6-30-2016

The Influence of Wait Time Units on Patience in Intertemporal Choice

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Submitted in Partial Fulfillment of the Requirements

For the Degree of Doctor of Philosophy in

Business Administration

Darla Moore School of Business

University of South Carolina

2016

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ACKNOWLEDGEMENTS

I am incredibly lucky to have Ashwani Monga and Eva Buechel as my co-advisors. I thank Ashwani for being instrumental in my development as a researcher from the very first day that I joined the doctoral program. His invaluable guidance has not only allowed me to learn the intricacies of doing good research, but to also be well prepared for the next step in my academic career. I thank Eva for providing unwavering support and guidance for both my current and future aspirations, which has been pivotal towards my progress.

I would like to thank my committee members Tom Kramer and Priyali Rajagopal. Tom and Priyali have given me valuable advice throughout, which has not only improved this work, but has also made me a better researcher.

I also owe a lot to the current and former faculty, and students, of the marketing department. Collectively they shaped an environment that was conducive to learning, and to the fostering of new ideas. I look forward to continue working with them, and to learning from them, in the years to come.

Finally, I would like to thank my parents Anwar and Amna, and my brother Sauleh, for inspiring me to pursue my interests. I would not be here without their support.

ABSTRACT

Patience is important for consumers. It allows consumers to forgo immediate desires and instead reap greater benefits in the future. We can see a conflict between immediate and future benefits in our everyday decisions, such as when we decide whether to spend money on frivolous products while shopping at the mall, or to set money aside for the future.

In this dissertation I study patience through the context of intertemporal choice. These choices are commonplace in the marketplace, and involve choosing between a smaller-sooner (SS) and a larger-later (LL) reward. SS and LL are separated by a wait time period. If consumers are willing to endure the longer wait time for LL, then they are able to receive the greater benefits of the larger reward. Thus, choosing LL reflects greater patience, and choice of LL should increase when the wait time feels short. The wait time for the rewards can be described in different units of time. For example, 3 months can just as easily be described as 90 days. I investigate how describing the wait time in different units of time can impact patience. I argue that expressing wait time in larger time units (e.g., months rather than days) shrinks wait time perceptions, and consequently boosts patience. Importantly, I argue that this effect emerges more strongly when rewards are hedonic rather than utilitarian.

My predicted effects are based on what we know about the numerosity heuristic and the hedonic utilitarian distinction between rewards. The numerosity heuristic is the tendency to equate smaller numbers with smaller magnitudes while not fully considering the associated units. Thus, a wait time expressed as 3 months rather than 90 days should feel shorter when the influence of the numerosity heuristic is strong, since '3' is less than '90'. I argue that numerosity's influence will remain strong only when rewards are hedonic, and diminish when they are utilitarian. This is because utilitarian rewards in intertemporal choice should lead to a more calculative mindset when compared to hedonic rewards, which should decrease reliance on the numerosity heuristic.

I find evidence for my proposed interactive effect between time units and reward types in six studies. Also, in line with numerosity, I show that this effect is mediated by larger time units shrinking wait time perception. Finally, in line with my theory about utilitarian (vs. hedonic) rewards leading to a greater reliance on calculation, I show that a primed calculative mindset, or a simple individual tendency to be more calculative in decisions, diminishes the effect of units even for hedonic rewards, and thus eliminates the hedonic-utilitarian asymmetry. These results contribute to research on numerosity, intertemporal choice, and hedonic-utilitarian differences; and offer a simple tool for practitioners to influence patience.

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INTRODUCTION

Consumer choice often involves a conflict between immediate and future benefits. This can be seen in everyday choices involving tradeoffs between the present and the future. When consumers receive a paycheck, they can either put some money in a savings account, or splurge on new purchases. Putting money in a savings account might not bring immediate pleasure, but provides more money in the future. Splurging on a new television will give immediate pleasure, but will provide less money in the future. Thus, choosing to save money rather than splurging means a consumer has chosen future benefits over immediate benefits.

The conflict between immediate and future benefits is exhibited in plenty of consumer scenarios. One such scenario is when consumers decide whether or not to wait for something better. For example, consumers in the market for an iPad have two choices. On the one hand they can go to the store and buy the currently available one immediately. This would provide immediate benefits. On the other hand, they can wait for a better iPad. Much like many technology products, consumers know that a new and improved version of the iPad is likely to be released in the future. While waiting can be quite

aversive, it will result in better benefits in the future. If one does choose to wait for the better reward, i.e., the better iPad, then it reflects patience. In this situation, the immediately available iPad can be characterized as a smaller-sooner reward (SS), while the new version as a larger-later reward (LL). Such choices between SS and LL rewards are known as intertemporal choices, as people are choosing between two rewards separated by a wait time in between. If consumers choose to endure the wait time, then they get something better than what is immediately available. Thus choosing LL reflects patience. It is important to explore intertemporal choice, so that we can determine how consumers can be made to overcome their immediate desires, and thereby become patient for better rewards in the future.

One of the key determinants of patience in intertemporal choice is the perception of wait time. Since SS and LL rewards are separated by wait time, one may be more likely to pick the LL reward if the wait time is perceived to be short. That is, the shorter the wait time feels the more patient one becomes. Prior research has identified several variables which can impact wait time perception (Ebert and Prelec 2007; Kim and Zauberman 2013; Kim, Zauberman and Bettman 2012; LeBoeuf 2006; May and Monga 2014; Read 2001; Read et al. 2005; Scholten and Read 2006; Zauberman et al. 2009). One variable which has received considerably less attention is the unit used to express the wait time. Let's again consider the example of consumers in the market for an iPad. They know that they can buy the currently available version, or wait for the new version. Let's assume the consumers are informed that the new version will release in 3 months. That is, the wait time for the LL reward, the new version of the iPad, is 3 months. The time unit used to express this wait time can be easily changed. It can be expressed as 90 days if one

chooses to use the unit of ‘days’, or as 3 months if one chooses to use the unit of ‘months’.

In my dissertation, I explore how using different wait time units in intertemporal choice can impact consumer patience. I predict that using a larger unit of wait time (e.g., months rather than days) shrinks wait time perception and consequently increases patience, but more so when the rewards are hedonic rather than utilitarian in nature.

Research on the numerosity heuristic documents how a change in unit impacts magnitude perceptions. The numerosity heuristic refers to the tendency to equate smaller numbers with smaller magnitudes (Pelham, Sumarta and Myaskovsky 1994). Consider an individual evaluating the quantity of pizza that is available at a dinner. According to the numerosity heuristic, the quantity of 1 whole pizza may seem less relative to when the same pizza is cut into 8 slices. This occurs because the magnitude of the numbers ($1 < 8$) is used as a cognitive short-cut to judge quantity, and the magnitude of the units (whole > slice) is not fully considered. Hence, numerosity is a heuristic, essentially a quick rule of thumb, which guides an individual’s perception of magnitude.

If the numerosity heuristic is relied upon when evaluating an intertemporal choice, then the length of the wait time should feel shorter when it is described as 3 months rather than 90 days, resulting in more patience for the LL reward. Again, this effect should occur since individuals will tend to use the numerical comparison ($3 < 90$) as a short-cut to judge the length of the wait period and not fully consider the unit comparison (months > days). Because of this, if the influence of the numerosity heuristic is strong, 3 months should feel shorter than 90 days, which should consequently increase

patience for the LL reward. In other words, use of the numerosity heuristic should result in greater patience when the wait time is expressed in large vs. small time units.

I expect this effect of units on wait time perception to weaken when the rewards are utilitarian rather than hedonic in nature. That is, I expect the nature of the rewards to impact the effect of units on wait time perception. My expectation follows from the unique context of intertemporal choice. This context involves not only consideration of the wait time but also a consideration of the SS and LL rewards. That is, a consumer must consider whether the benefits that LL brings in comparison to SS are worth the cost of waiting. For example, a consumer who is considering waiting for the new version of the iPad would consider how much better the new version is than the current one. The consideration of certain types of rewards may induce a calculative mindset and thus diminish reliance on quick heuristics such as numerosity. I theorize that consideration of utilitarian rather than hedonic rewards will lead to more careful calculation. Consequently, the numerosity heuristic will be relied upon less when an intertemporal choice involves utilitarian rewards.

Utilitarian and hedonic rewards vary along many dimensions. One of the main differences between the two is that utilitarian rewards are less affectively intense and involve consideration of functionality, while hedonic rewards are more affectively intense and involve consideration of sensory experiences (Dhar and Wertenbroch 2000; Hirschman and Holbrook 1982; Khan, Dhar and Wertenbroch 2005; Okada 2005; Pham 1998; Strahilevitz and Myers 1998). Thus, an intertemporal choice involving utilitarian rewards would lead to an evaluation focusing on functional considerations, while that

involving hedonic rewards would lead to an evaluation focusing on affective considerations.

Affect has been found to promote the use of heuristics and lead to the occurrence of biases in decision making rather than the use of careful calculation (Hsee and Rottenstreich 2004, Pham 1998, Pham 2004; Schwarz and Clore 2007). For example, it has been shown that willingness to pay for affectively intense products is based more on feelings rather than calculative processes (Hsee and Rottenstreich 2004). Similarly, Pham (1998) showed that when individuals have purely consummatory (hedonic) motives for watching a movie, they tend to base their decision of whether to watch it or not on a 'how do I feel about it' heuristic rather than reason. Thus, an intertemporal choice involving hedonic rewards should lead to less calculative decision making, while that involving utilitarian rewards should lead to more calculative decision making.

In summary, I predict that larger (vs. smaller) units should shrink wait time and thereby boost patience in the case of hedonic rewards, while this effect should diminish in the case of utilitarian rewards. This prediction is based on two key theoretical links: 1) Since numerosity is an effortless heuristic (Pelham et al. 1994), its effects should diminish when individuals rely more on calculation, and 2) An intertemporal choice involving utilitarian (vs. hedonic) rewards should lead to a greater reliance on calculation, since the affective nature of hedonic consumption lessens reliance on calculation (Hsee and Rottenstreich 2004, Pham 1998).

Six studies reveal this interactive effect across a diverse range of time units (hours, days, weeks, months), and also across different types of hedonic and utilitarian

rewards, such as technology products and purely monetary rewards. In line with my proposed process, I observe mediation for the interactive effect via wait time perception. I also observe moderation, such that when individuals have a chronic tendency to engage in more calculative processing, or are manipulated to use calculative processing, the hedonic-utilitarian asymmetry is eliminated. The results are robust. They emerge for choice and preference measures, for hypothetical and real rewards, and regardless of whether hedonic versus utilitarian perceptions are measured or manipulated.

My first contribution is to the literatures on intertemporal choice and numerosity. I address the lack of research with regards to when numerosity effects will be expected to replicate in intertemporal choice. I show that the influence of numerosity on wait time and consequently patience depends on whether the rewards are hedonic or utilitarian. And specifically for intertemporal choice, while it is known that both rewards and wait time can influence patience through separate pathways, I reveal a new interactive effect: the nature of the reward makes wait time perception more susceptible to changes in units, thus influencing patience. My findings also augment research on the hedonic-utilitarian distinction by connecting this literature to time perception, and revealing a new asymmetry. I show that hedonic rewards make time perception more malleable (i.e., perception changes more easily with time units), and such malleability can extend to patience. I also show that this hedonic-utilitarian asymmetry dissipates in the face of a calculative mindset, and among individuals who have a natural tendency to be more calculative in their decisions. Finally, my results have implications for managers and public-policy makers who may change time units to influence patience.

CHAPTER 2

PATIENCE IN INTERTEMPORAL CHOICE

In this section, I review past work on intertemporal choice. Research in this area has outlined several factors which influence consumer patience for a larger later reward. In order to explore how a change in wait time units might impact patience in intertemporal choice, it is important to first look at factors which are known to impact patience in these choice situations.

Individuals often encounter choices between two options where one offers immediate gratification and the other delayed gratification. When a child is offered a choice between having one marshmallow now versus two marshmallows later, the child finds it hard to resist the temptation of eating a marshmallow immediately, and thus forgoes the larger reward of having twice as many marshmallows (Mischel and Ebbesen 1970; Mischel, Ebbesen and Zeiss 1972; Mischel, Shoda and Rodriguez 1989). Children's tendency to wait for the larger reward of two marshmallows can increase when they are distracted from thinking about the marshmallow (Mischel et al. 1972). In the marketplace, consumers face choices similar to these, and in these cases certain variables can influence their patience for larger rewards.

Choices where consumers are choosing between a smaller sooner reward (SS) and a larger later reward (LL) have been characterized as intertemporal choices. Consumers considering the purchase of an iPad now versus waiting for a superior version arriving in three months are faced with a choice between SS (currently available iPad) vs LL (better version arriving in three months). A similar choice happens when one chooses between shipping options. When shopping online, consumers often have to choose between an expensive expedited shipping option and a cheaper standard shipping option. In this case, expedited shipping is the SS reward, since one pays more in order to receive a product sooner. Standard shipping on the other hand is the LL reward, since one pays less in exchange for waiting for a longer period of time. In all of these of consumer contexts, whether it is waiting for more food vs. less, waiting for a better technology product, or waiting longer in order to pay less for shipping, waiting for the LL reward reflects patience. Patience in intertemporal choice has been shown to be dependent on two factors: 1) the nature of the rewards and 2) perception of the wait time.

The nature of the rewards in intertemporal choice can influence patience since rewards may vary in terms of certain characteristics, such as perceived size. Consider a consumer who has the option between receiving $100 right now (SS) versus $150 in 4 weeks (LL). If the size of LL were to increase to $200, without any change in the 4 week wait period, then we can expect the consumer to be more patient for LL. Thus, given no change in the wait time, when the LL option is perceived to be much larger, it results in greater patience (Mischel and Ebbesen 1970; O'Donoghue and Rabin 1999; Thaler 1981). Other changes in the perception of the reward can also impact patience. For example, when children are given a choice between one marshmallow now versus two

marshmallows later, the way the marshmallows are presented to the children can significantly impact patience. When the marshmallows are depicted in pictures rather than put in a plate in front of them, children become more patient (Mischel et al. 1989).

The perception of wait time in intertemporal choice can influence patience since patience increases when the wait time feels short. If we decrease the wait for a LL reward from 4 weeks to 3 weeks, the consumer will be more patient. Research has shown that wait time periods do not need to change in absolute terms to influence patience. That is, the same wait time period can seem subjectively shorter in certain circumstances. Several extraneous factors can make a given wait time seem subjectively shorter (Ebert and Prelec 2007; Kim and Zauberman 2013; Kim, Zauberman and Bettman 2012; LeBoeuf 2006; May and Monga 2014; Read 2001; Read et al. 2005; Scholten and Read 2006; Zauberman et al. 2009). For example, the perceived wait time for LL rewards has been shown to be impacted by prior exposure to large spatial distances (Kim, Zauberman and Bettman 2012). In one of their studies, Kim et al. (2012) presented participants with the map of a neighborhood. When participants were asked to focus on the distance between a building that was close to their current location (vs. further away), participants rated a subsequent wait time period as shorter as well. That is, simply thinking about shorter spatial distances led participants to perceive temporal distances as shorter as well. Similarly, exposing people to sexual cues prior to an intertemporal choice also impacts subjective perceptions of wait time (Kim and Zauberman 2013).

Wait time perceptions in intertemporal choice may also be impacted by the framing of the wait time. Thus, in addition to extraneous factors such as spatial distances and sexual cues, factors intrinsic to the decision situation can also impact wait time

perception. For example, let's assume that the next version of Apple's iPad is slated to come out on October 1st, which is 3 months away. Apple can describe the wait time to the consumer either in terms of dates (receive it on October 1st) or in terms of a length expressed in time units (receive it in 3 months). LeBoeuf (2006) and Read et al. (2005) demonstrated that describing the wait time for an LL option as a date rather than a length results in shortened perception of wait time and thereby greater patience for the LL. In order to predict how describing wait time in different units may impact intertemporal choice, in the next section I discuss a numerical bias known as the numerosity heuristic.

CHAPTER 3

THE NUMEROSITY HEURISTIC

In this section, I review prior work on numerical biases, and particularly that related to the numerosity heuristic. This work provides insight into how perception of time might be impacted once the unit used to express time is changed.

Numbers are a convenient, absolute and objective way to describe quantities, and yet, researchers have documented many peculiar ways in which they may bias our judgments. For example, research on anchoring reveals how judgments are affected by arbitrary numbers (Brewer et al. 2007; Tversky and Kahneman 1974; Wilson et al. 1996). Tversky and Kahneman (1974) conducted a study in which they assigned a random number between 0 to 100 to every participant. After this assignment, the participants were asked to estimate the percentage of African nations in the United Nations. Surprisingly, participants' estimates were heavily influenced by the random number that they had received. The median estimate of the percentage of African nations in the United Nations was 25% when participants encountered the number 10, while it was 45% when they encountered the number 65. This reveals a strong anchoring effect of numbers,

where simple random encounters with supposedly meaningless numbers can influence our judgments in subsequent decisions.

In addition to anchoring, another example of numerical biases is the ratio bias. Researchers in this line of research investigated people's preference for lotteries and found that people preferred a winning chance of 9 out of 100 over a chance of 1 out of 10. This effect happens because the larger number (i.e., 9 rather than 1) makes them feel that they have a better chance of winning, even though 9 out of 100 should clearly be considered a lower chance than 1 out of 10 (Pacini and Epstein 1999). Related to such effects is the numerosity heuristic: the tendency to equate larger units with smaller magnitudes because larger units are naturally associated with smaller numbers (Pelham et al. 1994).

Numbers are often a valid means to assess magnitudes, but individuals tend to weigh numbers much more than they should in decision making. This tendency is known as the numerosity heuristic. For instance, 8 slices of pizza do denote a greater quantity than 1 slice. However, people seem to over-extend this notion for quantities that are expressed using numbers with different units. Specifically, they use numbers as a heuristic to assess quantities while not adequately taking the associated units into consideration. Thus, the quantity of 1 whole pizza may seem less relative to when the same pizza is cut into 8 slices because the magnitude of the numbers ($1 < 8$) is used as a cognitive short-cut, and the magnitude of the units (whole > slice) is not fully considered. Pelham et al. (1994) found evidence of this in one of their studies. They asked participants to judge the area of a circle. However, in one condition the circle was one whole circle, while in another condition the circle was divided into multiple sectors. Even

though both circles were of the exact same area, participants rated the area of the circle to be larger when it was divided into multiple sectors rather than presented as a whole circle. Thus, participants relied more on the numerical comparison of many sectors vs. 1 circle, and did not fully consider the difference in units (sectors vs. circle).

The numerosity effect has been found in consumer contexts as well. For example, when consumers engage in currency comparisons, numerosity effects are likely. Given the currency exchange rate of Yen vs. Won (1 Japanese Yen = 10 Korean Won), 1,000 Yen should appear equivalent to 10,000 Won. However, 1,000 Yen are perceived to be of much lower value because people once again rely more on the numerical comparison (1,000 < 10,000) than on the comparison between the currency units (Raghubir and Srivastava 2002; Wertenbroch et al. 2007). Other research has revealed that numerosity effects extend to a variety of quantities, including time (Burson et al. 2009; Pandelaere et al. 2011). Pandelaere et al. (2011) presented participants with two dishwashers. In one condition, the two dishwashers were said to have a warranty period of 7 years and 9 years respectively, while in another condition the warranty period was expressed as 84 months and 108 months. Thus the warranty periods were the same in both conditions, but just expressed in different units. They found that participants rated the difference between the two warranty periods as shorter when they were expressed in terms of years rather than months.

Given the robust evidence of numerosity effects in past research, we can see how it can impact wait time. According to numerosity, the same quantity of wait time should be perceived to be smaller in the case of larger (vs. smaller) time units because people will use the smaller (vs. larger) numbers as a cue for shorter wait time. In other words,

expressing wait time in terms of larger time units (e.g., as 3 months instead of 90 days) should shrink wait time perception. Past work has only peripherally explored these effects. As discussed in the last section, LeBoeuf (2006) and Read et al. (2005) focused on how expressing wait time in dates versus lengths impacts patience in intertemporal choice, and thus did not fully explore how using different units of time (e.g., months rather than days) to express the wait time can impact wait time perceptions, and consequently patience. In one study each, they do manipulate wait time units (e.g., months versus weeks), but do not find any significant effects on patience. Monga and Bagchi (2012) also conducted a study in which they vary wait time units in an intertemporal choice, but in their study participants were induced to be in specific mindsets before they faced the intertemporal choice. Thus, the default effect of units on patience (i.e., when no specific mindsets are induced) was not explored. Given the robustness of numerosity effects found in contexts other than intertemporal choice, the lack of significant effects found by LeBoeuf (2006) and Read et al. (2005), which are the only works to examine an effect of units on patience, is surprising. This suggests that there may be a boundary condition that determines when numerosity effects may emerge, one which is yet to be explored. We know from past research that intertemporal choices can be influenced not just by wait time perception, but also by the nature of the rewards. Thus, it is possible that the nature of the rewards can impact the effect of units on patience. In the next section, I discuss how the hedonic vs. utilitarian nature of rewards may influence the effect of units on patience.

CHAPTER 4

HEDONIC VS. UTILITARIAN CONSUMPTION

In this section, I review how past research has distinguished hedonic consumption from utilitarian consumption. Further, I also review how the distinction between hedonic and utilitarian consumption may impact a consumer's mode of thinking when making a decision.

Consumers' motives for seeking products and experiences can vary. Buying a computer to stream movies is a different motive when compared to buying a computer to work on school projects. When one intends to stream movies, the computer is evaluated based on all the fun and joy that it will bring, while when one intends to work on school projects, the computer is evaluated based on all the usefulness that it will bring. Fundamentally, in the former case, the computer serves hedonic gratification, while in the latter, it serves utilitarian fulfillment (Batra & Ahtola 1991; Dhar and Wertenbroch 2000; Khan et al. 2005). Utilitarian goods are associated with characteristics such as cognition, goal orientation, functionality, and practicality while hedonic goods are associated with characteristics such as affect, sensory experiences, aesthetics, fantasy, and fun (Hirschman and Holbrook 1982; Strahilevitz and Myers 1998). Thus, utilitarian goods are

less affectively intense because their primary purpose is to fulfill an instrumental goal, such as necessary tasks that one must complete, while hedonic goods are more affectively intense, since they fulfill a consummatory goal such as fun and pleasure (Dhar and Wertenbroch 2000; Khan et al. 2005; Okada 2005; Pham 1998, Strahilevitz 1999).

The differences between hedonic and utilitarian consumption can lead to strong differences in decision making. For example, compared to utilitarian consumption, hedonic consumption can lead to a sense of guilt, since fun and enjoyment is seen as a luxury that one cannot afford when compared to the more functional purpose of utilitarian consumption (Kivetz and Simonson 2002; Okada 2005; Strahilevitz and Myers 1998). Because of this associated guilt, people find it hard to justify the consumption of hedonic goods when compared to the consumption of utilitarian goods (Kivetz and Simonson 2002; Okada 2005; Okada and Hoch 2012). Utilitarian goods tend to evoke thoughts of goal achievement, efficiency and functionality, which are important factors to consumers as opposed to the thoughts of fun and enjoyment that hedonic goods evoke. Given these differences, utilitarian and hedonic goods may lead to different modes of thinking when making a decision.

Past work has theorized that decisions may be guided by two modes of thinking: intuition and reason (Epstein 1994, Kahneman 1973; Kahneman 2003; Schwarz and Clore 2007, Stanovich and West 2000). The intuitive mode of thinking is fast and effortless, and tends to be more emotional, while the reasoning mode is slow and effortful, and tends to be more deliberative. Thus, use of effortless heuristics like numerosity should be more likely when the intuitive mode is active, such as when individuals are relying more on emotion and feelings. Further, the heuristic-systematic

model, also similarly points to two modes of thinking: one based on heuristics, and the other more on careful calculation (Chaiken 1980, Chaiken, Liberman and Eagly 1989, Chaiken and Maheswaran 1994, Petty and Cacioppo 1984). Certain decisions situations can motivate individuals to use more calculative (systematic) processing rather than heuristic processing, such as when individuals decide based on conflicting information (Chaiken and Maheswaran 1994, Petty and Cacioppo 1984). For example, Chaiken and Maheswaran (1994) tested the persuasiveness of messages. When the messages involved two pieces of information that contradicted each other, participants were more likely to be careful and calculative in their evaluation of how persuasive the message is. When the two pieces of information were not contradicting each other, participants were more likely to be careless and instead rely on heuristics in their evaluations of message persuasiveness. Thus, the greater feelings a decision situation evokes, or the less carefully one thinks about a decision, the more likely it should be that heuristics such as numerosity are relied upon.

Consumption that signals affect has also generally been found to shift decision makers away from calculative decision making (Hsee and Rottenstreich 2004, Pham 1998, Pham 2004, Schwarz and Clore 2007). For example, Pham (1998) conducted a study where participants' hedonic and utilitarian motives were manipulated. In one condition, participants were told that they need to go watch a movie because it's enjoyable, while in another condition they were told that they need to go watch a movie because it's part of a school assignment. Pham (1998) found that participants' incidental mood, whether it was positive or negative, affected their decision of whether to go watch the movie or not more when the motive was hedonic, and less when it was utilitarian.

Thus, participants were using a ‘how do I feel about it’ heuristic when they evaluated the movie as being hedonic, but did not use this heuristic when they evaluated the movie as being utilitarian.

Affect can also influence decision processes when people simply evaluate affectively intense vs. less intense stimuli. Work by Hsee and Rottenstreich (2004) suggests that when participants evaluate stimuli based more on affect, their decisions are based less on careful calculative processes and more on their feelings. Hence, given the affective nature of hedonic consumption, it is likely that an intertemporal choice involving hedonic (vs. utilitarian) rewards will lead to lesser reliance on a calculative mindset, and thus a greater use of heuristics such as numerosity. In the next section, I develop my theoretical predictions for how a change in wait time units may impact intertemporal choice differently, depending on whether the rewards are hedonic vs. utilitarian in nature.

CHAPTER 5

HYPOTHESES DEVELOPMENT

In this section, I now formulate my predictions. In the previous sections, I outlined a number of key findings from past literature: Firstly, in an intertemporal choice between a smaller sooner reward (SS) and a larger later reward (LL), the shorter the wait time feels for the LL reward, the more likely one is to wait for the LL reward. That is, shortened wait time perceptions boost patience. Secondly, according to the numerosity heuristic, using larger (vs. smaller) units of wait time should shorten wait time perception. However, given past work on numerosity and intertemporal choice, it is not clear whether a change in units impacts patience in intertemporal choice. Lastly, compared to hedonic rewards, utilitarian rewards should lead to a more calculative mindset, which should reduce the use of heuristics in decision making. I now bring these key findings together and formally state my predictions.

If consumers rely on the numerosity heuristic when evaluating an intertemporal choice, the wait time for the larger later reward (LL) should appear smaller in the case of larger (vs. smaller) time units, because people will use the smaller (vs. larger) numbers as a cue for shorter wait time. In other words, larger time units (e.g., 3 months instead of 90

days) should shrink wait time perception, which should then result in higher patience for the LL option. Given the robust evidence on numerosity effects provided by past work, one would expect this effect of units to influence intertemporal choice. That is, one can expect the numerosity heuristic to be relied upon in intertemporal choice. However, given that an intertemporal choice involves not only the perception of the wait time but also an evaluation of a smaller reward and a larger reward, the strength of the numerosity effect may vary with the type of rewards under consideration.

Since numerosity is a heuristic which involves overweighing numerical comparisons and underweighting unit comparisons, numerosity effects should weaken when individuals are being more careful and calculative in their decision making. Thus far, numerosity effects related to time have generally not been observed in situations akin to intertemporal choice. For example, making a simple judgment of how long the difference between 7 days and 14 days feels as opposed to that between 1 week and 2 weeks might not involve a careful and calculative evaluation. People may well use a heuristic to decide on how long the time period feels in such evaluations. An intertemporal choice on the other hand involves not only an evaluation of a magnitude, i.e., the wait time, but also a comparison between SS and LL rewards, as one must choose whether to wait for the LL reward. The nature of these rewards might influence people's decision making. Thus, while numerosity effects should be expected to replicate for wait time perception in intertemporal choice, this might not always be the case. If the rewards under consideration promote the use of calculation, rather than heuristics, numerosity effects might not emerge. This possibility is exemplified by the fact that there have been no consistent effects found in the few studies where numerosity effects have been looked

at in intertemporal choice, which I discussed earlier in the literature review. I theorize that the type of rewards in intertemporal choice can heavily influence the strength of numerosity effects.

Given the hedonic-utilitarian distinction in consumption, we can see that an intertemporal choice involving utilitarian rewards would lead to a comparison between SS and LL based on functional properties, while that involving hedonic rewards would lead to a comparison based on affective properties. For example, consider a consumer who is thinking about whether to get the current version of the iPad or wait for the new one. The consumer may intend to use the iPad for either more utilitarian purposes (use it to become efficient and organized) or for more hedonic purposes (use it to listen to music and watch videos). In the utilitarian case, the consumer would be comparing SS (current version of the iPad) and LL (new version of the iPad) on the basis of functional properties (i.e., the new version will allow me to achieve my goals better). In the hedonic case, the consumer would be comparing SS and LL on the basis of affective properties (i.e., the new version will bring me more pleasure).

Since utilitarian (vs. hedonic) rewards evoke a greater sense of function (vs. feeling), and are less affectively intense, it is likely that they also lead to a more careful and calculative mindset rather than one based on feelings. This is supported by past research which has linked affect with a greater use of feelings rather than calculation (e.g., Pham 1998, Hsee and Rottenstreich 2004). Hence, an intertemporal choice involving hedonic rewards should lead to a lesser use of calculation, and a greater use of the numerosity heuristic, while that involving utilitarian rewards should lead to a greater use of calculation, and a lesser use of the numerosity heuristic. I therefore predict that

larger (vs. smaller) units should shrink wait time and thereby boost patience in the case of hedonic rewards, while this effect of units should diminish in the case of utilitarian rewards. Formally:

> **H1**: Using larger (vs. smaller) units of wait time in intertemporal choice will lead to an increase in patience when the rewards are hedonic. This effect of units will diminish when the rewards are utilitarian.

An increase in patience will occur because participants will perceive the wait time for the LL reward to be shorter when the wait time units are large (vs. small). Thus, the interactive effect of reward type and time units on patience should be mediated by wait time perception. Formally:

> **H2**: The interactive effect of wait time units and reward type on patience (H1) will be mediated by wait time perception.

Given my theorizing that reliance on the numerosity heuristic should decrease when rewards are utilitarian due to a shift towards a more calculative mindset, if individuals are made to rely on a more calculative mindset then numerosity effects should be diminished for hedonic rewards as well. Thus, for individuals who chronically engage in more careful calculation, or who are primed to be in a calculative mindset, the effect of units in the case of hedonic rewards should diminish, while there should be no effect on utilitarian rewards, since in that case individuals are already more likely to be in a calculative mindset. Consequently, the asymmetry in how numerosity influences time perception, and patience, for hedonic versus utilitarian rewards should diminish when decision makers have a calculative mindset. Formally:

H3: The interactive effect of wait time units and reward type on patience (H1) will be moderated by reliance on a calculative mindset such that greater (vs. lesser) reliance on a calculative mindset will eliminate the hedonic-utilitarian asymmetry predicted by H1.

In the next section I discuss the studies I conducted in order to test the predictions made in H1, H2 and H3.

CHAPTER 6

STUDIES

To test my hypotheses, I conducted six studies. Study 1 examines an intertemporal choice situation between SS and LL rewards, with wait time being described in either small or large units. In support of H1, larger (vs. smaller) units of wait time boost patience in the case of hedonic rewards, but this effect is not observed in the case of utilitarian rewards. I replicate this interaction in study 2 by employing a study that involves a choice between monetary rewards that are real rather than hypothetical. The same interaction emerges for preference in study 3 when I measure rather than manipulate hedonic versus utilitarian rewards. Hence, I once again find support for H1. Additionally, I find support for H2 in study 3 as well, where I measure time perception. I find that my results are indeed due to the numerosity of time units; the effect of units on patience is mediated by how long the wait time is perceived to be. In study 4, I find further evidence for H1 and H2 while using a different intertemporal choice context. In this context, the LL product is the same as the SS product, but involves cheaper product shipping (i.e., standard rather than expedited).

In studies 5 and 6, in addition to support for H1 and H2, I find support for H3. I use moderation to verify my argument about the effect of units emerging for hedonic (vs. utilitarian) rewards due to utilitarian rewards shifting individuals towards a more calculative mindset. Specifically, in study 5, I show that for those more inclined to be calculative in their decisions, the effect of units on time perceptions for hedonic rewards is diminished, and thus the hedonic-utilitarian asymmetry is erased. And in study 6, I show that when individuals are primed to use more calculation in decision making, the effect of units on time perception and patience for hedonic rewards is diminished, and thus the hedonic-utilitarian asymmetry is once again erased.

6.1 STUDY 1

In the context of a new version of an electronic device, I test H1, in order to see whether time units interact with reward type to influence patience. This study involves a hypothetical scenario of a choice between buying a tablet computer right away (SS) or buying an improved version that would be available at the same price at a later date (LL). The time until the release date of the new, improved, version is expressed in either days or months. The tablet is manipulated to have a hedonic or a utilitarian purpose. I expect participants to be more patient (i.e., more likely to opt for the new version) when the time units are large (vs. small), provided the tablet is framed as hedonic. This effect should be diminished when the tablet is framed as utilitarian.

Method

Two hundred and twenty three undergraduate students (M_{age} = 21, female = 60%) successfully participated in the study. This is the number of participants left after five responses were excluded based on incorrect answers to an attention-filter question: "This question is just to make sure that you are paying attention to this survey. Please mark '2' as your response."

Participants were randomly assigned to a 2 (time unit: small, large) X 2 (reward type: hedonic, utilitarian) between subjects design. Those in the hedonic [utilitarian] condition read the following scenario:

> "Imagine that you do not have a tablet computer at this point, but would like to buy one. Your friends have told you great things about one particular tablet. This tablet is not really for making life more efficient and organized, but simply for making it more fun and enjoyable [This tablet is not really for making life more fun and enjoyable, but simply for making it more efficient and organized]. You cannot wait to get this tablet. You head on over to a retail website with the intention of buying it. You search for the tablet and arrive at its product page. You see the following price information: 'Get this tablet now for $299!'"
>
> Then, in the small [large] time unit condition, participants read:
>
> "However, you also notice the following on the same page: 'A new version of this tablet will be releasing in 120 days [4 months] for $299. It

will have upgraded hardware and software.' You are now faced with the decision of whether to buy the tablet right now, or to hold off and get the new version. What is your decision?"

All participants then indicated whether they would choose to buy the tablet right now or hold off and get the new version. Participants then answered the following question as a manipulation check for the hedonic-utilitarian manipulation: "While deciding to get it now or later, did you anticipate using the tablet for fun or for work?" on a 0 to 100 slider scale with 0 = work and 100 = fun. (For all 0-100 scales that I employed in this dissertation, the numerical values on the slider scale were not visible to participants.) Finally, participants answered standard demographic questions and the attention-filter question described earlier.

Results

Check for hedonic-utilitarian manipulation. A 2-way ANOVA confirmed that the manipulation worked. There was a significant main effect of reward type such that participants rated the tablet to be more hedonic in the hedonic condition ($M_{Hedonic}$ = 62.50) than in the utilitarian condition ($M_{Utilitarian}$ = 50.09; $F(1, 219) = 13.95$, $p < .001$). There was no significant main effect of time unit, and no significant interaction (*ps* > .1).

Choice. I conducted a binary logistic regression with time unit (large = -1, small = 1) and reward type (hedonic = -1, utilitarian = 1) as the independent variables and choice (buy now = 0, buy later = 1) as the dependent variable. A significant 2-way interaction

emerged between time unit and reward type (β = .72, z = 2.40, p < .05). The main effect of time unit was significant (β = -.61, z = -2.05, p < .05), while that of reward type was not (β = -.42, z = -1.42, p > .10). As predicted, when the tablet was hedonic, participants chose the superior version significantly more in the large unit condition (98.15%) compared to the small unit condition (78.95%, β = -1.32, z = -2.50, p < .05). However, when the tablet was utilitarian, there was no significant difference in patience between the large unit (84.48%) and the small unit conditions (87.04%, β = .10, z = .39, p > .5; see figure 6.1). Hence, for the hedonic tablet, participants were more patient when the delay was described as 4 months, as opposed to 120 days, but this pattern did not extend to the utilitarian tablet.

Discussion

In a choice context, this study provides support for H1. I had presented participants with a choice between the current version of a computer tablet vs. a new and improved version of the tablet which was to release after a certain period of time. I had also manipulated the tablet to be either hedonic in nature or utilitarian. For the hedonic tablet, participants were more patient for the newer version when the wait time for it was expressed in terms of large (vs. small) units. For the utilitarian tablet, participants were equally patient in the large and small time unit conditions. Thus, participants were influenced by a change in time units (in line with the numerosity heuristic) when the rewards were hedonic, but not when they were utilitarian.

6.2 STUDY 2

Having found evidence for my predicted effect in study 1, in this study I sought to establish whether time units and reward type can interact to influence patience in a consequential choice involving real money (a bonus payment to mTurk participants). That is, I now test H1 in a real choice scenario. I also used different units of time than in study 1, and a shorter objective wait time. Also, in study 1, I had changed the nature of the reward (i.e., tablet) to make it seem hedonic versus utilitarian. Now, I keep the reward (i.e., amount of money) constant, and ask participants to think of hedonic versus utilitarian products that they can purchase with money. The choice participants make is whether to receive a small monetary bonus sooner, or a large monetary bonus later. I predict that participants will be more patient for the larger bonus when the time unit is large (vs. small), provided they think of money as a means to acquire hedonic products.

Method

One hundred and forty six respondents from the mTurk online panel (M_{age} = 33.57, female = 42.5%) successfully participated in the study (four responses were excluded because participants incorrectly answered the attention-filter question described in study 1). Participants were randomly assigned to conditions in accordance with a 2 (time unit: small, large) X 2 (reward type: hedonic, utilitarian) between subjects design. They were first made to think of hedonic versus utilitarian products that can be bought

with money. In the hedonic [utilitarian] condition, participants engaged in the following task:

> "Money can be spent on many different products. We want you to think about all the fun products that you can buy with money. For example, think about products that can bring you sensory pleasure, or products that can be used for your enjoyment. [We want you to think about all the useful products that you can buy with money. For example, think about products that are functional, or products that can be used to accomplish a practical task.] Below, please write down the names of three fun [useful] products that you can buy with money."

After participants completed the task, they moved on to the next section of the study. In this section they were informed that they have the opportunity to receive a bonus payment for completing the study (in addition to their regular payment of 30 cents). In the small [large] time unit condition, they were presented with the following two options for their bonus payment:

> Option A: Receive a $25 bonus in 48 hours [2 days]
> Option B: Receive a $30 bonus in 96 hours [4 days]

Participants were told that one randomly selected participant will receive the bonus that they choose. After choosing between the two options, they answered a manipulation check for the hedonic versus utilitarian manipulation. Specifically, they indicated the extent to which they were thinking about using money to buy something fun rather than useful (0 = 'something useful' and 100 = 'something fun'). Finally,

participants answered standard demographic questions and the attention-filter question. One randomly selected participant was then paid the bonus according to what they had chosen.

Results

Check for hedonic-utilitarian manipulation. A 2-way ANOVA confirmed that the manipulation worked. There was a significant main effect of reward type; participants indicated that they were thinking about buying something hedonic relatively more in the hedonic condition ($M_{Hedonic}$ = 33.46) than in the utilitarian condition ($M_{Utilitarian}$ = 25.44; $F(1, 142) = 5.23$, $p < .05$). There was no significant main effect of time unit, and no significant interaction (*ps* > .1)

Choice. I conducted a binary logistic regression with time unit (large = -1, small = 1) and reward type (hedonic = -1, utilitarian = 1) as the independent variables and choice (smaller sooner bonus = 0, larger later bonus = 1) as the dependent variable. A marginally significant 2-way interaction emerged between time unit and reward type ($\beta = .43$, $z = 1.77$, $p = .07$). The main effect of time unit was significant ($\beta = -.57$, $z = -2.33$, $p < .05$), while that of reward type was not ($\beta = .13$, $z = .54$, $p > .10$). As predicted, participants in the hedonic condition chose the LL bonus significantly more when the time unit was large (92.5%) versus small (62.5%, $\beta = -1.00$, $z = -2.85$, $p < .01$). However, in the utilitarian condition, there was no significant difference in the large (87.10%) versus the small time unit condition (83.72%, $\beta = -.14$, $z = -.40$, $p > .6$; see figure 6.2). Hence,

participants were more patient for the larger-later bonus when the delay was described as 4 days as opposed to 96 hours, but only when thoughts about the purchase of hedonic (vs. utilitarian) rewards were activated.

Discussion

This study builds on the findings of study 1 by replicating my predicted effect when the rewards pertained to real rather than hypothetical rewards. Thus, I was able to show that H1 holds for real choices as well. I first manipulated participants to view money as either a means to acquire hedonic rewards or utilitarian rewards. Then, I presented participants with a choice between a smaller monetary amount which was available sooner and a larger monetary amount which was available later. The choice had real consequences, since participants had a chance of receiving the option that they chose. Participants were found to be more patient when the wait times were expressed in large (vs. small) units of time, but only when money was seen as a means to acquire hedonic, rather than utilitarian rewards.

I found these results when participants were told that they have a chance of winning the reward that they choose. To ensure that my effects replicate even when everyone has a 100% chance of receiving the reward they choose, I conducted a follow up study. In this study, one hundred and twenty three respondents from the mTurk online panel (M_{age} = 32, female = 39%) went through a similar procedure as in study 2, but the SS was a 20 cent bonus available immediately while the LL was a 30 cent bonus

available in 2 weeks. In the small time unit condition the wait time for LL was described as 14 days instead. All participants were guaranteed to receive the bonus that they chose. My results replicated. A significant 2-way interaction emerged between time unit and reward type ($\beta = .38$, $z = 2.10$, $p < .05$). Participants in the hedonic condition chose the LL bonus significantly more when the time unit was large (65.52%) versus small (38.71%, $\beta = -.55$, $z = -2.05$, $p < .05$). However, in the utilitarian condition, there was no significant difference in the large (45.45%) versus the small time unit condition (56.67%, $\beta = .23$, $z = .89$, $p > .3$). Hence, whether participants only had a chance of receiving their chosen reward, or were guaranteed to receive their chosen reward, patience for a larger later monetary reward increased when a larger time unit was used to describe the wait time.

6.3 STUDY 3

Having found evidence for H1 in studies 1and 2 using both hypothetical and real choices, the objective of this study is to build upon these findings in three ways. First, I seek to extend the effect from choices (studies 1 and 2) to participants' subjective preference between the SS and LL options. Second, rather than inducing participants to think about spending money on buying hedonic versus utilitarian products (study 2), I measure the extent to which participants are, on their own, inclined to spend their money on hedonic versus utilitarian products. Lastly, I now test H2. I measure participants' perception of wait time to establish that, consistent with the numerosity heuristic, it is the

shrinking of wait time that mediates the effect of larger units boosting patience.

Method

Two hundred and thirteen undergraduate students (M_{age} = 21, female = 44.1%) successfully participated in the study (eight responses were excluded because participants incorrectly answered the attention-filter question). I employed a study design in which one variable was manipulated (time unit: large, small) and another one was measured (reward type: hedonic, utilitarian). Participants were told the following:

> "Imagine that you have just won a $100 Visa gift card as a prize. We would like to know what kind of goods you would spend the money on. So please take a moment to think about what you would spend the money on."

On the next screen, participants randomly assigned to the small [large] time unit condition read the following:

> "Now imagine that you were offered the following deal: If you wait for 14 days [2 weeks] before receiving your prize, you can get a $110 Visa gift card instead of a $100 Visa gift card."

All participants then indicated their preference between the two gift cards on a 0 to 100 slider scale with 0 = '$100 card now' and 100 = '$110 card later'. Participants were then asked the following question to measure time perception: "How long did the

wait time for the $110 card feel?" (0 = very short, 100 = very long). To measure whether participants intended to use the money for something hedonic rather than utilitarian, they were asked: "When you thought about whether or not to wait for the $110 card, did you think about using the money you won for something useful or something fun?" (0 = something useful, 100 = something fun). Finally, participants answered standard demographic questions and the attention-filter question.

Results

Preference. To investigate the 2-way interaction between time unit (large = -1, small = 1) and reward type (hedonic vs. utilitarian; continuous), I used the Johnson-Neyman floodlight analysis technique (Johnson and Neyman 1936; Spiller et al. 2013). The 2-way interaction with preference as the dependent variable was significant ($\beta = -.18$, $t = -1.98$, $p < .05$; figure 6.3.1). The main effect of time unit was not significant ($\beta = 7.55$, $t = 1.24$, $p > .10$), while that of reward type was significant ($\beta = -.19$, $t = -2.11$, $p < .05$). As predicted, for participants leaning toward using the money for something hedonic (who were at, or higher than, .46 SD above the mean on the useful-fun scale), preference to wait for the $110 card was significantly higher in the large unit condition compared to the small unit condition ($\beta_{JN} = -5.69$, $p = .05$). For those leaning toward spending on something utilitarian, there was no significant difference between the large and small time unit conditions in their preference to wait for the $110 card (no Johnson-Neyman significance region).

Mediation. The pattern of results for the proposed mediator, wait time perception, was similar to what I observed for the preference measure. Specifically, a significant 2-way interaction emerged between time unit and reward type ($\beta = .16$, $t = 2.47$, $p < .05$; figure 6.3.2). The main effect of time unit was not significant ($\beta = -4.62$, $t = -1.08$, $p > .10$), while that of reward type was significant ($\beta = .16$, $t = 2.52$, $p < .05$). As predicted, for participants leaning toward using the money for something hedonic (who were at, or higher than, .25 SD below the mean on the useful-fun scale), the wait time felt much shorter in the large (vs. small) unit condition ($\beta_{JN} = 3.76$, $p = .05$). However, for those leaning toward spending on something utilitarian, there was no significant difference between the large and small time unit conditions (no Johnson-Neyman significance region).

To explore if, in fact, time perception was responsible for the interactive effect of time units and reward type on preference, I ran a mediation analysis using the PROCESS SPSS macro (Model 8; Preacher and Hayes 2004; Hayes 2013). In the regression model, the dependent variable was preference while the independent variables were time unit (large vs small), reward type (hedonic vs. utilitarian), time unit x reward type, and time perception (how long did the wait time feel). The effect of the mediator, time perception, was significant ($\beta = -.99$, $t = -13.96$, $p < .001$). The interactive effect of time unit and reward type was not significant ($\beta = -.02$, $t = -.36$, $p > .6$). A bootstrap analysis showed that the indirect effect of the highest order interaction with time perception as the mediator was significant ($\beta = -.16$, 95% CI = -.30 to -0.03). Thus, these results confirm that time perception mediated the effect on preference.

Discussion

Once again I observed evidence for H1. Complementing the choice results observed in the first two studies, the current study established the interactive effect of time units and reward type on preference for a larger later reward. I measured participants' preference between two gift cards of monetary value that were separated by a wait time. Participants showed greater preference for the larger-later gift card over the smaller-sooner gift card when the wait time was expressed in large (vs. small units). But this effect only happened when they thought about using the money from the gift card towards something hedonic rather than utilitarian.

This study also augments my earlier findings by demonstrating that my results replicate even when I rely on participants' natural inclinations toward spending on hedonic versus utilitarian products (i.e., when I measure rather than manipulate the reward). Finally, I find evidence for H2 by showing that my process chain is consistent with my theorizing about reliance on the numerosity heuristic when the rewards are hedonic: Large (vs. small) units shrink wait time perception and boost patience.

6.4 STUDY 4

Choosing a shipping speed represents an intertemporal choice. Consumers must decide between an SS option (pay more for expedited shipping; get product sooner) and

an LL option (pay less for standard shipping; get product later). In the current study, participants imagine purchasing a pair of headphones online. After the headphones are manipulated to have either a hedonic or utilitarian purpose, participants choose between standard and expedited shipping.

This study denotes a departure from my previous studies in which a larger benefit was associated with the LL rather than the SS option (i.e., better version of tablet, or more money). In the current study, I examine whether my results replicate when I keep the benefits identical in the SS and LL options (i.e., the same pair of headphones) but introduce a higher cost associated with the SS relative to the LL option (i.e., more expensive product shipping). Hence, I once again test H1 and H2, but now in a different type of intertemporal choice.

Method

Two hundred and thirty four undergraduate students (M_{age} = 21, female = 61%) successfully participated in the study (six responses were excluded because participants incorrectly answered the attention-filter question). Participants were randomly assigned to conditions in accordance with a 2 (time unit: small, large) X 2 (reward type: hedonic, utilitarian) between subjects design. Participants in the hedonic [utilitarian] condition read the following scenario:

> "Imagine that you are shopping online for a pair of headphones. You are looking for a pair that would be fun to use, and offer good clarity of

musical notes [that would function reliably, and offer good clarity of voice]. Your goal is to have a pleasurable experience when listening to your preferred music over the Internet (when using Pandora and similar services) [Your goal is to have an effective conversation when interviewing for your preferred jobs over the internet (when using Skype and similar services)]. You find a good pair available for $40. You then head on over to the checkout page where you are presented with a couple of shipping options."

Participants were then informed that they had two shipping options for their headphones: Expedited for $4 or standard for $2. In the large (small) unit condition, standard shipping was said to take 3 days (72 hours) and expedited shipping to take 1 day (24 hours). Participants made a choice and then answered the question: "How long did the time period between now and the time at which you would receive your headphones through standard shipping feel?" They provided their answers on a 0-100 scale with 0 = very short and 100 = very long. Finally, participants answered a manipulation check for the hedonic versus utilitarian manipulation (as in study 1), standard demographic questions, and the attention-filter question.

Results

Check for hedonic-utilitarian manipulation. A 2-way ANOVA confirmed that the manipulation worked. There was a significant main effect of reward type such that

participants rated the headphones to be more hedonic in the hedonic condition ($M_{Hedonic}$ = 84.49) than in the utilitarian condition ($M_{Utilitarian}$ = 54.72; $F(1, 230) = 90.2$, $p < .001$). There was no significant main effect of time unit, and no significant interaction (*ps* > .1)

Choice. I first conducted a binary logistic regression with time unit (large = -1, small = 1) and reward type (hedonic = -1, utilitarian = 1) as the independent variables and shipping choice (expedited = 0, standard = 1) as the dependent variable. A significant 2-way interaction emerged between time unit and reward type ($\beta = .26$, $z = 2.00$, $p < .05$; figure 6.4.1). The main effect of time unit was not significant ($\beta = -.22$, $z = -1.66$, $p = .10$), while that of reward type was also not significant ($\beta = .05$, $z = .34$, $p > .10$). As predicted, when the headphones were hedonic, participants chose to go with standard shipping significantly more in the large unit condition (62.50%) compared to the small unit condition (38.60%, $\beta = -.49$, $z = -2.52$, $p < .05$). Hence, participants were more patient for the hedonic headphones when the delay was described in the larger unit of days, as opposed to hours. However, when the headphones were utilitarian, there was no significant difference in participants' choice of standard shipping between the large (51.72%) and small unit conditions (53.97%, $\beta = .05$, $z = .25$, $p > .7$).

Mediation. The pattern of results for the proposed mediator, wait time perception for the later option (i.e., standard shipping), was similar to what I observed for the choice measure. Specifically, a significant 2-way interaction emerged between time unit and reward type ($\beta = -3.94$, $t = -2.40$, $p < .05$; figure 6.4.2). The main effect of time unit was not significant ($\beta = 2.57$, $t = 1.57$, $p > .10$), while that of reward type was also not significant ($\beta = -1.62$, $t = -.99$, $p > .10$). As predicted, in the hedonic condition, subjects thought standard shipping would take significantly shorter when the time unit used was

large (M_{Days} = 27.88) rather than small (M_{Hours} = 40.89, β = 6.51, t = 2.76, p < .01). In the utilitarian condition, there was no significant difference (M_{Days} = 32.50, M_{Hours} = 29.78, β = -1.36, t = -.59, p > .5).

To explore if, in fact, time perception was responsible for the effect on choice, I ran a mediation analysis using the PROCESS SPSS macro (Model 8; Preacher and Hayes 2004; Hayes 2013). In the regression model, the dependent variable was choice while the independent variables were time unit (large vs small), reward type (hedonic vs. utilitarian), time unit x reward type, and time perception (how long standard shipping seemed to take). The effect of the mediator, time perception, was significant (β = -.04, z = -5.94, p < .01). The interactive effect of time unit and reward type was not significant (β = .16, z = 1.08, p > .2). A bootstrap analysis showed that the indirect effect of the highest order interaction with time perception as the mediator was significant (β = .32, 95% CI = .06 to .66). Thus, these results confirm that time perception mediated the effect on choice.

Discussion

Study 4 provides further evidence for H1 and H2 by replicating the results from studies 1, 2 and 3 in a different intertemporal choice scenario (i.e., product shipping) in which the product remains the same across the SS and LL options. I had provided participants with two shipping options for a pair of headphones: expedited shipping (which was more expensive but faster) and standard shipping (which was cheaper but slower). Choosing standard over expedited shipping reflects more patience, since

participants would be waiting longer in exchange for paying less. The headphones, other than being manipulated to be either hedonic or utilitarian, were exactly the same. Providing evidence for the robustness of my effect, the results remained the same even in this kind of intertemporal choice: Larger time units boosted patience in the hedonic condition, but not the utilitarian condition. Finally, mirroring study 3, the current study established mediation via wait time perception.

6.5 STUDY 5

Studies 1 to 4 provide robust evidence for my predicted interaction. In addition, studies 3 and 4 provide evidence for my proposed process by showing that the effect of units on patience is mediated via wait time perception. In study 5, I now test H3. That is, I seek evidence for my proposed theory about the hedonic-utilitarian asymmetry being driven by hedonic rewards leading individuals to use a less calculative mindset when evaluating an intertemporal choice. If my theory is valid, my proposed effect should be moderated by reliance on calculation. Specifically, when individuals are chronically more likely to be calculative, the effect of units in the case of hedonic rewards should diminish. In other words, a calculative mindset should eliminate the hedonic-utilitarian asymmetry.

I use Hsee et al. (2015)'s Lay Rationalism Scale in order to differentiate between participants who are more naturally inclined to use greater vs. lesser calculation when making decisions. Hsee et al. (2015) define Lay Rationalism as an individual difference variable which measures the extent to which individuals use reason vs. feelings to guide

their decision making. Higher scores on Lay Rationalism reflect greater use of reason, such as a greater tendency to do a careful cost-benefit analysis based on objective facts. In line with H3, I predict that the interactive effect of hedonic vs. utilitarian rewards and large vs. small time units should diminish among individuals high on Lay Rationalism, as these individuals will be using a more calculative mindset in their decision making even when rewards are hedonic.

Method

Two hundred and ninety respondents from the mTurk online panel (M_{age} = 35.84, female = 44.6%) successfully participated in the study (ten responses were excluded because participants incorrectly answered the attention-filter question as described in study 1).

Participants were randomly assigned to conditions in accordance with a 2 (time unit: small, large) X 2 (reward type: hedonic, utilitarian) X 2 (lay rationalism: low, high; measured) between-subjects design. Participants were first made to think of hedonic versus utilitarian products that can be bought with money, using the same procedure as in Study 2. After participants completed the task, they moved on to the next section of the study, where those in the small [large] time unit condition were asked to read the following scenario:

> "In order to reward you for being a loyal customer, an online retailer wants to offer you a free gift card. You can use this gift card on their site

towards the purchase of any of their wide selection of goods. The retailer has given you two options to choose from:

Option A: Receive a $100 gift card in 14 days [2 weeks]

Option B: Receive a $120 gift card in 56 days [8 weeks]"

All participants then indicated their preference between the two gift cards on a 0 to 100 slider scale with 0 = '$100 gift card' and 100 = '$120 gift card'. Participants were then asked the following question to measure time perception: "How long did the wait time for the $120 card feel?" (0 = very short, 100 = very long). After choosing between the two options, participants then completed the six-item Lay Rationalism Scale (Hsee et al. 2015). Finally, participants answered a manipulation check for the hedonic versus utilitarian manipulation just as in Study 2 and answered standard demographic questions and the attention-filter question.

Results

Check on Lay Rationalism. First, I wanted to check if the measured variable of lay rationalism was influenced by the manipulations used in this study. Thus, I ran a regression with lay rationalism as the dependent variable and reward type (hedonic = -1, utilitarian = 1) and time unit (large = -1, small = 1) as the independent variables. The 2-way interaction between reward type and time unit was not significant ($\beta = .05$, $t = .94$, $p > .10$). The main effect of reward type was not significant ($\beta = .08$, $t = 1.47$, $p > .10$), while that of time unit was also not significant ($\beta = .07$, $t = 1.30$, $p > .10$). Thus,

participants' responses to the lay rationalism scale were not significantly influenced by either the reward type or time unit manipulation.

Preference. Using the dependent variable of preference, I conducted a regression with reward type (hedonic = -1, utilitarian = 1), time unit (large = -1, small = 1) and lay rationalism as the independent variables. A significant 2-way interaction emerged between reward type and time unit ($\beta = 4.70$, $t = 2.04$, $p < .05$; figure 6.5.1) and a marginally significant 3-way interaction emerged between reward type, time unit, and lay rationalism ($\beta = -4.09$, $t = -1.67$, $p = .09$; figure 6.5.2). The main effect of reward type was not significant ($\beta = -3.45$, $t = -.27$, $p > .10$), while that of time unit was significant ($\beta = -27.83$, $t = -2.14$, $p < .05$). There was a significant main effect of lay rationalism ($\beta = 10.59$, $t = 4.32$, $p < .05$).

First, the 2-way interaction reported above was as I predicted, and consistent with my earlier studies. As is clear from the pattern (figure 6.5.1), participants in the hedonic condition preferred the LL gift card significantly more when the time unit was large ($M_{Weeks} = 55.13$) versus small ($M_{Days} = 36.17$, $\beta = -9.48$, $t = -2.87$, $p < .01$). However, in the utilitarian condition, there was no significant difference in the large ($M_{Weeks} = 47.42$) versus the small time unit condition ($M_{Days} = 47.28$, $\beta = -.07$, $t = -.02$, $p > .9$). Hence, participants were more patient for the larger-later gift card when the delay was described as 8 weeks as opposed to 56 days, but only when thoughts about the purchase of hedonic (vs. utilitarian) rewards were activated.

Next, to investigate the 3-way interaction, I used the Johnson-Neyman floodlight analysis technique (Johnson and Neyman 1936, Spiller et al. 2013). The 2-way

interaction between reward type and time unit was only significant for those who scored relatively low on lay rationalism—who were at or below 0.19SD below the mean on the lay rationalism scale (β_{JN} = 4.49, t = 1.97, p = 0.05). To further explore these results, I examined the 2-way interaction at 1 SD below and above the mean of the lay rationalism scale (see figure 6.5.2).

At 1SD below the mean of lay rationalism, the 2-way interaction was significant (β = 7.56, t = 2.38, p < .05; figure 6.5.2, panel A). Participants in the hedonic condition preferred the LL gift card significantly more when the time unit was large (M_{Weeks} = 53.89) versus small (M_{Days} = 20.30, β = -16.79, t = -3.81, p < .001). However, in the utilitarian condition, there was no significant difference in the large (M_{Weeks} = 37.66) versus the small time unit condition (M_{Days} = 34.31, β = -1.68, t = -.37, p > .6). Thus, participants were more patient for the larger-later gift card when the delay was described as 8 weeks as opposed to 56 days, but only when thoughts about the purchase of hedonic (vs. utilitarian) rewards were activated. However, at 1SD above the mean of lay rationalism, the 2-way interaction was not significant (β = -.05, t = -.02, p > .9; figure 6.5.2, panel B). Thus, for those using more rationalism (calculation) in their decision making, the hedonic-utilitarian asymmetry was no longer present.

Mediation. The pattern of results for the proposed mediator, wait time perception, was similar to what I observed for the preference measure. Specifically, when using reward type (hedonic = -1, utilitarian = 1), time unit (large = -1, small = 1) and lay rationalism as the independent variables, the 2-way interaction between reward type and time unit was marginally significant (β = -3.33, t = -1.89, p = .06; figure 6.5.3), and the 3-way interaction between reward type, time unit and lay rationalism was significant (β =

4.48, t = 2.34, p < .05; figure 6.5.4). The main effect of reward type was not significant (β = 8.36, t = .82, p > .10), while that of time unit was also not significant (β = 7.62, t = .75, p > .10). There was a significant main effect of lay rationalism (β = -3.91, t = -2.04, p < .05).

In the 2-way interaction between reward type and time unit, participants in the hedonic condition felt the wait time to be marginally significantly shorter when the time unit was large (M_{Weeks} = 57.19) versus small (M_{Days} = 66.56, β = 4.68, t = 1.86, p = .06). However, in the utilitarian condition, there was no significant difference in the large (M_{Weeks} = 64.81) versus the small time unit condition (M_{Days} = 60.84, β = -1.98, t = -.80, p > .4). Hence, participants felt the wait time for the larger gift card was shorter when the delay was described as 8 weeks as opposed to 56 days, but only when thoughts about the purchase of hedonic (vs. utilitarian) rewards were activated.

Next, to investigate the 3-way interaction, I used the Johnson-Neyman floodlight analysis technique (Johnson and Neyman 1936, Spiller et al. 2013). The 2-way interaction between reward type and time unit was only significant for those who scored relatively low on lay rationalism—who were at or below 0.14SD below the mean on the lay rationalism scale (β_{JN} = -3.49, t = -1.97, p = 0.05). To further explore these results, I examined the 2-way interaction at 1 SD below and above the mean of the lay rationalism scale (see figure 6.5D).

At 1SD below the mean of lay rationalism, the 2-way interaction was significant (β = -7.08, t = -2.86, p < .01; figure 6.5.4, panel A). Participants in the hedonic condition felt that the wait time for the LL gift card was shorter when the time unit was large

(M_{Weeks} = 54.49) versus small (M_{Days} = 73.57, β = 9.54, t = 2.77, p < .01). However, in the utilitarian condition, there was no significant difference in the large (M_{Weeks} = 72.50) versus the small time unit condition (M_{Days} = 63.24, β = -4.63, t = -1.30, p > .1). Thus, participants felt the wait time was shorter when it was described as 8 weeks as opposed to 56 days, but only when thoughts about the purchase of hedonic (vs. utilitarian) rewards were activated. However, at 1SD above the mean of lay rationalism, the 2-way interaction was not significant (β = 1.25, t = .50, p > .6; figure 6.5.4, panel B). Thus, for those using more rationalism (calculation) in their decision making, the hedonic-utilitarian asymmetry was no longer present.

To explore if, in fact, time perception was responsible for the effect on preference in the 3-way interaction between reward type, time unit and lay rationalism, I ran a mediation analysis using the PROCESS SPSS macro (Model 12; Preacher and Hayes 2004; Hayes 2013). In the regression model, the dependent variable was preference while the independent variables were time unit (large vs small), reward type (hedonic vs. utilitarian), lay rationalism, the interactions between these variables, and time perception (how long did the wait time feel). The effect of the mediator, time perception, was significant (β = -.59, z = -8.72, p < .0001). The interactive effect between time unit, reward type and lay rationalism was not significant (β = -1.45, t = -.66, p = .51). Most importantly, a bootstrap analysis confirmed a significant indirect effect of the highest order interaction with time perception as the mediator (β = -2.65, 95% CI = -5.37 to -0.30).

Taken together with the results reported earlier, the results from the mediation analysis confirm that time perception mediated the effect on preference. When lay

rationalism was low, the hedonic-utilitarian asymmetry was present for both time perception and preference. However, when lay rationalism was high, the hedonic-utilitarian asymmetry was eliminated for both time perception and preference. And as confirmed in the mediation analysis, the indirect effect of the highest order interaction (i.e., the interaction between reward type, time unit and lay rationalism) through time perception on preference was significant.

Discussion

In this study, I found evidence for H3. I had looked to find evidence for my proposed process through moderation. I had predicted in H3 that participants who are naturally more inclined to be calculative in their decision making would show a weak effect of units on patience, even when the rewards are hedonic. Hence, in study 5, I measured individual tendency to use a lesser vs. greater calculative mindset in decisions, i.e., those low vs. high on lay rationalism respectively, and I found that those who use a calculative mindset to a lesser degree demonstrate an interactive effect between time unit and reward types such that time units have an effect on time perception and consequently patience when rewards are hedonic, but less so when utilitarian. However, for those who use a calculative mindset to a greater degree, this interaction is no longer significant. I also observed mediation via wait time perception, just as I did in studies 3 and 4. Hence, the hedonic-utilitarian asymmetry did not emerge for individuals who have a tendency to use a more calculative mindset in decision making.

6.6 STUDY 6

In study 6, my objective was to provide further evidence for H3. Whereas in study 5 I measured individual tendency to be more vs. less calculative in decisions, in study 6, I now induce a calculative mindset. In line with H3, I expect that for individuals who have been primed to rely on calculation, the interactive effect of time units and reward type on patience will diminish. That is, even for hedonic rewards, the effect of units on patience should diminish when individuals are in a more calculative mindset.

Method

One hundred and eighty five undergraduate students (M_{age} = 20, female = 61%) successfully participated in the study (seven responses were excluded because participants incorrectly answered the attention-filter question as described in study 1).

Participants were randomly assigned to conditions in accordance with a 2 (time unit: small, large) X 2 (reward type: hedonic, utilitarian) X 2 (reliance on calculation: control, calculation prime) between-subjects design. Those in the calculation prime condition first answered five questions that required performing calculations (Hsee and Rottenstreich 2004). For example, one of the questions was: "If a consumer bought 30 books for $540, then, by your calculations, on average, how much did the consumer pay for each book?" Participants in the control condition did not complete this task. All participants then read the headphone scenario that we employed in study 4, and followed

the same procedure.

Results

Choice. Using the dependent variable of shipping choice (expedited = 0, standard = 1), I conducted a binary logistic regression with reward type (hedonic = -1, utilitarian = 1), time unit (large = -1, small = 1) and reliance on calculation (control = -1, calculation prime = 1) as the independent variables. There was no significant main effect of either reward type ($\beta = .09$, $z = .57$, $p > .10$) or time unit ($\beta = .002$, $z = .01$, $p > .10$), while that of reliance on calculation was marginally significant ($\beta = -.30$, $z = -1.82$, $p = .07$). Importantly, the 3-way interaction between reward type, time units, and reliance on calculation ($\beta = -.31$, $z = -1.86$, $p = .06$; figure 6.6.1) pointed toward the predicted pattern of results.

In the control condition, the 2-way interaction between reward type and time unit was significant ($\beta = .60$, $z = 2.36$, $p < .05$). The specific patterns were just as I observed in earlier studies. When the headphones were hedonic, participants opted for standard shipping significantly more in the large unit condition (78.95%) compared to the small unit condition (42.86%, $\beta = -.80$, $z = -2.06$, $p < .05$). But when the headphones were utilitarian, there was no significant difference in participants' choice of standard shipping between the large (70.37%) and small unit conditions (83.87%, $\beta = .39$, $z = 1.21$, $p > .2$; figure 6.6.1). That is, in the control condition, hedonic (but not utilitarian) headphones

led to more patience when the delay was described in days (vs. hours) because of a reliance on heuristics rather than systematic calculations.

In the calculation prime condition, the 2-way interaction between reward type and wait time was not significant (β = -.02, z = -.11, p > .8). This confirmed my proposed process, such that a calculative mindset erased the hedonic-utilitarian asymmetry; participants in the hedonic condition were now behaving just as participants in the utilitarian condition already were.

Mediation. The pattern of results for the proposed mediator, wait time perception, was similar to what I observed for the choice measure. I conducted a regression using reward type (hedonic = -1, utilitarian = 1), time unit (large = -1, small = 1) and reliance on calculation (control = -1, present = 1) as the independent variables. There was no significant main effect of either reward type (β = -2.96, t = -1.53, p > .10) or time unit (β = 1.69, t = .88, p > .10), while that of reliance on calculation was marginally significant (β = 3.31, t = 1.71, p = .09). Importantly, the 3-way interaction between reward type, time unit and reliance on calculation (β = 4.50, t = 2.32, p < .05; figure 6.6.2) pointed toward the predicted pattern of results. In the control condition, the 2-way interaction between reward type and time unit was significant (β = -5.39, t = -1.95, p = .05). As predicted, when the headphones were hedonic, wait time for standard shipping seemed shorter when the time unit was large (M_{Days} = 41.68) rather than small (M_{Hours} = 59.71, β = 9.01, t = 2.03, p < .05); when the headphones were utilitarian, there was no significant difference (M_{Days} = 31.77, M_{Hours} = 35.29, β = -1.76, t = -.53, p > .5). However, the 2-way interaction between reward type and wait time was not significant in the calculation prime condition (β = 3.61, t = 1.33, p > .10).

To explore if, in fact, time perception was responsible for the effect on choice in the 3-way interaction between reward type, time unit and reliance on caclculation, I ran a mediation analysis using the PROCESS SPSS macro (Model 12; Preacher and Hayes 2004; Hayes 2013). In the regression model, the dependent variable was choice while the independent variables were time unit (large vs. small), reward type (hedonic vs. utilitarian), reliance on calculation (control vs. calculation prime), the interactions between these variables, and time perception (how long standard shipping would take). The effect of the mediator, time perception, was significant (β = -.05, z = -5.28, p < .001). The interactive effect of time unit, reward type and reliance on calculation was not significant (β = -.19, z = -1.03, p > .3). Most importantly, a bootstrap analysis confirmed a significant indirect effect of the highest order interaction with time perception as the mediator (β = -.20, 95% CI = -.48 to -.02).

Taken together with the results reported earlier, the results from the mediation analysis confirm that time perception mediated the effect on choice. In the control condition, the hedonic-utilitarian asymmetry was present for both time perception and choice. However, in the calculation prime condition, the hedonic-utilitarian asymmetry was eliminated for both time perception and choice. And as confirmed in the mediation analysis, the indirect effect of the highest order interaction (i.e., the interaction between reward type, time unit and reliance on calculation) through time perception on preference was significant.

Discussion

The control condition of the current study replicated the interactive effect on patience that I observed in the earlier studies. I used the exact same scenario as in study 4, and replicated the effect in the control condition. I also observed mediation via wait time perception, just as I did in studies 3, 4 and 5. Importantly, the current study provided further process evidence for my theory via moderation, and in doing so found support for H3 once again. Consistent with the results from study 5, when participants were primed to rely on calculation, reliance on the numerosity heuristic was diminished. That is, even in the case of hedonic rewards, larger units did not influence wait time and patience. Consequently, the hedonic-utilitarian asymmetry no longer emerged when participants were primed to rely on calculation in their decision making.

FIGURES

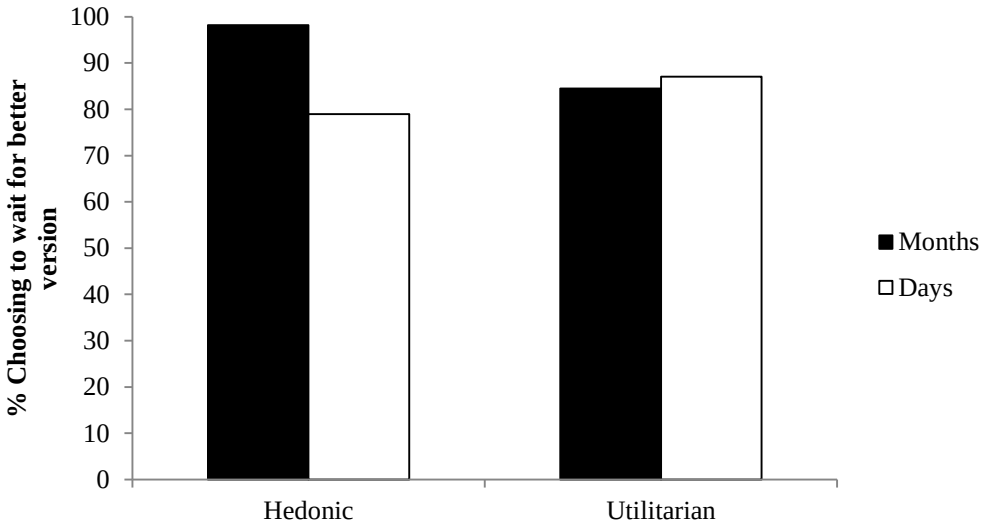


Figure 6.1: % choosing to wait for superior version of tablet when it seems hedonic versus utilitarian (study 1)

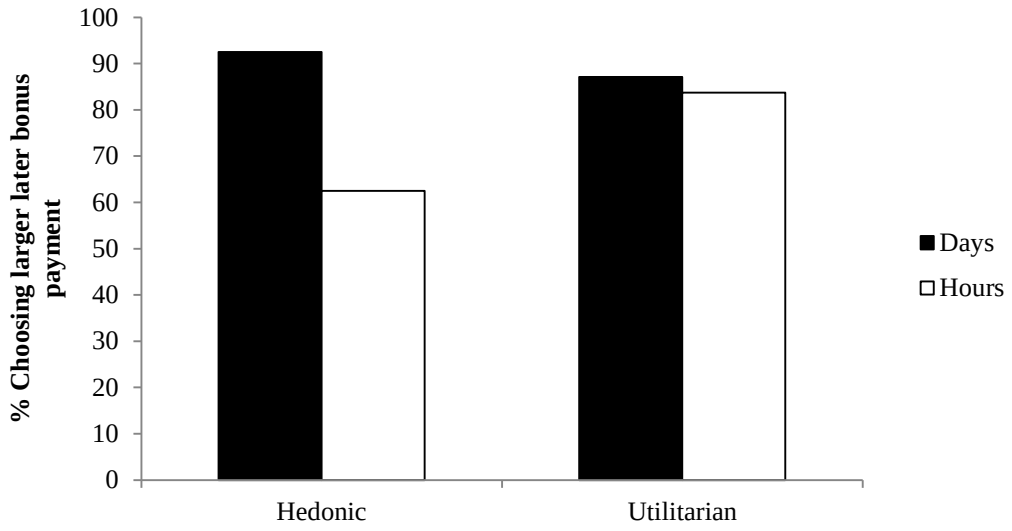


Figure 6.2: % choosing to wait for the larger-later bonus payment in the hedonic versus utilitarian conditions (study 2)

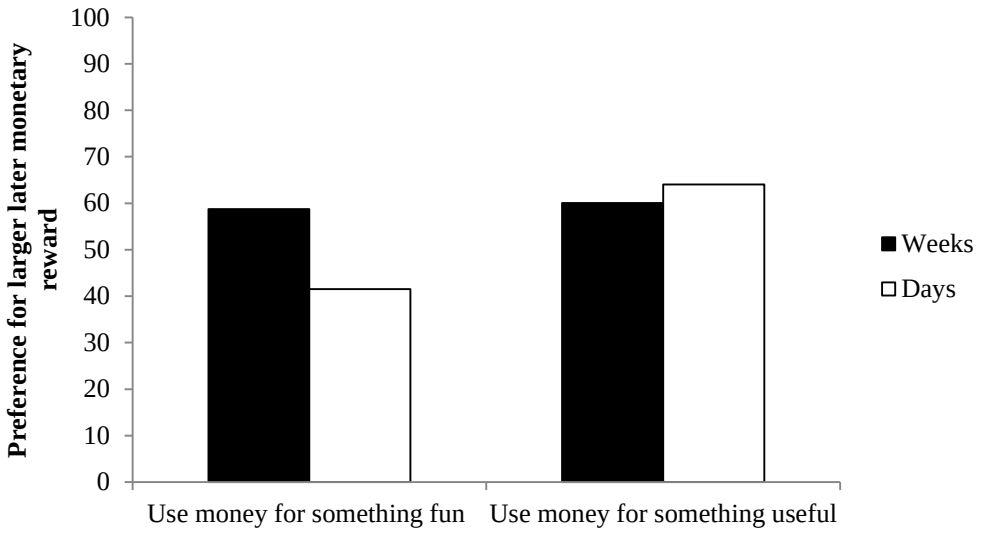


Figure 6.3.1: Subjective preference for the larger-later monetary reward (means shown at +/-1 sd of fun vs. useful; study 3)

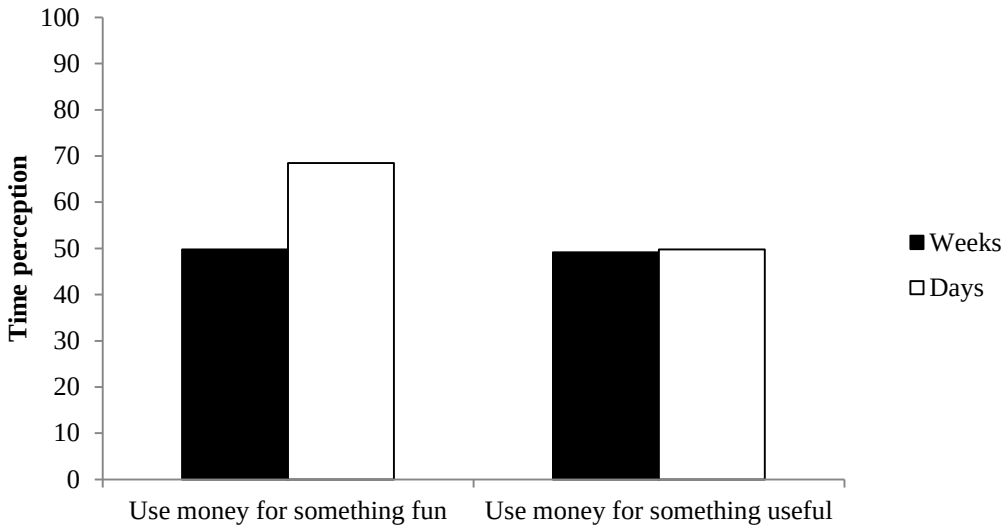


Figure 6.3.2: Wait time perception (means shown at +/-1 sd of fun vs. useful; study 3)

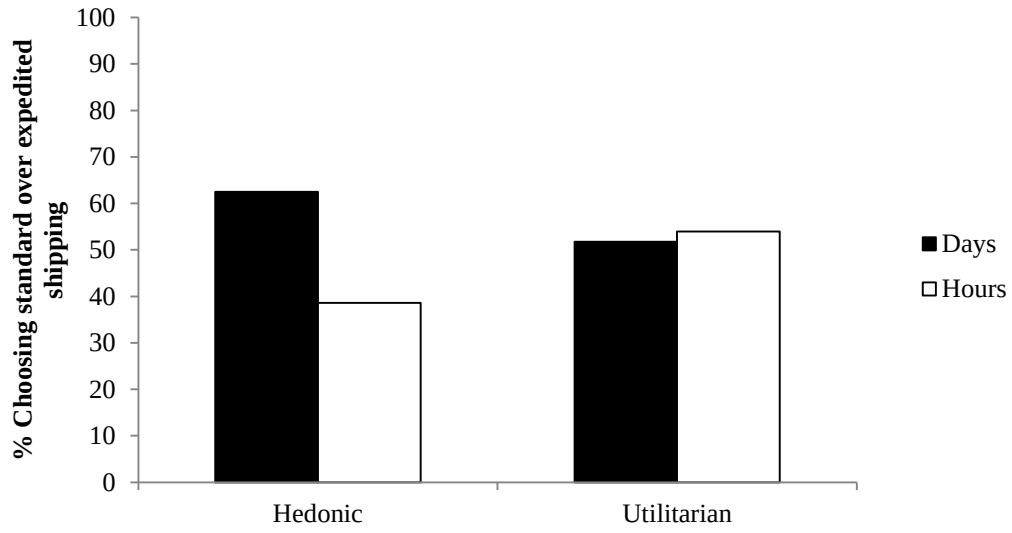


Figure 6.4.1: % choosing standard over expedited shipping when headphones seem hedonic versus utilitarian (study 4)

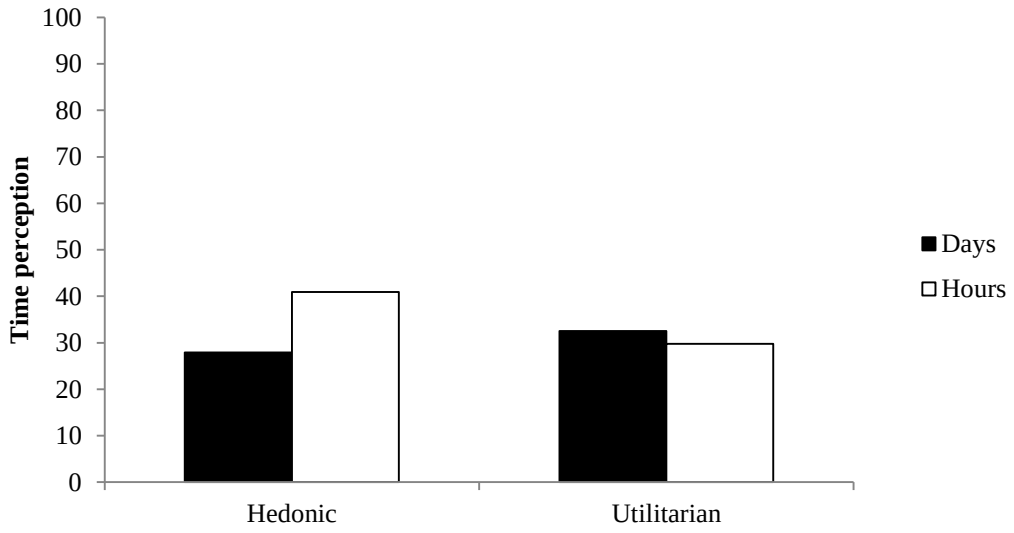


Figure 6.4.2: Subjective time perception when headphones seem hedonic versus utilitarian (study 4)

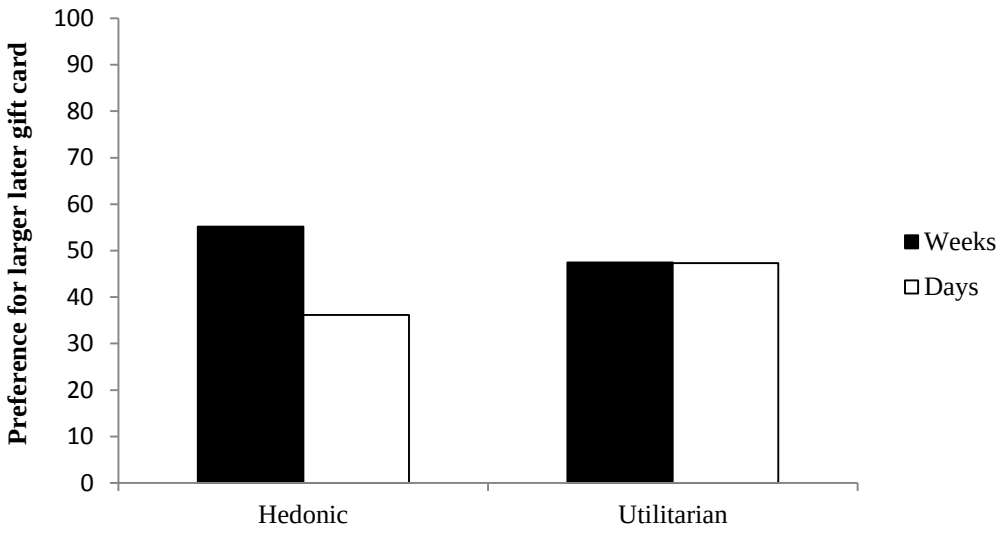
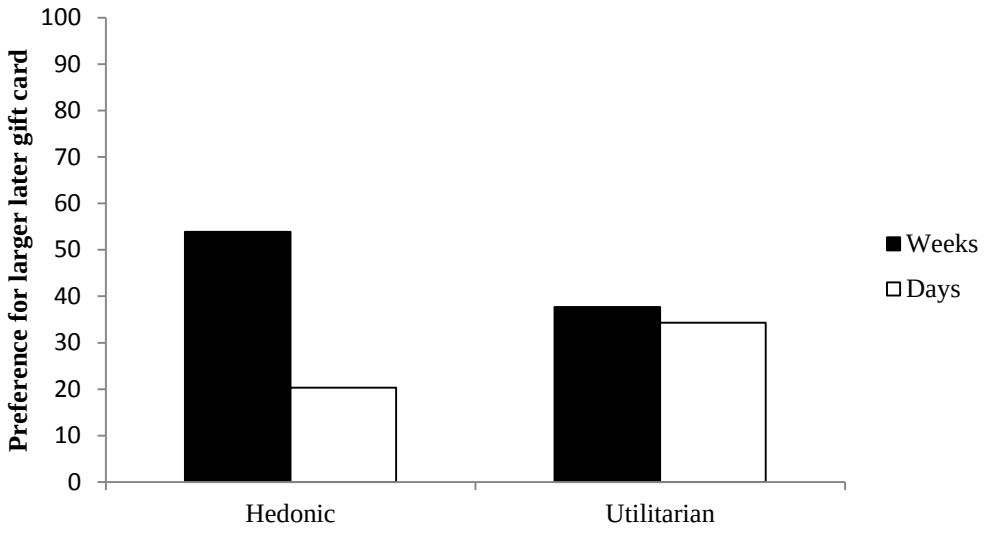
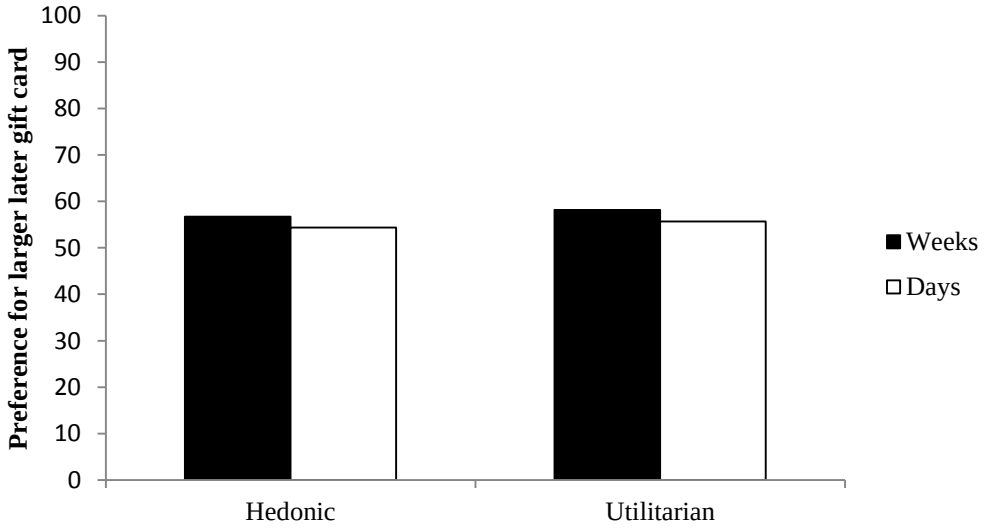


Figure 6.5.1: Subjective preference for the larger-later gift card (study 5)



Panel A: Low Lay Rationalism



Panel B: High Lay Rationalism

Figure 6.5.2: Subjective preference for the larger-later gift card (patterns for lay rationalism at +/-1 sd of the mean; study 5)

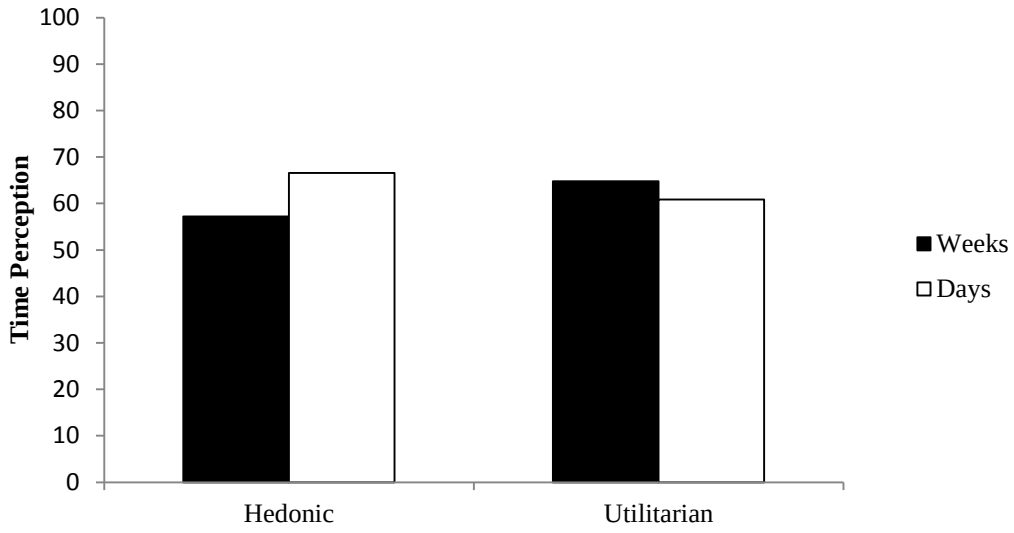
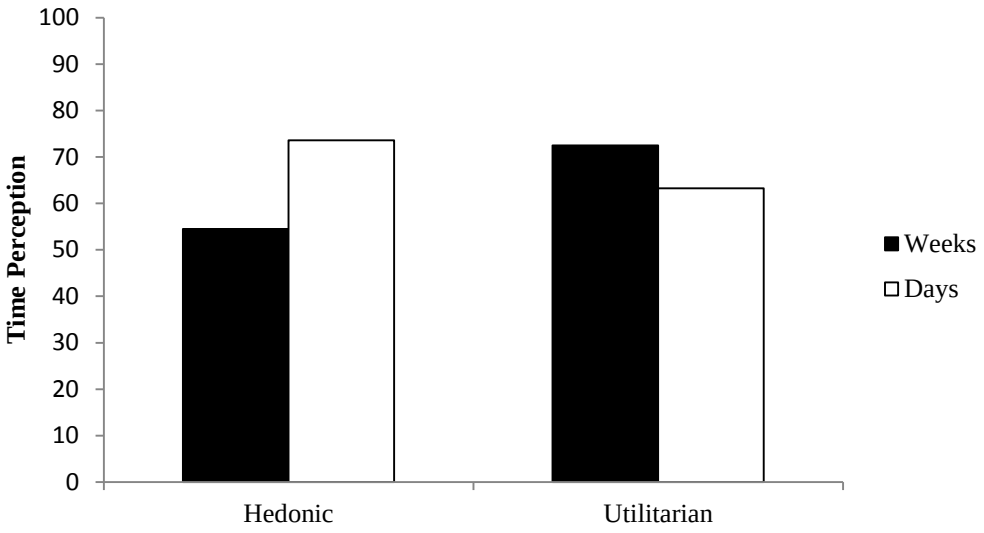
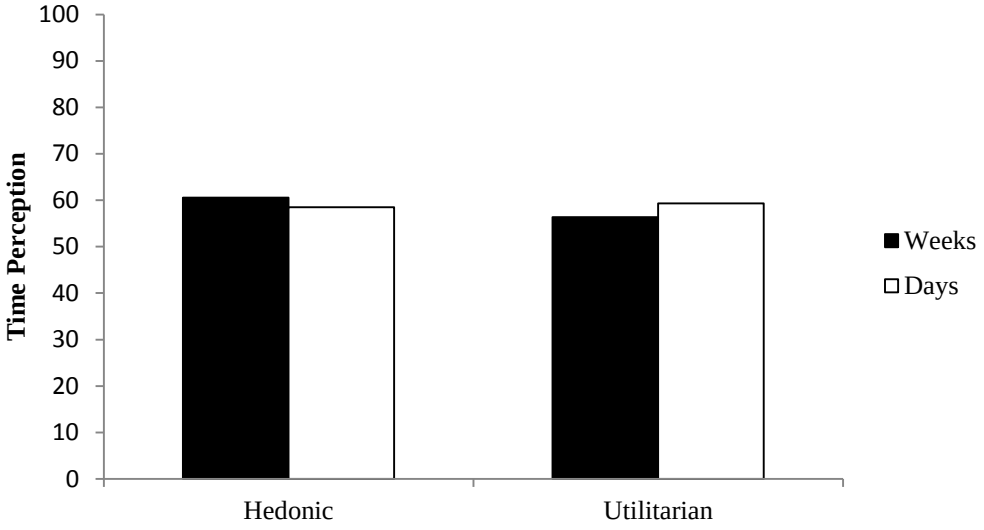


Figure 6.5.3: Wait time perception (study 5)

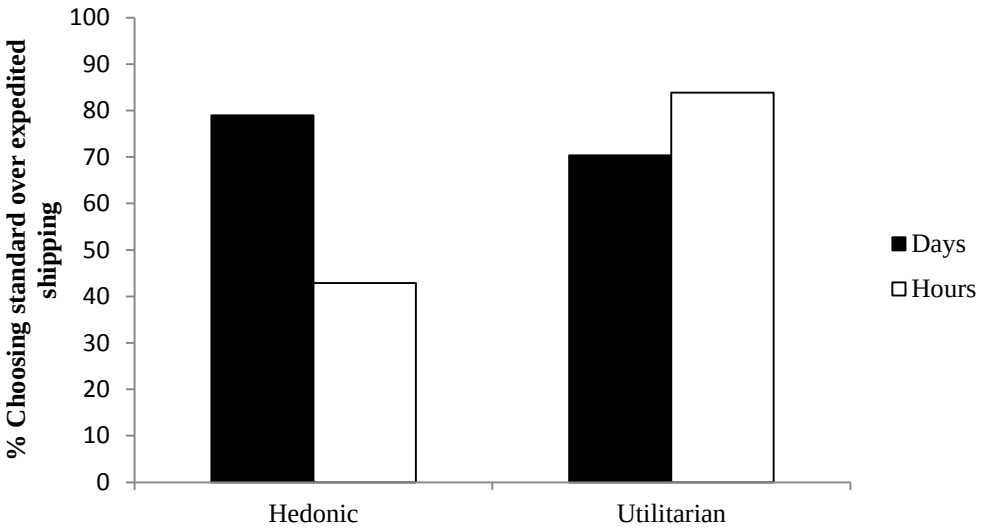


Panel A: Low Lay Rationalism

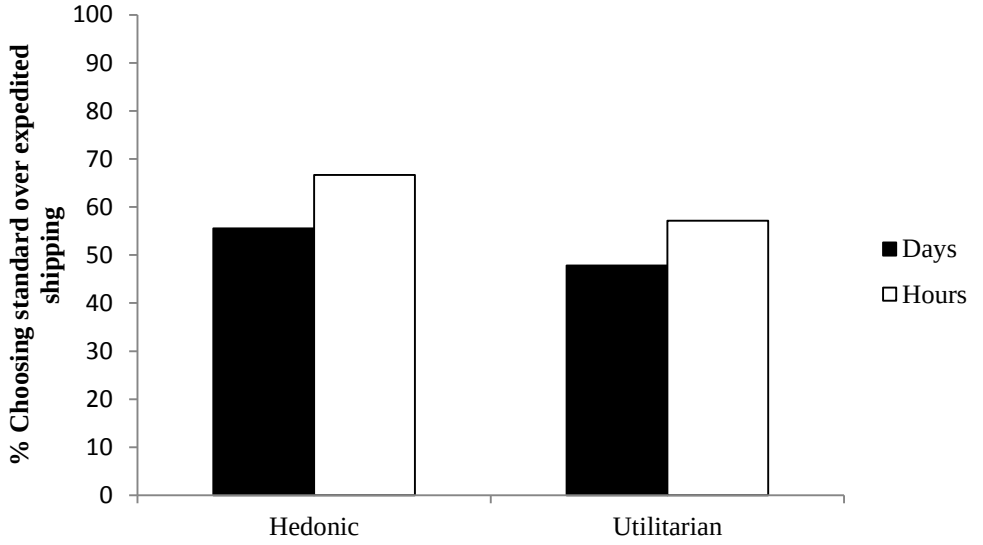


Panel B: High Lay Rationalism

Figure 6.5.4: Wait time perception (patterns for lay rationalism at +/-1 sd of the mean; study 5)

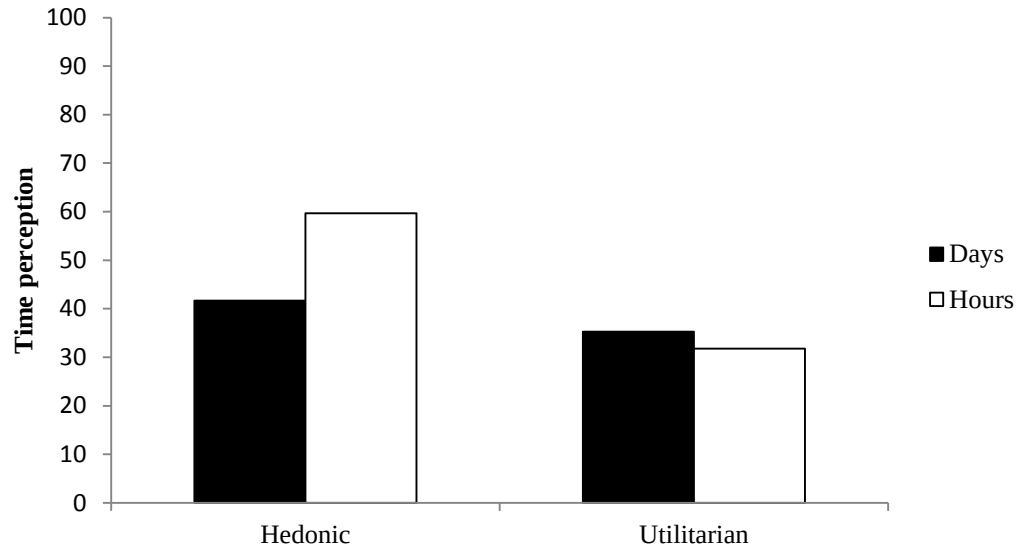


Panel A: Control

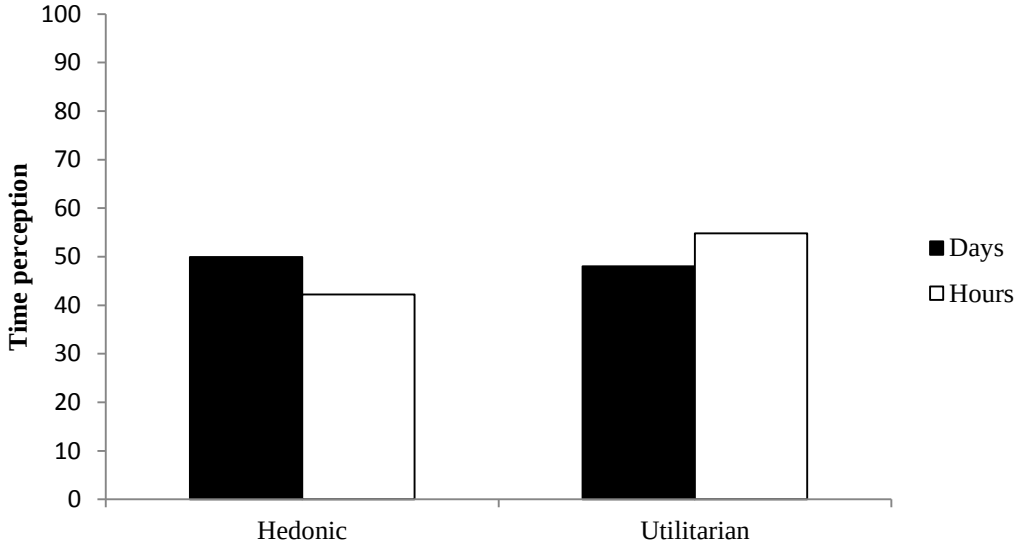


Panel B: Calculation Prime

Figure 6.6.1: % choosing standard over expedited shipping when headphones seem hedonic versus utilitarian (patterns for control vs. calculation prime; study 6)



Panel A: Control



Panel B: Calculation Prime

Figure 6.6.2: Subjective time perceptions when headphones seem hedonic versus utilitarian (patterns for control vs. calculation prime; study 6)

CHAPTER 7

GENERAL DISCUSSION

Consumers often encounter a choice between a smaller reward that is available sooner (SS) and a larger reward that is available later in time (LL). In such intertemporal choice situations, patience is reflected by the willingness to forgo the SS reward and wait for the LL reward. These situations are reflected in every day decisions, such as deciding whether to spend money or save it, whether to buy a product now or wait for a better version, and whether or not to spend more money to get a product delivered sooner through faster shipping. Since the SS and LL rewards in such situations are separated by a wait time, the shorter this wait time feels, the more patient one becomes for the LL reward. In this dissertation, I investigate how expressing the wait time in different units of time can impact time perception, and consequently patience, and how the nature of the SS and LL rewards can determine whether this effect will occur. In doing so, I reveal a new antecedent of patience that involves the interactive effect of two defining aspects of an intertemporal choice: wait time and rewards.

I argue that while numerosity effects would be expected to emerge in intertemporal choices, this may not always be the case. An intertemporal choice is a

unique context that involves not only consideration of the wait time but also a comparison between SS and LL rewards. Thus, the nature of the rewards might determine whether decision makers rely more on careful calculation rather than quick heuristics such as numerosity. I theorize that utilitarian rather than hedonic rewards are more likely to lead to a reliance on calculation in decision making. Hence, I predict an interactive effect, such that larger (vs. smaller) time units shorten wait time perception and thereby boost patience, but more so when rewards are hedonic rather than utilitarian. Further, I also predict that this effect will be moderated by reliance on calculation. If the tendency to rely on calculation increases, the predicted asymmetry between hedonic and utilitarian rewards will diminish.

Six studies reveal this interactive effect across several units of wait time, for choice and preference measures, for hypothetical and real rewards, and regardless of whether hedonic versus utilitarian perceptions are measured or manipulated. Mediation analyses in studies 3 to 6 also establish that my results are driven by wait time perception, just as the numerosity heuristic would predict. Studies 5 and 6 delineate a boundary condition for the hedonic-utilitarian asymmetry, which is in line with my proposed underlying process. Specifically, my theory is built around the notion that utilitarian rather than hedonic rewards will lead to a more calculative mindset in intertemporal choice, which should lead to a lesser reliance on the numerosity heuristic, and hence diminish the effect of units on patience. In line with this theory, I show in study 5, that the effect of units neutralizes even for hedonic rewards for individuals with a natural tendency to be more calculative in their decisions. Similarly in study 6 I show that inducing a more calculative mindset also neutralizes the effect of units on patience when

rewards are hedonic. These diminished numerosity effects for hedonic rewards eliminate the hedonic-utilitarian asymmetry.

My studies relate to a number of consumer contexts in which consumers can either choose to receive immediate benefits, or exhibit patience and thereby receive better benefits in the future. Study 1 showed support for my predictions when participants were asked to choose between the current version of a computer tablet vs. an upcoming new version. Studies 2, 3 and 5 used monetary rewards instead, and provided support for my predictions even when participants were simply choosing between less money now vs. more money later. In studies 4 and 6, participants chose between standard and expedited shipping, and once again my predictions were supported. These results help to demonstrate that my hypothesized effects extend to a variety of decisions that consumers make every day in the marketplace.

My results connect chiefly to three theoretical areas: intertemporal choice, numerosity, and hedonic-utilitarian differences. I next discuss the implications of my results for these three areas and present some new ideas for future research. I then conclude with implications for managers and public-policy makers.

Implications for Research on Intertemporal Choice

My results provided a detailed account of when a change in time units can impact time perception, and thereby patience, in intertemporal choice. Past research on intertemporal choice, which has peripherally explored this issue (e.g., LeBoeuf 2006,

Read et al. 2005), has not found any significant effects of units on patience. I believe that the lack of significant results found in this work might have been due to their use of money as the SS and LL rewards. As my results demonstrate, the effect of units is heavily dependent on whether the nature of the rewards is hedonic or utilitarian. When rewards are utilitarain, the effect of using different time units on time perception and patience is weaker, as compared to when rewards are hedonic. Further, as studies 2, 3 and 5 demonstrate, using different time units can also impact patience for purely monetary rewards, provided that individuals are viewing money as a means to more hedonic rather than utilitarian goods.

In my investigation, I observe an interaction between the defining traits of an intertemporal choice setting: wait time and rewards. Showing that wait time units interact with the hedonic-utilitarian nature of rewards offers a novel lens to view intertemporal choice. It is already known that patience is affected by the nature of the rewards (O'Donoghue and Rabin 1999; Thaler 1981). It is also known that patience is influenced by the perception of wait time (Zauberman et al. 2009). What I show is that the nature of the rewards influences the perception of wait time. By showing that a factor integral to intertemporal-choice settings—the nature of the rewards—can influence wait time perception, I also add to a stream of literature on the antecedents of wait time perception (Ebert and Prelec 2007; Kim, et al. 2012; Kim and Zauberman 2013; LeBoeuf 2006; May and Monga 2014; Read 2001; Read et al. 2005; Scholten and Read 2006; Zauberman et al. 2009).

My results also provide new research opportunities. I considered standard intertemporal-choice settings in which waiting is aversive, and people want rewards

sooner rather than later. However, waiting may be pleasurable, such as when one savors the time spent waiting in anticipation of a kiss from a celebrity (Loewenstein 1987). For such fleeting and vivid experiences, the shrinking of wait time due to larger units may not be appreciated by individuals. One may prefer small units, which elongate time perception, so that savoring can be extended. My focus was on a choice between a sooner and a later option. Other situations involve choices between sequences. For instance, would one prefer to go to (a) a French dinner sooner and a Greek dinner on an evening a few days later or (b) a Greek dinner sooner and a French dinner later? People who prefer French food opt for the latter sequence, which is an improving one (i.e., better food later). However, this happens only when the two dinners are close enough in time, so that they are seen to be part of the same sequence (Loewenstein and Prelec 1993). My results suggest that time units may influence which sequence people prefer. Large units may make wait time seem short, resulting in a preference for an improving sequence (because the short wait time would make the events appear to be part of the same sequence). However, small units may make wait time seem long, leading to a preference for a declining sequence. That is, in the case of small units, the two dinners may not seem to be part of a sequence, and people may just prefer to have what they love (French food) sooner rather than later.

Implications for Research on Numerosity

Numbers are a precise way to describe quantities and yet they can lead us astray. In particular, prior research suggests that individuals neglect the units of quantities, and

over-rely on the numbers. Consequently, larger units lead to smaller magnitude perceptions (Burson et al. 2009; Pandelaere et al. 2011; Pelham et al. 1994; Raghubir and Srivastava 2002; Shen and Urminsky 2013; Wertenbroch et al. 2007). I show that the numerosity heuristic emerges in intertemporal settings, but more so when rewards are hedonic.

My results also offer new opportunities for research in this area. In particular, my exploration was limited to how numerosity effects are weaker for utilitarian rewards compared to hedonic rewards, and I showed that effects for hedonic rewards may be nullified by encouraging participants to be more calculative. What remains to be explored is how numerosity effects may be evoked for utilitarian rewards. Perhaps one way to do so would be to induce an affective mindset instead of a calculative mindset. That would again erase the hedonic-utilitarian asymmetry, but instead of both hedonic and utilitarian conditions yielding a null effect (as I show), both conditions would likely reveal a numerosity effect.

While past work on numerosity has shown numerosity effects for utilitarian products as well, such as when people evaluate the length of warranty periods for dishwashers (Pandelaere et al. 2011), I theorize that the hedonic-utilitiarian asymmetry I observe here is most likely due to the unique scenario an intertemporal choice presents. An intertemporal choice involving rewards is not a simple evaluation of magnitude, such as how much longer the length of a warranty period is for one product vs. the other, but a comparison between a smaller reward versus a larger one separated by wait time. As I discussed in my theorizing, it is due to the presence of this comparison between two rewards, and the assessment of whether it is worth enduring the wait time to receive the

larger reward, that can possibly lead individuals to be in a more calculative mindset when evaluating the wait time. Specifically, since the comparison between rewards can vary along utilitarian vs. hedonic properties, a more calculative mindset may be used in intertemporal choice. Future work could look at other scenarios where the decision situation leads people to use a more calculative mindset, and hence become relatively immune to numerosity effects, and other possible numerical biases.

I observed numerosity results using a variety of different units (hours, weeks, days, and months), but did not consider very large units (years, decades, etc.). Future research could examine these additional units, and also how responses change depending on other factors that influence numerosity, such as the differential attention to units (Pandelaere et al. 2011; Shen and Urminksy 2013). Moreover, while numerosity is the default effect in most cases, and emerges even when concrete mindsets are induced, reversals may occur under abstract mindsets, or when personal relevance is high (Monga and Bagchi 2012; Ulkumen and Thomas 2013). Future research could examine how my numerosity results (in the case of hedonic rewards) replicate for larger units (e.g., years), and are influenced by variables such as abstract construals.

Implications for Research on Hedonic-Utilitarian Differences

Research on hedonic-utilitarian differences is extensive (Dhar and Wertenbroch 2000; Hirschman and Holbrook 1982; Khan et al. 2005; Okada 2005; Pham 1998; Strahilevitz and Myers 1998). However, prior literature is silent on how such differences

may influence patience via wait time perception. Indeed, to my knowledge, there is no literature to connect hedonic-utilitarian differences to time perception. I show that wait time perception is more malleable in the context of hedonic rewards (i.e., perception changes more easily with time units), which has consequences for patience. There is research in other areas—affect dependence and guilt—that suggests pathways by which hedonic-utilitarian differences may influence patience, but those pathways are conflicting (Urminsky and Kivetz 2004). People may exhibit *lower* patience for hedonic (vs. utilitarian) goods because they are known to be more affect laden (Loewenstein 1996); or they may exhibit *higher* patience for hedonic goods because they are known to induce guilt and encourage people to exert self-control (Kivetz and Simonson 2002; Wertenbroch 1998). I do not contribute to this debate because my studies were not designed to compare the patience of hedonic versus utilitarian products. Indeed, my participants did not choose between hedonic and utilitarian options, but between two hedonic options, or two utilitarian options. However, a question that remains open is whether factors such as guilt may influence the hedonic-utilitarian asymmetry that I observe.

In my theorizing, I had contended that hedonic (vs. utilitarian) rewards should lead to a relatively stronger effect of units on patience in intertemporal choice, since the affective nature of hedonic consumption leads to a decreased reliance on a calculative mindset. There is, however, the possibility that under certain circumstances affect intensity will in fact lead to an increased reliance on a calculative mindset. For example, in situations where one feels uncertain emotions, such as fear and surprise, individuals may actually engage in more careful processing of their decisions (Bless et al. 1996;

Bodenhausen 1994; Forgas 1998; Lerner and Tiedens 2006; Tiedens and Linton 2001). While the type of hedonic rewards I investigated are unlikely to lead to emotions that promote uncertainty, it would be interesting to investigate how numerosity effects may diminish under certain conditions where affect intensity takes the form of uncertain emotions.

Future research could also examine the asymmetry between hedonic and utilitarian stimuli in domains outside of intertemporal choice. For instance, prior research has examined the influences on task-related durations, such as how long a task is perceived to take (Kanten 2011; Liberman et al. 2007; McCrea et al. 2008; Siddiqui, May, and Monga 2014). My results suggest that time perceptions may be shorter when hedonic tasks are framed using larger units (e.g., spending 1 evening at a party) versus smaller units (e.g., spending 5 hours at the party), but that units may not have an influence in the case of utilitarian tasks (e.g., spending 1 morning cleaning the garage vs. 5 hours cleaning it).

Implications for Managers and Public Policy

My research offers insights into how marketers of hedonic products could employ units of time. Consider video-game consoles that individuals often buy for fun rather than a functional purpose. A company trying to sell the remaining inventory of a current model before the release of the new model would want to communicate the time till the new release in small units. Wait time would seem long, and reduced patience would make

it more likely that consumers purchase the current model rather than wait for the new one. In contrast, if the company has just a few units of the current model left and is keen to shift consumer demand toward pre-ordering the new model, then using larger units would be more beneficial. This is because wait time would seem short, and increased patience would make it more likely that consumers bypass the current model and pre-order the new one. Such strategies could also be employed for products that a marketer may be able to frame as either hedonic or utilitarian. Employing such framing (as I did in study 1) could have consequences for wait time and patience.

A similar strategy could also be applied for the online shipping of hedonic products. To garner the additional revenues of expedited shipping, a company may make consumers more impatient by using small units that would elongate the perception of wait time for standard shipping. However, if the company is running out of stock and would like to delay shipping, then using larger units would be helpful in shifting preferences toward standard shipping.

Companies may sometimes be compelled to follow certain units of time, such as when the entire industry follows a certain norm, or when the use of certain units is mandated. In such cases, if the units are not in line with what a company would ideally want (e.g., the units are small, lowering patience, whereas the marketer would benefit from the higher patience of consumers), then a manager could try to neutralize the effect of units. One such approach could be to induce a calculative mindset, as I did in study 6.

While the above techniques may help boost firm profits, public-policy makers need to monitor whether the manipulation of units is detrimental to consumer welfare.

Consider the example of credit-card use. For consumers tempted to charge hedonic products to their credit cards, companies may stoke impatience by using smaller units to make the credit-card payment seem far away (e.g., payment due in 30 days, rather than 1 month). Such threats to the financial welfare of consumers could be countered by governmental organizations, such as the Consumer Financial Protection Bureau, which may try to standardize the units of time that credit-card companies use to express payment schedules. In fact, such standardization could mandate units that actually help individuals be more patient, and better manage their finances. Thus, units could be employed as a valuable nudge to improve patience (Thaler and Sunstein 2008). Similarly, to prevent the biases that may creep in due to units, consumer advocacy groups could try to encourage calculative mindsets in consumers.

Conclusion

I present a novel perspective to intertemporal choice. Specifically, I find that the influence of time units on wait time perception and patience is a function of the nature of the rewards. When rewards are hedonic, larger units shrink wait time perception and boost patience. This effect does not arise for utilitarian rewards. Theoretically, my results make an important contribution the literature, by demonstrating a case where the nature of rewards in intertemporal choice interacts with wait time perception to jointly influence patience.

My results have important practical implications for consumer decision making. Consumers often face a conflict between immediate and future benefits in their everyday decisions. Whether it is an employee deciding on how much money from this month's paycheck should be set aside as savings, or an online shopper deciding whether or not to splurge on expedited shipping and receive purchased goods sooner, this conflict exists. It is vital for consumers to understand the factors that can lead them to make better or worse decisions. As my results demonstrate, inducing the use of more calculation in decisions can make consumers more immune to biases such as numerosity, and the numerosity bias is more likely to affect intertemporal decisions when consumers are deciding on hedonic consumption. Practitioners may use these results as a simple guide on how to influence consumer patience.

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APPENDIX A: STUDY 1 STIMULI

Hedonic condition scenario:

"Imagine that you do not have a tablet computer at this point, but would like to buy one. Your friends have told you great things about one particular tablet. This tablet is not really for making life more efficient and organized, but simply for making it more fun and enjoyable. You cannot wait to get this tablet. You head on over to a retail website with the intention of buying it. You search for the tablet and arrive at its product page. You see the following price information: 'Get this tablet now for $299!'"

Utilitarian condition scenario:

"Imagine that you do not have a tablet computer at this point, but would like to buy one. Your friends have told you great things about one particular tablet. This tablet is not really for making life more fun and enjoyable, but simply for making it more efficient and organized. You cannot wait to get this tablet. You head on over to a retail website with the intention of buying it. You search for the tablet and arrive at its product page. You see the following price information: 'Get this tablet now for $299!'"

Wait information when time unit is small:

"However, you also notice the following on the same page: 'A new version of this tablet will be releasing in 120 days for $299. It will have upgraded hardware and software.' You are now faced with the decision of whether to buy the tablet right now, or to hold off and get the new version."

Wait information when time unit is large:

"However, you also notice the following on the same page: 'A new version of this tablet will be releasing in 4 months for $299. It will have upgraded hardware and software.' You are now faced with the decision of whether to buy the tablet right now, or to hold off and get the new version."

APPENDIX B: STUDY 2 STIMULI

Hedonic condition task:

"Money can be spent on many different products. We want you to think about all the fun products that you can buy with money. For example, think about products that can bring you sensory pleasure, or products that can be used for your enjoyment. Below, please write down the names of three fun products that you can buy with money."

Utilitarian condition task:

"Money can be spent on many different products. We want you to think about all the useful products that you can buy with money. For example, think about products that are functional, or products that can be used to accomplish a practical task. Below, please write down the names of three useful products that you can buy with money."

Options when time unit is small:

Option A: Receive a $25 bonus in 48 hours
Option B: Receive a $30 bonus in 96 hours

Options when time unit is large:

Option A: Receive a $25 bonus in 2 days
Option B: Receive a $30 bonus in 4 days

APENDIX C: STUDY 3 STIMULI

Scenario:

"Imagine that you have just won a $100 Visa gift card as a prize. We would like to know what kind of goods you would spend the money on. So please take a moment to think about what you would spend the money on."

Wait information when time unit is small:

"Now imagine that you were offered the following deal: If you wait for 14 days before receiving your prize, you can get a $110 Visa gift card instead of a $100 Visa gift card."

Wait information when time unit is large:

"Now imagine that you were offered the following deal: If you wait for 2 weeks before receiving your prize, you can get a $110 Visa gift card instead of a $100 Visa gift card."

APPENDIX D: STUDY 4 STIMULI

Hedonic condition scenario:

"Imagine that you are shopping online for a pair of headphones. You are looking for a pair that would be fun to use, and offer good clarity of musical notes. Your goal is to have a pleasurable experience when listening to your preferred music over the Internet (when using Pandora and similar services). You find a good pair available for $40. You then head on over to the checkout page where you are presented with a couple of shipping options."

Utilitarian condition scenario:

"Imagine that you are shopping online for a pair of headphones. You are looking for a pair that would function reliably, and offer good clarity of voice. Your goal is to have an effective conversation when interviewing for your preferred jobs over the internet (when using Skype and similar services). You find a good pair available for $40. You then head on over to the checkout page where you are presented with a couple of shipping options."

Options when time unit is small:

Expedited: 24 hour shipping for $4
Standard: 72 hour shipping for $2

Options when time unit is large:

Expedited: 1 day shipping for $4
Standard: 3 day shipping for $2

APPENDIX E: STUDY 5 STIMULI

Scenario:

"In order to reward you for being a loyal customer, an online retailer wants to offer you a free gift card. You can use this gift card on their site towards the purchase of any of their wide selection of goods. The retailer has given you two options to choose from."

Options when time unit is small:

Option A: Receive a $100 gift card in 14 days
Option B: Receive a $120 gift card in 56 days

Options when time unit is large:

Option A: Receive a $100 gift card in 2 weeks
Option B: Receive a $120 gift card in 8 weeks