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METHODS FOR IMPROVING DELAY DISCOUNTING

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METHODS FOR IMPROVING DELAY DISCOUNTING

by

Tiaja Strickland

B.S., Southern Illinois University, 2019

A Research Paper

Submitted in Partial Fulfillment of the Requirements for the
Master of Science

Department of Rehabilitation
in the Graduate School
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RESEARCH PAPER APPROVAL

METHODS FOR IMPROVING DELAY DISCOUNTING

by

Tiaja Strickland

A Research Paper Submitted in Partial

Fulfillment of the Requirements

for the Degree of

Master of Science

in the field of Behavior Analysis and Therapy

Approved by:

Dr. Deija McLean, Chair

Graduate School
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October 17, 2021

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TITLE: METHODS FOR IMPROVING DELAY DISCOUNTING

MAJOR PROFESSOR: Dr. Deija McLean

Spending addictions pose a serious threat to the younger population as they have no prior experience making long term financial decisions. The goal of this research paper is to identify therapies to help reduce delay discounting accompanied by poor spending habits; in some events individuals are likely to choose the more immediate rewards rather than the future reward presented with delay discounting. Choosing the more immediate rewards shows a lack of control and impulsive behavior by the person engaging in the behavior. The objective was to identify possible therapies to help reduce delay discounting such as acceptance and commitment therapy, visual exposure, and money management-based therapies which many authors have found to **reduce** discounting in a variety of participants. The argument here suggests that there is not one but many therapies that may be used with one another to help target spending addictions. In conclusion, acceptance and commitment therapy and other multidiscipline therapies can be beneficial in treating delay discounting.

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HEADING 1

DELAY DISCOUNTING

Delay discounting has been referred to as “The tendency for outcomes that are remote in time to have less value than more immediate outcomes” (Odum, 2011, p.1). An example of this phenomenon is when an individual may choose the most immediate smaller outcome instead of waiting for the larger outcome that will be hypothetically given later. Findings suggest that nonhumans and humans typically do not choose the larger delayed reward to receive a smaller but more immediate reward (Johnson & Bickel, 2002). It is suggested that delay discounting is goal driven and can be explained by applying a principle known as the goal pursuit (Kopetz, Briskin, Sultana, and Stanciu, 2021). The behavior people exhibit is often driven by their goals (Kopetz et al., 2021). These goals are willfully adopted by the person and arise un- subconsciously through their environment or internal cues cognitively associated with the goal (Kopetz et al., 2021). Kopetz et al., 2021 research supported the ideal of goal pursuit. Kopetz et al., 2021, showed that people discount a reward to a greater extent if the reward is closely related to their goals but on the other hand people have the tendency to discount rewards as a function of delay when these goals could be achieved through other ways. Using humans in experimental research has shown patterns involving real, hypothetical or potentially real rewards could produce similar patterns when they respond to making choices (e.g., Johnson & Bickel, 2002). These choices have been labeled as impulsivity compared to being labeled self-control (Johnson & Bickel, 2002). Impulsive decision making and delay discounting are relevant to one another because delay discounting describes the decline in value as the delay to that outcome increases (Johnson & Bickel, 2002). Delay discounting is used as an identification tool by researchers to identify people who may be considered more impulsive or less impulsive. Reward values decline

hyperbolically with the delay in time (Odum, 2011). In other words, as the value of the reward presented decreases the delay begins to rise. The steepness in which discounting declines is typically shown by whether the delay is shorter or longer. Steepness declines more rapidly when the delay is shorter when choosing a reward however, it is shallower when the delay is extended longer. When the delay is shallower individuals experience higher rates in discounting because of the wait associated with the larger later reward. Recent research has suggested that the rates at which a person discounts should be seen as an independent personality trait due to predictive validity value and stability (Odum, 2011).

Smaller sooner versus later larger

There are two important components involved in delay discounting, the smaller sooner reward, and the larger later reward. The smaller sooner reward versus the larger later reward is describing the rewards that are available right away. Smaller sooner is available sooner than the later reward although it is the smaller amount compared to the later larger. When the smaller reward is continuously chosen because of its availability is sooner those who pick this choice are impulsive. Greater discounting of a large reward (e.g., steeper discounting) may show that a person is more inclined to be impulsive (Hamilton et al., 2015). Examining the area under the curve (AUC) (Myerson, Green, and Warusawitharana, 2001) allows one to identify the degree of temporal discounting and evaluate the value of that reward. This method can be applied to individual and group data moreover it applies to a variety of studies that measure delay discounting.

Delay Discounting: Hypothetical vs Real rewards

When unexpected time or the likelihood of the occurrence of the rewards is taken into consideration, many may choose a reward that has a far less waiting period (Greens & Myerson,

2006). Five of the six participants were employed to explore delay discounting between hypothetical and real rewards. The results concluded that there was no systematic difference between each condition (Johnson & Bickel, 2002). Examining the relation between reward type of delay discounting with a larger group of participants allowed for the evaluation of greater statistical power to be detected of reward if one should exist (Madden et al., 2003). College students were randomly assigned to a hypothetical reward condition or real reward condition. Each participant completed a single-digit addition or subtraction problem. This task was designed to reduce the probability that choices made during the first condition would be remembered and repeated during the second condition (Madden, Begotka, Raiff, and Kastern, 2003). Delay discounting rates were held constant when assessed and the k -value that was present were not significant enough to show any relation. The hyperbolic functions provided a better fit of the median hypothetical (hyperbolic $k=.0042$, $R_2 = .65$; exponential $k= .0025$, $R_2 = .54$) and real (hyperbolic $k = .0044$, $R_2 = .85$; exponential $k = .0027$, $R_2 = .73$) reward data (Madden et al., 2003). These results are consistent with Johnson and Bickel (2002).

Although hypothetical rewards are imaginative, it is suggested that they are discounted at the same rate as a real more immediate reward (Dixon et al., 2013; Johnson & Bickel, 2002; Miller, 2019; Madden et al., 2003). Not immediately getting the reinforcer is commonly experienced when dealing with hypothetical rewards (Dixon, Lik, Myerson, 2013). The effects of holding reinforcement rates continuous on delay discounting real money and hypothetical have been evaluated by incorporating conditions in which some participants were required to wait for the rewards. Using blackout periods, for instance, has been shown that the rate of reinforcement could be held constant whether monetary amounts were hypothetical or real. (Dixon, Lik, Myerson, 2013). A blackout period involves a period where the response option is not available.

Discounting rates within the study were very minimal when reinforcement rates were held constant and steepest in only conditions where delays were experienced but reinforcement was not held constant. Results of a one-way ANOVA on the AUCs shows an effect of condition, $F(4,53) = 8.83, p < .001$, and a Scheffé post-hoc analysis indicated that the means of the hypothetical money/blackout ($M = 0.92$) and real money/blackout ($M = 0.96$) groups did not differ significantly from each other but differed (all $ps < .05$) from the hypothetical money/no-blackout ($M = 0.44$) and the real money/no-blackout groups ($M = 0.44$), which did not differ. When delay discounting between real and hypothetical money the same outcome was seen in participants.

A five-trial adjusting delay task (ADT) has also been used to assess delay discounting for real and hypothetical monetary rewards. Miller (2019) presented ADTs to nine children who had a history of destructive behavior (e.g., aggression, property destruction) (Miller, 2019). Trials included a choice between a “smaller more immediate” (\$0.25) reward and a “larger later” reward (\$.50), and the amount for the rewards was held constant across all trials. Delays were shown to participants in units of hours, minutes, and/or seconds, as appropriate (e.g., 100 s was presented as “one minute and forty seconds” (Miller, 2019, p. 50). Results suggest that using a modified ADT-5 using hypothetical rewards can be a choice for assessing delay discounting in children with psychological disorders. Additional research would not too further examine hypothetical and real rewards in a population that is equivalent (Miller, 2019).

Morrison, Madden, Odum, and Friedel (2014), altered impulsive decision making by using a shorted version of ACT. Participants were assigned to waitlist or an acceptance-based procedure. The sessions duration lasted 60-90 minutes which made it a brief treatment plan in comparison to the standard ACT (Morrison et al., 2014). The Monetary Delay Discounting

measured the rate at which the perceived value of a reward decreases as the delay to the receive increases (Morrison, Madden et al., 2014)). There are a series of choices presented to the participants between hypothetical monetary rewards. The sooner-small rewards were available “now” whereas the larger-later reward is available after one of seven different delays. The larger later was kept constant at \$100. Results suggest that an acceptance-based procedure consisting of shorten sessions were able to reduce delay discounting.

Impulsivity versus Self-control

Impulsivity may be influenced by other behaviors the person experiences. These experiences may make the person choose items hastily. Impulsivity is a personality trait and may be made up of several independent factors throughout an individual’s life (Evenden, 1999). It has been proposed that differences in impulsivity between individuals may mirror variances in the mechanism which allocates attention (Evenden, 1999). Individuals who are more impulsive may be less may spend less time focused on a task and will make hasty decisions. When compared to those who have low impulses, they are more likely to spend time and attention to the task. Impulsivity has been related to a plethora of psychiatric conditions including bipolar disorder, substance abuse, and personality disorders (Hamilton et al., 2015; Denhardt & Murphy, 2011). Assessing choice impulsivity involves choosing between a smaller sooner and larger later rewards (Hamilton et al., 2015)

It has been shown that the college population deal with impulsive spending can lead to serious problematic behaviors such as overspending (Roberts & Jones, 2001). College students have more access to credit cards with more than twenty percent of college students owning four or credit cards (Roberts & Jones, 2001). Impulsivity involves actions that are poorly considered, prematurely expressed, overly risky, or not appropriate to the situation, and often result in less

than desirable outcomes (Evenden, 1999). College students tend to make poor decisions which can be synonymous with being impulsive to buy and spend money (Roberts & Jones, 2001). A change in money attitude is one important feature of how college students think about spending (Roberts & Jones, 2001). Changing the college population's views on money can help decrease impulsive spending as seen in Roberts and Jones, 2001. With the introduction of credit cards, it has made buying everyday things simpler. A credit card has made it much easier for individuals to spend money on items that are not affordable. Some people may not have the money immediately to spend so using a credit card makes it easier to get the item sooner.

Causes of Impulsiveness

There are many reasons as to why many people are impulsive and a variety of impulsiveness have withstood centuries (Ainslie, 1975). Three approaches to these reasons are: people do not knowingly choose the poorer alternative but have yet to learn the consequences of their behaviors, people may be compelled by some lower principle to act without regard for differential reward, and lastly people know the consequences of the behavior they choose to neglect the consequences of their actions (Ainslie, 1975). Studying human behavior towards delayed rewards may be difficult due to differences in culture (Ainslie, 1975). Cultural values play a vital role because over time this behavior has been controlled when patterns were seen in the community which does not allow it to be studied as closely. Steeply discounting the value of a larger later reward often underlies fondness for a smaller sooner reward (Ainslie, 1975) – a pattern of choice creating one of the many aspects of impulsivity.

Some might suggest that being impulsive is a trait that has been developed throughout an individual's life (Odum, 2012). With the evidence that is provided some may consider delay discounting a personality trait (Odum, 2012). Delay discounting may not exactly fit into the

frame of the common definition of a personality trait. Which is often described as “enduring pattern of thoughts, feelings, behaviors that reflect the tendency to respond in certain ways under certain circumstances” (Odum, 2012). When discounting for one commodity and delay discounting for another commodity; a person who is impulsive in one situation may be relatively impulsive in other situations (Odum, 2012). Much like a trait, personality could be an indicator in predicting delay discounting rates (Odum, 2012). Hirsh, Morisano and Peterson (2008), evaluated personality and cognitive ability interaction in predicting delay discounting rates. Personality was measured using the Big Five an assessment used to measure five factors. Participants completed the monetary choice questionnaire, big five inventory, fake-proof big five scale and demographics. The big five measurement was given twice at separate times to promote accuracy. For example, Hirsh and colleagues (2008) found that those who exhibit extraversion showed preference for smaller but more immediate rewards, while those who have larger cognitive ability preferred to choose larger but more delayed rewards. Those who are labeled as extraverts tend to discount at higher rates (Hirsh et al., 2008).

When taken into consideration financial education may help reduce impulsive decision making when handling money (DeHart, Friedel, Lown, and Odum, 2016). DeHart and colleagues (2016) evaluated the effects of taking a semester long financial course on delay discounting. Participants selected were enrolled in a financial education course or an abnormal psychology course. The financial education course primary focus was on personal finances. Participants completed an online multi-part survey at two separate times: immediately after the semester began and two weeks prior to the start of finals (DeHart et al., 2016). During the delay-discounting task, participants chose between hypothetical outcomes of smaller-sooner amount of money and \$100 after a delay; they monetary value then decreased to \$1. The measure that was

reported for delay discounting is AUC; AUC is reported between 0 and 1, with lower AUC values representing a higher degree of delay discounting (DeHart et al., 2016). Participants in the financial education groups AUC for \$100 was reported to increase from Time 1 to Time 2 ($\beta = 0.18, p < .01$). Financial risk tolerance at Time 2 ($\beta = 0.02, p < .01$). Those enrolled in the financial education class did relatively better than participants from the abnormal psychology course. There was a decrease in delay discounting seen in the financial education group at the end of the semester when compared to those who took the abnormal psychology course. Hence, offering a financial educational course may reduce impulsive decision making.

HEADING 2

TREATMENT AND REDUCTION OF DELAY DISCOUNTING

Visual exposure to natural environments may decrease impulsive decision making in a delay discounting task (Berry, Sweeny, Morath, Odum, and Jordan, 2013). Undergraduate students were selected from an introductory psychology course. Participants were randomly assigned to one of three conditions- natural, built, and geometric. During the natural condition participants viewed scenic areas, built consisted of architecture such as buildings and lastly the geometric condition consisted of geometric patterns. Hypothetical monetary outcomes were used during delay discounting. Each choice screens were presented as the following: “Would you rather have [amount] now or [amount] in [delay]”? Participants that viewed natural environment showed less impulsive decision-making in comparison to those who viewed built environments or geometric shapes. When exposed to natural environments it can lead to a decrease in impulsive decision making. When shown scenes of natural environments the study was able to show that impulsive decision making was reduced. This study shows that individuals tend to enjoy looking at natural environment and find them appealing.

Altering temporal attention

Altering temporal attention in delay discounting may be a useful tool in reducing delay discounting. A simple method that has been used to reduce delay discounting is “explicit-zero,” this is done by reframing the classical discounting choice as “something now but nothing later” versus “nothing now but more later” (Radu, Yi, Bickel, Gross and McClure, 2011). The present study explored altering temporal attention to reduce delay discounting in 27 undergraduate students. During the past hidden-zero effects, delay discounting effects options were framed as “[option i] \$5.00 today and \$0.00 in 26 days, OR [option ii] \$0.00 today and \$8.20 in 26 days”

(Radu et al., 2011). During Experiment 1 the larger later outcome was chosen more when it was presented with an explicit-zero frame. The following experiment evaluated the relationship between past and future hidden-zero effects. The results showed that there was a relationship between past and future hidden-zero discounting. Smaller proximate (SP) choices for both future and past outcome were reduced during explicit-zero framing. Therefore, manipulating temporal attention could be a useful tool in reducing the need to pick smaller sooner rewards over larger later ones.

Acceptance and Commitment Therapy

A common psychotherapeutic intervention used is Acceptance and commitment therapy (ACT; Hayes et al., 2006), which is rooted in Relational Frame Theory (RFT). From an RFT perspective human language and cognition is the learned ability to arbitrarily relate events, mutually and in combination and to change the function of events based on these relations (Hayes, et al., 2006). There is a shared connection between RFT and ACT; RFT looks at the language in which we use and how that relates to events we have experienced, and ACT takes those events and tries to create more workability for the human. ACT is primarily used to target rudimentary thinking and is trying to strengthen psychological flexibility (Hayes et al., 2006). Acceptance based and mindfulness-based strategies hones in on the individual's willingness to experience what cannot be managed such as stress or spending, and support choices that are rooted in awareness of the present moment (Scholten, Scheres, Water, Graf, Granic, Luijten, 2019). By strengthening, psychological flexibility clients are more likely to come in contact with the behaviors that they value (Hayes et al., 2006). From an ACT/RFT view, psychological problems can appear weak or not helpful contextual control over language processes (Hayes, Luoma, Bond, Masuda, and Lillis, 2006). ACT can be successful in reducing dysfunctional

behaviors related to delay discounting (Morrison et al., 2020). ACT is focused on strengthening psychological flexibility and the goal of ACT is to help individuals gain a sense of workability. Psychological flexibility is defined as, “The ability to contact the present moment more fully as a conscious human being, and to change or persist in behavior when doing so serves valued ends” (Hayes et al., 2006). The process found in ACT are what make up psychological flexibility. When an individual reaches psychological flexibility, they can regulate themselves and not get caught up in the form of their thoughts. When the individual can regulate themselves, they may pay more attention to details and have consistent behaviors such as achieving some goals. ACT targets these central problems by using acceptance which is taught as an alternative to experiential avoidance. Targeting cognitive fusion is an attempt to alter thoughts and change the thoughts forms. Present moment is the goal staying in the moment of the current environment. Self-as-context- is taught so that one can be aware of one’s experience without attachment to themselves. Values are chosen qualities of action that can be seen as achievable. Lastly, there are committed actions that encourage the development of larger actions to chosen values (Hayes et al., 2006). Targeting these components of ACT may help in reducing problematic behaviors caused by psychological inflexibility (Morrison et al., 2020).

ACT focuses on turning what is considered psychological inflexibility into psychological flexibility (Hayes et al., 2006). When a person is experiencing psychological inflexibility, they are often engaging in patterns of behaviors that do not align with their values (Hayes et al., 2006). There are six areas of psychological inflexibility. Dominance of conceptualized past or future or limited self-knowledge (Harris, 2008). Clients may find themselves dwelling on the past or worrying about the future. Fusion identifies what unhelpful thoughts, rules or limiting thoughts the individual may be experiencing (Harris, 2008). Experiential avoidance is what

thoughts are the individual trying to avoid such as painful experiences or memories. Most individuals may have the thought “if I don’t acknowledge the situation, it doesn’t exist” (Harris, 2008). Attachment to the conceptualized self is another process that is identified as being attached to your “story.” These stories can contain actual facts or false facts (Harris, 2008). Unclear values and lack of clarity is another process identified and may cause the person to lose sight of what they want to achieve. Lastly, we have unworkable action such as where the person may fail at doing, what impulsive decision are they taking and how may they be avoiding them (Harris, 2008).

Findings have identified a relationship between delay discounting and hypothetical rewards by using the illusion of gaining a reward, but many studies thus far have not evaluated a real-world commodity such as money or food (Green & Myerson, 2006; Dixon, Lik, Green & Myerson, 2013; Madden, Begotka, Raiff & Kastern, 2003; Miller, 2019).

Procrastination is prevalent in many academic settings (Sutcliffe et al., 2019), and may be associated with impulsive decision making. Psychological flexibility and steeper delay discounting are potentially associated with intense academic procrastination (Sutcliffe et al., 2019). Individuals with high self-control may be able to cushion the effects of low flexibility on procrastination (Sutcliffe et al., 2019). Sutcliffe and colleagues found that there was a no significant correlation ($r_s=.38, p < .001$) among psychological flexibility and academic procrastination. Delay discounting did not sufficiently suggest a relationship between psychological flexibility and procrastination (Sutcliffe et al., 2019). Psychological inflexibility may be a contributing factor in procrastination in the college population. Ultimately, ACT is potentially a great benefit in mediating psychological inflexibility in relation to procrastination in an academic setting.

Targeting areas such as psychological inflexibility, delay discounting and distress tolerance can all be assessed by using ACT (Morrison et al., 2020). Morrison et al., 2020, used brief treatments of ACT were used to assess impulsive decision making and following that ACT may help in significant reduction of the problem behavior (Morrison et al., 2020). Participants were randomly assigned to the ACT or control condition (Morrison et al., 2020). Using Acceptance-based intervention may prove to be useful as it may decrease distress that could arise from waiting on delayed outcome (Morrison et al., 2014) It was hypothesized that intervention would result in a reduction of problematic behaviors and delay discounting as well increase psychological flexibility, distress tolerance, valued living and well-being more than the inactive control (Morrison et al., 2020). This hypothesis was supported, excluding changes in delay discounting and valued living (Morrison et al., 2020). In summary the use of an acceptance and commitment therapy-based treatment could be a vital option for decreasing delay discounting rates and potentially affecting the choices that underlie an addiction or various problem behaviors (Morrison et al., 2014). ACT can be a useful tool when impulsive decision-making leads to higher delay discounting rates (Morrison et al., 2014). ACT can be a great tool when psychological flexibility is increased which may help those who suffer from high impulsivity.

There is no consensus on what defines brief ACT many studies have variation as to what this entails (Morrison et al., 2014; Hahs, Dixon, and Palliums, 2019). Morrison et al., 2014 used brief ACT that focused on two components of ACT: acceptance and value. Morrison et al., 2014, applied brief acceptance-based training on delay discounting rates which have been shown to be effective. A brief acceptance-based training is ACT may be a vital part used in treating high rates of delay discounting (Morrison et al., 2020; Morrison et al., 2014). Brief acceptance and commitment therapy training was also shown effective in treating psychological challenges

experienced by parents (Hahs et al., 2019). The purpose was to compare the effects of brief ACT-based workshop for parents of children with autism. The workshop format was used because of the limited time parents may have to dedicate to attending multiple sessions due to parental responsibilities. Using a randomized control design participants were allocated to the control group or ACT workshop. The control group completed the pre- and posttest while the ACT workshop completed two sessions. A slide show was used to describe the process of ACT and the concept of psychological flexibility (Hahs et al., 2019). The participants then were exposed to and completed the metaphors and activities included during the interventions (Hahs et al., 2019). The results suggest that the intervention could be effective for increasing elements psychological flexibility and mindfulness (Hahs et al., 2019).

Psychological flexibility as defined by Hayes et al., 2006 is “the ability to contact the present moment more fully as a conscious human being and to change or persist in behavior when doing so serves valued ends” (Hayes et al., 2006, p. 7). On the other hand, most individuals are experiencing psychological inflexibility. Psychological inflexibility is the inability to come in contact with what you value. Most individuals that experience psychological inflexibility are very rigid. It will be briefly explained how ACT is connected to RFT; RFT is the core human language and cognition that is learned through arbitrarily related events, mutually and combination and to change the function of events based on these relations (Hayes et al., 2006). ACT is a part of an ever-growing movement in behavioral and cognitive therapies to help promote being mindful and accepting (Hayes et al., 2006). There are six core processes of ACT which are: acceptance, cognitive fusion, present moment, self-as-context, committed actions and values. In the following weeks will talk about each one of these processes and participants will also do an exercise surrounding these core processes.

Working memory training

The term working memory (WM) refers to “a brain system that provides temporary storage and manipulation of the information necessary for such complex cognitive task such as language comprehension, learning, and reasoning” (Baddeley, 1992) The WM is an important feature of executive functioning and is described as the ability to briefly hold in mind and manipulate small amount of information to use in execution of cognitive task. An example of WM tasks could include holding a person's phone number in mind while listening to instructions about how to input the number in your phone, or listening to a sequence of events in a story while trying to understand what the story means. Past research has shown that WM and delay discounting has a significant correlation (Bobova, Finn, Rickert and Lucas, 2009). Bickel, Yi, Landes, Hill and Baxter, 2011 explored the functional cause between discounting and memory. Bickel et al., (2011), investigated participants receiving working memory training and whether that would result in less delay discounting of future rewards. Twenty-seven adults that were in treatment for stimulant use were randomly assigned to receive either working memory training or controlled training using a yoked experimental design. Results from Bickel et al., 2011, showed that discounting was significantly reduced among participants who received memory training in comparison to those who received control training. Pre- and post-training assessment were correlated with the composite working memory by applying Spearman’s correlational coefficient. The evidence presented here showed neurocognitive training on working memory can help decrease delay discounting and there is a relationship between working memory and delay discounting. Wesley and Bickel (2014), earlier study showed that working memory training decreased the delay discounting of future rewards but were unsure of what area of the brain contributed to this ability. Using the Activation likelihood estimation (ALE) a tool

designed to examine the degree of convergence since some difficulty was met, they created three z-score maps. The three z-maps corresponded to two individual 1=discounting and 2=finger tapping and one pooled set 3=delay discounting + finger tapping. Finger tapping and response inhibition was used to separate activity during tasks of delay discounting and working memory. In comparison to Bickel et al., 2011, Wesley and Bickel (2014) were able to identify the left lateral prefrontal cortex as the location where delay discounting and working memory process link together in the brain. Moreover, this indicated that this area can be target for therapy and improve behaviors that depend on the combination of the recent past with the future to come. The lateral prefrontal cortex is the most active part during the process of decision making and is especially when considering the rational cost and benefits of alternatives. Multiple identification has shown that the lateral prefrontal cortex is activated in studies of working memory and theorize specialization through monitoring and manipulation of task-relevant information. Although it is turned on by delay discounting there is no difference in other parameter such as length of delay, individual discounting rate or reward magnitude (Wesley & Bickel, 2014).

Money- management training

Focusing on money management may prove to be helpful in improving the value of future rewards as seen in these studies. There have been no studies so far that have examined money management and its relation to impulsivity but many on delay discounting. The first study found null results for delay discounting but yielded the expected results for cocaine abstinence. The second study found that teaching money management to people that have a disability is purpose in making them more independent. Black and Rosen (2011), study assessed money management with substance abuse users. The goal of this study was to show the effectiveness of a money management intervention, Advisor- Teller Money Manager (ATM), in

reducing delay discounting over time and the relationship to change in substance users. Participants were randomly assigned to 36- weeks of ATM treatment or a minimal-attention control condition (Black & Rosen, 2011). Through the intervention a measurement of delay discounting and cocaine was taken with a 52-week follow up measure of cocaine. During the ATM participants were motivated to make monthly budgets reflecting long-term goals, broken down into shorter-term spending plans. Options were given to the participants to deposited their funds into the ATM money manager and/or having checkbooks and ATM cards stored by the money manager. During the control condition patient did not receive individualized feedback about their spending and substance use but they were given a workbook. The workbook was used to make a monthly budget and they were encouraged to meet weekly with a counselor about their progress. Results indicated the ATM intervention had much more of significantly less delay discounting and less cocaine usage. Overall ATM treatment decreased delay discounting rates and the effects also showed up in how much the substance was not used. Improving financial skills can help individuals with disabilities and suffering from substance abuse as shown in Black and Rosen, 2011 and Elbogen, Tiergreen, Vaughan, Bradford, 2011. If applied to typically developing, college students or people with poor spending habits we may see the same reduction. Studies suggest that many people with severe mental illness poor money management skills are not due to their disability but to living with their parent and never having to create a budget for themselves (Elbogen et al., 2011). Hence, many students often live with adults, and they do not have to make any decisions about the money in the household. Once students are in college, they must make their own decisions leading them to make poor choices since they have no chance to perfect this skill. Elbogen 2011, suggested that money is a learned behavior and like any learned behavior there must be the will to learn the new skill. Kidwell, Brinberg and Turrisi (2003),

examined social psychological variables relevant to money management decisions among students in college. In regard to the results of this study the authors found that attitude, affect, perceived ability, and past experiences were found to have an influence on their money-management behavior. All the components contributed significantly to the direction in which budgeting behavior with an overall effect of R^2 of .544 (Kidwell et al., 2003).

HEADING 3

CONCLUSION

When looking to develop a program aimed at reducing delay discounting impulsive spending habits, there are a plethora of factors to be considered to help mend the problem. Delay discounting is generally studied in people who have substance abuse, mental disabilities, gambling addictions, and many other fields. Delay discounting does not have a single known cause, but it has shown to have a significant problem when it is not addressed. When it is mediated, we can see changes as observed in substance abuse uses, college students and (Black & Rosen, 2011; Elbogen, 2011; Bobova, 2011). Wesley and Bickel (2014), were able to uncover the unique role the later prefrontal cortex plays in delay discounting. Receiving treatment may prove to be helpful in choosing the later rewards in regards to delay discounting as shown in Black and Rosen, 2011; Radu, 2011; Green & Myerson, 2006). There needs to more studies that explore delay discounting in regards to money. There are not many out there that explore how always picking the sooner more available option can lead to worse behaviors. What we can tell is that many studies had two or more components added to it to be effective (Black and Rosen, 2011; Bickel et al., 2011; Morrison, 2014).

Given the successful nature of programs such as ACT, money management, altering temporal outcomes and its byproducts, it is likely that is a beneficial intervention would require multiple components across different disciplinaries.

CHAPTER 4

IMPLICATION FOR PRACTICE

From thorough analysis and translation of a variety of treatments and ideologies this review shines a light on many options for clinicians to interact with college students, with other populations and with other fields. There is no single course of treatment for treating delay discounting but when used in conjunction with a combination of other treatments delay discounting has been reduced. Behavior Analysts are seeking to find the best treatment to mediate delay discounting as well as trying to understand why high rates of delay discounting happen. In the analysis we say that CBT and ACT could be translated into behavioral language. For example, discounting is described as an overt behavior in behavior analysis, and it is believed that discounting is the act of encountering a highly reinforcing variable. From this research, one could in theory study how receiving ACT and money-based training may reduce spending habits in college students. By doing this one could develop a method to significantly lower delay discounting rates over a longer period (< 1 year). There are similar methods seen in programs such as money management and acceptance and commitment therapy. In these programs the primary focus is to teach the participants how to change their thought patterns on how they feel about money and money management teaches them how to better manage their money (Morrison et al., 2015; Black and Rosen, 2011; Kidwell et al., 2014). Integrating different therapies and programs can be done with the translation of behavioral terms and by doing this it may lead to new programs and ideologies that are geared towards finding a solution to a problem that weren't seen in treatment was unstable.

In the current literature we see many studies focusing on people suffering from substance abuse and gambling but there is a lack of literature that focuses on people with delay discounting

accompanied by impulsive spending habits. The research that is available suggests that acceptance and commitment therapy can help with decreasing psychological inflexibility (Hayes, 2006). When psychological inflexibility is decreased there is a change in how people tend to see things happening in the environment. Targeting working memory can help as well because many times learning the value of many can influence how you see it. New research has found the activated part of the brain that may controls the process of decision making and is especially when considering the rational cost and benefits of alternatives. Multiple identification has shown that the lateral prefrontal cortex is activated in studies of working memory and theorized specialization through monitoring and manipulation of task-relevant information. Knowing this information can help when it comes to doing future studies and also expending on what is already know.

For practice treatment should be the individual engaging in less delay discounting accompanied by better spending habits. When targeting a behavior like this we must also think about things they individual cannot control such as spending money on necessities (e.g. rent, car, utility bills).

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