GIVING VS. LOSING: AGE DIFFERENCES IN DECISIONS ABOUT CHARITABLE DONATIONS

By

Erika Sparrow, Bachelor of Science (Honours)

Carleton University, 2013

A thesis

presented to Ryerson University

in partial fulfillment of the

requirements for the degree of

Master of Arts

in the Program of

Psychology

Toronto, Ontario, Canada, 2016

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Abstract

Giving vs. Losing: Age Differences in Decisions about Charitable Donations

Master of Arts, 2016

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In addition to making decisions about gains and losses that affect only ourselves, often in life we make decisions that benefit others. Research on lifespan changes in motivation suggests that altruistic motives become stronger with age. However, few studies have explored the effect of age on decisions that affect others. The current study used a realistic financial decision making task involving choices for gains, losses, and donations. Each decision involved an intertemporal choice, in which the participant selected either a smaller-sooner or a larger-later option that could affect their bonus payout. Participants included 36 healthy younger adults (M = 25.1 years) and 36 healthy older adults (M = 70.4 years). Both age groups chose more larger-later donations than larger-later losses, but the magnitude of this effect was amplified in older relative to younger adults. These findings suggest that intertemporal choices may be sensitive to an age-related increase in altruistic motivation.

Keywords: altruism, reward, intertemporal choice, aging

Acknowledgements

First, I would like to sincerely thank my supervisor Dr. Julia Spaniol for her guidance throughout this project. Dr. Spaniol's superior knowledge and devotion to this science provided me with the opportunity to study a topic of profound interest to me. I would also like to thank my committee members, Dr. Todd Girard and Dr. Frank Russo for their thoughtful suggestions. I would also like to thank my family for the support they provided me throughout the process.

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Chapter 1: Introduction and Theoretical Background

Everyday life often presents us with choices between smaller-sooner and larger-later rewards, forcing us to engage in "intertemporal decision making" (Frederick, Loewenstein & O'Donoghue, 2002). Individuals tend to discount the value of the delayed reward, and often choose the more immediate – if smaller – reward, a phenomenon known as temporal discounting (Frederick et al., 2002). Choosing the smaller-sooner reward is sometimes viewed as disadvantageous, since it results in a smaller overall reward over time (Green, Fristoe & Myerson, 1994). Therefore, a choice pattern that maximizes personal earnings over time (i.e., choosing more larger-later rewards) is more reflective of optimal decision making. One factor shown to influence intertemporal choice behaviour is age, with several studies supporting an age-related decrease in temporal discounting (e.g., Eppinger, Nystrom & Cohen, 2012; Green et al., 1994; Löckenhoff, O'Donoghue & Dunning, 2011).

In addition to decisions that affect primarily ourselves, often in life we make decisions that benefit others. Charitable donations are an example of this. Comparable to rewards that benefit the self, charitable contributions have been shown to elicit positive affect and increased activity in reward regions of the brain, suggesting that individuals perceive donations as "personally rewarding" (Harbaugh, Mayr, & Burghart, 2007). Although altruistic behaviours such as charitable donations are gratifying, they often involve costs to the self (i.e., giving resources to others; Twenge, Baumeister, Ciarocco & Bartels, 2007). Therefore, the loss associated with charitable giving may account for why some groups of individuals behave more altruistically than others. Specifically, research has supported an age-related increase in altruism, whereby older adults are more likely to engage in altruistic tendencies than younger adults (e.g.,

Freund & Blanchard-Fields, 2014; Hubbard, Harbaugh, Srivastava & Mayr, under review). However, it is unknown whether delayed charitable rewards are discounted in the same manner as delayed self-rewards, and whether age moderates this relationship. The objective of the current study was to examine how discounting of gains and losses relate to discounting of charitable donations in younger and older adults.

1.1 Temporal Discounting

Many situations force us to make choices between costs and benefits at varying temporal distances, a task referred to as intertemporal choice (Frederick et al., 2002). As delays between intertemporal choices increase, the subjective value of the delayed outcome decreases, a phenomenon known as temporal discounting (Frederick et al., 2002). Temporal discounting, also referred to as delay discounting, is commonly measured with a series of choices between a smaller immediate monetary reward, and a larger delayed monetary reward that affects only the self. For example, do you prefer $5 now or $7.50 in 30 days? Individuals high in temporal discounting are those who more often choose the smaller-sooner rewards over larger-delayed rewards, whereas individuals low in temporal discounting are those who more often prefer larger delayed rewards over smaller sooner rewards. Choosing the smaller, more immediate reward is often viewed as impulsive or irrational since it results in less total reward over time (Green et al., 1994). Therefore, delaying gratification is more reflective of optimal decision-making (Halfmann, Hedgcock & Denburg, 2013). Although temporal discounting rates vary considerably between individuals, humans in general have a marked ability to forgo immediate gratification in favour of larger delayed rewards since many important decisions are only rewarded after several months or years (Peters & Büchel, 2010). By analyzing choices between smaller-sooner and larger-later rewards, researchers have consistently found that reward is

discounted hyperbolically as a function of delay (Frederick et al., 2002). Hyperbolic functions have been shown to describe discounting of several different types of rewards such as money, food, health, and vacations (e.g., Chapman & Einstein, 1995; Estle, Green, Myerson & Holt, 2007).

Research on temporal discounting has also explored how individuals discount negative outcomes, such as monetary losses. Similar to gains, losses are also discounted hyperbolically but the slope of the hyperbolic curve has consistently demonstrated to be more shallow than for gains. Specifically, research has supported a gain-loss asymmetry known as the "sign effect", which refers to the finding that delayed gains are discounted more than delayed losses (e.g., Lowenstein, 1987; Xu, Liang, Wang, Li & Jiang, 2009). That is, while the subjective utility of gains diminishes with temporal distance, the subjective disutility of losses does not diminish with temporal distance. Stated differently, individuals prefer smaller-sooner losses more often than smaller-sooner gains (see Xu et al., 2009). Research supporting the sign effect reflects the notion of loss aversion whereby individuals have a stronger tendency to avoid losses than to acquire gains (Kahneman & Tversky, 1984).

In addition to decisions for the self, often in life we make decisions on behalf of others (O'Connell, Christakou, Haffey & Chakrabarti, 2013). The majority of studies on temporal discounting have employed self-directed rewards, wherein individuals are presented with intertemporal choices that benefit themselves. In contrast, less effort has been directed towards intertemporal decisions for others, in which individuals make intertemporal choices that result in rewards for other persons, rather than for themselves. Studies examining discount rates between self-directed rewards and other-directed rewards are limited and inconsistent. In two studies, individuals discounted less (i.e., more often choosing the larger delayed reward) when choosing

rewards for others as a function of increasing social distance (i.e., level of intimacy; Albrecht, Volz, Sutter, Laibson & von Cramon, 2011; Ziegler & Tunney, 2012). In contrast, O'Connell et al. (2013) found that individuals discounted more for others and that the steepness of discounting increased with greater social distance from the self. A key difference between these studies is that O'Connell et al. (2013) instructed participants to "put themselves in someone else's shoes" by responding from the perspective of the other, rather than the benefit of the other, whereas Albrecht et al. (2011) and Ziegler and Tunney (2012) asked participants to simply "make choices for the other person" and "make choices you think the other person should make" respectively. O'Connell et al. (2013) suggested that the ease of simulation varies as a function of social distance, such that it is easier to make choices for others that are closest to one's self (socially intimate) compared to individuals for whom we know little information (socially distant). Therefore the social distance between the decision maker and the recipient may influence intertemporal decisions for others.

An important aspect of making decisions that affect others is the possibility of obtaining vicarious rewards. Personal and vicarious rewards have been shown to elicit overlapping activation of the ventromedial prefrontal cortex (vmPFC), a region commonly activated in response to reward (Morelli, Sacchet & Zaki, 2015). Mobbs et al. (2009) found that individuals who viewed others receive rewards had increasing activation in reward areas of the brain when the recipient was more socially desirable. This suggests that our perceived similarity to the beneficiary influences both our subjective and neural valuation for vicarious rewards. Supporting this idea, immediate self-rewards have been shown to elicit significantly more activation of the reward network than immediate rewards for others (Albrecht et al., 2011). Overall, these studies suggest that levels of personal reward received are contingent upon the perceived social

closeness towards the recipient. In addition to making decisions for ourselves, individuals who passively observed intertemporal choices being made by another person for themselves and for others showed more activity in "reward network" regions when rewards were immediate rather than delayed (Albrecht, Volz, Sutter & von Cramon, 2013). Additionally, activation of these regions was stronger when immediate rewards were for the self than others, suggesting that individuals derive more personal gratification when observing immediate rewards that benefitted themselves.

In contrast to decisions that reward only others, research on intertemporal choice has also explored how individuals discount rewards that are shared with others. This line of inquiry is motivated by the fact that real-world decisions often involve groups. Yi, King, Carter, Landes and Bickel (2011) found that when individuals are presented with intertemporal choices to be equally split between themselves and their group members, discount rates are similar to the discount rates that benefit the self only. Interestingly, Yi and colleagues found gender to be a moderating variable, such that males showed greater temporal discounting for self-rewards, whereas females discounted more for group rewards. Suboptimal intertemporal decision making pattern for males relative to females has also been found across studies (Silverman, 2003). This effect compliments Bjorklund and Kipp's (1996) hypothesis that due to selection pressures operating during evolution, females are better able than males to postpone gratification A more recent study demonstrated that individuals discounted less when reward outcomes affected the group, relative to when the reward outcomes affected the self (Charlton, Yi, Porter, Carter, Bickel & Rachlin, 2013). Charlton et al. (2013) did not report information on participant's gender, which may be an important variable in regards to the mixed results in this area.

In summary, although there remains some controversy, research suggests that individuals

display different levels of discounting for outcomes that affect the self versus outcomes that affect others. Importantly, the social distance from and similarity to the recipient may be influential factors in determining how individuals discount outcomes for others. Currently, research on intertemporal decisions for groups has been limited to groups that are unknown to the participant. It therefore remains undetermined how individuals discount other-directed rewards that are targeted towards specific groups (e.g., charitable donations). Outcomes for unknown individuals within specific groups may be less ambiguous than those for individuals in non-specific groups.

1.2 Age Differences in Temporal Discounting

Several factors have been shown to be associated with temporal discounting rates, including age, personality, risky behaviours and health behaviours (Alessi & Petry, 2003; Green et al., 1994; Hirsh, Morisano & Peterson, 2008; Reimers, Maylor, Stewart & Chater, 2009). Research on age differences in temporal discounting is limited and has yielded mixed results.

Age-related decrease in temporal discounting. Green et al. (1994) were the first to explore temporal discounting across the lifespan. Their results showed that older adults discounted delayed rewards less than younger adults, who in turn discounted less than children. More recent studies have also found an age-related decrease in discounting whereby older adults show a stronger preference for larger later rewards than younger adults (Li, Baldassi, Johnson & Weber, 2013; Green, Myerson & Ostaszewski, 1999; Jimura et al., 2011; Reimers et al., 2009; Whelan & McHugh, 2009). In an attempt to minimize the natural variability associated with aging, Halfmann et al. (2013) found that older adults discounted less than middle-aged adults when controlling for age-related cognitive decline, using the Iowa Gambling Task as a measure of neurocognitive decline. Similarly, Löckenhoff et al. (2011) emphasized the importance of

matching younger and older samples on relevant background characteristics, including cognitive functioning (i.e., vocabulary, verbal working memory, perceptual-motor speed, numeracy), income and education. Löckenhoff and colleagues explored age differences in temporal discounting and the role of affective responses, while controlling for these characteristics. Results showed that the age-related increase in patient choices was most prominently driven by the improved ability to inhibit emotional factors from interfering with daily functioning in older age (Löckenhoff et al., 2011). Other studies have expanded on these behavioural studies with neuroimaging methods to better understand age-related differences in the neural mechanisms of discounting. Eppinger et al. (2012) explored the neural mechanisms of temporal discounting in younger and older adults. Behavioural results confirmed that older adults discounted less than younger adults, while functional magnetic resonance imaging (fMRI) results indicated a reduced sensitivity of dorsal and ventral striatal regions to reward (Eppinger et al., 2012). These age-related changes in sensitivity to rewards may reflect changes in dopaminergic modulations prevalent in older age (Eppinger et al., 2012). These results further support an age-related decline in temporal discounting.

Age-related increase in temporal discounting. Other studies have reported age differences in the opposite direction, such that discount rates increase with age. Harrison, Lau and Williams (2002) found that older adults discounted more than younger adults and middle-aged adults discounted less than both other groups. To date two studies have found evidence supporting this curvilinear pattern, such that middle-aged adults discounted the least (Martorano, Hands, Halper, Pettifor & Thirumurthy, 2015; Read & Read, 2004). This middle-aged drop in discounting is best reflected by Sozou and Seymour's (2003) evolutionary perspective of delay discounting. Specifically, from adolescent to middle-age, patience for later outcomes increases

due to greater familiarity with receiving future rewards. After middle-age, patience for future rewards declines due to reduced fertility and time left in life. Similarly, Albert and Duffy (2012) found that older adults made more smaller-sooner preferences than younger adults. Green, Myerson, Lichtman, Rosen and Fry (1996) explored the potential role of income in discounting and found that upper income younger and older adults discounted similarly, whereas lower income older adults discounted more than upper income younger adults. Contrary to the majority of studies that use Western samples, Liu et al. (2016) utilized a life-span sample of Chinese participants and also found an age-related increase in discount rates. These results contradict the age-related decrease in discounting and highlight the importance of socioeconomic and cultural factors that may influence economic decision making in general.

No age differences in temporal discounting. A number of studies on age differences in temporal discounting have found an absence of behavioural age effects. After controlling for potential confounds, younger and older adults have been shown to discount monetary rewards similarly (Chao, Szrek, Pereira & Pauly, 2009; Rieger & Mata, 2015; Roalf, Mitchell, Harbaugh & Janowsky, 2012). Samanez-Larkin et al. (2011) also found no behavioural age differences in temporal discounting, but fMRI results showed that the ventral putamen (a region within the dorsal striatum) was less sensitive to the delay period in older adults relative to younger adults. These results coincide with Eppinger et al. (2012) such that reduced striatal sensitivity may be due to age-related changes in dopaminergic production. Additionally, two studies to date have explored age differences in the discounting of losses, but found no age differences (Halfmann et al., 2013; Löckenhoff et al., 2011). Since previous research on younger adults has shown that individuals discount future losses less than future gains (e.g., Xu et al., 2009), perhaps low levels of loss discounting remain stable into older age, supporting the absence of age differences found

in these studies.

Methodological differences make cross-study comparisons difficult and may account for these inconsistent findings. For example, Green et al.'s (1994) younger adult sample had an average age of 20 while Green et al.'s (1996) younger adult sample had an average age of 30. Additionally, a better understanding of other factors that may moderate the impact of age on intertemporal choice is necessary to elucidate these inconsistencies. Although mixed, most research on age differences in temporal discounting supports an age-related increase in the preference for patient choices and is limited to exploring how age influences discounting of self-rewards. Therefore, it is unknown how age may influence intertemporal decisions that involve others. This is an interesting question, given that in real life situations, we often make decisions that either directly or indirectly affect others.

1.3 Altruism

Altruism is defined as the motivation to help others with the ultimate goal of benefitting others rather than the self (Andreoni, 1989). Acts of altruism are forms of prosocial behaviours, which encompass a broad class of voluntary actions that are intended to help or benefit another individual or group of individuals (Eisenberg & Mussen, 1989). Acts of altruism can include formal helping behaviours (i.e., charitable giving, volunteering, donating blood) and informal helping behaviours (helping family, friends, strangers; Wiepking & James, 2013).

Forms of altruism can be distinguished by the underlying motivation that precipitates the prosocial action. Pure altruism is the benefit an individual experiences by contributing to the public good without hedonistic pleasure, whereas warm-glow altruism is motivated by the positive experience associated with the act of giving, and may thus be viewed as more hedonistic than pure altruism (Harbaugh et al., 2007). In an fMRI study, voluntary acts of altruism (e.g.,

charitable donations) elicited more activity in brain regions associated with reward processing than did mandatory contributions to the public good (e.g., taxes; Harbaugh et al., 2007). This suggests that individuals derive more pleasure from voluntary acts of altruism than from mandatory acts (Harbaugh et al., 2007). In addition to intrinsic motivation, individuals can also be extrinsically motivated to act altruistically. Charitable donations can have many psychological benefits such as increased well-being and happiness (Andreoni, 1989; Dunn, Aknin & Norton, 2008; Kahana, Bhatta, Lovegreen, Kahana & Midlarsky, 2013). Donors can also benefit economically. For example, in North America, charitable contributions can be deducted from taxable income, making the price of giving inversely associated to the marginal tax rate (Yörük, 2014). Individuals who donate to charities can also gain the social benefits of giving by demonstrating their wealth. For example, the provision of public goods can allow individuals to gain social recognition for their donation, thus signaling their income status to others (Glazer & Konrad, 1996). Lastly, charitable donors have been shown to benefit physically in terms of overall health. For example, tax benefits for charitable giving have been shown to have positive spillover effects on health outcomes (Yörük, 2014). Importantly, health benefits of donating are robust even when accounting for endogenous factors such as income (Yörük, 2014).

In addition to the intrinsic or extrinsic rewards received, altruistic behaviours often involve costs to the self (Twenge et al., 2007). For example, decisions to make charitable donations can present individuals with a discrepancy between the general long-term goal of being altruistic and immediate negative consequences of giving. Downsides of donating include forgoing alternative uses for the money that is being given away, and the immediate "pain" of paying (Prelec & Lowenstein, 1998). Pain of paying is described as the direct displeasure from the act of making a payment (Prelec & Lowenstein, 1998). The pain of paying may reduce the

satisfaction of donating to a charitable cause, decreasing an individual's likelihood of acting prosocially. Therefore, charitable donations can also be interpreted as a loss to the self if an individual places more value on the immediate negative outcomes of giving rather than the long-term positive outcomes of acting prosocially.

In sum, engaging in forms of altruism can have several positive outcomes for the individual, regardless of the underlying motivation that gives rise to the prosocial action. When deciding on whether to participate in an act of altruism, individuals may weigh the positive and negative outcomes of acting prosocially. Differential weighting of the negative and positive outcomes of the prosocial behaviour may influence one's likelihood of behaving altruistically.

1.4 Age Differences in Altruism

Individual difference factors that have been demonstrated to influence acts of altruism include age, religion, education and socialization (for review see Bekkers & Wiepking, 2011). Prior work on age differences in altruism suggests an age-related increase in altruistic tendencies.

Age-related increase in altruism. One factor that has been believed to influence altruistic behaviour is age. In terms of charitable giving, the percentage of income devoted to non-profit organizations increases steadily across the lifespan (Andreoni, 2006). In 2013, Canadians aged 65 and older gave an average of $720 to non-profit or charitable organizations, compared to $531 for all Canadian donors (Statistics Canada, 2015). In addition to observations in the "real world", laboratory-based studies have also found support of an age-related increase in terms of charitable contributions (Freund & Blanchard-Fields, 2014; Hubbard et al., under review). Some studies have employed common economic games to explore age differences in altruism. In the standard dictator game, the participant presents an anonymous stranger with a one-time monetary offer (Kahneman, Knetsch & Thaler, 1986). Utilizing this measure, Roalf et

al. (2012) found that older adults were more likely to split funds equally with the recipient than younger adults. Similarly, when inducing empathy into participants serving in the dictator role, Beadle, Sheehan, Dahlben and Gutchess (2013) found that older adults gave significantly more than younger adults. These results support an age-related increase in altruism since older adults were more likely to give away more money, which in turn reduced their own reward (Roalf et al., 2012).

To date, research has supported an age-related increase in altruistic behaviour, but the mechanisms that support this association have received little attention. Hubbard et al. (under review) sought to explore the mechanisms that support altruism throughout the lifespan. Hubbard and colleagues proposed the general benevolence (GB) hypothesis, according to which altruism is a trait-based concern for others. Utilizing a multi-method approach combining measures from psychology, behavioural economics and neuroscience, Hubbard and colleagues found that the measures converged on a single GB factor, which showed a strong positive correlation with age. Additionally, GB was found to be positively correlated with religiosity and helping behaviour, and negatively correlated with neuroticism. There was no association between GB and wealth.

In addition to an age-related increase in GB, lifespan theories of motivation speak to the issue of age-related change in prosocial behaviour. Social Exchange Theory (SET) applies the economic theory of supply and demand to interpersonal relationships, whereby social behaviours are viewed as a result of an exchange process (Homans, 1958). Therefore, as the number of social interactions decrease, the value of social interactions increase. Since social interactions become less frequent in older age due to physical constraints (e.g., increased fragility) and age-related role losses (e.g., death of spouse), this places a greater value on seeking social interactions. Decreased social interactions associated with normal aging have been shown to

positively associate with loneliness (Smith, 2012). Loneliness is viewed as a significant problem in the older population, and can lead to many negative outcomes such as depression, alcoholism, poor self-concept and suicide (Newson, 2006; Rokach, 1999). Therefore, older adults may use forms of giving as sources of social power to secure greater interpersonal relationships (Mathur, 1996). Perhaps securing greater social interactions may help to offset the negative outcomes associated with loneliness in older adulthood.

This age-related focus towards securing social interactions is supported by Socioemotional Selectivity Theory (SST), in which the association between time left in life and chronological age influences the pursuit of social goals. Specifically, older adults perceive their time left in life as more limited, and therefore prioritize socioemotional goals, whereas younger adults perceive their lives as more open-ended, therefore prioritizing knowledge-related goals (Carstensen, Isaacowitz, & Charles, 1999). Freund and Blanchard-Fields (2014) explored the effects of future time perspective on charitable giving in younger and older adults. Results showed that older adults manipulated with a longer future time perspective decreased their donations, whereas a shorter future time perspective manipulation did not increase donations in younger adults. These results partly confirm SST, such that a longer future time perspective may decrease older adult's tendency to engage in behaviours that promote socioemotional goals. This age-related valuation of socioemotional goals reflects the notion that maximizing one's own resources becomes less important with increasing age (Freund & Riediger, 2001). Specifically, younger adults are reluctant to spend resources such as money on anything but themselves because these resources are essential to achieve important developmental goals, whereas older adults have already acquired a sufficient amount of resources throughout their life (Freund & Riediger, 2001).

In addition to the social and contextual factors that may contribute to aging and altruism, it is also important to consider the potential role of age-related changes in cognition. Specifically, increasing age is associated with a decline in dopaminergic activity (Erixon-Lindroth et al., 2005). This age-related decline in dopamine has shown to influence a variety of cognitive functions, including incentive processing via dopaminergic pathways to the brain's reward network (Haber & Knutson, 2010). Since the dopaminergic and serotonergic brain systems have been identified as being implicated in economically relevant behaviour (Mohr, Li & Heekeren, 2010), perhaps these neurotransmitters contribute to age-related differences in altruistic decision making.

Age-related curvilinear relationship in altruism. It is important to note that commonly, studies examining age differences in altruism view older adults as a homogenous group (i.e., 65 and older). Although older age has commonly been associated with charitable giving, when the positive linear trend is examined more closely, studies commonly find that the positive relationship between age and charitable donations becomes negative at the oldest ages (Wiepking & James, 2013). Specifically, prior research has supported an age-related increase in charitable giving up until age 75 and then declines with further age (Midlarsky & Hannah, 1989; Wiepking & James, 2013). Wiepking and James (2013) suggest that the decrease in giving at the older age may be due a decline in health and cognitive status associated with normal aging. Specifically, declining health conditions may lead to lower charitable contributions due to increase health care costs and inability to attend events where charitable donations are commonly received (e.g., religious services, fundraisers). On the other hand, donations may decrease in oldest age due to impairments in normal cognitive functioning since cognitive skills enable individuals to understand the needs of distant people (Wiepking & James, 2013). Other factors such as loss of

financial control, and the will to pass on wealth after death may also mediate the relationship between age and charitable giving. Therefore, future research is needed to elucidate the type of relation between aging and charitable giving. Perhaps dividing older adults into more specific age groups may obtain a more accurate account of charitable giving in older age.

Regardless of the trend supported in older age, prior research indicates that altruistic tendencies increase steadily until at least age 75. Consistent with this notion, real-world observations of charitable giving have consistently shown that older adults are more likely to donate to charitable organizations, even when controlling for factors such as income. Several lifespan theories of cognition and emotion have proposed potential mechanisms that may underlie greater altruistic tendencies in late-life, but their predictions have yet to be fully investigated. The current study seeks to help fill this empirical gap by examining age differences in altruistic decision making in the context of temporal discounting.

1.5 Summary

As this review of the literature has shown, older adults tend to display greater prosociality than younger adults. Additionally, older adults generally discount future rewards less steeply than younger adults. However, it is unknown whether or not charitable rewards are discounted in the same way as rewards for the self, and whether or not age moderates this relationship. To the best of our knowledge, the current study is the first to examine how discounting of gains and losses relate to discounting of charitable rewards in younger and older adults. Gains included personal monetary gains, donations included monetary gains for a charity accompanied by a personal loss, and losses included personal monetary losses. Because donations can be viewed as both rewarding and costly to the self, charitable discount rates were compared to the discount rates to both gain and loss conditions to help disentangle the extent to which intertemporal

charitable decisions resemble gain versus loss decisions.

Chapter 2: The Current Study

Given the inconsistencies in the literature on age differences in temporal discounting, the first objective of the current study was to help clarify the effect of age on discount rates for gains, and contribute to the aging literature on loss discounting, which to date has received little attention. The second objective was to explore the effect of age on intertemporal decisions involving charitable donations. To test this, younger and older adults completed a realistic financial decision making task involving choices for a) gains, b) losses, and c) charitable donations. Each decision involved an intertemporal choice, in which the participant selected either a smaller-sooner or a larger-later option that could affect their bonus payout. For each participant, we calculated separate measures of intertemporal choice preference, or "reward indices" (Benoit, Gilbert & Burgess, 2011), for gain, loss, and donation conditions. A reward index of 1.0 is obtained by choosing outcomes that maximize overall personal earnings (i.e., constant selection of the larger-later outcome for gains and constant selection of the smaller-sooner outcome for donations and losses).

Hypotheses

In line with past research supporting a gain-loss asymmetry in discount rates, we predicted that individuals would have a lower Gain Index than Loss Index (Lowenstein, 1987; Xu et al., 2009). Therefore, regardless of age, participants were predicted make choice patterns were more optimal for losses than gains for in terms of maximizing personal earnings. The sign effect is consistent with the theory of loss aversion, whereby individuals have a stronger tendency to avoid losses than to accumulate gains (Kahneman & Tversky, 1984).

Secondly, we hypothesized an age-related increase in the Gain Index, and possibly also for the Loss Index. In other words, we expected that older adults would choose more larger-later gains and perhaps more smaller sooner-losses than younger adults, which would be more

reflective of optimal decision making (minimizing losses and maximizing gains over time; Löckenhoff et al., 2011). Löckenhoff and colleagues previously reported a non-significant trend for age differences in the loss discounting; therefore we maintained the possibility of potential age differences in the Loss Index.

Lastly, we predicted age-related differences in the degree to which intertemporal choice patterns would differentiate between Loss and Donation Indices. In line with the GB hypothesis (Hubbard et al., under review), the altruistic gain was expected to "outweigh the pain" of giving for older adults, more so than for younger adults. According to this hypothesis, Donation Index was expected to be smaller than the Loss Index for older adults. In other words, older adults were predicted to choose more larger-later options in the for donations than losses. In contrast, for younger adults, the "pain of giving" was predicted to be more pronounced, which would result in a similar intertemporal choice pattern for donations and losses.

Past research has shown that temporal discounting can be influenced by a variety of factors, therefore we included several demographic, cognitive and affective measures thought to contribute to potential age differences in intertemporal decision making. To account for the influence of age-related cognitive decline, we included measures of perceptual speed, numeracy, vocabulary and mild cognitive impairment (MCI). We also included measures of mood and behavioural motivation to control for potential age-related differences in these domains. Lastly, we assessed participants' future orientation and altruistic tendencies, all of which may plausibly be linked to intertemporal choice preferences.

2.1 Method

Participants

All participants gave written informed consent for the study, which was approved by the

ethics committee at Ryerson University. Participants included 36 younger adults (age range 18-35 years old) and 36 older adults (age range 65-85 years old). Younger adults were recruited through flyers in the community and social media outlets including Kijiji, Craigslist and Facebook. Older adults were recruited through the Ryerson Senior Participant Pool (RSPP). Participants reported no major health problems (e.g., history of neurological disorder, traumatic brain injury, or psychiatric disorder), had normal or corrected-to-normal vision and hearing, were not taking any medications or supplements that may affect normal cognition and fell within the normal to moderate categories on the depression and anxiety subscales of the Depression Anxiety and Stress Scale 21 (DASS21; Lovibond & Lovibond, 1995). Additionally, older adults scored 26 or higher on the Montreal Cognitive Assessment (MOCA; Nasreddine et al., 2005), therefore fit the criterion for normal cognitive status. Additional participant characteristics are shown in Table 1. Two younger adults were excluded due to severe scores on the DASS21 subscales, and one younger adult was excluded due to refusal to choose a charity for the discounting task. Three older adults were excluded due to low scores on the MOCA, and one older adult was excluded due to misunderstanding the discounting task. Participants were replaced and administered the appropriate version of the discounting task. All participants received a monetary incentive ($12) for their participation.

Design

The design included the between-subjects factor group (younger vs. older) and the within-subjects factor reward type (gain vs. loss vs. donation). Reward types were presented in three separate blocks, counterbalanced across participants in each age group. Within each block, trials were presented in random order.

Individual Difference Measures

All participants completed a series of background measures: the Digit Symbol Coding Task (DSC), the DASS 21, the Positive and Negative Affect Schedule (PANAS), the Behavioural Approach Systems and Behavioural Inhibitions Systems Scale (BIS/BAS), the Berlin Numeracy Test (BNT), the Consideration of Future Consequences Scale (CFC-14), the Self-Report Altruism (SRA) Scale, two hypothetical trials of the dictator game, the Mill Hill Vocabulary Scale and lastly an "End of Study" questionnaire to assess level of income. Additionally older adults completed the MOCA.

DSC. The DSC task (Version 1) from the Wechsler Intelligence scales (1997) requires one to match 9 symbols to their corresponding numerical digit (see Appendix A). The participant is timed for 2 minutes and is asked to fill in as many symbols to the corresponding digit as accurately and as quickly as possible. The task measures general cognitive performance but specifically places high demands on processing speed under high cognitive workload and memory. Versions 1-4 of the DSC task have shown to have high intraclass correlation coefficients ranging from 0.88 to 0.99 (Hinton-Bayre & Geffen, 2005).

DASS21. The DASS 21, developed by Lovibond and Lovibond (1995), is a 21-item questionnaire comprised of three self-report scales that was used to measure negative emotional states of depression, anxiety, and stress (see Appendix B). The three scales of the DASS have demonstrated high Cronbach's alpha depression ($\alpha = .91$), anxiety ($\alpha = .81$), and stress ($\alpha = .89$; Lovibond & Lovibond, 1995).

PANAS. The PANAS, developed by Watson, Clark and Tellegen (1988) is a 20-item self-report questionnaire and was administered to measure positive (10 items) and negative mood (10 items; see Appendix C). High alpha reliabilities have been demonstrated for both the positive affect (.90) and negative affect (.84 to .87) subdimensions (Watson et al. 1988).

BIS/BAS. The BIS/BAS developed by Carver and White (1994) is a 24-item scale designed to measure two general motivational systems underlying behaviour (see Appendix D). The BAS is believed to control appetitive motives, in which the goal is to achieve something desirable, whereas the BIS is said to regulate aversive motives, in which the goal is to refrain from something undesirable. The BIS/BAS scales have shown sufficient reliability for Cronbach's α ranging from .54 to .82 (Smits & Boeck, 2006).

BNT. The BNT, developed by Cokely, Galesic, Schulz, Ghazal and Garcia-Retamero (2012) is a 4-item measure that was used to assess statistical numeracy and risk literacy (see Appendix E). The BNT has demonstrated high convergent validity with prior measures of numeracy and cognitive ability, and low associations with unrelated constructs (Cokely et al., 2012).

CFC-14. A modified version of the CFC (see Appendix F) was used to assess the extent to which the participant values the future outcomes of their behaviour (Joireman, Shaffer, Balliet & Strathman, 2012; Strathman, Gleicher, Boninger & Edwards, 1994). The modified 14-item CFC-scale is a one-dimensional scale and is composed of two sub-scales (CFC-Immediate and CFC-Future). The 14-item CFC scale is measured on a 5-point Likert scale (1= extremely uncharacteristic, 5 = extremely characteristic). Both CFC-Future and CFC-Immediate subdimensions have revealed high reliability (respective Cronbach's α = .80 and .84; Joireman et al., 2012).

SRA. The SRA scale, developed by Rushton, Chrisjohn, and Fekken (1981), is a 20-item measure that was administered to assess self-perceived levels of altruism (See Appendix G). Participants were asked to rate the frequency with which they have engaged in the altruistic behaviours (1 = never, 5 = very often). The SRA has displayed a high level of internal

consistency (α = .89; Rushton et al., 1981).

Dictator Game. Developed by Kahneman, Knetsch, and Thaler (1986), two trials of the dictator game were used to assess voluntary levels of other-regarding behaviour (see Appendix H). Participants were asked to decide how much of a hypothetical $10 endowment to keep for themselves and how much to donate to the charity of their choice. All possible whole dollar combinations by which $10 can be divided were presented to the participant.

Mill Hill Vocabulary Scale. The Mill Hill Vocabulary Scale (Raven, 1982) is a standard, multiple-choice format vocabulary scale comprising 34 items (see Appendix I).

MOCA. Older adults were given the MOCA as test to examine potential cognitive impairment (see Appendix J). Developed by Nasreddine et al. (2005), the MOCA is a 30-point test with high sensitivity and specificity for detecting MCI.

End of Study Questionnaire. Participants were presented the end of study questionnaire to assess level of household income (see Appendix K), acknowledging the sensitive nature of this information. If comfortable, participants were asked to indicate their annual household income before taxes from a list of 7 specified ranges, number of persons in each household supported by the annual income, and whether or not the participant is supported by their parents or contributes to the shared income.

Stimuli and Apparatus

E-Prime 2.0 (Psychology Software Tools, Inc.) was used for stimulus presentation and response collection on a 16.0″ LCD display running 32-bit Windows 7 Enterprise Edition. Viewing distance was approximately 50 cm. Participants chose one local charity from a list to allocate their donations to (see Appendix L). Additionally, participants were asked to indicate, using a visual analogue scale (VAS), how relevant the chosen charity was to them (i.e., to what

extent they identified, and/or have a close other who identified, with the charity; see Appendix M). This measure was included in light of research suggesting that social closeness may influence discount rates (e.g., O'Connell et al., 2013).

Procedure

Methods for the current study were adapted from Löckenhoff et al.'s (2011) study on aging, temporal discounting and affective responses. Before the 90-minute session began, the experimenter provided an overview of the study tasks. Participants were asked to sign a consent form and then completed the first set of background measures. The order of background measures were as follows: DSC, DASS 21, PANAS, BIS/BAS, BNT, CFC-14, SRA. Next, participants were guided to the computer where they were presented with a list of charities numbered 1 to 7 and were asked to choose a charity by entering the appropriate number on the computer. Participants then completed a VAS rating on a scale from 0 to 100 on the computer to indicate how self-relevant the chosen charity was for them. The experimenter allowed the participant privacy when selecting the charity and completing the self-relevance rating. Next, participants completed the two dictator game trials. A blank screen then appeared, prompting the experimenter to re-approach the participant and begin the experimental task demonstrations. After the experimental measures (described below), participants were asked to complete a second VAS rating on a scale from 0 to 100 to indicate how confident they were throughout the task that the reward selected for them would be paid out as instructed (see Appendix N). Afterwards all participants completed the Mill Hill Vocabulary scale, and older adults were administered the MOCA. Lastly, all participants were presented with the End of study questionnaire.

The computerized temporal discounting task administered in the current study offered

several advantages: (1) it provided behavioural rather than self-report measures of temporal discounting, (2) it involved real, rather than hypothetical, incentives, and (3) it included Gain, Loss, and Donation conditions.

On each trial of the task, participants choose between an immediate and a delayed gain for the self (gain condition), or between an immediate and a delayed donation to the charity they had previously chosen from the list (donation condition), or between an immediate and delayed loss for the self (loss condition). A sample display is shown in Figure 1. The immediate option was held constant at $5, whereas the delayed option varied with respect to amount ($4.75, $5.25, $5.50, $6.00, $6.50, $7.00, $7.50) and delay (7, 30, 90, or 180 days). Each combination of amount and delay was presented once in each of the three conditions, resulting in 84 unique trials. Conditions were blocked, with block order counterbalanced across participants in each age group. Within blocks, trials were presented in random order. Participants completed six practice trials (two for each condition) to ensure that they understood and were comfortable with the task. Each trial began with a self-paced cue, "choose amount," which was intended to prepare participants for the upcoming task. There were no time restrictions on responses, allowing participants as much time as they needed.

To lend realism to both reward types, the experimenter presented participants with a "starting capital" in two envelopes, labeled "now" and "later," each containing $10 in cash before they made their series of decisions. Participants were told that they would make a series of decisions in the upcoming task, that at the end of the task the computer would randomly select of their 84 choices, and that the money that remained in the two envelopes would be theirs to keep. Specifically, the appropriate change was applied to the starting capital, and the content of both envelopes went to the individual or to the charity, depending on the type of trial that was

randomly selected. For example, the computer may have randomly selected a gain trial on which the participant chose a $7 gain in 7 days over an immediate gain of $5. The participant would then receive $10 immediately ("now" envelope), as well as a cheque for $17 (i.e., $10+$7), mailed to the participant's home address 7 days later. Alternatively, the computer may have randomly selected a donation trial on which the participant chose to donate $6.50 in 30 days over an immediate donation of $5. The participant would then receive $10 immediately ("now" envelope), as well as a cheque for $3.50 (i.e., $10-$6.50), mailed to the participant's home address 30 days later, along with an e-mail confirmation of payment for $6.50 that was donated online by the researcher to the respective charity 30 days later on behalf of the participant. Finally, the computer may have randomly selected a loss trial in which the participant chose to lose $5.50 in 90 days over an immediate loss of $5. The participant would then receive $10 immediately ("now" envelope), as well as a cheque for $4.50 (i.e., $10-$5.50), mailed to the participant's home address 90 days later. The rewards for the choice task were separate from the reimbursement for participating in the study.

After the task instructions, participants' understanding of the payoff scheme was checked to ensure that the incentives were effective. To further instill realism of the rewards, the computer randomly selected an option from the practice trials and the experimenter physically demonstrated with the starting capital how the payout would be administered. In addition, one more practice trial was completed in which participants were asked to demonstrate their understanding of the task. Specifically, participants were instructed to show the experimenter how the payout would be administered using the starting capital and when they would receive the contents of each envelope. After the 84 trials, the computer randomly selected one trial and the participants received the payout. Again, the participants final understanding of the task was

checked by having them demonstrate the payout that they would receive. To deliver the delayed payments, 89% of participants were successfully reached by mail. An examination of bank records indicated that among those who received the mailed cheque, all but 8 participants cashed the cheque shortly after its receipt. This suggests that delayed payments were received as planned.

Data Reduction

Participants' choice options from the temporal discounting task were converted into a measure of temporal discounting using Excel 2011. Specifically, a reward-based index (Benoit et al., 2011) was computed for each participant (separately for gain, loss and donation blocks). The reward index reflects the degree to which the total reward exceeds the amount that would have been attained by consistently choosing the smaller immediate option. Therefore, the reward index was calculated as the difference between a participant's actual accumulated reward and the minimum accumulated reward possible, divided by the difference between the maximum accumulated reward possible and the minimum accumulated reward possible: [actual-minimum]/[maximum-minimum]. For gains, the calculated reward index value ranges from 0.0 to 1.0, with the constant selection of the immediate reward yielding a reward index of 0.0, and constant selection of the larger delayed reward, yielding a reward index of 1.0. For losses and donations, the reward index was calculated as (1-[actual-minimum]/[maximum-minimum]). This was done so that we could compare the three conditions, under the interpretation that a reward index of 1.0 would be obtained by choosing outcomes that maximized one's overall personal study earnings (i.e., constant selection of the larger-later outcome for gains and constant selection of the smaller-sooner outcome for donations and losses).

Prior to the reward index calculation, we explored other means of deriving a measure of intertemporal choice. Specifically, researchers have found that value is discounted hyperbolically as a function of delay (Frederick et al., 2002), and that this hyperbolic relationship holds for different types of rewards (money, food, etc.). The discount parameter k is determined using $SV = A/(1 + kD)$, where SV is the subjective value, A is the objective value, and D is the delay. Higher k values indicate steeper discounting, that is, less-patient choices. In the current study, we chose not to use the discounting parameter in our analysis because this calculation requires that participants display an indifference point or "switch point" during the intertemporal decision making process (i.e., the point in which the smaller-sooner and larger-later outcome are equal in subjective value). A large portion of younger adults (69.0%) and older adults (67.0%) did not display a switch point in at least one of the three conditions, thereby motivating us to seek other indices of intertemporal choice to avoid significant data loss. We suspect that switch points were not observed in many participants due to the nature of the paradigm used in the current study. Specifically, our task included real monetary rewards therefore presenting us with practical limitations in both the reward amount and delay periods used. This limitation stands in contrast to titration procedures in which a participant's switch point is individually determined through a series of adjustments contingent upon their choice behaviour (e.g., Jimura et al., 2011) or hypothetical rewards that include a large range of monetary amounts and delay periods in which a switch point is more easily determined (e.g., Eppinger et al., 2012).

We also calculated a tally-based score for each participant, which similar to the reward index, did not require participants to indicate a switch point. The tally-based score was calculated by simply counting the number of times the participant chose the immediate option over the delayed option. After considering both alternatives, we opted to report results of the reward

index for each condition because it provided us the greatest clarity when interpreting the results in terms of overall personal earnings.

It is important to note that most existing research on temporal discounting has employed hypothetical gains and losses, which may not be representative of real-world decision making. Although most research suggests that hypothetical and real rewards are discounted similarly, there remains some controversy with respect to their psychological equivalence (Hinvest & Anderson, 2010; Johnson & Bickel, 2002). Therefore, the current study utilized realistic gains, losses and donations to better simulate every day decision making.

Preliminary Analysis

Data distribution was checked for assumptions of normality and statistical artifacts (i.e., outliers). Next, we conducted a 2x3 mixed ANOVA with the between-subjects factor age group (younger vs. older) and the within-subjects factor reward type (gain vs. loss vs. donation). Greenhouse-Geisser corrections were applied to correct for violations of the sphericity assumption. We then followed up the ANOVA with three independent *t*-tests on the reward indices. For descriptive purposes, we computed an "Altruism Index" by subtracting the Donation Index from the Loss Index to capture the difference between the two conditions. The rationale for this was that both conditions involve a personal loss, so the difference in decision making between the conditions can be attributed to altruism

Lastly, we performed non-parametric Spearman correlational analyses on the reward indices and scores obtained from the various background measures, separately for younger and older adults. Due to the similar pattern of associations in the Donation Index and Altruism Index, Spearman's *r* is only reported for the Donation Index to avoid redundancy. Following Löckenhoff et al. (2011) variables that showed large correlations for one or more of the reward

indices for both age groups would be entered into mediation analysis. In the current study, none of the variables included fit the above criteria; therefore mediation analysis was not warranted (see Table 2).

For the Loss Index, initial assessment of the distribution appeared negatively skewed (Skewness >1.5). We therefore applied logit transformations to all three reward indices to correct for violations of normality which successfully improved normality (Skewness < 1.0) for all three reward indices. Results from the logit transformed values yielded a similar pattern of results to the untransformed data; therefore the untransformed values are reported for ease of interpretation.

2.2 Results

Individual Difference Measures

Two-tailed independent *t*-tests on the individual difference measures revealed several significant differences between younger and older adults (see Table 1). Older adults reported more positive affect and scored significantly higher on vocabulary compared to younger adults. Relative to younger adults, older adults scored significantly higher on perceived levels of altruistic behaviour and the hypothetical amount given to the charitable organization. Additionally, older adults had a significantly higher annual income than younger adults, presumably due to the accumulation of wealth throughout the lifespan. Older adults scored significantly lower on the BAS-Total, suggesting that older adults place less emphasis on attaining desirable goals than younger adults. Older adults scored significantly lower on considering the future consequences of their behaviour, suggesting that younger adults value the future consequences of their behaviour more than older adults. Lastly, older adults had significantly slower perceptual speed.

Participants identified moderately with the charity they chose (M = 71.31), and no significant age differences were observed in self-relevance ratings, $t(70) = 0.71$, $p > .05$, d = 0.03, suggesting that younger and older adults identified with their chosen charities to a similar extent. Overall, participants were confident that they would be paid out as instructed (M = 84.04), although this level of perceived confidence was significantly greater in older relative to younger adults, $t(69) = -2.34$, $p < .05$, $d = -0.11$.

To ensure task understanding, participants were asked to demonstrate the correct payout using their starting capital immediately before and after the discounting task. The majority of participants were able to successfully demonstrate the correct payout before the task (M = 90.0%), and this check of task understanding did not significantly differ by age, $X^2(1) = 0.47$, p >.05. Similar to the first check, the majority of participants were able to successfully demonstrate their correct payout immediately after the task (M = 87.0%), and this final check of task understanding did not significantly differ by age $X^2(1) = 1.05$, p >.05. In light of research suggesting a female advantage in intertemporal choice, we examined gender differences in our reward indices across and within age groups but found no significant effects of gender.

Temporal Discounting

There was a significant main effect of reward type, $F(1.50, 104.78) = 18.28$, $p < .001$, η_p^2 = .21. The Loss Index was significantly higher (M = .84, SD = .25) than the Gain Index (M = .66, SD = .34, $t(71) = 4.70$, $p < .001$, d = 0.52). Additionally, the Loss Index was significantly higher (M = .84, SD = .25) than the Donation Index (M = .55, SD = .39, $t(71) = 6.11$, $p < .001$, d = 0.76). Lastly, there was no significant difference between Gain Index (M = .66, SD = .34) and the Donation Index (M = .55, SD = .39, $t(71) = 1.70$, $p > .05$, d = 0.29).

The mixed ANOVA also revealed a significant Age x Reward Type interaction, F(1.50,

104.78) = 10.64, $p <$ .001, η_p^2 = .13. Following up the interaction with three independent *t*-tests older adults had a significantly higher Gain Index (M = .79, SD = .27) than younger adults (M = .52, SD = .36), $t(70)$ = -3.54, p = .001, d = -0.17. A non-significant difference was observed between younger (M = .81, SD = .28) and older adults (M = .87, SD = .21) on the Loss Index, $t(70)$ = -1.02, p > .05, d = -0.04. Lastly, there was a significant difference between younger (M = .64, SD = .31) and older adults (M = .45, SD = .38) on the Donation Index, $t(70)$ = 2.06, p = .04, d = 0.08.

To isolate the influence of altruism on intertemporal choice, an independent *t*-test was performed separately for the Altruism Index. Results showed that older adults had a significantly higher Altruism Index than younger adults, $t(70)$ = -2.64, p = .01, d = -0.09.

Correlational Analyses. Following the age group comparisons, we examined individual difference variables and their associations to the reward indices, separately for younger and older adults (see Table 2). For younger adults, there was a medium correlation between CFC-Future and the Gain Index and a large correlation between CFC-Future and the Loss Index. Additionally, younger adults displayed medium correlations between household annual income and the Gain and Loss Indices. Younger adults also displayed a medium correlation between the Donation Index and the voluntary amount given to a charity and a small correlation between the Donation Index and the voluntary amount given to a stranger.

For older adults, medium correlations with the Donation Index were found for perceptual speed and verbal intelligence. Similar to younger adults, small correlations with the Donation Index were found for the voluntary amount given to a charity and voluntary amount given to a stranger. Lastly, both age groups showed a small, non-significant positive correlation between annual household income and the Donation Index.

Supplementary Analyses. Despite having counterbalanced the three conditions, we explored potential order effects on the reward indices. Specifically, we were interested in exploring if the Donation Index may be influenced by whether or not the donation block was preceded by gain or loss blocks. We acknowledged that individuals who were previously exposed to decisions to gain money might have been more likely to maximize the earnings of the charity over time than individuals who previously made decisions to lose money. We conducted a 2x3x6 Mixed ANOVA with the between-subjects factors age group (younger vs. older) and version number (one through six) and the within-subjects factor's reward type (gain vs. loss vs. donation). We found no effect of version order on reward indices across or between age groups, ruling out potential order effects on performance level between the three conditions.

In light of an age-related curvilinear trend in altruism, we wondered whether excluding the "old-old" adults would improve our *p*-value for the age difference in the Donation Index. Excluding older adults aged 75 reduced our "young-old" adult sample to 29 and only slightly increased the significance level of the Donation Index.

Chapter 3: Discussion and Summary

The current study contributes to the literature on the effect of age on temporal discounting in many aspects. Specifically, it is the first to explore intertemporal decisions that affect others in younger and older adults. Therefore, this is the first study of its kind to compare age differences in decisions for monetary gains, losses and donations. Secondly, we adapted a discounting task involving real monetary outcomes to better simulate real-world intertemporal decision making for the self and others. Lastly, we accounted for several empirically and theoretically related covariates that may contribute towards the effect on age and discount rates. Findings are discussed in detail below.

3.1 Gain-Loss Asymmetry

In support of our first hypothesis, we found that across age groups, individuals had a lower Gain Index than Loss Index. Stated differently, choice patterns were more optimal for losses than gains for in terms of maximizing personal earnings. This finding is consistent with research supporting a gain-loss asymmetry in discount rates or "sign-effect", such that individuals discount gains more steeply than losses (e.g., Lowenstein, 1987; Xu et al., 2009). Furthermore, these results align with the notion of loss aversion, whereby individuals tend to display a stronger tendency to avoid losses than acquire gains (Kahneman & Tversky, 1984). Research on gain-loss asymmetry has largely been studied in younger adult samples. Prior to the current study, only two studies we are aware of have compared discount rates for gains and losses in older adults (Halfmann et al., 2013; Löckenhoff et al., 2011). In line with these studies, the current results support that gain-loss asymmetry found in discount rates persist into older adulthood.

3.2 Age Differences in Temporal Discounting

Gains. In support of our second hypothesis, we found that older adults had a higher Gain Index than younger adults, suggesting that older adults chose gain options that more often maximized their personal earnings over time relative to younger adults. These results supplement the majority of past literature regarding an age-related decrease in temporal discounting (e.g., Eppinger et al., 2012; Green et al., 1994; Löckenhoff et al., 2011). In comparison to other studies who have found age patterns in the opposite direction or lack thereof, the current study included several individual differences thought to contribute to discount rates throughout the lifespan. This is critical when attempting to isolate the effect of age on intertemporal decision making due to changes in economic, social, emotional and cognitive domains. Löckenhoff et al. (2011) were the first to emphasize the importance of accounting for factors that may influence age-related changes in discount rates, with a particular focus on affect-related variables. Löckenhoff and colleagues found that dispositional affect significantly mediated age differences in temporal discounting for gains. In other words, the age-related increase in patient choices was most prominently driven by the improved ability to inhibit emotional factors from interfering with daily functioning in older age (Löckenhoff et al., 2011). The present study's affective measure examined the participants' present emotion to explore whether their current mood (rather than dispositional emotion) influenced discount rates. Because positive and negative affect did not associate with any of the reward indices for younger or older adults, perhaps measures of stable emotion are more predictive of age differences in gain discounting than transient emotion. Given that we replicated Löckenhoff et al.'s (2011) results for age differences for gains, utilizing a realistic discounting task while examining the relationship of several important variables, results from this study may help strengthen that temporal discounting rates decline in older age, rather

than remain stable or increase.

Losses. Contrary to our findings for the Gain Index, we did not find a significant age difference in the Loss Index. In other words, both younger and older adults choice patterns for losses yielded a similar level of optimality over time. We had predicted a possible age-related increase in the Loss Index in light of the trend previously found by Löckenhoff and colleagues (2011). However, results of the current study coincide with other past research reporting no age differences in loss discounting (e.g., Halfmann et al., 2013; Löckenhoff et al., 2011) suggesting that individuals tend to choose more smaller-sooner losses than larger-later losses, irrespective of age.

Donations. Lastly, we found support for our third hypothesis such that both age groups had a higher Loss Index than Donation Index, but that the magnitude of this effect was more pronounced in older relative to younger adults. Specifically, both age groups more often made choices to minimize their personal earnings in the donation condition relative to the loss condition, but this effect was stronger in older adults relative to younger adults. Although the age difference was only marginally significant, these results suggest that compared to younger adults, older adults were willing to incur a greater loss to the self when the money went towards a charitable cause versus money that was simply taken away from their starting capital and returned to the experimenter.

In addition to increased prosociality, older age is associated with an increased willingness to delay gratification (e.g., Green et al., 1994). The donation condition in the current study involved aspects of both altruism (i.e., maximizing another's welfare) and patience (i.e., delaying gratification). Therefore, it is unclear whether or not the age trend in the Donation Index is driven by an increase in altruism or a reduction in impulsivity. To help delineate whether or not

the trend in charitable discounting is influenced by an increase in generosity or patience, the Altruism Index was intended to capture whether the distinction in decision making between the Donation and Loss Indices was attributed to altruism. We found that older adults had a significantly higher Altruism Index than younger adults. From this perspective, it appears that older adult's pattern of intertemporal decisions for charitable donations reflected greater altruism than younger adults. This interpretation of our results aligns with research supporting an age-related increase in altruistic motivation (e.g., Freund & Blanchard-Fields, 2014; Hubbard et al., under review).

We also assessed baseline voluntary altruistic behaviour. Specifically, participants made two hypothetical one-shot decisions in the dictator game to allocate any whole dollar combination from $0 to $10 to the charity of their choice and a stranger. In support of an age-related increase of altruism, older adults chose to give significantly more money to the charity of their choice than younger adults. Critically, no age differences were found in the amount of money given to a stranger, suggesting that older adults did not view the money as highly disposable. In light of the warm-glow vs. pure altruism debate, these findings more likely reflect a warm-glow motivation for giving due to the dissociation that was present between the stranger and charity condition. The pure altruist would likely allocate equal funds to both recipients, whereas the impure or "warm-glow" altruist's allocation is dependent other external factors that may influence his or her perceived gratification. Perhaps the warm-glow altruist receives greater personal reward from giving money to a charity (e.g., greater social need) relative to giving money to a stranger (e.g., ambiguous level of social need). Taken together, the pattern of intertemporal decision making for donations may actually reflect greater altruistic tendencies in older age due to an age-related increase in the Altruism Index and the willingness of the older

adults to voluntarily give significantly more of their endowment to the charity than younger adults.

3.3 Correlational Analyses

To account for potential age differences in the Gain and Altruism Indices, we explored their association to a range of demographic, cognitive, and emotional variables separately for younger and older adults. Within the variables included, none showed significant correlations with either the Gain or Altruism Indices for both age groups. Therefore, mediation analysis was not performed in the present study.

Younger adults who prioritize the future over the immediate outcomes of their behaviour have displayed lower levels of temporal discounting for gains (Joireman, Sprott & Spangenberg, 2005). Therefore, the quality of intertemporal decision making in other domains may also be influenced by CFC. Supporting this view, we found that younger adults who placed greater emphasis on their future behavioural outcomes had a higher Loss Index than those who placed less emphasis on the future outcomes of their behavior. To the best of our knowledge, the present study is the first to explore age differences in CFC. Interestingly, older adults devalued the future outcomes of their behaviour to a greater extent than younger adults (see Table 1), yet displayed similar patterns of intertemporal choices for losses. These results may reflect research supporting an age-related increase in loss prevention (Carstensen et al., 1999). Therefore, although older adults are less focused on the future outcomes of their behaviour, they still maintain a strong tendency to avoid larger-delayed losses.

It has been suggested that individuals may behave more altruistically because they simply don't "know any better". Results of the current study refute that view since older adults who scored higher on verbal intelligence and perceptual speed displayed choice preferences that

maximized the earnings of the charity over time. In other words, older individuals with greater cognition displayed more altruistic choice patterns.

Importantly, annual household income only showed small correlations in either age group's Altruism Index, lending further support that the age-related trend in altruistic motivation is not driven by socioeconomic factors (e.g., Freund & Blanchard Fields, 2014; Hubbard et al., under review).

3.4 Limitations

The main limitation of the present study is that it used a cross-sectional design, therefore we cannot rule out the possibility of cohort differences contributing to the present results. This is especially important when interpreting the results for the Altruism Index since older cohorts may have been socialized in a way that emphasized prosocial engagement whereas younger cohorts may be more focused on personal gain (Freund & Blanchard-Fields, 2014). Earlier studies on aging and altruism found support for increased prosocial engagement in older age (e.g., Midlarsky & Hannah, 1989), therefore reducing the likelihood that cohort effects influenced results of the current study since that data was reported over two decades ago.

Another limitation is that participants made intertemporal decisions to lose/donate money from an endowment received in the study; therefore the pain of paying/giving is reduced compared with real-world donations. The use of noncostly donations in the current study may therefore not be representative of the cost of giving normally associated with charitable giving and self-losses. Future research could have participants "earn" their monetary endowment prior to the task in order to implement a greater sense of ownership. Additionally, because the participants did not make the online donations themselves, perhaps their distance from the act of giving itself may have influenced their prosocial choices. Although the current study attempted

to minimize this by e-mailing the participant the charitable tax receipt on the respective delay, future research could have participants return to the lab at that time and make the online charitable contribution themselves.

3.5 Future Directions

Future studies should delineate whether the age difference in the Altruism Index are driven by an age-related increase in altruism or age-related decrease in impulsivity. Specifically, research could use mouse tracking as a tool to index the motor trajectory during the decision making process. Examining participants' hand movements as they choose a response alternative, specifically how they may oscillate between alternatives, would provide insight into real-time cognitive processing during the intertemporal decision making process (Freeman & Ambady, 2010). Furthermore, researchers could utilize neuroimaging methods such as fMRI to identify how neuromodulatory changes present in older adulthood influence intertemporal choice patterns for the self versus others.

In the real-world, oftentimes intertemporal decisions are made under stressful conditions. The effects of acute stress have shown to increase discount rates for gains in younger adults (e.g., Kimura et al., 2013) and more recently, increase discount rates for monetary gains and losses for older adults (Moreno, unpublished manuscript). In the present findings, the DASS stress subscale did not associate with any reward indices for younger or older adults. Because our stress subscale measured the participant's dispositional level of stress within a one-week interval, temporarily induced stress may be more unfavorable towards intertemporal decision making. Current research in our lab is exploring the effects of acute psychosocial stress on discounting of gains, losses and donations for younger and older adults (Sparrow, Armstrong, & Spaniol, in progress). Results from this study may provide insight as to how acute stress influences intertemporal

decisions that affect the self and others in younger and older adults.

Another interesting avenue for future research is that of an age-related curvelinear trend in altruism after age 75. Future studies could employ the same paradigm, utilizing a heterogeneous sample of older adults to determine if discount rates differ between the "young-old" adults and the "old-old" adults. We were unable to perform an adequate between group comparison due to the small number of adults aged 75 and older in our sample. Interestingly, when the older adults over age 75 were excluded from our main analyses, our age difference in the Donation Index became slightly stronger, possibly hinting towards an age-related curvelinear trend in altruism.

3.6 Conclusions

Results of the current study help clarify present inconsistencies on the aging and discounting literature such that with age, discount rates for gains increases, whereas discount rates of losses remain unaffected. Novel to my thesis, the present results explored the effect of age on intertemporal decisions for charitable donations. This is important since individuals often make intertemporal decisions that affect others. Findings from the present study suggest that intertemporal choice may be sensitive to an age-related increase in altruistic motivation. Future research should examine the underlying mechanisms that promote altruism in later life.

Tables

Table 1

Summary of the mean (and SD) scores of younger and older adults on the individual difference measures

Questionnaire and scales	Younger Adults (N = 36)	Older Adults (N = 36)	t-value
Demographics			
Age	25.50 (5.21)	70.39 (4.72)	
Education (yr)	15.50 (2.09)	16.24 (2.21)	-1.45
Annual Income	2.64 (1.66)	4.00 (1.79)	-3.30**
Cognition			
Perceptual Speed	81.61 (17.36)	62.08 (12.85)	5.43***
Vocabulary	17.56 (5.06)	22.25 (5.90)	-3.62**
Numeracy	1.22 (1.10)	.78 (1.02)	1.78
Affect			
Positive Mood	28.58 (8.97)	33.61 (7.17)	-2.63*
Negative Mood	11.69 (2.96)	11.64 (2.17)	.09
Depression	3.28 (4.95)	3.28 (3.58)	.00
Anxiety	3.06 (3.75)	2.33 (2.97)	.91
Stress	5.90 (6.50)	7.22 (5.50)	-.93
Motivation			
BAS Total	40.94 (5.54)	37.37 (6.82)	2.44*
BIS	19.83 (4.35)	19.32 (2.73)	.60
Future Orientation			
CFC-Future	3.85 (.60)	3.39 (.70)	3.02**
CFC-Immediate	2.44 (.68)	2.61 (.77)	.60
Altruism			
Subjective Altruism	36.94 (9.52)	43.69 (11.82)	-2.67**
Dictator Charity	4.83 (3.17)	6.89 (3.78)	-2.49*
Dictator Other	4.03 (3.04)	4.44 (3.01)	-.59
Self-relevance	73.75 (25.66)	68.86 (32.64)	.71

Notes. MOCA= Montreal Cognitive Assessment, CFC = Consideration of Future Consequences, BAS = Behavioural Approach System, BIS = Behavioural Inhibition System, YA = younger adults, OA= older adults

*p<.05, **p<.01, ***p<.001, t(70), two-tailed test for group differences. Income: t(68) for income, Dictator Charity: t(69).

Table 2

Spearman correlation coefficients for the individual difference measures and the reward indices corrected for family wise error rate

Questionnaires and Scales	GAIN YA	LOSE YA	DONATE YA	GAIN OA	LOSE OA	DONATE OA
Demographics						
Age	-.12	.21	-.09	.16	.05	-.05
Education (yr)	.04	.38	.00	-.01	-.06	-.27
Annual Income	.32	.41	.22	-.02	-.07	-.14
Cognition						
Perceptual Speed	.11	.19	.36	.18	.22	-.47
Vocabulary	.02	.20	-.15	.03	.16	-.41
Numeracy	.04	-.21	.13	-.08	-.03	-.08
Affect						
Positive Mood	.06	.30	.05	.00	-.36	-.10
Negative Mood	-.17	-.18	-.01	-.14	-.05	.05
Depression	-.18	-.28	.05	.12	-.19	.14
Anxiety	-.24	-.21	-.10	.14	.21	.14
Stress	-.28	-.28	-.19	.14	-.06	.02
Motivation						
BAS Total	.04	.20	.11	.15	-.06	.19
BIS	-.06	-.01	.06	.12	.18	- .04
Future Orientation						
CFC-Future	.44	.67*	.19	.02	.15	.04
CFC-Immediate	-.36	-.40	-.00	.19	-.09	-.10
Altruism						
Subjective	.12	.23	-.00	.23	-.19	-.16
Altruism						
Dictator Charity	-.00	-0.1	-.26	-.06	.03	-.11
Dictator Other	-.08	-.12	-.34	.20	.08	-.14
Self-relevance	.01	.04	-.00	-.04	-.28	-.08

Notes. MOCA= Montreal Cognitive Assessment, CFC = Consideration of Future Consequences, BAS = Behavioural Approach System, BIS = Behavioural Inhibition System, YA = younger adults, OA= older adults

[1]Chi-Square analysis

*p<.001

Figures

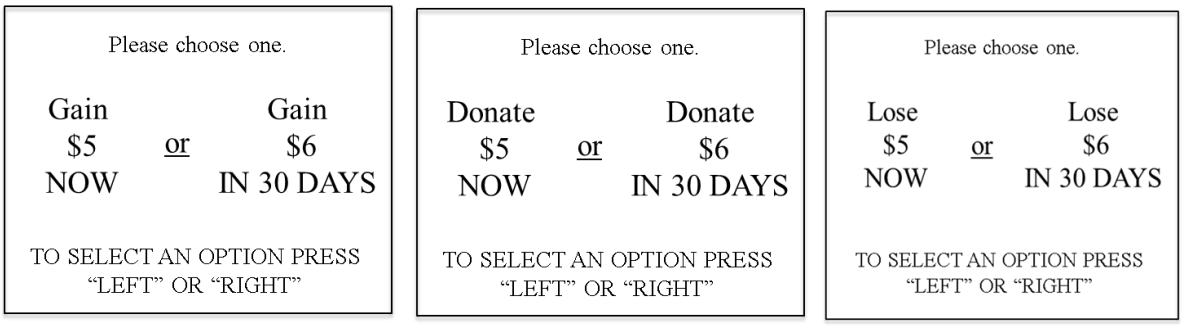


Figure 1. Sample displays from the temporal discounting task (Löckenhoff et al., 2011), for a Gain trial (left) and a Donation trial (middle) and Loss trial (right).

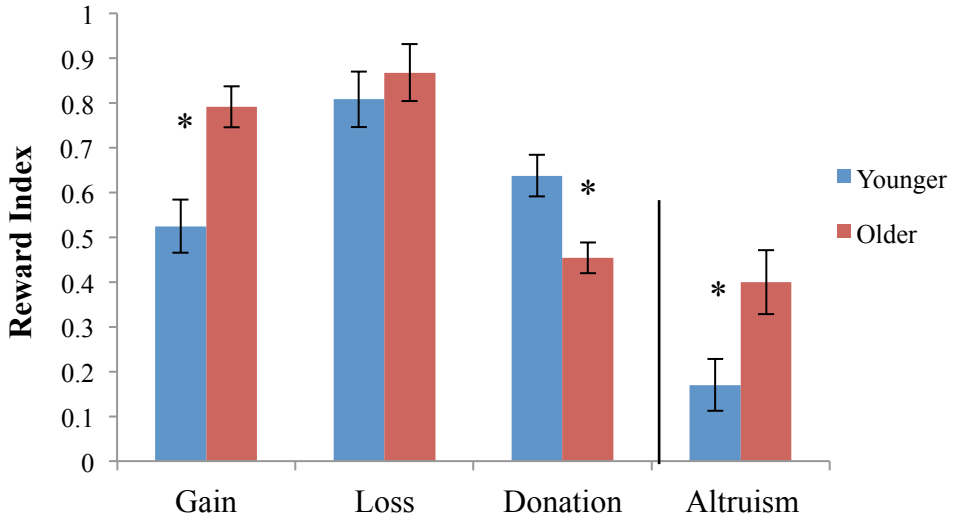


Figure 2. Bar graph illustrating reward index for gains, losses, donations and altruism separately for younger and older adults.

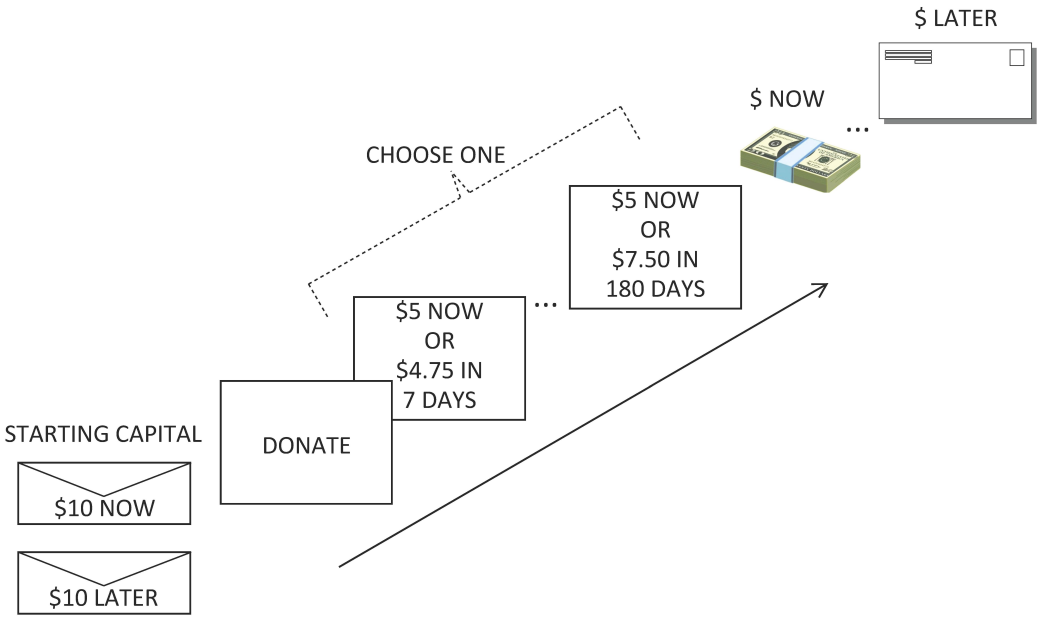


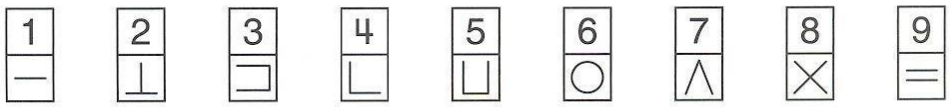
Figure 3. Schematic of payout procedure. Participants were given a starting capital, then made a series of intertemporal gains, losses and donations. At the end of the task one trial was randomly selected by the computer and applied to the starting capital. Depending on the choice outcome, the participant immediately received the money from their "now" envelope, and were mailed a cheque from their "later" envelope at the respective delay period.

Appendices

APPENDIX A: DIGIT SYMBOL CODING

Digit Symbol—Coding

VERSION 1



Sample Items

2	1	3	7	2	4	8	2	1	3	2	1	4	2	3	5	2	3	1	4

5	6	3	1	4	1	5	4	2	7	6	3	5	7	2	8	5	4	6	3

7	2	8	1	9	5	8	4	7	3	6	2	5	1	9	2	8	3	7	4

6	5	9	4	8	3	7	2	6	1	5	4	6	3	7	9	2	8	1	7

9	4	6	8	5	9	7	1	8	5	2	9	4	8	6	3	7	9	8	6

2	7	3	6	5	1	9	8	4	5	7	3	1	4	8	7	9	1	4	5

7	1	8	2	9	3	6	7	2	8	5	2	3	1	4	8	4	2	7	6

APPENDIX B: DEPRESSION, ANXIETY AND STRESS SCALE

DASS21

For each statement below, please circle the number in the column that best represents how you have been feeling in the **last week.**

Statement	Did not apply to me at all	Applied to me to some degree or some of the time	Applied to me a considerable degree or a good part of the time	Applied to me very much or most of the time
1. I found it hard to wind down	0	1	2	3
2. I was aware of dryness of my mouth	0	1	2	3
3. I couldn't seem to experience any positive feeling at all	0	1	2	3
4. I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5. I found it difficult to work up the initiative to do things	0	1	2	3
6. I tended to over-react to situations	0	1	2	3
7. I experienced trembling (eg, in the hands)	0	1	2	3
8. I felt that I was using a lot of nervous energy	0	1	2	3
9. I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10. I felt that I had nothing to look forward to	0	1	2	3
11. I found myself getting agitated	0	1	2	3
12. I found it difficult to relax	0	1	2	3
13. I felt down-hearted and blue	0	1	2	3
14. I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15. I felt I was close to panic	0	1	2	3
16. I was unable to become enthusiastic about anything.	0	1	2	3
17. I felt I wasn't worth much as a person	0	1	2	3
18. I felt that I was rather touchy	0	1	2	3
19. I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
20. I felt scared without any good reason.	0	1	2	3
21. I felt that life was meaningless	0	1	2	3

APPENDIX C: POSITIVE AND NEGATIVE AFFECT SCHEDULE

The PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then circle the appropriate answer next to the word. Indicate to what extent you feel this way right now at this moment.

Use the following scale to record your answers:

1	2	3	4	5
Very slightly or not at all	A little	Moderately	Quite a bit	Extremely

1. Interested	1	2	3	4	5
2. Distressed	1	2	3	4	5
3. Excited	1	2	3	4	5
4. Upset	1	2	3	4	5
5. Strong	1	2	3	4	5
6. Guilty	1	2	3	4	5
7. Scared	1	2	3	4	5
8. Hostile	1	2	3	4	5
9. Enthusiastic	1	2	3	4	5
10. Proud	1	2	3	4	5
11. Irritable	1	2	3	4	5
12. Alert	1	2	3	4	5
13. Ashamed	1	2	3	4	5
14. Inspired	1	2	3	4	5
15. Nervous	1	2	3	4	5
16. Determined	1	2	3	4	5
17. Attentive	1	2	3	4	5
18. Jittery	1	2	3	4	5
19. Active	1	2	3	4	5
20. Afraid	1	2	3	4	5

APPENDIX D: BEHAVIOURAL APPROACH AND BEHAVIOURAL INHIBITION SYSTEMS SCALE

BIS/BAS

Each item of this questionnaire is a statement that a person may either agree with or disagree with. For each item, indicate **how much you agree or disagree with what the item says**. Choose only one response to each statement. Please be as accurate and honest as you can be. Respond to each item as if it were the only item. That is, don't worry about being "consistent" in your responses. Choose from the following four response options:

1 = very true for me
2 = somewhat true for me
3 = somewhat false for me
4 = very false for me

	Very true for me			Very false for me
1. A person's family is the most important thing in life.	1	2	3	4
2. Even if something bad is about to happen to me, I rarely experience fear or nervousness.	1	2	3	4
3. I go out of my way to get things I want.	1	2	3	4
4. When I'm doing well at something I love to keep at it.	1	2	3	4
5. I'm always willing to try something new if I think it will be fun.	1	2	3	4
6. How I dress is important to me.	1	2	3	4
7. When I get something I want, I feel excited and energized.	1	2	3	4
8. Criticism or scolding hurts me quite a bit.	1	2	3	4
9. When I want something I usually go all-out to get it.	1	2	3	4
10. I will often do things for no other reason than that they might be fun.	1	2	3	4
11. It's hard for me to find the time to do things such as get a haircut.	1	2	3	4
12. If I see a chance to get something I want I move on it right away.	1	2	3	4
13. I feel pretty worried or upset when I think or know somebody is angry at me.	1	2	3	4
14. When I see an opportunity for something I like I get excited right away.	1	2	3	4
15. I often act on the spur of the moment.	1	2	3	4
16. If I think something unpleasant is going to happen I usually get pretty worked up.	1	2	3	4
17. I often wonder why people act the way they do.	1	2	3	4
18. When good things happen to me, it affects me strongly.	1	2	3	4
19. I feel worried when I think I have done poorly at something important.	1	2	3	4
20. I crave excitement and new sensations.	1	2	3	4
21. When I go after something I use a "no holds barred" approach.	1	2	3	4
22. I have very few fears compared to my friends.	1	2	3	4
23. It would excite me to win a contest.	1	2	3	4
24. I worry about making mistakes.	1	2	3	4

APPENDIX E: BERLIN NUMERACY TEST

BNT

Instructions:

The survey is about Decision Making. You will be presented with statistical and numerical questions. Please DO NOT USE calculators, though you can use paper and pencil to assist you. Please try your best to answer all the questions.

1. Out of 1,000 people in a small town 500 are members of a choir. Out of these 500 members in a choir 100 are men. Out of the 500 inhabitants that are not in a choir 300 are men. What is the probability that a randomly drawn man is a member of the choir? Please indicate the probability in percent.
_____ %.

2. Imagine we are throwing a loaded die (6 sides). The probability that the die shows a 6 is twice as high as the probability of each of the other numbers. On average, out of these 70 throws how many times would the die show the number 6?
_____ out of 70 throws.

3. In a forest 20% of mushrooms are red, 50% brown and 30% white. A red mushroom is poisonous with a probability of 20%. A mushroom that is not red is poisonous with a probability of 5%. What is the probability that a poisonous mushroom in the forest is red?
_____%.

4. Imagine we are throwing a five-sided die 50 times. On average, out of these 50 throws how many times would this five-sided die show an odd number (1, 3 or 5)?
_____ out of 50 throws.

APPENDIX F: CONSIDERATION OF FUTURE CONSEQUENCES SCALE

CFC

For each of the statements below, please circle the statement that is characteristic of you.

1 = Extremely uncharacteristic
2 = Somewhat uncharacteristic
3 = Uncertain
4 = Somewhat characteristic
5 = Extremely characteristic

	Extremely uncharacteristic				Extremely characteristic
1. I consider how things might be in the future, and try to influence those things with my day to day behaviour	1	2	3	4	5
2. Often I engage in a particular behaviour in order to achieve outcomes that may not result for many years.	1	2	3	4	5
3. I only act to satisfy immediate concerns, figuring the future will take care of itself.	1	2	3	4	5
4. My behaviour is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions.	1	2	3	4	5
5. My convenience is a big factor in the decisions I make or the actions I take.	1	2	3	4	5
6. I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes.	1	2	3	4	5
7. I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years.	1	2	3	4	5
8. I think it is more important to perform a behaviour with important distant consequences than a behaviour with less-important immediate consequences.	1	2	3	4	5
9. I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level.	1	2	3	4	5
10. I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time.	1	2	3	4	5
11. I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date	1	2	3	4	5
12. Since my day to day work has specific outcomes, it is more important to me than behaviour that has distant outcomes.	1	2	3	4	5
13. When I make a decision, I think about how it might affect me in the future.	1	2	3	4	5
14. My behavior is generally influenced by future consequences.	1	2	3	4	5

APPENDIX G: SELF REPORT ALTRUISM SCALE

SRA

Instructions: Check the category on the right that conforms to the frequency with which you have carried out the following acts.

	Never	Once	More than once	Often	Very often
1. I have helped push a stranger's car out of the snow.					
2. I have made change for a stranger.					
3. I have given directions to a stranger.					
4. I have given money to a charity.					
5. I have given money to a stranger who needed it (or asked me for it).					
6. I have donated goods or clothes to a charity.					
7. I have done volunteer work for a charity.					
8. I have donated blood.					
9. I have helped carry a stranger's belongings (books, parcels, etc.)					
10. I have delayed an elevator and heled the door open for a stranger.					
11. I have allowed someone to go ahead of me in a lineup (at Xerox machine, in the supermarket).					
12. I have given a stranger a lift in my car.					
13. I have pointed out a clerk's erorr (in a bank, at the supermarket) in undercharging me for an item.					
14. I have let a neighbour whom I didn't know too well borrow an item of some value to me (e.g., a dish, tools, etc.)					
15. I have bought 'charity' holiday cards deliberately because I knew it was a good cause.					
16. I have helped a classmate whom I did not know that well with a homework assignment when my knowledge was greater than his or hers.					
17. I have voluntarily looked after a neighbour's pets or children without being paid for it.					
18. I have offered to help a person with a disability or an elderly person across a street.					
19. I have offered my seat on a bus or train to a stranger who was standing.					
20. I have helped an acquaintance to move households.					

APPENDIX H: DICTATOR GAME

DG OTHER

Imagine yourself in a hypothetical situation in which you can keep, or give to another person, ALL or ANY PORTION of $10. The other person is a stranger. You may divide the money in increments of $1. For example, you can give $0 to the other person and keep $10 for yourself, or give $5 and keep $5, or give $10 and keep $0, or choose any other split. The decision of how to divide the money is entirely yours.

Please imagine the situation to be as close as possible to a real-life situation. Remember, your answer will not be linked to you personally.

GIVE $10 KEEP $0

GIVE $9 KEEP $1

GIVE $8 KEEP $2

GIVE $7 KEEP $3

GIVE $6 KEEP $4

GIVE $5 KEEP $5

GIVE $4 KEEP $6

GIVE $3 KEEP $7

GIVE $2 KEEP $8

GIVE $1 KEEP $9

GIVE $0 KEEP $10

DG CHARITY

Imagine yourself in a hypothetical situation in which you can keep, or give to a charity ALL or ANY PORTION of $10. The charity is the one you just selected. You may divide the money in increments of $1. For example, you can give $0 to the charity and keep $10 for yourself, or give $5 and keep $5, or give $10 and keep $0, or choose any other split. The decision of how to divide the money is entirely yours.

Please imagine the situation to be as close as possible to a real-life situation. Remember, your answer will not be linked to you personally.

GIVE $10 KEEP $0

GIVE $9 KEEP $1

GIVE $8 KEEP $2

GIVE $7 KEEP $3

GIVE $6 KEEP $4

GIVE $5 KEEP $5

GIVE $4 KEEP $6

GIVE $3 KEEP $7

GIVE $2 KEEP $8

GIVE $1 KEEP $9

GIVE $0 KEEP $10

End of Study Questionnaire

Please indicate your estimated annual household taxable income. If living with spouse, indicate total combined income; if supported by parents, indicate parental income.

___Living with spouse ___Supported by parents

1._____< $25,000
2._____$25,000 to $34,999
3._____$35,000 to $49.999
4._____$50,000 to $74,999
5._____$75,000 to $99,999
6._____$100,000 to $149,999
7._____$150,000 or more

Please indicate the number of people supported by this household income: ____

APPENDIX J: MILL HILL VOCABULARY SCALE

Mill Hill Vocabulary Scale

Instructions

After each number (1-34) there is a word in CAPITAL letters. Below the capitalized word there are 6 words in small print, one of which means the same as the word above. Please underline the small-print word that means the same as the word in capitals.

They start off fairly easily, but rapidly get harder – we don't expect you to get them all right. But we do want you to try every one.

Even if you have no idea about the meaning of the word, please always underline one word – simply guess if you don't know.

Take your own time, but don't spend ages on any one choice – just guess when you don't know.

1. CONNECT

accident	join
lace	bean
flint	field

2. PROVIDE

harmonize	commit
hurt	supply
annoy	divide

3. STUBBORN

obstinate	steady
hopeful	hollow
orderly	slack

4. SCHOONER

building	man
ship	singer
plant	scholar

5. LIBERTY

worry	freedom
rich	serviette
forest	cheerful

6. COURTEOUS

dreadful	proud
truthful	short
curtsey	polite

7. RESEMBLANCE

attendance	fondness
assemble	repose
likeness	memory

8. THRIVE

flourish	try
thrash	reap
think	memory

9. PRECISE

natural	stupid
faulty	grand
small	exact

10. ELEVATE

revolve	move
raise	work
waver	disperse

11. DWINDLE

swindle	pander
diminish	wheeze
linger	compare

12. LAVISH

unaccountable	selfish
romantic	lawful
extravagant	praise

13. WHIM

complain	noise
tonic	fancy
wind	rush

14. SURMOUNT

mountain	descend
overcome	concede
appease	snub

15. BOMBASTIC

democratic	pompous
bickering	cautious
destructive	anxious

16. RECUMBENT

fugitive	cumbersome
unwieldy	repelling
reclining	penitent

17. ENVISAGE

contemplate	activate
surround	estrange
enfeeble	regress

18. TRUMPERY

worthless	heraldry
etiquette	highest
amusement	final

19. GLOWER

extinguish	shine
disguise	gloat
aerate	scowl

20. PERPETRATE

appropriate	commit
propitiate	deface
control	pierce

21. LEVITY

parsimony	velleity
salutary	frivolity
alacrity	tariff

22. LIBERTINE

missionary	rescuer
profligate	canard
regicide	farrago

23. AMULET

savoury	jacket
flirtation	crest
cameo	charm

24. QUERULOUS

astringent	fearful
petulant	curious
inquiring	spurious

25. TEMERITY

impermanence	rashness
nervousness	stability
punctuality	submissiveness

26. FECUND

esculent	optative
profound	prolific
sublime	salic

27. ABNEGATE

contradict	decry
renounce	execute
belie	assemble

28. TRADUCE

challenge	attenuate
suspend	establish
misrepresent	conclude

29. VAGARY

vagabond	caprice
obscurity	vulgarity
evasion	fallacy

30. SPECIOUS

fallacious	coeval
palatial	typical
nutritious	flexible

31. SEDULOUS

rebellious	dilatory
complainant	diligent
seductive	credulous

32. NUGATORY

inimitable	adamant
sublime	contrary
numismatic	trifling

33. ADUMBRATE

foreshadow	protect
detect	eradicate
elaborate	approach

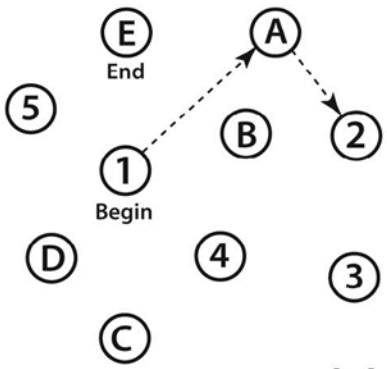
34. MINATORY

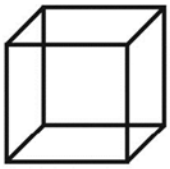
implacable	diminutive
belittling	quiescent
depository	threatening

APPENDIX K: MONTREAL COGNITIVE ASSESSMENT

Version 7.1 Original Version

VISUOSPATIAL / EXECUTIVE





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NAMING

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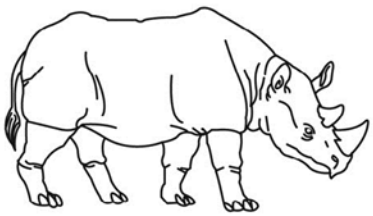

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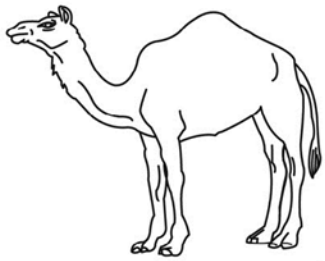

[ ]

__/3

MEMORY Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	FACE	VELVET	CHURCH	DAISY	RED
1st trial					
2nd trial					

No points

ATTENTION Read list of digits (1 digit/ sec.).

Subject has to repeat them in the forward order [ ] 2 1 8 5 4

Subject has to repeat them in the backward order [ ] 7 4 2

__/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

__/1

Serial 7 subtraction starting at 100 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt**

__/3

LANGUAGE Repeat : I only know that John is the one to help today. [ ]

The cat always hid under the couch when dogs were in the room. [ ]

__/2

Fluency / Name maximum number of words in one minute that begin with the letter F [ ] _____ (N ≥ 11 words)

__/1

ABSTRACTION Similarity between e.g. banana - orange = fruit [ ] train – bicycle [ ] watch - ruler

__/2

DELAYED RECALL

	FACE	VELVET	CHURCH	DAISY	RED	Points for UNCUED recall only
Has to recall words **WITH NO CUE**	[ ]	[ ]	[ ]	[ ]	[ ]	
Optional Category cue						
Optional Multiple choice cue						

__/5

ORIENTATION [ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

__/6

© Z.Nasreddine MD **www.mocatest.org** Normal ≥ 26 / 30

TOTAL __/30

Add 1 point if ≤ 12 yr edu

Administered by: _____

APPENDIX L: CHARITY LIST

CHOICE OF CHARITY

Below is a list of 7 charities. Please read through and choose the charity of your choice to donate your winnings from the charity blocks to. All charities can be found in Toronto. All charities have an option to donate any amount online. The researcher will donate to the charity of your choice on your behalf.

1. **SICK KIDS FOUNDATION**
   - Raises funds on behalf of The Hospital for Sick Children, which is dedicated to improving children's health.
   - Located downtown Toronto, community support is a crucial source of funding for SickKids.

2. **THE SALVATION ARMY**
   - Fights against poverty: distributes meals, provide shelter beds, provide clothing to those in need
   - Believes that "everyone has a right to access basic necessities such as nutritious food, health care, education and economic opportunity"

3. **DAILY BREAD FOOD BANK**
   - "Fighting to end hunger in our communities"
   - Runs food banks and food relief programs to provide food for hungry people

4. **COVENANT HOUSE**
   - Provide healthcare, educational support, GED preparation, job readiness, skills training, drug abuse treatment & prevention, legal services, mental health services, Mother/Child program, life skills training, aftercare programs for homeless youth
   - Advocates for homeless youth.

5. **519 CHURCH STREET COMMUNITY CENTER**
   - Working with the lesbian, gay, bi, trans, and queer communities in downtown Toronto
   - Provide peer support, recreational/arts/cultural opportunities
   - Programs include: anti-violence, anti-poverty & homelessness, counseling & advice, older LGBT, queer parenting, queer immigrants & refugees, trans, etc.

6. **EVERGREEN**
   - Solve today's environmental challenges by inspiring people into action.
   - School ground greening: provides consultation & funds (up to $3 500) for schools
   - Community greening: working with municipal governments, universities, etc. to provide community greening such as planting trees, removing invasive species, and holding educational talks among other activities.

7. **TORONTO PUBLIC LIBRARIES FOUNDATION**
   - Uses donations to fund library collections of books, programs and services, and community spaces
   - Also accepts donations of used books

APPENDIX M: SELF RELEVANCE VISUAL ANALOGUE SCALE

Self-relevance VAS

Indicate on the line below how self-relevant the charity you chose is to you. Self-relevant means that you identify strongly with the goals of the charity, or have a close other who identifies with the charity. The further your mark is to the right, the more self-relevant the charity is to you.

Not self-relevant _____ **Very self-relevant**

APPENDIX N: CONFIDENCE VISUAL ANALOGUE SCALE

Confidence VAS

Indicate on the line below how confident you were that the reward selected for you would be paid out as instructed. The further your mark is to the right, the more confident you were that this reward would be paid out as instructed.

Not Confident _____ **Very Confident**

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