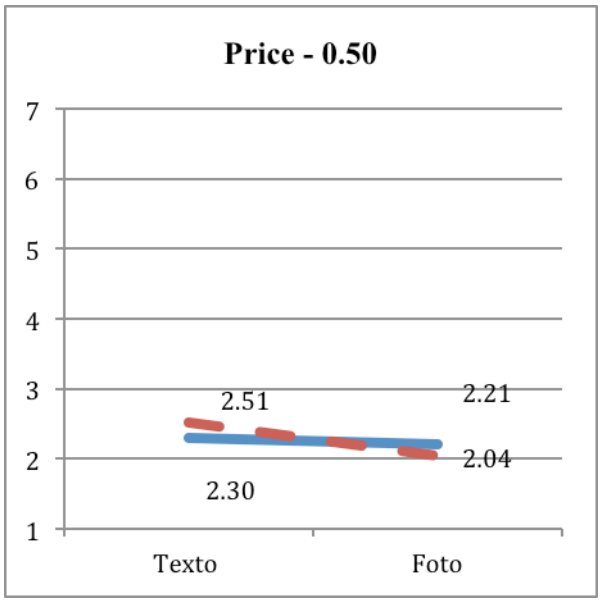
Representation Type and Product Type



8.6 Appendix F - Graphic Illustrations of Mean Differences in Price Changes and Product Representation - Perception of Price Unfairness

y = Perception of Justice (scale 1-7)

References: the red, dotted line represents the means for the utilitarian product, and the blue line stands for the hedonic product.

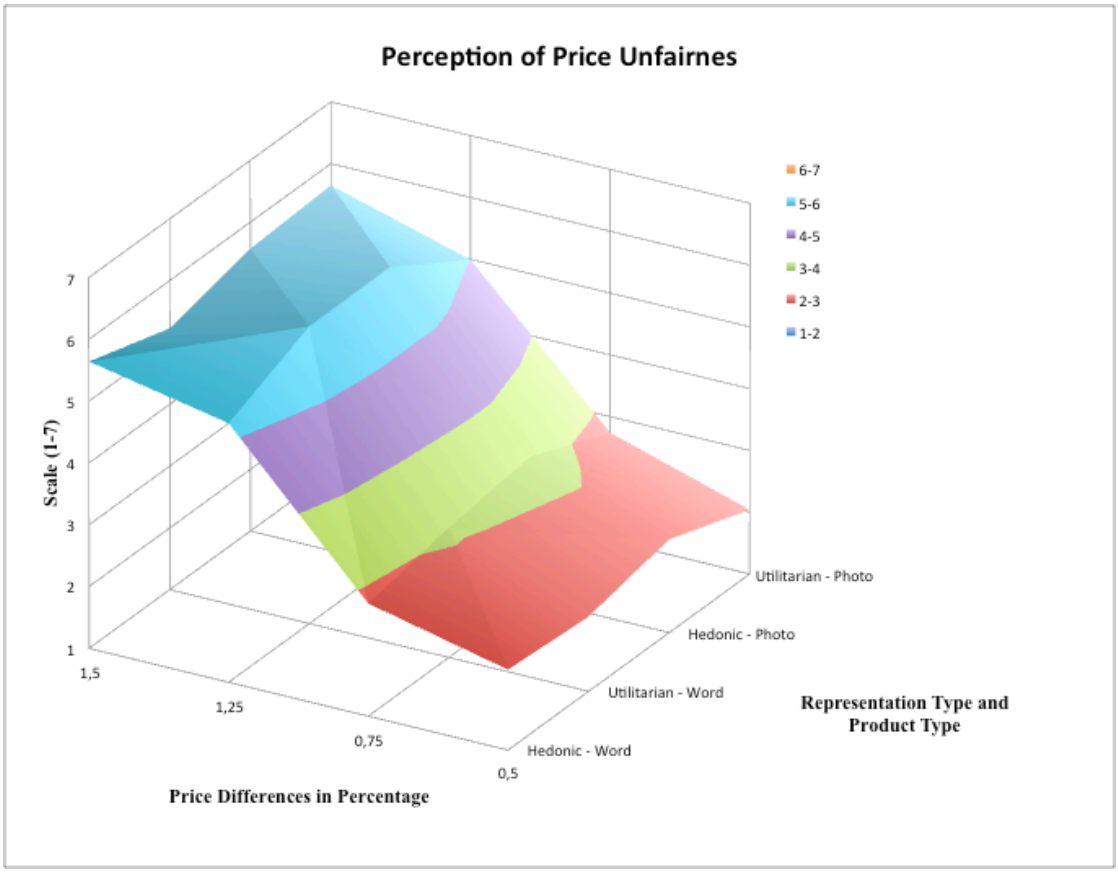


Price Unfairness – Graphic illustration of the means.

Scale (1 – 7)

Price Differences in Percentage

Representation Type and Product Type



8.7 Appendix G – Research Communication

ADVERTISING FOR STUDY SUBJECTS

The Department of Marketing, Fox Business School, at Temple University seeks healthy individuals older 18 to participate in a research study

The purpose of the research is to better understand how neurophysiological tools may be used to evaluate price perception in communication messages such as advertisements or print ads you see on television.

The study involves seeing some television ads and print ads and answering questions about them. Participation time will not exceed 2 hours.

Risks: There is a small risk of temporary, minor skin irritation when the electrodes are connected. Such irritation is very minor and disappears on its own within a few minutes.

Compensation will be provided

For more information please contact the Research Coordinator:

Giuliana Isabella
Marketing Department, Fox School of Business
1801 Liacouras Walk; Philadelphia PA, 19122
(215)-204-5274– giuliana.isabella@temple.edu

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APPROVED TO: 8/25/14

Location: *EMG Lab of the Department of Neurology at Temple University; 3401 N. Broad Street; Philadelphia, PA 19140*

This information is approved by Temple University for public display and is associated with project _____.

Price Perception Study
Giuliana: 215-204-5274
giuliana.isabella@temple.edu

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Giuliana: 215-204-5274
giuliana.isabella@temple.edu

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giuliana.isabella@temple.edu

Price Perception Study
Giuliana: 215-204-5274
giuliana.isabella@temple.edu

8.8 Appendix H – fEMG Consent Form

fEMG CONSENT FORM

TITLE: The Use of Neurophysiological Tools to Understand Price-Emotion Relationship

INVESTIGATOR: *Angelika Dimoka, PhD*
Assistant Professor, Marketing Department
Fox School of Business, Temple University
Alter Hall, A510; 1801 Liacouras Walk
Philadelphia, PA 19122
Tel: (215) 204-5672

RESEARCH: *Giuliana Isabella*
PhD Student, Marketing Department
Fox School of Business, Temple University
Alter Hall, A510; 1801 Liacouras Walk
Philadelphia, PA 19122
Tel: (215) 204-5672

SITE(S): EMG Lab of the Department of Neurology
Temple University hospital
Philadelphia, PA 19140

SPONSOR: *Center for Neural Decision Making*
Fox School of Business, Temple University
Philadelphia, PA 19122

GENERAL DISCLAIMER

This consent form may contain words that you do not understand. Please ask the study staff to explain any words or information that you do not clearly understand. You may take home an unsigned copy of this consent form to think about or discuss participation with family or friends before making your decision. You have volunteered to participate in this study. Temple University is not being compensated for performing this study.

What you should know about a research study:

- Someone will explain this research study to you.
- You volunteer to be in a research study.
- Whether you take part is up to you.
- You can choose not to take part in the research study.
- You can agree to take part now and later change your mind.

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APPROVED FROM: 8/26/13
APPROVED TO: 8/25/14

Subject Initials: _____
Date: _____

- Whatever you decide, it will not be held against you.
- Feel free to ask all the questions you want before and after you decide.

PURPOSE

The purpose of the research is to better understand how neurophysiological tools may be used to evaluate perception of products and prices in communication messages (advertisement, flyer). To help us gain further insights into the uses of these tools, you will be asked to see communication messages and answer some questions about them. The research will be conducted using an EMG machine and your decisions will be recorded using a keyboard and mouse. There is no right or wrong answer in these decisions. You are free to choose whatever best matches your preferences. The estimated duration of your participation will not exceed 2 hours.

PROCEDURES

While you are watching different communication messages and answering questions, the EMG machine will also record electrical signals from facial indicating changes in facial expressions. The machine only *receives* signals, no electrical signals are transmitted to the face. Four electrodes will be placed on your face; more specifically two electrodes on each of the muscles: the *zygomaticus* and the *corrugator supercilli*. The sensors will be attached to the electrodes and linked to the EMG machine. Electrodes will be disposed of after each participant. Sensors will be cleaned with alcohol wipes before and after testing to insure cleanliness. Electrode gel, such as Signa Gel, will be used to increase the natural conductance of the skin.

RISKS AND DISCOMFORTS

The risks of this research are minimal. Electrodes will be placed directly on skin. There is a small risk of temporary, minor skin irritation when the electrodes are connected. Such irritation is very minor and disappears on its own within a few minutes. There is a small risk that you might feel stressed by wearing the electrodes, and/or the elastic band that measures respiration. There is a small risk that you might feel stressed by having to sit in a comfortable chair without moving for up to 5 minutes at a time. If there are any signs of such stress or skin irritation you will be reminded that you can withdraw from participating at any time.

BENEFITS

This research study will provide you no direct benefit. However, the data you provide may help improve the scientific understanding of how people make decisions. Benefits are expected to contribute to research in the fields of Consumer Psychology, Marketing, and Judgments and Decision making

COSTS

You will not be required to pay for research related procedures.

COMPENSATION

You will select to receive class credit or payment in the form of gift certificate or cash for this study. For monetary compensation, you will be guaranteed $25 for the participation in this study. If you stop participating voluntarily, you will be compensated at a pro-rated rate of $12.50 for the time completed.

COMPENSATION FOR INJURY

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Date: _____

If you sustain an injury as a result of your participation in this study, your hospital and medical care will be provided at Temple University Hospital at no cost to you. Other financial compensation (such as lost wages or pain and suffering) for such injuries is not routinely available. By signing this consent form you are not waiving any of the legal rights that you otherwise would have as a participant in a research study.

CONFIDENTIALITY

Only the principal investigator and approved members of the research team will have access to the data (identified with a randomly assigned subject number) for analysis purposes. Efforts will be made to limit the disclosure of your personal information, including research study records, to people who have a need to review this information. However, the study team cannot promise complete secrecy. For example, although the study team has put in safeguards to protect your information, there is always a potential risk of loss of confidentiality. There are several organizations that may inspect and copy your information to make sure that the study team is following the rules and regulations regarding research and the protection of human subjects. These organizations include the IRB, Temple University, its affiliates and agents, Temple University Health System, Inc., its affiliates and agents, and the Office for Human Research Protections. Thus, you understand the records and data generated by the study may be reviewed by Temple University and its agents, the study sponsor or the sponsor's agents (if applicable), and/or governmental agencies to assure proper conduct of the study and compliance with regulations. You understand that the results of this study may be published. If any data is published, you will not be identified by name.

VOLUNTARY PARTICIPATION AND WITHDRAWAL

Your participation in this study is entirely voluntary, and refusal to participate will involve no penalty or loss of benefits to you. You may discontinue your participation at any time without penalty or loss of benefits. Withdrawal from study or failure to participate will not have any academic consequences to you. If you are a student, there are no risks to your student career.

REASONS FOR REMOVAL FROM THE STUDY

Your participation in this study may be stopped at any time by the investigator or the sponsor without your consent. This might occur if you become very uncomfortable or upset during the experiment.

ALTERNATIVE TREATMENT

This is not a treatment study. Your alternative is to not participate in this study.

PARTICIPATION IN FUTURE RESEARCH EXPERIMENTS

Research is ongoing and there may be future research experiments conducted at this institution that may be of interest to you. With your permission, we will store your contact information (name, email address (if applicable), and phone number) in a password-protected file accessible only by the investigators so that we can contact you in the future regarding experiments of interest to you. The information will not be used for any other commercial purposes. You may withdraw your interest to be contacted in the future and have your contact information removed at any given time by contacting the investigators listed above. If you do not wish to be contacted about future experiments, please indicate below.

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QUESTIONS

This research has been reviewed and approved by the Temple University Institutional Review Board. Please contact them at (215) 707-3390 or e-mail them at: irb@temple.edu for any of the following: questions, concerns, or complaints about the research; questions about your rights; to obtain information; or to offer input.

If you have any questions about research-related injuries, you may contact Dr. Angelika Dimoka at (215) 204-5672 or dimoka@temple.edu .

Do not sign this consent form unless you have had a chance to ask questions and have received satisfactory answers to all of your questions.

SIGNATURE BLOCK

Signing your name below indicates that you have read and understand the contents of this Consent Form and that you agree to take part in this study.

Are you willing to be contacted about future research experiments? ☐ Yes ☐ No

DO NOT SIGN THIS FORM AFTER THIS DATE →

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APPROVED TO: 8/25/14

Signature of subject _____ Date _____

Printed name of subject _____

Signature of person obtaining consent _____ Date _____

Printed name of person obtaining consent _____

Subject Initials: _____

Date: _____

8.9 Appendix I – fEMG Filter Review

Authors	Journal	Filter / facial EMG Information
Brown and Schwartz (1980, p. 52)	Biological Psychology	"The EMG signals were amplified by four Coulbourn Instruments Hi-Gain Bioamplifier/Couplers (S75-Ol), filtered below 90 Hz and above 1000 Hz, and output from the amplifiers was integrated by four Coulbourn Instruments Cumulative/Resetting Integrators (S76-21)."
Dimberg (1982, p. 644)	Psychophy-siology	"Bipolar EMG recordings were made from the left *zygomatic* and *corrugator supercilii* regions of the face, using Beekman miniature surface Ag/ AgCI electrodes, filled with Beckman electrode paste. The electrodes were connected to Hewlett Packard Bioelectric Amplifiers with high pass and low pass filters set at 50 and 1000 Hz respectively."
Lang, Greenwaldm Bradley and Hamm (1993, p. 263)	Psychophy-siology	"Signals were band pass filtered from 90 to 1,000 Hz, rectified, and integrated (time constant of 500 ms). Change scores were calculated separately for electromyographic activity at each facial muscle site by subtracting the mean activity during the 1 s preceding picture onset (baseline) from the average response during the 6-s picture viewing interval."
Soderberg and Knutson (2000, p. 491)	Physical Therapy	"Because most of the power in the EMG signal is in the frequency range of 5 to 500 Hz, submissions to that journal will not be considered unless the filter retains signals in the range of 10 to 350 Hz for surface electrodes and 10 to 450 Hz for intramuscular electrodes."
Sonnby-Bogstrom, Jonsson and Svensson (2003, p. 10)	Journal of Nonverbal Behavior	"An EMG amplifier (BIOPAC EMG 100A) with a band-pass filter, 10–4000 Hz, and a wave rectifier followed by a 10 Hz two-pole low-pass filter was used, and the output was fed to the computer and digitized by use of a special software for bioelectric data handling (AcqKnowledge). A sampling rate of 1 kHz was chosen because ECG was recorded and digitized simultaneously to the EMG signal."
Pauls and Stemmler (2003, pp. 290–291)	Emotion	"Electromyograms (EMG - in microvolts) were obtained from the m. *corrugator supercilii* and *zygomaticus major* of the left side of the face through Ag/AgCl surface electrodes (4 mm sensor diameter, In Vivo Metric). Amplification was 1,000, with filters set to 10 Hz and 1 kHz. After rectification, the signals were low-pass filtered at 40 Hz (24 dB/octave) and sampled at 100 Hz."
Larsen et. al. (2003, p. 778)	Psychophy-siology	"Offline, data were submitted to a 15-Hz high-pass filter to reduce movement and blink-related artifact, then full-rectified. Data were then visually inspected, and data with remaining artifact were excluded from subsequent analysis. To correct for the positive skew inherent to EMG data, all data were then subjected to a square-root transformation. Following Lang et al. (1993), EMG reactivity was measured as the difference between activity during the 6,000-ms stimulus period and the 1,000 ms immediately prior to stimulus onset."
Vrana and Gross (2004, p. 67)	Biological Psychology	"Electromyographic (EMG) activity at the *zygomaticus major* and *corrugator supercilii* facial muscle regions was recorded from the left side of the face using electrode placements recommended by Fridlund and Cacioppo (1986). The skin was cleaned and 4 mm Ag/AgCl electrodes were applied. Signals were filtered (below 90 and above 250 Hz) with a Coulbourn Hi-Gain Bioamplifier. The signals were rectified and integrated using a Contour-Following Integrator set for a time constant of 80 ms."

Authors	Journal	Filter / facial EMG Information
Stemmler, Aue and Wacker (2007, p. 145)	International Journal of Psychophy-siology	"Amplification was 1000 with filters set to 30 Hz and 1 kHz. Sampling rate was 2000 Hz. A root mean square rectification (Jäncke, 1996) was performed followed by low- pass filtering with 70 Hz and sampling with 20 Hz."
Cannon, Hayers, Tipper (2009, p. 923)	Psychophy-siology	"Electromyography activity was recorded using a BIOPAC MP100 system at a sampling frequency of 2000 Hz. Raw EMG data were filtered online with a high pass filter at 10 Hz, a low pass filter at 500 Hz, a notch filter at 50 Hz, and were amplified by 5000x. muscle activity was standardized by subtracting the mean (all trials) fixation activity from each data point, and then dividing these data by the fixation standard deviation."
Urry (2009, p. 788)	Emotion	*"Corrugator supercilli* activity was acquired continuously at 2000 Hz (bandpass-filtered online from 0.5 Hz to 3 kHz, 60 Hz notch filter on). Offline, data were resampled to 400 Hz, rectified and smoothed with a 16Hz low-pass filter, decimated to 4 Hz, and smoothed with a 1-s prior moving average filter."
Larsen and Norris (2009, p. 7)	Psychophy-siology	"Offline, data were submitted to a 15Hz high pass filter to reduce movement and blink-related artifact, then full-rectified. Data were then visually inspected and data with remaining artifact were excluded from subsequent analysis. Data were then collapsed across 100ms bins. To correct for the positive skew inherent to EMG data, all values were submitted to a square-root transformation. Following standard practice (e.g. Lang et al., 1993; Schwartz, et al., 1976; Vrana, 1993; Winkielman & Cacioppo, 2001), EMG reactivity was measured as change scores representing the difference between activity during each second of the 6s picture period and the 1s immediately preceding stimulus onset."
Böddeker and Stemmler (2010, p. 746)	Cognition and Emotion	"Amplification was 1,000 with filters set to 10 Hz and 1 kHz. After rectification, the signal was low-pass filtered at 40 Hz (24 dB/octave) and sampled with 100 Hz."
Urry (2010, p. 127)	Emotion	"Electromyography was selected as an index of facial expressive behavior, even that which is not overtly observable. It is sensitive to stimulus valence, exhibiting greater activity in response to unpleasant stimuli and lower activity in response to pleasant stimuli (Bradley & Lang, 2007). Two 4mm Ag/AgCl electrodes were placed in bipolar configuration over the left eye per Fridlund and Cacioppo (1986). One ground electrode for all physiological channels was placed on the forehead. *Corrugator supercilli* electromyography was sampled at 2000 Hz and band pass-filtered online (5 Hz to 3 kHz; 60 Hz notch filter on). Offline, data were resampled to 400 Hz, rectified and smoothed with a 16Hz low-pass filter, decimated to 4Hz, and smoothed with a 1s prior moving average filter."
Chiew and Braver (2010, p. 845)	Emotion	"The data were filtered using a second-order digital Butterworth high-pass filter with a normalized cutoff frequency of 0.01 Hz and converted to the root-mean- square of the signal, with smoothing set to 25 ms and frequency to 1,000 Hz. EMG data were first characterized in terms of two dependent measures, response onsets and error rates. Response onsets were obtained by calculating the time after probe onset at which muscle activity, measured by EMG recording at the channel of the correct response (*zygomatic or corrugator* muscle), exceeded a threshold of 50 µV on each experimental trial."

Authors	Journal	Filter / facial EMG Information
Boxtel (Boxtel, 2010)	Proceedings of Measuring Behavior 2010	"Following amplification, the EMG signal must be band pass filtered within the frequency range 20–500 Hz, being the predominant frequency range of facial EMG signals. Effective high-pass filtering at 20 Hz is essential because of the strong influence of low-frequency artifacts such as motion potentials, eye movements, eyeblinks, activity of neighboring muscles, respiration, swallowing, etc. In most practical applications occurring outside an electrically shielded laboratory, it may also be necessary to remove 50 Hz power line interference by applying 50 Hz notch filtering. Baseline EMG amplitudes and affective EMG response magnitudes strongly vary between individuals, not only because of differences in affective processes but also due to anatomical and biophysical differences. This implies that, when determining group means, individual contributions will strongly differ in weight. An adequate method to standardize individual results, and making them comparable between individuals, is expressing EMG response magnitudes as a proportion of an adequate baseline value."
Fujimura et al. (2010, p. 90)	International Journal of Psychophy-siology	"EMG recordings for the *corrugator supercilii* and *zygomatic major* muscles were conducted using Ag/AgCl electrodes (NT–611U, Nihonkoden). The electrodes were placed as per the guidelines of Fridlund and Cacioppo (1986). Impedances were balanced and maintained below 15 kΩ. The data were amplified and filtered online (band pass: 50–500 Hz; notch: 60 Hz) by a polygraph (NEC, Synafit 1000) and sampled by a digital converter system (MP100, BIOPAC Systems) at 1000 Hz."
Davydov, Zech and Luminet (2011, p. 72)	Federation of European Psychophy-siology Societies	"The raw EMG signal was subjected to a 10–500 Hz digital band-pass filter, rectified, and smoothed using a 1s time constant and down sampled to 10 Hz."
Hofelich and Preston (2012, p. 122)	Cognition and Emotion	"Raw EMG signals were amplified by a factor of 500 and filtered online with a 10 Hz high-pass filter, integrated, and root-mean squared. Facial mimicry per trial was calculated by subtracting mean baseline activity from mean trial activity (500–1000 ms after stimulus onset, after Moody, McIntosh, Mann, & Weisser, 2007)."
Lindsey, Rohan, Roecklein and Mahon (2011, p. 314)	Journal of Affective Disorders	"Prior to recording, the EMG signal was calibrated via an internal calibration signal. Impedance levels of b10 k were considered acceptable. The EMG pass band for analysis was 80–250 Hz, and the filter settings included a low pass filter (LPF) setting of 500 Hz and a high pass filter (HPF) setting of 30 Hz."
Bornemann, Winkielman and Meer (2012, p. 119)	International Journal of Psychophy-siology	"EMG was recorded with a BIOPAC MP150WSW Data Acquisition System, using the BIOPAC recording software AcqKnowledge, Version 4.0, and BIOPAC EL503 disposable electrodes. Sampling rate was 2000 Hz. filter (10–1000 Hz filter, see Fridlund and Cacioppo, 1986), and rectify them or the EMG data, outlier/artifact analysis was performed by removing activity that was 2 standard deviations above or below the individual mean activity of the respective channel. The last 200 ms before the onset of the prime was taken as a baseline and subtracted from the subsequent data points."
Blanchette and Richards (2013, p. 131)	Emotion	"The signal was sampled at 500 Hz and amplified with a single amplifier, with high-pass filter 30 Hz and low-pass filter at 400 Hz. The EMG signal was rectified and smoothed offline using a low-pass filter with a time constant of 25 ms and cutoff of 5 Hz."

Authors	Journal	Filter / facial EMG Information
Franklin, Lee, Hanna and Prinstein (2013, pp. 2–3)	Psychologic al Science	"Startle was quantified by measuring the electromyography (EMG) activity from surface recording electrodes, processed and sampled at 1000 Hz by a BIOPAC (Goleta, CA) MP150 workstation, relayed through a band-pass filter at 28 to 500 Hz, and smoothed with a five sample boxcar filter (cf. Blumenthal et al., 2005)."
Yin, Dijkm and Clark (Y. Wu, van Dijk, & Clark, 2014)	Psychophy-siology	"The data were filtered through a 30 Hz high-pass filter to remove low frequency noise and artifacts recorded during the task. The filtered data were then rectified, converting negative values into positive values. Mean values were extracted for a baseline period in the final 2 s of the spin, and for 4 s following the wheel stopping (the outcome). Percentage change from baselines was calculated, in order to compare activity at the two muscle locations."
Dillen, Harris, van Dijk and Rotteveel (2014, p. 6)	Cognition and Emotion	"EMG activity was recorded using a BIOPAC system at a sampling frequency of 2000 Hz. Raw EMG data were filtered online with a high-pass filter at 10 Hz, a low-pass filter at 500 Hz, a notch filter at 50 Hz and were amplified 5000×.Change scores were calculated using the final 500 ms of the fixation screen as a baseline."