An Examination of Social Motivation in Dementia

by

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Abstract

The present research examined social motivation in dementia within the theoretical framework of socioemotional selectivity theory (SST; Carstensen, 2006). SST is a lifespan theory of social motivation that argues goal selection and pursuit are inextricably related to perceived time remaining in life. When the future is perceived as expansive (as in youth), knowledge-related goals and novel social partners are prioritized. When constraints on time horizons are perceived (as in old age), emotion-regulation goals and familiar social partners are emphasized. Evidence reveals that social goals impact cognition. Termed the positivity effect, older adults, relative to younger adults, often demonstrate superior processing of positive stimuli and/or reduced processing of negative stimuli. Although it is widely understood that dementia is associated with disorientation to time (e.g., clock and calendar), little is known about whether persons with dementia are also disoriented to perceived time remaining in life. The objectives of the present research were to examine how moderate severity dementia affects (1) subjective time horizons, (2) the relative prioritization of knowledge- and emotion-related goals, (3) mental representations of social activities, (4) social partner preferences, and (5) the processing of emotional information in attention and memory. To make comparisons across the adult lifetime and as a comparison to aging in the presence of dementia, our sample included twenty-five young adults (M = 22.48 years), young-old adults (M = 67.56 years), old-old adults (80.24 years), and twenty-six participants with dementia (M = 85.38 years). Results indicated that those with dementia remained relatively oriented to lifetime in that, similar to young-old and old-old adults, they believed they had less time remaining in life than young adults. Participants with dementia reported goals centered on emotion-regulation to a greater extent than those related to knowledge-acquisition. Three-way multidimensional scaling revealed common dimensions along which groups considered social activities and indicated that the salience of these dimensions varied across

groups. Dimensions related to affect were most important to older adults (i.e., young-old, old-old, participants with dementia) and least important to young adults. The prominence of information seeking in mental representations of social activities also varied across groups: this dimension was least important to older adults and most important to young adults. Group differences in preference for familiar over novel social partners were not observed. We did not find evidence of the positivity effect in attention, however an examination of memory performance did support the presence of a memory advantage for positive over negative information. Old-old adults and participants with dementia recalled and recognized a higher ratio of positive-to-negative images than did young adults. Young-old adults performed comparable to young adults on a recall task, but recognized a higher ratio of positive-to-negative images that did young adults. Theoretical and practical importance of these findings is discussed.

Preface

This thesis is an original work by Linzy Bohn. No part of this thesis has been previously published. The research project, of which this thesis is a part, received ethics approval from the University of Alberta Research Ethics Board, “Social Cognition”, Pro00028700, March 2012.

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An Examination of Social Motivation in Dementia

Socioemotional selectivity theory (SST; Carstensen, 2006) argues that our ability to monitor time and to appreciate that time eventually runs out has profound implications for basic human processes. Prioritized social goals, social activities, personal ties, and cognitive preferences are all argued to vary as a function of perceived time remaining in life. When time is perceived as expansive, as is typical in youth, future-oriented goals aimed at knowledge acquisition and the broadening of social horizons become prioritized (Lang & Carstensen, 2002). Interactions with novel social partners are preferable to familiar ones as these individuals promote actualization of the latter goals (Fredrickson & Carstensen, 1990). When constraints on time horizons are perceived, as is common in old age, present-oriented goals assume primacy and the desires to derive emotional meaning and satisfaction from life become central (Lang & Carstensen, 2002). Diminishing resources are no longer directed towards forming new bonds, but rather towards nurturing emotionally close relationships (Fredrickson & Carstensen, 1990). The perception of time as open-ended or restricted is also reflected in attention and memory. A growing body of evidence has documented a positivity effect (see Reed, Chan & Mikels, 2014 for a meta-analysis), which is characterized by a lifespan change in the ratio of positive-to-negative material attended to and remembered (Scheibe & Carstensen, 2010).

Because chronological age is inversely related to time remaining in life, systematic associations between age and time horizons appear (Fung, Lai & Ng, 2001). However, socioemotional selectivity theorists stress that it is time perspective (i.e., the subjective sense of distance from death) and not age (i.e., distance from birth) that determines the relative prioritization of goals. When time perspective is statistically controlled (Lang & Carstensen, 2002) or experimentally manipulated (Fung, Carstensen & Lutz, 1998), older and younger adults behave remarkably similar across the abovementioned domains. Research examining the impact

of health status on goal constellations further decouples age from subjective time horizons (Fredrickson & Carstensen, 1998; Kin & Fung, 2004; Pinquart & Silbereisen, 2006). When the fragility of life is primed (e.g., because of a diagnosis of cancer or HIV/AIDS), younger adults perceive their social world in a manner that is virtually indistinguishable from older adults.

The present research examined the impact dementia, a diagnosis typically associated with older age, has on subjective time horizons, the relative prioritization of social goals, cognitive representations of social activities, relationship preferences, and the way in which Wellemotional information is attended to (attention) and remembered (memory). Dementia stems from a class of progressive, neurodegenerative diseases, and is associated with dysfunction across a number of domains, including memory performance and time orientation. This suggests that, while persons with dementia are typically of advanced age, they may not perceive constraints on time horizons and therefore diverge from age-related social and cognitive preferences. It is also possible that, when faced with the reality of cognitive decline in the earlier stages of disease progression, persons with dementia may perceive further constrains on time horizons and place a greater emphasis on emotionally meaningful motives and positive information. These questions have not been examined.

Empirically exploring these questions has implications for improving quality of care and quality of life for persons with dementia by generating recommendations for social programming to better match social goals and communication practices to better match cognitive preferences, and thus encoding and retention. These are important considerations in light of the mounting number of individuals with dementia (Alzheimer Society of Canada, 2012). Moreover, by examining whether its central postulates provide a useful framework for exploring social motivation in dementia, the present work expands the theoretical scope of SST. The remainder of this review summarizes the literature on future time perspective, the relationship between time

perspective and social goals, the influence of time perspective on partner preferences, and the link between social goals and cognitive processing. An emphasis in the review is placed on the measures that have been used in the literature to operationalize constructs. This provides the background and rationale for understanding the current study that examines the impact of dementia on social motivation.

Socioemotional Selectivity Theory

Time Perspective

Extant theoretical models of human development focus almost exclusively on the passage of time since birth (Carstensen, 2006). This marker has served researchers studying child development well. At progressively older ages, however, chronological age loses the predictive precision that it holds in youth. Socioemotional selectivity theorists thus advocate for the use of a different index of time, namely the subjective sense of distance from death, to predict change across several domains, including goal-directed behavior. The theory posits that goal selection and pursuit are inextricably related to future time perspective. When time is perceived as expansive, knowledge related goals are pursed. When boundaries on time are perceived, emotionally meaningful goals assume primacy.

Because mortality places constraints on time (Carstensen, Fung & Charles, 2003), age-related differences in time perspective are observed. Recent studies have explored these using the Future Time Perspective Scale (FTP; Carstensen & Lang, 1996). Lang and Carstensen (2002) administered the FTP scale to 480 individuals between the ages of 20 to 90 years and found a strong negative correlation between age and FTP scores. Fung, Lai, and Ng (2001) asked 571 young and older adults living in Taiwan or Mainland China to complete the FTP scale. These areas were chosen because, while they are ethnically identical and share many customs and beliefs, they differ in actuarial life expectancy—Taiwanese live seven years longer than those

residing in Mainland China. As predicted, older adults living in Mainland China anticipated a more limited future than age-matched comparisons, and both older samples endorsed a more limited time perspective than younger adults. The latter finding has been replicated across other studies using the FTP scale (Cate & John, 2007; Kwon, Scheibe, Samanez-Larkin, Tsai & Carstensen, 2009) and in research using a single item derived from the FTP scale (i.e., "I have the feeling that time is coming to an end"; Lang, 2000).

Analogous findings have emerged from research that assessed time perspective by showing participants a line on a piece of paper and asking them to imagine that it represents the entire human lifespan and to place a mark on the line that represents their temporal position in life (Hicks, Trent, Davis & King, 2011). Older adults placed a mark further along the line than did younger adults. When this finding is taken together with the abovementioned, it suggests that time perspective changes in a linear fashion, such that typically aging older adults foresee a relatively more limited future than healthy younger adults.

Impact of Time Perspective on Social Goals

SST predicts clear developmental trajectories for social goals. When time is perceived as expansive, attention is directed towards the future and ways in which one can optimize long-range outcomes. Resources are directed towards acquiring knowledge and expanding skill sets for future payoff. This runs in contrast to the approach taken by individuals understanding time to be limited. Older adults, who increasingly feel the pressure of time and its passage, prioritize present-oriented goals that concern the regulation of feeling states. Resources are directed towards deriving emotional meaning and satisfaction from life, presumably because the payoff is often in the immediate social contact itself rather than at some unspecified point in the future (Carstensen et al., 2003).

Empirical evidence exists in support of these claims. Lang and Carstensen (2002)

examined social motivation in a large sample of younger and older adults. Goals were inferred through the use of a card-sort task. Participants were presented with cards describing different goals and asked to sort the cards into piles according to their relative importance. Consistent with the central assertions of SST, older adults deemed emotion regulation and generativity goals to be of the greatest importance (e.g., "Have control over my feelings" and "Be available to others who need to be comforted", respectively), whereas younger adults valued goals related to autonomy and social acceptance (e.g., "Be well educated and knowledgeable" and "Receive good advice on important decisions", respectively).

Comparable results are found when self-reported goals are examined. Penningroth and Scott (2012) instructed younger and older adults to write down currently held goals and found that, relative to younger adults, older adults reported goals that were more focused on the present, emotion regulation and generativity, and less focused on the future and knowledge acquisition. Older participants also generated a larger number of goals related to deepening emotional bonds with familiar social partners than did younger participants.

These results mirror those found in research that explored how the SARS epidemic affected time horizons and goal constellations of young adults living in Hong Kong during the outbreak (Fung & Carstensen, 2006). Hong Kong was an interesting setting for this research as it was severely affected by the disease: 1755 cases of infection and 296 deaths were reported. Under these conditions, there was reason to believe that young adults came to view their future as precarious. Evidence confirmed this notion. Time perspective became increasingly limited over the course of the 13-week study. This shift was accompanied by an emphasis on experiencing emotional meaning and satisfaction.

Influence of Time Perspective on Social Partner Preference

Socioemotional selectivity theorists argue that time perspective affects social partner preferences. When knowledge-related goals are emphasized, novel social partners are of primary interest. This is because their unfamiliarity increases the likelihood that interactions will be followed by the acquisition of new and potentially useful information. When emotional goals are accentuated, emotionally close partners are preferable. This is attributed to the fact that interactions with these partners are not only predictable, but they are also likely to evoke positive affect and feelings of social connectedness (Carstensen et al., 2003). Research spanning various geographical regions, including the United States (Fredrickson & Carstensen, 1990), Hong Kong (Fung, Carstensen & Lutz, 1999), Taiwan and Mainland China (Fung et al., 2001), has documented this shift in partner preferences. In these studies, young and older adults were asked to imagine that they had a half an hour of free time with no pressing commitments, and that they would like to spend with time with another person. They were to indicate their preference from the following choices: a member of your immediate family, the author of a book you have read, and a recent acquaintance with whom you seem to have much in common. These partners represent goals related to deriving emotional meaning, gaining information, and expanding social horizons, respectively. Across each of the studies, older adults were more inclined than younger adults to select the emotionally close partner.

The abovementioned findings are underscored by variations in time horizons and thus do not reflect static, age-related differences. Research demonstrates that both older and younger adults are capable of adopting a time perspective that differs from what would be predicted by their place in the lifespan. For example, Fredrickson and Carstensen (1990, Study 2) asked older adults to imagine that they had just received word on a medical breakthrough that would extend their life expectancy by 20 years and to then indicate their choice from the partners outlined above. Younger adults were asked to imagine an impending geographic relocation and to then

indicate their partner preference. Under these conditions, older adults showed an increased preference for novel social partners and younger adults for emotionally close partners.

In an attempt to further decouple age from time perspective, Carstensen and Fredrickson (1998) examined mental representations of social partners in middle-aged gay men who were HIV negative, HIV positive and asymptomatic of AIDS, or HIV positive and symptomatic of AIDS. Participants were asked to sort cards describing prospective social partners (e.g., "your sibling", "new neighbor", "person running for a local political position"). Results directly replicated previous research (Fredrickson & Carstensen, 1990), in that multidimensional scaling revealed the following three dimensions accounted for most of the variance in terms of how participants classified partners: affective potential, future contact, and information seeking. The authors found that, in comparison to the other groups, individuals who were both HIV positive and symptomatic of AIDS were the strongest endorsers of a limited time perspective and assigned the greatest importance to the affective potential of social partners and the least importance to considering partners on the basis of their information potential. These results are mirrored by research that examined contact preferences of recently diagnosed cancer patients (Kin & Fung, 2004). Patients were more concerned with deriving emotional meaning from social interactions than age-matched controls.

Positivity Effect

A large body of evidence supports the notion that, in comparison to younger adults, older adults' focus on optimizing emotional satisfaction renders them more sensitive to positive information and/or less sensitive to negative information. One of the first studies to document this age-related positivity effect employed a dot-probe visual attention paradigm (Mather & Carstensen, 2003). Participants were presented with a series of trials where two faces (one emotional: positive or negative expression, and one neutral) appeared in the left and right

positions of a computer screen. A dot probe replaced one of the two faces following a brief delay. Participants were instructed to press a button that corresponded with the location of the dot as quickly as possible. Reaction time served as an index of attentional preference. In contrast to younger adults, older adults were quicker to respond to probes replacing neutral expressions than to probes replacing negative expressions (i.e., angry or sad faces). Subsequent research exploring attentional preferences using this paradigm found that older adults had a tendency to respond quicker to probes replacing happy faces in happy-neutral face pairs (Isaacowitz, Wadlinger, Goren & Wilson, 2006a**)**. Younger adults did not show this preference. Studies exploring age-related differences in attentional preferences using eye-tracking techniques have also documented the positivity effect (e.g., Fung, Isaacowitz, Lu & Li, 2010; Isaacowitz, Toner, Goren & Wilson, 2008; Isaacowitz, Wadlinger, Goren & Wilson, 2006a; Isaacowitz, Wadlinger, Goren & Wilson, 2006b; Li, Fung, & Isaacowitz, 2010). For example, Isaacowitz et al. (2006b) found that younger adults displayed preferential fixation toward negative stimuli displaying fear and older adults showed preferential fixation toward positive stimuli displaying happiness and away from negative stimuli displaying anger and sadness.

Studies exploring memory for emotional material have also found evidence of the positivity effect. Kennedy, Mather, and Carstensen (2004) asked 300 nuns between the ages of 47 to 102 years to recall personal information they had reported 14 years prior. Older adults showed a tendency to remember the past more positively than originally stated, whereas younger participants tended to remember the past more negatively than originally reported. Charles, Mather, and Carstensen (2003) presented young, middle-aged, and older adults with positive, negative, and neutral pictures and found that the ratio of positive images to negative images recalled and correctly recognized increased for each successive age group. The latter finding has been replicated across cultures (Kwon et al., 2009). Younger and older Koreans were presented

with emotional images and asked to complete a recall and recognition memory task. Relative to younger adults, older adults recalled and recognized a greater proportion of positive images than negative images. Analogous findings have emerged from studies exploring a range of cognitive processes, including age-related differences in working memory (Mikels, Larkin, Reuter-Lorenz, & Carstensen, 2005), false memories (Fernandes, Ross, Weigand & Schryer, 2008), and decision-making (Lokenhoff & Carstensen, 2007, 2008).

Rationale for the Present Research

Time Perspective in Dementia

Scant research has explored disorientation to time in dementia (Rueda & Schmitter-Edgecombe, 2009) and the limited work that has been done centers primarily on perceptions of clock time. Various paradigms have been used to explore this facet of time perspective. Prospective time estimation paradigms alert the participant in advance that his or her task will be to estimate time intervals. Participants may then be exposed to a duration interval and asked to provide a verbal estimate of its length, asked to indicate when a stated time has elapsed, or experience an interval of time and subsequently indicate when the same duration has passed (Rueda & Schmitter-Edgecombe, 2009). Retrospective time estimation paradigms do not alert the participant of his or her task in advance, but rather requires participants to provide a verbal estimate of elapsed time durations.

One of the first studies to explore time estimation abilities in memory impairment was conducted with H.M (Scoville & Milner, 1964). The authors found that, when asked reproduce time intervals of varying durations, H.M. performed comparable to healthy controls for intervals less than 20 seconds but demonstrated a severe underestimation deficit for longer intervals (i.e., $\geq$300 seconds). Subsequent research has found results that both compare (Iwamoto & Hoshiyama, 2012) and diverge (Papagno, Allegra & Cardaci, 2004) from the previously

described. With respect to the latter, errors of overestimation were found to be more common than underestimation when participants with AD were asked to give verbal estimates of 15- or 50-second intervals. This finding runs in contrast to prospective time estimation research that did not find evidence of a consistent pattern of over- or underestimation, but rather found that, relative to healthy controls, persons with dementia showed increased variability in error responses (Carrasco, Guillem & Redolat, 2000; Caselli, Iaboli, Nichelli, 2009; Nichelli, Venneri, Molinari, Tavani, & Grafman, 1993; Rueda & Schmitter-Edgecombe, 2009). Relatively little is known about retrospective timing deficits in dementia. The slim body of work that has been conducted suggests that persons with dementia exhibit underestimation deficits when asked to provide estimates of time durations ranging from 30- to 120-seconds (El Haj, Moroni, Samson, Fasotti & Allain, 2013).

Orientation to calendar time is a common parameter assessed in several cognitive status tests, including the Mini-Mental State Exam (MMSE; Folstein, Folstein & McHugh, 1975). The orientation subscale of the MMSE asks participants to indicate the date, year, month, day, and season. Despite the widespread use of this scale in dementia-related research, relatively little is known about whether persons with dementia over- or underestimate the passage of calendar time. This is attributable to the fact that (a) researchers do not tend to report the types errors made and (b) participants are often unable to generate an answer. We do know, however, that orientation scores may differentiate those with persistent versus transient cognitive impairment (Wayne, Vellas, Brodie, Garry & Baumgartner, 2005) and correlate with dementia severity (Ryan, Glass, Bartels, Bergner & Paola, 2009).

Comparably little is known about the extent to which persons with dementia are disoriented to time as indexed by chronological age. Age-disorientation is defined as misstating one's own age by five or more years (Manschreck, Maher, Winzig, Candela, Beaudette &

Boshes, 2000). Shomaker (1989) found evidence of this concept when individuals with AD were asked to indicate their age. Participants exhibited underestimation deficits and reported a value that ranged from 16 to 59 years younger. Several participants were unable to state a specific age, however their actions led proxies to estimate that they were oriented to a reality between 30 to 58 years prior. Age-disorientation has been demonstrated by subsequent research (Grewal, 1995). Individuals with mild to moderate AD were asked to report their age and then indicate whether or not they believed they could live for another 200 years. Participants with mild AD gave correct answers to both questions, whereas errors were observed amongst participants in the moderate stages of disease progression. Information on the nature of errors was not reported. While these data suggest that individuals with dementia are unable to orient to chronological age, data stemming from qualitative research suggests that they remain aware of the aging process (Clare, Rowlands, Bruce, Surr & Downs, 2008) and routinely express concerns surrounding the prospect of grave losses and constrained possibilities accompanying the passage of time (Cottrell & Hooker, 2005; Hedman, Hansebo, Ternestedt, Hellstrom & Norberg, 2014; Roger, 2008; Steeman, Dierckx, Casterle, Godderis & Grypdonck, 2006).

Social Goals and Social Partner Preference in Dementia

There are longstanding assumptions that those with dementia are unable to provide meaningful insight into their subjective experience—observed deficits in cognitive function are argued to render data collected from these individuals as unreliable, and therefore unusable (Aggarwal, Vass, Minardi, Ward, Garfield & Cybyk, 2003). This has led to the relative exclusion of the perspective of those with dementia in empirical research. Although evidence discredits this notion (for a review see de Boer, Hertogh, Droes, Riphagen, Jonker & Eefsting, 2007), the number of studies exploring subjective preferences of those with dementia remains limited. A review of available literature does seem to suggest that persons with dementia retain a relative

prioritization of social goals and contacts that facilitate emotion-regulation.

Cohen-Mansfield, Parpura-Gill, and Golander (2006) conducted interviews with 104 people with dementia to explore self-identity roles, defined as the roles an individual assumes throughout their lifetime. In line with their previous work (Cohen-Mansfield, Golander & Arnheim, 2000), the authors found that the most salient role for these individuals was family-related (as opposed to roles related to profession, leisure activities, and personal attributes/achievements), and that within this realm, parental, spousal and grandparental relationships were the most important. Further, when participants were asked to describe notable achievements, accomplishments related to family roles were cited to the greatest extent (e.g., remaining devoted to the family, facilitating success of family members).

The emphasis that individuals with dementia place on deriving emotional meaning and satisfaction from life is highlighted by additional research. Phinney, Chaudhury, and O'Connor, (2007) engaged individuals with AD in open-ended interviews to identify what they constitute as meaningful activity. As per previous research (Cahill et al., 2004; Droes et al., 2006), participants expressed a desire to engage in activities that facilitate meaningful contributions to the community (e.g., helping to prepare meals for fellow care center residents), as activities along these lines promote feelings of social connectedness and belonging. Both of these feelings are considered to be central aspects of emotion-regulation goals (Carstensen, Isaacowitz & Charles, 1999; Carstensen et al., 2003). Research exploring hoped-for selves in older adults with and without a diagnosis of AD reiterates the importance of this constellation of social goals (Cotrell & Hooker, 2005). Healthy older adults and those with AD expressed a longing for meaningful and deepened relationships with their families, well-being of family members, and a desire to participate in leisure activities that promote enjoyment of life. Interestingly, group differences were observed in the extent to which these goals were emphasized: persons with AD

reported a greater percentage of family-related strivings than did healthy controls.

Research asking individuals with AD to describe what they consider to be important in life complements the abovementioned results (Hedman et al., 2014). Participants reported that relationships with children and grandchildren are of central importance and credit these relationships as giving their life meaning. Additional research corroborates the notion that, similar to the well documented shift in contact preferences observed in normal aging, participants with dementia are increasingly selective in the nature of relationships maintained (Hedman et al., 2014; McGowin, 1993; Phinney et al., 2007), often preferring to allocate diminishing resources to spending time with family members. Self-report data reveals that these contact preferences are underscored by an appreciation of the comfortable companionship that loved ones provide (Phinney et al., 2007).

Positivity Effect in Dementia

Our understanding of the extent to which the positivity effect generalizes to those with dementia remains limited (Mark, 2012). Studies exploring the differential impact of positive and negative information on memory seldom include younger comparisons (Abrisqueta-Gomez, Bueno, Bertolucci, 2002; Boller, Massioui, Devouche, Traykov, Pomati & Starkstein, 2002; Budson, Todman & Schacter, 2006; Fromhalt & Larsen, 1991; Gallo, Foster, Wong & Bennett, 2010; Hamann, Monarch & Golstein, 2000; Kazui et al., 2000; Moayeri Cahill, Jin & Potkin, 2000; Okada & Matsuo, 2012; Satler & Tomaz, 2011; Sundstrom, 2011; Weirheid, McDonald, Simmons-Stern, Ally, & Budson, 2011) or have centered on whether emotional information is better remembered than neutral information (i.e., the emotional enhancement effect; Abrisqueta-Gomez, Bueno, Bertolucci, 2002; Nieuwenhuis-Mark, Schalk & de Graaf, 2009; Satler, Uribe, Conde, Da-Silva & Tomaz, 2009). Given that the positivity effect refers to a lifespan shift in the relative prioritization of positive over negative information (Scheibe & Carstensen, 2010), these

data preclude us from drawing a conclusion as to whether or not individuals with dementia demonstrate this memory advantage. Our knowledge of cognitive preferences in dementia is further restricted by the fact that, to our knowledge, no studies have systematically explored whether attentional preferences vary as a function of emotional valence.

Literature exploring memory for emotional material in dementia has generated mixed results. Hamann et al. (2000) presented emotional images to individuals with AD and then administered a free recall and recognition memory task. In contrast to recognition memory performance, which was comparable across valence, participants recalled a larger number of positive images than negative images. Sundtrom (2011) presented six objects (three were presented as gifts) sequentially to participants with AD. Participants completed a recall and recognition test for the objects following a brief delay. Participants demonstrated superior memory for gifts (i.e., positive material) over non-gifts (i.e., neutral material) in recall memory. Recognition memory was consistent across objects. In research that presented individuals with AD with a series of emotional images and words, participants were found to recall positive and negative information to a comparable degree for both types of stimuli (Kensinger, Brierly, Medford, Growdon & Corkin, 2002). Recognition memory in AD for faces with happy or angry expressions has also been shown to be comparable across valence (Weirheid et al., 2011). These findings run in contrast to work by Satler and Tomaz (2011) that found individuals with AD perform better for negative than positive stimuli on a spatial-delayed recognition span (SRST) working memory task.

Some evidence supports the generalizability of the positivity effect to dementia (Huijbers, Bergman, Rikkert & Kessels, 2011). The authors presented images in varying positions on a computer screen to younger adults, older adults, and adults with AD. Participants were instructed to remember the locations of the images, as they would be asked to relocate them at a later time.

Group differences by valence were observed. Individuals with AD were better at relocating positive versus negative images, whereas spatial memory was consistent across valence for younger and older controls. Recognition memory for the images was examined following a brief delay. All groups correctly recognized positive and negative images to an equal extent. Nashiro and Mather (2011) also examined memory for picture locations in a sample of young and old adults and individuals with AD. They found that, across groups, participants recalled more positive than negative images. Results indicated that valence did not differentially impact memory for picture location. Conflicting findings emerged from research using emotional word lists (Fleming, Kim, Doo, Maguire & Potkin, 2003), in that younger and older controls recalled similar proportions of positive and negative words, and participants with AD recalled more negative than positive words.

Overview of Present Research

The present research examined social motivation in dementia within the theoretical context of socioemotional selectivity. Specific research aims were as follows. (1) Explore the impact dementia has on subjective time horizons as measured by the FTP scale (Carstensen & Lang, 1996) and a modified line task (Hicks et al., 2011). (2) Determine the relative emphasis placed on emotion- and knowledge-related goals by asking participants with dementia to report up to four currently held goals (Penningroth & Scott, 2011). (3) Understand how persons with dementia conceptualize social activities by asking participants to complete a card-sort task on social activity preference. (4) Investigate whether individuals with dementia choose to interact with familiar over novel social partners (Fung & Carstensen, 2004). (5) Examine the extent to which persons with dementia privilege positive information over negative information in attention and memory. Participants were young adults, healthy young-old adults (60 – 75 year-olds), healthy old-old adults (76 years of age and up), and persons with moderate severity

dementia (74 – 93 years of age). Comparisons between young, young-old, and old-old adults served to establish patterns of age-related differences and allow insight into whether or not individuals with dementia diverge from typical aging in the abovementioned domains. Persons with dementia were, for the most part, old-old adults and therefore divergence (or similarity) with the old-old group was intended to assist in determining the nature of disorientation in time perspective and the impact thereof on social motivation. Predictions are outlined for healthy comparisons by research objective below. Specific hypotheses were not made for participants with dementia. The rationale for this is also highlighted below.

Predictions. (1) Group differences in the time perspective of young, young-old, and old-old adults were expected to align with previous research (e.g., Lang & Carstensen, 2002), in that each group would endorse an increasingly limited time perspective. (2) Addressing this objective required data collection only with participants with dementia and was exploratory. (3) Building on previous research that employed a card-sort paradigm (e.g., Carstensen & Fredrickson, 1998) we anticipated that (a) common dimensions social activities were considered along would emerge across groups, (b) these dimensions would differ on the basis of affective and information potential, and (c) the importance of these dimensions would vary across groups. The importance of affective dimensions was hypothesized to increase with age. The inverse was predicted for dimensions related to information. (4) Predictions made for age-group differences in partner preference were in line with previous research (e.g., Fung et al., 2001): young-old and old-old adults would prefer familiar to novel social partners and young adults would not show this preference. (5) We anticipated that young-old and old-old adults would demonstrate the age-related positivity effect in visual attention. Comparable predictions were made for memory performance. Relative to younger adults, older controls were expected to recall and correctly recognize a higher ratio of positive-to-negative material.

The preceding review of the literature indicates that individuals with dementia are disoriented to clock time (Caselli et al., 2009), calendar time (Ryan et al., 2009) and time as indexed by chronological age (Grewal, 1995). Reasoning from these data, we hypothesized that participants with dementia would be disoriented to perceived time remaining in life. The nature of this disorientation (i.e., over- or under-estimation of lifetime relative to old-old adults) was an empirical question. Our inability to predict whether persons with dementia would endorse a perception of future time as open-ended or finite precluded us from making directional predictions. As highlighted in the research summarized above, proponents of SST stress that time perspective underscores the relative prioritization of social goals, social contacts, and emotional information in cognitive processes. Whether participants with dementia would diverge from patterns observed in typical aging across these domains was therefore an empirical question.

Method

Participants

Participants with dementia. Participants were 26 individuals (27% male**)** with a clinical diagnosis of probable AD (n = 23) or mixed dementia (n = 3). Diagnoses were verified by chart review of medical history or interview with legal decision makers. On average, individuals were 3.23 years (SD = 2.08) post-diagnosis. Participants were recruited from a number of sources. Nineteen participants were residing in and recruited from one of the following Alzheimer Care Centers in Edmonton, Alberta: McConnell Place North, McConnell Place West, and Harvest House. Three participants were recruited from long-term care facilities in the Edmonton area. The remaining participants were recruited through the Edmonton Chapter of the Alzheimer Society (n = 2) or by physician referral (n = 2). Participants ranged in age from 74 to 93 years (M = 85.38, SD = 4.07). The majority were widowed (62%) or married (23%), and the remaining participants were divorced (11%) or separated (4%). They averaged 11.62 years (SD = 2.71) of

education.

The MMSE (Folstein et al., 1975) and revised Dementia Severity Rating Scale (DSRS; Xie, Ewbank, Chittams, Karlawish, Arnold & Clark, 2009) were used to classify cognitive status and severity of impairment. The MMSE is a cognitive screening measure that scores from 0 to 30. Lower scores indicate greater impairment. Scores above 25 indicate normal functioning, 21 to 25 suggest mild impairment, 10 to 20 denotes moderate impairment, and scores of 0 to 9 are indicative of severe impairment (Vertesi, Lever, Molloy, Sanderson, Tuttle & Prinicipi, 2001; Feldman & Woodward, 2005). Variability in scoring of the MMSE is observed across studies, where some researchers categorize moderate impairment as scores ranging from 13 to 23 (Harvan & Cotter, 2006). Given that disorientation to time is thought to initially present in the moderate stages of dementia, only participants with MMSE scores between 10 and 23 (M = 17.58, SD = 3.85) were eligible for participation.

The DSRS is based on the Clinical Dementia Rating scale (CDR; Berg, 1988**)** and is an informant-based, multiple-choice questionnaire that assesses impairment in the major functional and cognitive domains affected by AD. The descriptions, which are ordered by increasing level of severity, are assigned sequential values that range from 0 (*normal functioning*) through to a maximum of 6 (*severely impaired*). Totaling the numbers chosen for each category provides the score on the DSRS. Scores range from 0 to 54. Previous research has shown the DSRS to have high test-retest reliability and concurrent validity (Moelter, Glenn, Xie, Chittams, Clark, Watson & Arnold, 2014; Xie et al., 2009). It is argued to be useful across the course of the disease—from the earliest stages of memory impairment (i.e., scores $\leq$ 11), through to very high levels of impairment (i.e., scores $\leq$ 35; Xie et al., 2009). While variability in DSRS scores was observed, on average, participants were classified as moderate dementia severity (M = 18.00, SD = 8.79).

The AB Isophonemic Word Lists (Boothroyd, 1968) was used to assess hearing ability.

Previous research has shown this measure to be suitable for use in populations with dementia (Hopper, Bayles & Holland, 2001). This measure consists of 15 lists of 10 words. Two lists were randomly chosen for use in the present research. Words were read aloud to participants one at a time. Participants were instructed to immediately repeat back the word just heard. A practice trial was used to ensure task comprehension. Words for which the participant requested a repetition or incorrect repetitions were scored as incorrect. The researcher's mouth was covered for the reading of one of the lists. The best score across the two trials (i.e., correct repetitions out of 10) was used as the measure of hearing ability. The criterion for inclusion was at least 70% accuracy on one of the two trials (Hopper et al., 2001). All participants met this inclusionary criterion.

The following precautions were taken to ensure that participants were visually capable of completing the computer-based portions of the research. Individuals were sequentially shown two white 18-point font fixation crosses and two white 18-point font dots in the center of a black computer screen and asked to verbally indicate whether or not there was a shape on the screen. They did this by answering yes or no. Participants responding yes were then asked to point to the shape on the computer screen. Responses were scored as correct if the participant directly touched the shape. Participants were given an opportunity to practice following instruction. Participants unable to reach 75% accuracy on these trials (n = 1) were asked to redo this task using 36-point font. All participants were able to correctly point to 75% or more of the images at either the smaller (n = 24) or larger (n = 1) presentation size, and were thus eligible for participation. Performance accuracy during these trials determined the font size used in the experimental portion of the research. Participants were then shown four sequential pairs of colored images. For each set, participants were asked to point to the image named by the researcher. The image serving as the target was counterbalanced across participants. Participants completed this task following two practice trials. All participants performed this task with 75%

or greater accuracy and were thus eligible for participation.

Individuals with a history of severe head trauma, alcohol or substance abuse, cerebrovascular disease, comorbid neurodegenerative disease, or untreated thyroid complications were ineligible for participation.

Control participants. Twenty-five young (16% male), 25 young-old (36% male), and 25 old-old adults (36% male) were recruited as controls. Young adults were recruited from an introductory psychology pool and received partial-course credit for participation. They ranged in age from 20 to 30 years (M = 22.48, SD = 2.52) and were primarily single (92% unwed; 8% married). They had an average of 14.16 (SD = 0.55) years of education. Older controls were community dwelling. A $25 honorarium was offered for participation. Young-old adults were between the ages of 60 and 75 years (M = 67.56, SD = 4.71). The vast majority was married (80%), followed by those who were widowed (12%), single (4%), or divorced (4%). On average, young-old adults had 15.28 (SD = 2.23) years of formal education. Old-old adults ranged from 76 to 88 years of age (M = 80.24, SD = 2.83). Fifty-six percent were married, 24% widowed, 12% divorced, and 8% were single. They averaged 15.50 (SD = 2.59) years of formal education.

Control groups were asked to complete the Mill Hill Vocabulary Scale (MHV; Raven, Raven & Court, 1985), which serves as an indicator of acquired verbal knowledge. In this measure, participants are presented with 34 words and must select the most accurate synonym for each word from a list of 6 alternatives. The number answered correctly out of 34 serves as the measure of verbal ability. Consistent with the literature on aging, group differences were observed, $F(2, 72) = 8.94$, $p < .001$, $\eta^2 = .20$. Post hoc Tukey tests indicated that verbal abilities of the old-old (M = 21.56, SD = 5.87) and young-old (M = 20.52, SD = 3.22) were comparable, but superior to those of the young (M = 16.20, SD = 4.80), all p-values < .05.

Control participants indicating that English was not the first language learned were asked

to rate their proficiency in English on a 7-point Likert-type scale (1 = *poor*, 4 = *good*, 7 = *excellent*). Of the 28% of young adults for whom this was applicable, all rated their proficiency in English as in the range of good to excellent (M = 5.38, SD = 1.06). Twenty-four percent of young-old adults indicated that English was not the first language learned, and again, all rated their proficiency as within the range of good to excellent (M = 5.33, SD = 0.82). The same pattern was observed for the 20% of old-old participants who completed this question (M = 5.60, SD = 1.34). Decision makers were asked to complete this question with respect to those with dementia. The values reported were comparable to the previously described (M = 5.73, SD = 1.51), $F(3, 40) = 0.42$, *ns*.

As a crude indicator of subjective health, control participants rated their general health, hearing, and vision with respect to the average person their age on a scale of 1 (*poor*) to 5 (*excellent*). Decision makers completed these questions on behalf of those with dementia. While group differences were not observed in terms of perceived general health, $F(3, 96) = .31$, *ns*, and vision, $F(3, 96) = 1.0$, *ns*, groups differed in reported hearing ability, $F(3, 95) = 3.82$, $p = .012$, $\eta^2 = .11$. Post hoc Tukey tests showed that young adults (M = 4.25, SD = 0.85) reported hearing abilities comparable to the young-old (M = 3.96, SD = 0.94), marginally better than those with dementia (M = 3.58, SD = 0.90), $p = .07$, and superior to those of the old-old (M = 3.42, SD = 1.10), $p = .016$. As anticipated, young, young-old, old-old adults, and persons with dementia differed in mean age, Welch's $F(3, 52.72) = 2524.23$, $p < .001$, $\eta^2 = .98$. Post hoc Games-Howell tests revealed that each successive group was of more advanced age, all p-values < .001. The educational background of the four groups also differed, Welch's $F(3, 43.38) = 11.51$, $p < .001$, $\eta^2 = .34$. Games-Howell tests indicated that young adults had relatively less education than young-old adults and old-old adults, all p-values = .09, while participants in the latter two age groups possessed similar levels of education. Participants with dementia had the least years of

formal education, all p-values < .001.

Measures

Time perspective. The FTP scale (FTP; Carstensen & Lang, 1996) and a modified line task (Hicks et al., 2011) were used to assess future time perspective. The FTP scale is comprised of 10-items. Sample items include "Many opportunities await me in the future", "I have the sense that time is running out", and "There is plenty time left in my life to make new plans." Participants indicate their agreement with each item on a scale of 1 (*very untrue*) to 5 (*very true*). Scores range from 10 to 50. Higher values indicate more expansive time perspectives. Construct validity of the scale has been demonstrated by previous research (Fung et al., 2001). Internal consistency of the scale in our sample, as indexed by Cronbach's alpha, was 0.86. Within-group values ranged from 0.73 (participants with dementia) to 0.89 (young-old adults). We computed a composite index for each participant by taking mean scores across the 10-items. To reduce the likelihood of the FTP scale resulting in lingering negative affect for older adults, two items from the Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985) were interspersed into the middle and end of the questionnaire. These items were chosen because previous research has shown older adults respond favorably to items pertaining to life satisfaction (Hamarat, Thompson, Zabrucky, Steele, Matheny & Aysan, 2001). Selected items were "So far I have gotten the important things I want in life" and "If I could live my life over, I would change almost nothing."

Participants were shown a line measuring 8 inches and asked to imagine that it represented the entire human lifetime from beginning to end. They were instructed to place a mark on the line that represented where they are located in their lifetime at the present moment. One end of the line was labeled *birth* and the other *death*. To promote task comprehension, a picture of an infant (to represent birth) and a coffin (to represent death) was placed under the appropriate

labels for persons with dementia. The distance of the mark from the label *birth* in inches was taken as the measure of time perspective. Higher values indicate narrowed time horizons.

Self-reported social goals in dementia. Participants with dementia were asked to tell the researcher up to four goals, hopes, plans, or dreams they have for the future (Nurmi, 1992; Penningroth & Scott, 2012). Goals were coded for the presence or absence of five features of SST: knowledge-acquisition, emotion-regulation, social contact narrowing, future- and present-orientation. Coding was done in accordance with a manual developed by previous research (Penningroth & Scott, 2012). The manual contained at least five definitions and two examples of goals demonstrating the feature in question (see Table 1).

Table 1

Select definitions and examples used to code self-reported social goals

Goal characteristic	Partial definition	Example
Knowledge-acquisition	Motivation to increase knowledge base or skills	Learn how to knit
Emotion-regulation	Emphasis on increasing emotional wellbeing	Be happy
Social-contact narrowing	Motivation to experience meaningful relationships	Spend more time with my wife
Future-oriented	Focus on planning and analyzing	Plan a trip for next year
Present-oriented	Motivation to achieve satisfaction in the moment	Enjoy every day as it happens

Mental representations of social activities. We assessed cognitive representations of social activities by asking participants to complete a 32-item card-sort task. Cards were 5.5 inches x 4.25 inches. Each had a description of a social activity written in the center in black 28-point font (see Appendix A for a complete list of items). Activities were described in such a way as to be relevant to participants regardless of age, class, ethnicity, and health status. Cards were given to participants in a pre-determined randomized order. Instructions were demonstrated with a 5-item food preference card-sort. A 10-item emotional-preference card-sort task served as practice.

Card-sort techniques have two important advantages. First, this empirical approach minimizes socially desirable responding by avoiding leading questions that are often inherent in rating scales (Carstensen & Fredrickson, 1998). Second, ordinal data generated by this method can be subjected to multidimensional scaling (MDS), a mathematical modeling technique that enables researchers to discover (versus impose) relevant organizing constructs (Rudy & Merluzzi, 1984). The latter consideration is particularly relevant when researchers are concerned

with understanding participants' own cognitive distinctions among targets and wish to avoid presupposing the relevant dimensions (Carstensen & Fredrickson, 1998).

Social partner preference. Preference for social partners was assessed in a manner consistent with previous studies (Fung & Carstensen, 2004). Participants were asked to imagine that they had half an hour of free time with no pressing commitments, and that they have decided they would like to spend this time with another person. They were to indicate with whom they would like to spend that time from the following three prospects: a member of their immediate family, a recent acquaintance with whom they seem to have much in common, or a famous person they admire. Preference for the latter two partners indicates motivation to acquire novel information, whereas preference for the foremost partner represents motivation to regulate affect. The order in which partners were presented was randomized.

Attention and Memory Stimuli. Experimental stimuli consisted of 128 images selected from the International Affective Picture System (IAPS; Lang, Bradley & Cuthbert, 2008). The IAPS is a repository of experimental stimuli for which there are normative ratings of valence and arousal ranging from 1 (*the most negative; least arousing*) to 9 (*the most positive; the most arousing*). Thirty-two images were coded as negative ($M = 2.74$, $SD = 0.65$), 64 neutral ($M = 5.45$, $SD = 0.77$), and 32 as positive ($M = 7.52$, $SD = 0.34$) in emotional valence on the basis of normative ratings. Valence ratings for the categories differed, $F(2, 133) = 423.65$, $p < .001$, $\eta^2 = .86$, in that each of the respective categories were rated as higher (i.e., more positively) than the previous category. Categories also differed from one another in normative ratings of arousal, $F(2, 133) = 34.10$, $p < .001$, $\eta^2 = .34$. Neutral images ($M = 3.93$, $SD = 1.07$) were seen as less arousing than positive ($M = 5.14$, $SD = 0.98$) and negative images ($M = 5.47$, $SD = 0.74$), all p-values = .000. The latter two categories were comparable.

In an effort to ensure that individuals' perceptions of the images were comparable to IAPS

valence ratings, participants were asked to report for each image whether it made them unhappy, happy, or neither unhappy nor happy. These items were listed below each image and the text "Please rate the emotion of the image" was listed above. The researcher entered responses by use of the keyboard. Images were presented one at a time and in random order. Due to time constraints, some participants with dementia were unable to rate each the emotion of each of the 128 images, but rather did so for only a subset of the stimuli. Overall, participants were in moderate agreement with normative IAPS ratings, $\kappa = 0.48$ (Viera & Garrett, 2005).

Of the images presented, half depicted people (e.g., grandfather with grandchildren) and the other half inanimate objects (e.g., eating utensils) or nature scenes (e.g., shipwreck). All images were chosen to be sufficiently distinct from one another as to allow coders to easily identify the image being referenced during the free recall period. Half of the images within each valence category were presented during encoding. Each of these images had a novel partner similar in content that was used to contrast previously seen images during a recognition task. Computer-based tasks were presented using E-Prime software (Version 2.0, Psychology Software Tools, Pittsburgh, PA).

Procedure

Written consent was obtained from all participants and their caregivers (where appropriate). Participants with dementia provided written assent. The University Research Ethics Board (REB) approved the study protocol. Participants were tested individually. Individuals with dementia completed the hearing and vision assessment at the outset of the study. Like healthy controls, they then received instruction on the dot-probe. The nature of this task was as follows. Each trial consisted of a white fixation cross appearing in the center of a black computer screen for 500 ms (healthy controls) or 1000 ms (participants with dementia). To better orient participants' gaze on the center of the screen at the start of each trial, a beep sounded at the same

time as the fixation cross appeared. One neutral and one emotional image (i.e., positive or negative) were then presented in the left and right positions of the screen for 1000 ms (healthy controls) or 1500 ms (participants with dementia) against a black background. Stimulus presentations differed according to cognitive status in an attempt to prevent ceiling or floor effects (Kensinger et al., 2002; Weirdhard et al., 2011). A white dot then appeared in the center of the screen location where one of the images had been shown. The dot remained on the screen until participants responded by pressing one of two buttons on a button box. Large buttons (two inches in diameter) were used in an effort to decrease task difficulty. To fully counterbalance the side of the screen the emotional image appeared on and dot positioning for each participant, images were shown four times, resulting in a total of 128 trials. Image pairings were randomized for each block of 32 trials, as was the presentation order for each participant.

Participants were sat 3 feet away from a 24-inch high definition computer screen for the completion of the dot-probe. They were told the purpose of the task was to investigate perceptual processes. Participants were instructed that they were about to view a series of images and that they should look at them naturally, as though they were watching television. They were told the images would be shown for a brief period of time and would then disappear. Once the images disappeared, a small dot would appear in the center of where one of the two images was shown. Participants were instructed to press the button that corresponded with where the dot was shown as quickly and accurately as possible. They were asked to use only their dominant hand and to return it back to a central position after each trial. Experimental trials were preceded by four practice trials, which could be repeated as many times as was necessary. Task comprehension was inferred on the basis of performance accuracy during these trials. Comprehension was monitored throughout the task by the researcher who reminded participants of the instructions as necessary. Participants were asked to refrain from talking for the duration of the task.

Modifications were made for participants with dementia as needed.

Immediately following the dot-probe, participants with dementia completed a free recall task in which they were asked to describe all of the pictures they remembered seeing during the previous task. Participants were not aware in advance that their memory for the images would be tested. Individuals were informed that they did not need to give lots of detail, just enough that the experimenter could identify the image being referenced. Participants were instructed they had 5-minutes to complete this task. The researcher wrote down responses verbatim. Healthy controls received the same instruction, however, they completed this task following a 10-minute delay during which time they completed the MHV (Raven et al., 1985). This modification was made in an attempt to prevent ceiling or floor effects.

Participants then completed a recognition memory test for the images. They were instructed that they were going to view a series of images—some of which were previously seen and some of which were not—and to indicate whether or not they remembered the image by use of the button box. Buttons were labeled yes or no and remained this way for the duration of the task. Label positioning was counterbalanced across participants. Individuals with dementia were asked to respond verbally to the experimenter who then entered responses. Practice trials were used to ensure task comprehension. For each trial, the following text was listed above the image "Did you see this image during the last phase." This served to ease the cognitive load of the task. Participants were subsequently asked to rate the emotion of each image.

The aforementioned tasks were completed on the first day of participation for those with dementia. Three participants with dementia requested to complete the tasks in a single session. This request was accommodated given that they did not seem fatigued. One participant with dementia declined to participant in computer-based tasks, and as a result, only data for tasks outlined below were available for analysis. The remaining 22 participants with dementia

completed tasks over the course of two days (consecutive, when possible). The number of days separating sessions ranged from 0 to 12 ($M = 1.46$, $SD = 2.98$).

Measures pertaining to time perspective were then administered. Participants first placed a mark on the line that represented their temporal position in life and then completed the FTP scale. Individuals were subsequently asked to indicate their social partner preference. Controls were asked to circle their choice and persons with dementia to verbally indicate or point to their preference. This was followed by card-sort instruction and practice. Instructions given were comparable to previous research (Lang & Carstensen, 2002). Participants were informed that each of the cards described an activity that one may or may not enjoy doing. They were asked to sort the cards into piles with respect to how much they would like to do each of the described activities. Activities they wanted to do the most were to be placed towards the left, near a label *really want to do*. Activities they wanted to do less, or not at all, were to be ordered towards the right, labeled *really do not want to do*. Activities they wanted to do an equal amount were to be placed in the same pile. Labels were intended to serve as a memory aid and were spaced 3 feet apart. Participants were further instructed to imagine that money and transportation were not an issue. They were then informed that there was no right or wrong way to sort the cards and encouraged to build as many piles as was necessary to represent their views. Instructions were repeated as needed throughout out the task. Participants were encouraged to ask questions at any point during task completion. To aid in our interpretation of these data, participants were then asked to tell the researcher what was appealing about the activities they wanted to do the most, and what was unappealing about the activities they wanted to do the least.

Individuals with dementia then indicated up to four currently held goals. Participants were asked to take some time to reflect before answering. The experimenter wrote down responses verbatim. Once participants indicated they were finished or reached four goals, the researcher

read responses aloud and confirmed their importance. In the event that participants indicated that a said goal was not important, the item was either replaced, or if no new responses could be generated, excluded from further analysis. This led to the exclusion of .02% of data. The MMSE was subsequently administered to participants with dementia.

Once healthy controls had discussed their activity preferences, relevant demographic information was collected. A subset of these participants (n = 42) was then asked to rate the 32 card-sort items along the following dimensions: information seeking, affective potential, and social contact. Questions for each of the respective features were as follows. Participants were to indicate how much new information they would learn from participating in the activity (1 = *none,* 7 = *a great deal*), how positively they would feel participating in the activity (1 = *very negative,* 7 = *very positive*), and how likely they would be to do the activity with another person (1 = *very unlikely*, 7 = *very likely*). These data were collected to facilitate with subsequent interpretation of card-sort data. Participants were then thanked for their contribution and debriefed. The amount of time needed to complete the tasks varied across participants, however, testing sessions did not tend to exceed two hours.

Results

The criterion for significance was set at an alpha level of .05. To facilitate comparison with previous research, findings between .06 and .10 are reported as trends. All statistical tests were two-sided. Where planned comparisons were not made and homogeneity of variance was observed, corrections for multiple comparisons were made using post hoc Tukey tests. Corrections for violations of homogeneity of variance were made using Welch's F and post hoc Games Howell tests for multiple comparisons. Effect sizes are reported at eta-squared or partial eta-squared for analyses of variance. Cohen's d is reported for t tests.

Time Perspective

FTP scale. Predictions made for young, young-old, and old-old adults were that each successive age group would endorse an increasingly limited time perspective. The nature of disorientation to subjective time horizons in dementia was an empirical question. Results of a one-way analysis of variance (ANOVA) revealed group differences in partial support of our predictions, $F(3, 97) = 20.56$, $p < .001$, $\eta^2 = .39$. Young-old adults ($M = 3.45$, $SD = 0.56$) believed they had less time remaining in life than young adults ($M = 3.89$, $SD = 0.49$), $p = .016$. The same was true of old-old adults ($M = 2.84$, $SD = 0.42$) relative to young and young-old adults, all p-values $< .001$. Participants with dementia ($M = 3.05$, $SD = 0.56$) envisioned a more limited future than did young adults, $p < .001$, and young-old adults, $p = .029$. Their understanding of time remaining in life was comparable to old-old adults.

Modified line task. Results of a one-way ANOVA revealed that groups differed in where they placed a mark on the line, Welch's $F(3, 51.46) = 232.25$, $p < .001$, $\eta^2 = .70$. As expected, young-old ($M = 5.52$, $SD = 0.82$) and old-old adults ($M = 6.26$, $SD = 0.69$) placed a mark further from the label *birth* than did young adults ($M = 2.17$, $SD = 0.49$), all p-values $< .001$. Old-old adults envisioned a more constrained future than did young-old adults, $p = .007$. Participants with dementia ($M = 4.87$, $SD = 1.67$) understood time as more limited than young adults, $p < .001$. In contrast to the above, those with dementia and young-old adults reported comparable subjective time horizons. A comparison with old-old adults revealed that individuals with dementia believed they had more time remaining in life, $p = .002$.

Self-Reported Social Goals in Dementia

We explored whether participants with dementia would report a greater number of goals related to emotion-regulation and social contact narrowing than those related to knowledge-acquisition. We also examined whether goals pertaining to the present would be more salient

than those pertaining to the future. Two independent raters blind to study hypotheses coded goals on the basis of these features. Inter-rater agreement was 90%. Agreement reached 100% following discussion. Differences were explored by paired-sample *t* tests. Seven participants did not report any goals and are thus not represented in analyses outlined below.

Goals pertaining to emotion regulation ($M = 1.17$, $SD = 1.15$) were reported to a greater extent than goals pertaining to knowledge acquisition ($M = 0.33$, $SD = 0.49$), $t(17) = 2.64$, $p = .017$, $d = 0.62$. In line with this finding, participants were more concerned with deepening emotionally meaningful relationships ($M = 1.11$, $SD = 1.08$) than acquiring information, $t(17) = 2.72$, $p = .015$, $d = 0.64$. Significant differences in the temporal extension of goals were not observed, $t(17) = 0.88$, *ns*. Participants indicated goals related to present or near future ($M = 1.50$, $SD = 1.04$) to the same degree as those related to the distant future ($M = 1.11$, $SD = 1.02$).

Mental Representations of Social Activities

Overview of multidimensional scaling. Groupings of social activities for each participant were transformed into a 32 x 32 Euclidian distance proximity matrix. We summed these matrices across the participants in each group, allowing us to produce four group-level proximity matrices corresponding to young, young-old, old-old adults, and participants with dementia. Matrices were analyzed by use of the individual differences algorithm of three-way MDS (INDSCAL; Takane, Young & De Leeuw, 1976). This analysis has three essential features. First, it places items in multidimensional space according to perceived similarity. Items routinely grouped together are proximate in this configuration and items routinely grouped separate are distant. Second, it highlights the number of dimensions required to represent the stimuli under investigation. It is the responsibility of the researcher to interpret the dimensions. Finally, it permits examination of group differences in the importance of common dimensions in the overall multidimensional configuration.

Scaling results. Our expectations for these data were as follows. We anticipated that common dimensions would emerge across age groups and that, broadly speaking, these dimensions would differ on the basis of information and affective features. We further hypothesized that the importance of these dimensions would vary across groups. We expected dimension(s) corresponding to emotion-regulation to be most salient for old-old adults, followed by the young-old, and then young adults. The inverse pattern was predicted for dimension(s) corresponding to knowledge-acquisition. We hypothesized that the importance of these dimensions would vary for participants with dementia according to whether future time was perceived as limited or expansive.

Our initial analysis yielded a common two-dimensional configuration that accounted for 40% of the variance. We sought to increase this value (i.e., improve goodness-of-fit of our scaling solution; Kruskal & Wish, 1978) by refining our list of social activities. In doing so, we made use of the open-ended answers provided by participants after sorting cards (i.e., qualitative data) and responses to the following three questions: how much new information do you expect to learn from the activity (information seeking), how positively would you feel engaging in the activity (affective potential), and how likely would you be to engage in the activity with another (social contact). We revised items along Dimension 1 as follows. Activities with positive values on this dimension appeared to be less social in nature than activities with negative values. Given this distinction, we calculated the average social contact for items with positive values on Dimension 1 ($M = 3.39$, $SD = 0.72$) and the average social contact for items with negative values on Dimension 1 ($M = 4.94$, $SD = 0.87$). We removed activities with positive values on Dimension 1 that fell one standard deviation above the former mean. Activities with negative values on Dimension 1 that fell one standard deviation below the latter mean were also omitted. A comparable approach was used to refine Dimension 2, which appeared to differentiate

activities associated with minimal knowledge acquisition from those associated with high knowledge acquisition. We calculated the average information seeking for activities with positive values on Dimension 2 ($M = 4.33$, $SD = 0.92$) and the average information seeking for activities with negative values on Dimension 2 ($M = 4.40$, $SD = 0.88$). We removed activities with positive values on Dimension 2 that fell one standard deviation above the former mean. We also excluded items with negative values on Dimension 2 that were one standard deviation below the latter mean. We were left with 22 social activities following these calculations. Analysis on these items yielded a common three-dimensional configuration that accounted for 62% of the variance in the proximity data. Table 2 outlines coordinates for the 22-items in the overall stimulus configuration.

Dimension 1 accounted for 23% of the variance. Reasoning that predictability is associated with affective reaction, activities with positive values on this dimension included those associated with unpredictable (e.g., go shopping, watch a new TV show, attend a sports game) and potentially unsettling emotions (e.g., listen to a politician give a talk, take a cooking class, try a music lesson). We were initially perplexed that two items (i.e., read old cards, dance with a family member) sharing positive values on this dimension appeared to run in contrast to this distinction. Qualitative data revealed, however, that individuals were often disinterested in these activities for reasons in line with our distinctions. Social activities sharing low values on this dimension included those related to predictable (e.g., garden, enjoy your favorite meal, watch a movie you love, look at pictures from a past vacation) and positive emotional experiences (e.g., play a game with friends, have coffee with family, talk on the phone with a friend). This pattern of proximities led us to interpret this dimension as *predicted affect:* it differentiated activities expected to promote positive affect from those associated with more uncertain or negative affect. This interpretation is bolstered by the fact that activities sharing positive values on this

dimension ($M = 4.28$, $SD = 0.46$) were perceived as lower in positive affect than activities sharing negative values ($M = 5.51$, $SD = 0.62$), $F(1, 20) = 27.15$, $p < .001$, $\eta^2 = .58$.

Dimension 2 accounted for 22% of the variance. Reasoning that social interchange affords more information than solitary activity, the distribution of activities along this dimension led us to interpret it as *social information*: it distinguished activities accompanied by minimal social interchange (e.g., look at pictures from a past vacation, people watch, attend a religious service, paint, read old cards, garden, listen to a politician give a talk) from those accompanied by considerable social interchange (e.g., attend a sports game, play a game with friends, volunteer, try a new restaurant, talk on the phone with a friend, have coffee with family). We further reasoned that, because the latter activities promote social interactions, they facilitate the acquisition of knowledge related to the self and where one fits within the broader social context to a greater extent than the former activities. Evidence supports these claims. Activities sharing positive values on this dimension were rated as less social ($M = 4.04$, $SD = 0.78$) in nature than activities sharing negative values ($M = 5.08$, $SD = 0.91$), $F(1, 20) = 8.16$, $p = .01$, $\eta^2 = .28$. Activities with positive values along this dimension were also perceived as providing less information ($M = 4.01$, $SD = 0.61$) than activities with negative values ($M = 4.62$, $SD = 0.58$) along this dimension, $F(1, 20) = 5.59$, $p = 0.028$, $\eta^2 = .22$.

Dimension 3 accounted for 18% of the variance. Reasoning that frequency of participation in an activity is associated with emotional commitment, we interpreted this dimension as *emotional investment*. Activities with positive values on this dimension (e.g., watch a movie you love, people watch, learn a new language, read old cards, listen to a politician give a talk, try a music lesson, talk on the phone with a friend) differ from those with negative values on this dimension (e.g., attend a sports game, play a game with friends, dance with a family member, attend an art gallery, garden, paint, volunteer) in the extent to which they are routinely

undertaken for leisure. Qualitative data supports this interpretation. Activities with negative values on this dimension were often discussed in relation to the high frequency with which they are performed for enjoyment purposes.

Table 2

Coordinates of social activities in the overall stimulus configuration

Description of Prospective Activity	Stimulus Coordinate on Dimension 1	2	3
Look at pictures from a past vacation	-0.78	.04	-0.13
Watch a movie you love	-0.72	-0.92	0.16
People watch	-0.71	0.76	1.44
Talk on the phone with a friend	-1.04	-0.29	0.66
Learn a new language	1.13	-0.35	1.56
Go shopping	1.08	-1.06	-0.37
Have coffee with family	-1.26	-1.10	-1.43
Attend a religious service	-0.25	1.70	-0.59
Paint	1.78	0.85	-0.37
Volunteer	-1.19	-0.58	-0.21
Watch a new TV show	0.53	-0.78	-0.03
Read old cards	0.28	1.07	1.50
Garden	-0.43	1.29	-0.54
Enjoy your favorite meal	-1.16	-1.20	-1.36
Dance with a family member	0.64	0.70	-1.39
Try a new restaurant	-1.19	-1.14	0.03
Go to an art gallery	-0.49	0.70	-0.76
Listen to a politician give a talk	1.12	2.28	0.80
Take a cooking class	1.62	-0.53	0.82
Play a game with friends	-0.92	-1.20	-1.02
Attend a sports game	1.15	-0.27	-0.84
Try a music lesson	0.79	0.01	2.09

Group differences in cognitive representations. Our scaling solution yielded weights for each of the respective dimensions for young, young-old, old-old adults, and participants with dementia. These values represent the importance of the associated dimension to participants

belonging to that group. High values indicate that a dimension is of importance and low values that the dimension is of less importance. Examination of these values thus affords insight into group differences in cognitive representations of social activities. Dimension weights for each group are depicted in Figure 1 and Figure 2.

Weights for Dimension 1 are displayed along the horizontal axis in both Figures. In line with our predictions for age groups and revealing the pattern for dementia, old-old adults (0.75) assigned the greatest importance to considering the anticipated emotional outcome of social activities, followed by young-old adults (0.39) and participants with dementia (0.36). Young adults demonstrated minimal regard for the affective potential of social activities (0.17). Weights for Dimension 2 are highlighted on the vertical axis of Figure 1. The importance of social information declined with age and infirmity. Young adults placed the strongest emphasis on this dimension (0.82), which was of less importance to young-old adults (0.37), and relatively unimportant to old-old adults (0.18) and participants with dementia (0.13). Weights for Dimension 3 are represented on the vertical axis of Figure 2. The observed pattern suggests that pastimes with emotional investment are most important to participants with dementia (0.73), and of less importance to young-old (0.33) and old-old adults (0.28). Young adults tended not to consider social activities along these lines (0.13).

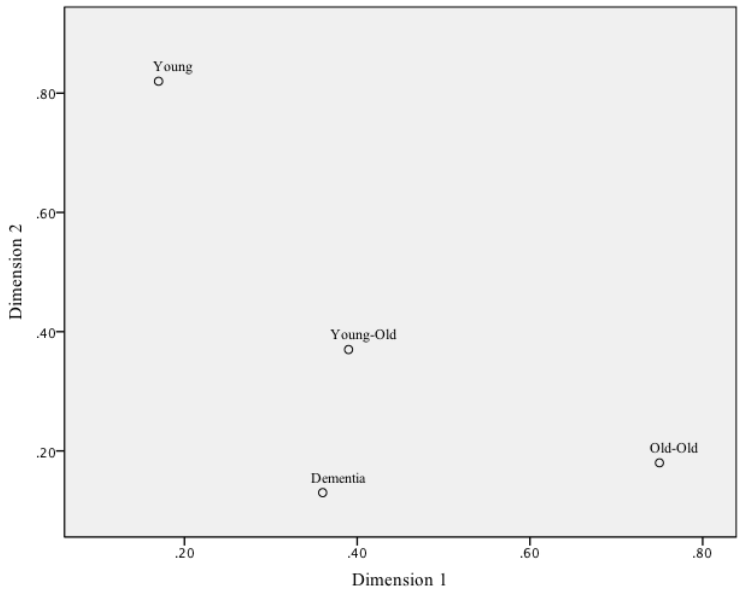

Figure 1. Weights for Dimension 1 and Dimension 2 by group. Weights represent the importance of the dimension to participants in a group.

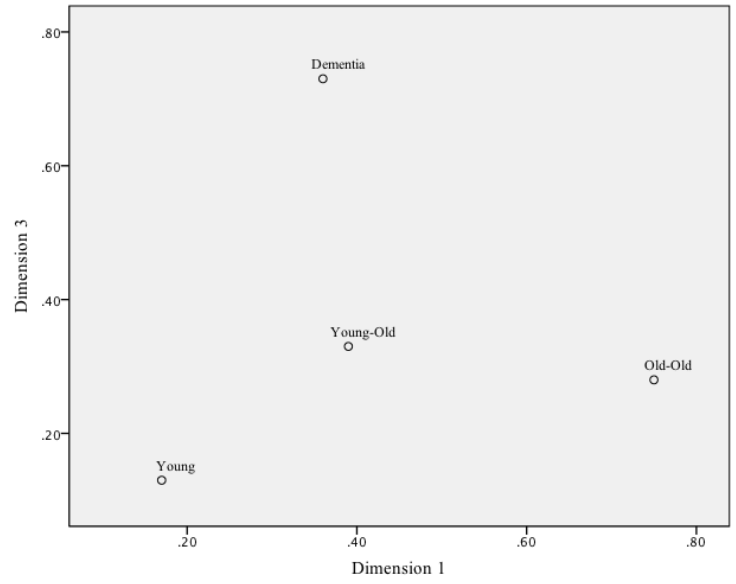

Figure 2. Weights for Dimension 1 and Dimension 3 by group. Weights represent the importance of the dimension to participants in a group.

Social Partner Preference

We hypothesized that young-old and old-old adults would choose to interact with the familiar (i.e., a member of immediate family) as opposed to novel social partners (i.e., a recent acquaintance, admired famous person). Young adults were predicted to choose familiar and

novel social partners to a comparable extent. Partner preference in dementia was an empirical question.

Because previous research made no theoretical distinction between the novel social partners (Fung et al., 2001), we collapsed these items to form one category. Figure 3 displays the percentage of participants in each group that chose to interact with the familiar or unfamiliar social contact. Results of a chi-square test-of-association ran in contrast to our predictions. Significant group differences were not observed, $\chi^2(3) = 1.89$, *ns*, but rather it appeared as though, across groups, participants preferred interactions with familiar to novel social partners. We conducted a chi-square goodness-of-fit to examine this notion. Results supported this hypothesis. Participants were more inclined to select the familiar social contact (70%) as opposed to the unfamiliar social contact (30%), $\chi^2(1) = 16.64$, $p < .001$.

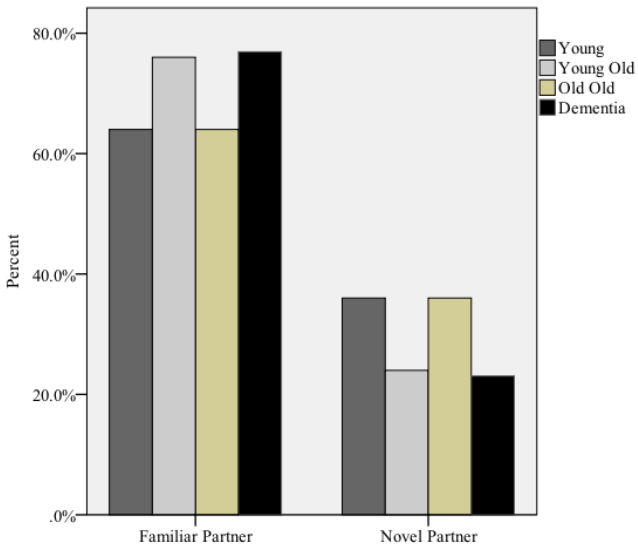

Figure 3. Social partner selection by group.

Positivity Effect

Dot-probe reaction times. We hypothesized that young adults would not demonstrate an attentional preference for emotional or neutral stimuli. Young-old and old-old adults were predicted to demonstrate an age-related positivity effect and would orient towards positive

stimuli and away from negative stimuli. This question has not been previously explored in the context of dementia, thus specific predictions were not made.

Hypotheses were examined by calculating attentional bias scores for each participant by subtracting mean probe-detection times for probes appearing on the same side as an emotional image (i.e., positive or negative) from mean probe-detection times for probes appearing on the other side (Isaacowitz et al., 2006a; Mather & Carstensen, 2003). Separate bias scores were calculated for neutral-positive and neutral-negative image pairings. Because higher values indicate longer reaction times, positive values on this measure indicate a bias to attend to emotional images and negative values indicate a bias to attend to neutral images. Values near zero reflect an absence of attentional bias. Calculations were performed using logarithmically transformed reaction times. Mean reaction times are presented in Table 3. Reaction times for incorrect responses to the dot were excluded from analysis. This led to the removal of less than 0.01% of data. The number of errors made did not differ across groups, $F(3, 96) = 1.32$, *ns.* To reduce the influence of outliers, responses quicker than 200 milliseconds or above three standard deviations from each participant's mean were excluded (Ratcliff, 1993**)**. This again led to the exclusion of less than 0.01% of the data.

Table 3

Mean reaction times (in milliseconds) by group on the dot-probe task

	Neutral-positive pairings		Neutral-negative pairings	
Group	Dot in location of neutral image	Dot in location of positive image	Dot in location of neutral image	Dot in location of negative image
Young	650.25 (124.88)	655.92 (120.77)	657.51 (124.16)	662.96 (132.32)
Young-old	815.44 (157.69)	824.41 (169.31)	827.21 (177.02)	838.94 (167.97)
Old-old	837.43 (175.95)	851.64 (176.06)	839.56 (175.43)	858.06 (167.55)
Dementia	2700.64 (2456.90)	2763.53 (2364.85)	2830.20 (2729.95)	2599.32 (2314)

Note: Standard deviations are in parentheses.

Bias scores were compared using a 4 (Group: young, young-old, old-old, dementia) x 2 (Bias valence: neutral-positive, neutral-negative) mixed ANOVA. Group served as a between-subjects factor and bias valence as a within-subjects factor. We did not observe a main effect of group, $F(3, 96) = 1.06$. A main effect of bias valence emerged, $F(1, 96) = 6.48$, $p = .012$, $\eta_p^2 = .06$, which was qualified by a significant Group X Bias Valence interaction, $F(3, 96) = 8.97$, $p < .001$, $\eta_p^2 = .22$. Bias scores are presented in Figure 4.

To clarify the interaction, we conducted one-sample *t* tests with a hypothesized difference of 0 (indicates that attention is equally allocated to neutral and emotional images) to explore within-group biases, and subsequently performed a one-way ANOVA for each level of bias valence. Results for neutral-positive image pairings were as follows. Young adults were faster to respond to probes replacing neutral images ($M = -0.01$, $SD = 0.02$), $t(24) = -2.10$, $p = .046$, $d = -0.42$. Young-old adults showed no bias towards positive or neutral images ($M = -0.01$, $SD = 0.04$), $t(24) = -1.29$, *ns*. Old-old adults showed a trend towards faster responses for probes replacing neutral images ($M = -0.02$, $SD = 0.04$), $t(24) = -1.99$, $p = .058$, $d = -0.40$. Participants

with dementia were quicker to detect probes replacing neutral images (M = -0.04, SD = 0.07), $t(24) = -2.67$, $p = .013$, $d = -0.53$. Group differences were not found for neutral-positive bias scores, Welch's $F(3, 50.25) = 1.36$, *ns*, indicating that, overall, neutral images were attended to over positive images (M = -0.02, SD = 0.05), $t(99) = -3.90$, $p < .001$.

The pattern of results for neutral-negative image pairings differed from the above. Young adults showed no difference in reaction time as a function of image valence (M = -0.01, SD = 0.03), $t(24) = -0.93$, *ns*. Young-old adults were faster to respond to the dot when it was in the location of a neutral image (M = -0.02, SD = 0.04), $t(24) = -2.12$, $p = .045$, d = -0.42. Old-old adults did not preferentially attend to neutral or negative images (M = -0.02, SD = 0.08), $t(24) = -1.56$, *ns.* Participants with dementia were faster to detect probes replacing negative images (M = 0.05, SD = 0.11), $t(24) = 2.12$, $p = .044$, $d = 0.42$. Group differences in bias scores were observed, Welch's $F(3, 50.13) = 2.78$, $p = .05$, $\eta^2 = .13$. Simple contrasts revealed that bias scores of young-old and old-old adults did not differ from those of young adults, all p-values > .05. Differences between participants with dementia and young adults were found, $p = .029$, indicating that a preference to orient towards negative images was unique to those with dementia.

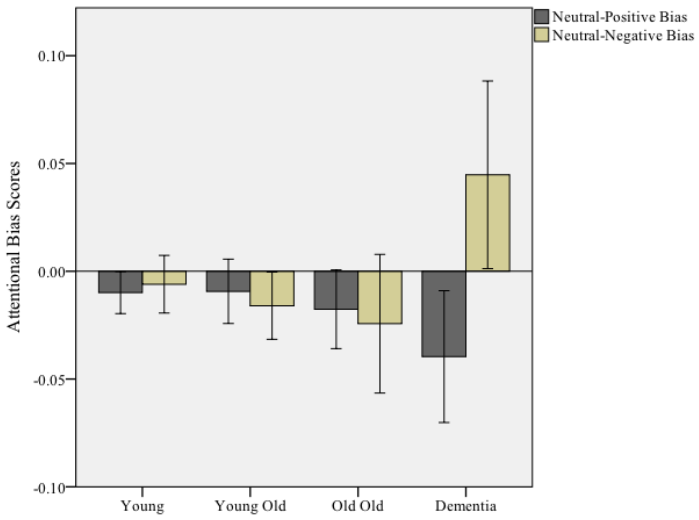

Figure 4. Log-transformed attentional bias scores by group. Errors bars represent 95%

confidence intervals.

Recall memory. Recall responses were matched to their respective IAPS number by two coders. Coders were in agreement on 90% of the images. Coders met in person to discuss discrepancies and reach consensus. A total of 34 responses could not be coded because they did not match the description of an image presented or were too vague. The number of responses that could not be coded did not vary by group, $F(3, 87) = 1.29$, *ns*. Responses coded as a repeat of a previously described image were excluded from analysis. Groups differed in the number of images that were coded as such, $F(3, 87) = 3.04$, $p = .033$, $\eta^2 = 0.10$. Participants with dementia ($M = .00$, $SD = .00$) repeated responses to a lesser extent than young-old adults ($M = 0.64$, $SD = 0.95$), $p = .013$, and marginally less than old-old adults ($M = 0.48$, $SD = 0.92$), $p = .068$. No comparisons involving young adults ($M = 0.20$, $SD = 0.50$) were significant. Consistent with research showing declines in recall memory performance with age, group differences were observed, Welch's $F(3, 44.52) = 124.93$, $p < .001$, $\eta^2 = .64$. Young adults recalled the largest number of images ($M = 16.16$, $SD = 4.85$), all p-values < .05, performance of the young-old ($M = 11.56$, $SD = 4.88$) and old-old ($M = 10.60$, $SD = 4.38$) was comparable, and individuals with dementia generated the fewest responses ($M = 1.24$, $SD = 1.23$), all p-values < .001. Note: degrees of freedom vary from those reported for sample composition as one old-old participant and 13 participants with dementia were unable to recall any images.

The total number of positive and negative images recalled was computed for each participant. Images were categorized on the basis of IAPS ratings. A positive-to-negative ratio was then calculated for each participant by dividing the total number of positive pictures recalled by the sum of recalled positive and negative pictures (Kwon et al., 2009). Young adults were expected to recall positive and negative images to an equal extent. We anticipated that young-old and old-old adults would demonstrate a positivity effect. Participants in the latter groups were

expected to recall positive images to a greater extent than negative images, leading to a higher positive-to-negative ratio than younger adults. Literature exploring memory performance in dementia as a function of valence has generated mixed results. It was therefore open to conjecture whether these participants would demonstrate a positivity effect.

Within-group differences in positive-to-negative ratios were explored by one-sample *t* tests with a hypothesized difference of .50 (indicates equal proportion of emotional material remembered). Young adults recalled positive images to a lesser extent than negative images (M = 0.43, SD = 0.11), $t(24) = -3.28$, $p = .003$, $d = -0.65$. The performance of young-old adults also ran in contrast to our predictions in that they did not demonstrate a memory advantage for positive material (M = 0.50, SD = 0.24), but rather recalled equal proportions of positive and negative stimuli, $t(24) = 0.05$, *ns*. Our hypothesis that the old-old would privilege positive material over negative material was supported (M = 0.61, SD = 0.20), $t(23) = 2.74$, $p = .012$, d = 0.56. The same pattern was observed for participants with dementia. Positive stimuli was recalled more often than negative stimuli (M = 0.83, SD = 0.33), $t(11) = 3.55$, $p = .005$, $d = 1.02$.

A one-way ANOVA revealed that groups differed in the ratio of positive-to-negative material remembered, Welch's $F(3, 33.54) = 9.72$, $p < .001$, $\eta^2 = .29$. Against our hypothesis, young-old adults did not evince the positivity effect, but rather were comparable to young adults in terms of the proportion of emotional material remembered. Results for old-old adults were as predicted. Positive material was more salient for these participants than for young adults, p = .002. Participants with dementia also demonstrated the positivity effect. Relative to young adults, they recalled a higher proportion of positive material, $p = .005$. Within- and between- group differences in recall memory performance are illustrated in Figure 5.

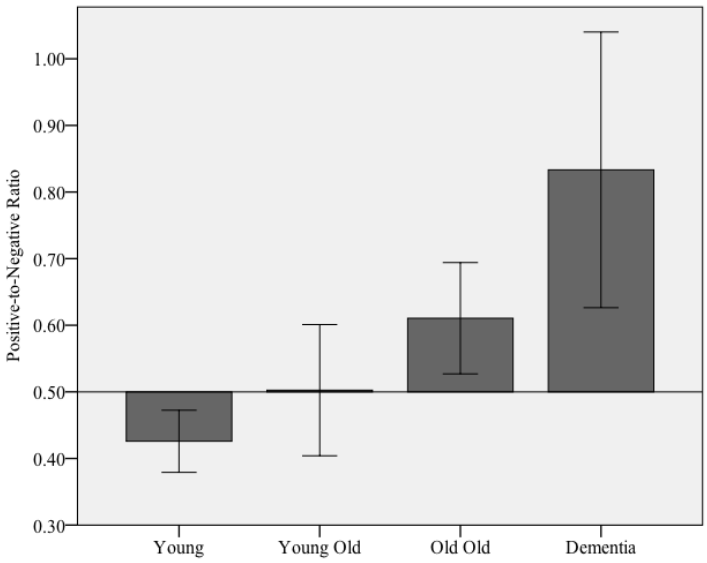

Figure 5. Ratio of positive-to-negative images recalled by group. Values above .50 indicate better memory for positive relative to negative images. Values below .50 indicate better memory for negative relative to positive images. Error bars represent 95% confidence intervals.

Recognition memory. To examine group differences in recognition memory performance, we calculated a positive-to-negative ratio for each participant by dividing the total number of correctly recognized positive pictures (hits) by the sum of correctly recognized positive and negative pictures (Kwon et al., 2009). Valence was determined on the basis of IAPS ratings. Three participants with dementia identified no images as previously seen, and as a result, positive-to-negative ratios could not be calculated. Hypotheses made were comparable to those outlined for recall memory performance.

Within-group memory preferences were explored by one-sample *t* tests. Findings for young and young-old adults ran in contrast to our predictions. Young adults correctly recognized positive images to a lesser extent than negative images ($M = 0.40$, $SD = 0.09$), $t(24) = -5.51$, $p < .001$, $d = -1.11$. Memory performance of young-old adults did not differ as a function of image valence ($M = 0.49$, $SD = 0.10$), $t(24) = -0.63$, *ns*. Performance of the old-old was in line with our expectations. A greater proportion of positive images were recognized than negative images ($M = 0.54$, $SD = 0.08$), $t(24) = 2.34$, $p = .028$, $d = 0.47$. Positive material was also more salient than

negative material for individuals with dementia (M = 0.62, SD = 0.24), $t(21) = 2.36$, $p = .028$, d = 0.50.

Results of a one-way ANOVA supported the positivity effect, Welch's $F(3, 48.67)$ = 13.05, $p < .001$, $\eta^2 = .25$. Positive material was more salient for young-old adults than for young adults, $p = .012$. The ratio of positive-to-negative images recognized was higher for old-old adults than for young adults, $p = .000$. The same pattern was observed amongst those with dementia. Positive material was more salient to these individuals than it was to young adults, p = .002. Figure 6 highlights within- and between-group findings.

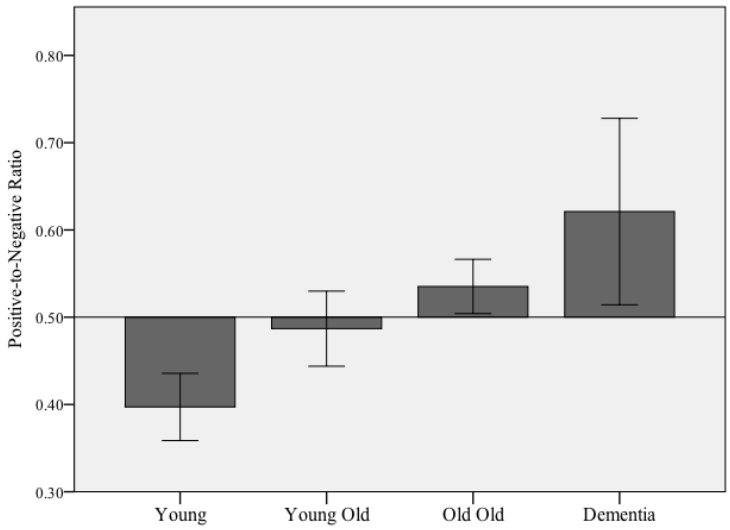

Figure 6. Ratio of positive-to-negative images correctly recognized by group. Values above .50 indicate superior memory of positive relative to negative images. Values below .50 indicate better memory for negative relative to positive images. Error bars represent 95% confidence intervals.

Discussion

Socioemotional selectivity theory is a lifespan theory of social motivation (Carstensen, 2006). The central postulate is that social goals vary as a function of perceived time remaining in life. Future-oriented goals related to novelty and knowledge acquisition are prioritized when time is perceived as expansive. Constraints on time horizons reorganize goal constellations such that

present-oriented goals directed towards optimizing emotional meaning and satisfaction become prioritized over those related to preparedness (Lang & Carstensen, 2002). Owing to the relationship between chronological age and perceived time remaining in life, predictable age-group differences appear (Fung et al., 2001). Younger adults are motivated to expand their knowledge base and social horizons. Older adults are motivated to regulate affect and spend time with emotionally meaningful partners. Empirical investigations reveal that social goals influence cognition (Reed & Carstensen, 2012). The positivity effect describes an age-related trend that favors positive over negative information.

This study examined social motivation in moderate stage dementia within the framework of SST. There were five objectives: (1) examine how dementia affects future time perspective, (2) determine the relative prioritization of emotion- and knowledge-related goals, (3) understand how persons with dementia mentally represent social activities, (4) investigate preference for social partners, and (5) examine whether persons with dementia evince the positivity effect in attention and memory. Participants were young adults, healthy young-old adults, healthy old-old adults, and individuals with moderate severity dementia. Comparisons between the foremost groups allowed us to ascertain patterns of age-related differences, and in turn, determine whether individuals with dementia diverge from typical aging in the variables of research interest.

Group differences in future time perspective were explored by use of the FTP scale (Carstensen & Lang, 1996) and a modified task that asked participants to place a mark on a line according to their temporal position in life (Hicks et al., 2011). Consistent with the literature summarized above (e.g., Fung et al., 2001; Hicks et al., 2011; Kwon et al., 2009), we found that young-old and old-old adults believed they had less time remaining in life than young adults. Our data extends this body of work by exploring whether young-old and old-old adults also differ in perceptions of future time. Results indicated that old-old adults did in fact perceive a

more foreshortened future relative to young-old adults. This pattern of differences was observed across the FTP scale and the line task. The same was true for comparisons between participants with dementia and young adults. Across both measures, time was perceived as more restricted for participants with dementia than for young adults. Results of comparisons between persons with dementia and older adults varied across measures. When the FTP scale was used to index time perspective, individuals with dementia believed they had less time remaining in life than young-old adults and a comparable amount of time as old-old adults. When participants indicated their position in the lifespan on a line, those with dementia reported a time perspective comparable to young-old adults and more expansive than old-old adults.

Previous research confers a viable explanation for this variability. Demiray and Bluck (2014) asked 285 young adults and 135 middle-aged adults to complete the FTP scale and an analogous line task. The authors found the two measures were only moderately correlated and conclude that this is because they assess somewhat different aspects of time perspective. Whereas both measures encompass sense of position within the lifespan, they argue that only the former incorporates subjective sense of opportunities in the future. This claim is in line with earlier research. Cate and John (2007; Study 1 and 2) examined the factor structure of the FTP scale and found that *focus on opportunities* and *focus on limitations* emerged as distinct dimensions. In subsequent cross-sectional and longitudinal research (Study 3 and 4), the authors found that these dimensions show divergent patterns of age-related differences and change, respectively. Research examining attitudes towards grandparenthood also employed the FTP scale and performed an exploratory factor analysis (Fung, Siu, Choy & McBride-Chang, 2005). The authors found that a three-factor model best described the FTP scale, and termed the dimensions *opportunities, planning,* and *lack of time*. Interpreting our results in the context of these findings, we argue that participants with dementia envisioned a more foreshortened future

on the FTP scale relative to the modified line task because of the emphasis the former measure places on perceived future opportunities. This explanation is plausible given that individuals with dementia retain awareness that the future will be marked by constrained opportunities (Clare et al., 2008; Graneheim & Jansson, 2006; Hedman et al., 2014).

Examination of the pattern of results across both measures of time perspective suggests that participants with dementia experience slight disorientation to perceived time remaining in life. Studies examining retrospective time estimation abilities offer a possible explanation for this disorientation. Block (1989) reports that retrospective time intervals are underestimated if fewer events are remembered. El Haj et al. (2013) obtained comparable results in their examination of retrospective time perceptions in AD: time estimation abilities were significantly correlated with the ability to recount past events. These findings suggest that participants with dementia may have underestimated the amount of lifetime elapsed as a result of deficits in episodic memory (Perry, Watson & Hodges, 2000), and in turn envisioned a more open-ended future than would have been reported in the absence of dementia.

Deficits in lifetime estimation were not so severe that participants with moderate dementia were unaware of the pressure of time and its passage. We found that time horizons were lessened compared to young adults (across measures) and young-old adults (FTP scale). These data reveal that individuals with dementia continue to perceive boundaries on time. Cotrell and Hooker (2005) make a parallel argument. They found those with AD expressed awareness of a finite amount of quality time left to live before "nothing is left" (p. 292) and conclude that persons with dementia often understand that limited time remains before life as they know it ends.

We found the perception of time as limited in dementia was reflected in self-reported goals. Participants prioritized emotion-regulation goals to a greater extent than knowledge-acquisition goals. Goals related to social contact selection were also emphasized over goals

related to knowledge-acquisition. Though we did not find a difference in the temporal extension of goals, reasoning from SST, we argue that the prominence of emotional goals reflects a desire to optimize present- over long-range outcomes. These results align with research that investigated age-group differences in self-reported goals. Penningroth and Scott (2012) found that motivation to regulate affect and spend time with emotionally meaningful social partners was greater for older than younger adults, and goals related to knowledge expansion were of lesser importance to older versus younger adults. The overlap between these findings and our own suggests that participants with dementia retain social strivings in line with typical aging.

An examination of mental representations of social activities revealed further evidence in support of this notion. Our results uncovered three naturally occurring dimensions used to discriminate amongst prospective activities in the card-sort task. Dimensions differed on the basis of predicted affect, social information, and emotional investment. In line with the assertion that perceived future time impacts the relative prioritization of social goals, we observed differences in the extent to which these dimensions were considered across adulthood. Predicted affect was most important to old-old adults, followed by young-old adults, participants with dementia, and finally, young adults. Acquiring information through social interchange was most important to young adults, and least important to young-old adults, old-old adults, and lastly, participants with dementia. Individuals in the latter group weighted emotional investment most heavily, followed by the young-old, old-old, and then young adults.

Our finding that emotion is particularly salient in older adults' cognitive appraisal of potential activities and knowledge acquisition in younger adults' is in line with previous research. Fredrickson and Carstensen (1990) found that, when organizing prospective social partners, older adults emphasized affect anticipated in the interaction over possibilities for future contact and information seeking. Lang and Carstensen (2002) found individuals with limited

future time horizons placed higher priority on goals and social partners associated with strong emotional meaning. Persons with expansive time perspectives expressed a preference for goals promoting autonomy and social acceptance, and valued interactions with social partners expressing acceptance and trust. The importance of considering affect in social activities to those with dementia also replicates earlier work (Cotrell & Hooker, 2005; Phinney et al., 2007). Across these studies, individuals with dementia indicated a preference for social activities that foster emotional satisfaction, wellbeing, and pleasure (e.g., leisure activities; Phinney et al., 2007). These data reiterate the relative stability of social strivings from old age and into dementia status, and merge well with our examination of partner preference.

We investigated contact preferences by asking participants to indicate with whom they would like to spend time from a list of prospective social partners (Fung & Carstensen, 2004). Results support of the assertion that constraints on time horizons reorganize preferences such that interactions with emotionally meaningful partners become preferential to interactions with novel partners. Across groups, participants were more inclined to select a familiar social partner (i.e., member of their immediate family) than they were to select an unfamiliar social partner (i.e., recent acquaintance or admired famous person). These findings mirror earlier work that found older adults are motivated to spend time with social partners that promote the experience of positive affect (e.g., Fredrickson & Carstensen, 1990; Fung et al., 1999; Fung et al., 2001). Results for participants with dementia dovetail well with these studies, and support the claim made by previous research that family ties remain of central importance in dementia (Clare et al., 2008; Cotrell & Hooker, 2005; Hedman et al., 2014; Phinney et al., 2007).

The finding that young adults displayed contact preferences in line with older adults was unexpected, yet interpretable within the context of previous research. Fredrickson (1995) found that social endings heighten the salience of affective potential in social ties. It is therefore

possible that we did not find group differences in contact preferences because we collected portions of these data from (a) undergraduates near the end of the term and (b) international students in their first year of studies. Both of these considerations reflect social endings (impeding or recent, respectively) that may result in a temporary increased preference for interactions that enhance emotional wellbeing versus expand horizons. An alternate possibility is that younger adults are motivated to spend time with familiar partners for reasons that differ from those of older adults'. For example, familiar social partners offer a sense of continuity in one's life, are an important source of information, and confer acceptance and trust. Previous research has shown these considerations to be central elements underscoring young adults' preference for social partners (e.g., Lang & Carstensen, 2002).

Our final objective centered on investigating whether persons with dementia evince the positivity effect in attention and memory. We employed a dot-probe paradigm to determine whether older participants direct attention towards material congruent with prioritized goals and away from material incongruent with prioritized goals. We did not find evidence of this notion. The centrality of emotion regulation to young-old and old-old adults did not render them more likely to attend to positive images or less likely to attend to negative images than young adults. The importance of emotional wellbeing to participants with dementia also did not lead them to orient towards positive images to a greater extent than young adults. In fact, those with dementia were more inclined than young adults to orient towards negative images. These results run in contrast to earlier work that found the positivity effect in older adults' dot-probe reaction times (Isaacowitz et al., 2006; Mather & Carstensen, 2003). It is possible that unstudied moderating factors (Fung et al., 2010; Li et al., 2010) or the diverse cultural background of our participants (Fung, Isaacowitz, Lu, Wadlinger, Goren & Wilson, 2008) resulted in an inability to detect a positivity effect in encoding. It is also plausible that our measure of attention, which relies on

analysis of response speed, was not sensitive enough to detect group differences because an age-related advantage for positive over negative material was observed in memory for emotional pictures presented during encoding.

Performance on the recall task was comparable for young and young-old adults, while differences between young and old-old adults were observed. Young adults better recalled negative stimuli relative to positive stimuli. The reverse was true for old-old adults. Recall memory in dementia also accorded with what would be predicted on the basis of SST. Participants recalled a greater proportion of positive than negative images, and thus had a higher positive-to-negative ratio than did young adults. Examination of recognition memory also revealed the positivity effect. Young-old adults recognized a higher proportion of positive images than did young adults, who had better memory for negative than positive images. Old-old adults favored positive over negative material, leading to an increased positive-to-negative ratio relative to young adults. In contrast to young adults, those with dementia correctly recognized positive images more often than negative images. These systematic differences in memory performance are consistent with previous studies (e.g., Charles et al., 2003; Kwon et al., 2009; Lockenhoff & Carstensen, 2008), and corroborate the assertion that motivation affects cognition. Our demonstration that the positivity effect generalizes to those with dementia bolsters earlier findings (Huijbers, et al., 2011), and challenges the assumption that the effect will not appear under conditions where cognitive resources are limited (Reed & Carstensen, 2012).

The results of this study need to be interpreted within the context of certain methodological limitations. This study is cross-sectional in nature. It is therefore possible that observed differences are due to cohort effects rather than age or dementia status. The validity of our results may also be limited by sampling biases. Young-old and old-old participants possessed high levels of education and may thus not be representative of these populations. Results may also not

generalize to those with dementia living outside of a long-term care facility. It is possible that individuals residing in the community have more access to social supports and diverse programming, and may thus differ in important ways from those residing in continuing care settings. Future research should explore this possibility. Additional studies are also needed to examine whether individuals bearing a diagnosis other types of dementia (e.g., frontotemporal dementia) understand time as limited and value emotion regulation goals as did the participants in our study.

A further limitation is that participants with dementia had less years of formal education than control groups. While this finding is in line with research demonstrating education to be a risk factor for the development of AD (Sando et al., 2008), it is possible that these differences contributed systematic variability to our findings. We contend that this does not impact the validity of our findings. Previous studies examining the variables outlined above also did not match participants on the basis of education (e.g., Fredrickson & Carstensen, 1990; Kwon et al., 2009; Lang & Carstensen, 2002).. An additional limitation is that we did not screen control groups for the presence of cognitive impairment, but rather inferred that participants were healthy on the basis of self-report and the fact that they were residing independently in the community. Finally, it is important to note that variability across measures of cognitive status and disease severity were observed. While all participants were deemed to be in the moderate stages of disease progression by the MMSE, several participants scored in the mild range on the DSRS (Xie et al., 2009). This is a concern and results need to be interpreted accordingly.

Despite these limitations, our study has notable strengths. Previous research conducted with persons with dementia has been criticized as lacking in theoretical specificity and conceptual clarity (Marshall & Hutchinson, 2001). Our study was not hampered by these limitations. Our interest in exploring these questions in the context of dementia was underscored

by a strong theoretical orientation and the measures employed were established as reliable and valid by previous research. Our relatively homogenous sample also increased our ability to gain meaningful insight into social motivation in dementia. We excluded individuals with dementia on the basis of diagnosis, disease progression, and presence of concomitant conditions known to impact cognition.

This project has important theoretical applications. Our results expand the scope of socioemotional selectivity to dementia and lend credence to the tenet that systematic differences in goal constellations appear as time horizons shrink. By incorporating a sample of young-old and old-old adults, this study answers a call from previous research that comparisons between young adults and a wider age-range of older adults are needed in order to better understand how variables of interest to socioemotional selectivity theorists differ across later adulthood (Reed, Chan & Mikels, 2014). The finding that perceived time remaining in life differed across measures adds to a small body of research that deems time perspective to be a multidimensional construct (Cate & John, 2007; Fung et al., 2005). Continued research efforts are needed to better understand these dimensions and identify patterns of age-related differences and change.

Our results also bear practical significance. The perspective of those with dementia has been largely ignored in the context of social programming and in related research (Gitlin et al., 2009). An examination of a subset of day programs in the United States revealed that social activity preference in AD was determined solely by caregiver report (Kelsey & Laditka, 2005). No programs reported directly asking individuals with AD as to what types of activities they find preferable. This is unfortunate given that research has shown relatives are poor predictors of preferences in AD (Hamann et al., 2011). It is therefore not surprising that individuals with dementia in long-term care facilities often express dissatisfaction with activities available for participation (Clare et al., 2008). While activities are recognized as promoting wellbeing

(Menec, 2003) and increased quality of life in dementia (Logsdon, McCurry &Teri, 2007), research highlights that this link primarily holds when individuals find the activity meaningful (Chapman, 2005).

Meaningful activities are increasingly advocated for in the programming literature, however, the definition of this concept from the perspective of those with dementia remains elusive, as does the nature of activities conceptualized as such (Gitlin et al., 2009; Marshall & Hutchinson, 2001; Phinney et al., 2014). Our research serves to remediate this gap in our understanding. We highlighted that individuals with dementia deem emotional meaning and satisfaction to be of integral importance. Our finding that predicted affect and emotional investment in social activities are central to persons with dementia is also useful. Taken together, these results allow us to suggest the following evidence-based recommendations for social programming to better match preferences. First, activities promoting acquisition of these goals should be central in dementia-related programming, and second, users of these programs should be conferred the opportunity to provide direct input on the structure of social programs.

Our finding that persons with dementia show the positivity effect is also of importance. Research has demonstrated that individuals are more likely to remember and be persuaded by information that coincides with personally held goals (e.g., Clary, Snyder, Ridge, Miene & Haugen, 1994). Communicating information in a positive context will arguably make it more appealing, memorable, and persuasive to those with dementia. This may serve to improve health outcomes. The latter has been demonstrated in the context of typical aging. Zhang, Fung, and Ching (2009) presented younger and older adults with health-related pamphlets that contained identical factual information but differed in the extent to which emotional goals were emphasized. Pamphlets that emphasized emotional goals, as opposed to future-oriented or neutral goals, were better remembered, evaluated more positively, and led to greater adoption of

healthy behaviors by older adults. Reasoning from these data, emphasizing positive information may increase communication effectiveness and maximize gains derived from intervention programs.

Social motivation in dementia is an avenue ripe for future research. Empirical efforts centered on replicating these results are required. Incorporating the views of persons with dementia into programming research is an important first step in developing care tailored to the needs and interests of these individuals. Examination of whether the positivity effect generalizes across stimuli and cognitive processes in dementia is also warranted. Participants in our study had dementia of the Alzheimer's type or mixed dementia. Additional work is needed to understand whether the pattern of results we observed holds for other types of dementia. Longitudinal research is also needed. Studies of this nature will afford insight into the ways in which the variables explored by this project change over time and with disease progression.

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Appendix A

List of Social Activity Card-Sort Items

Item	Description on card
1.	Look at pictures from a past vacation
2.	Watch a movie you love
3.	Learn about unfamiliar travel destinations
4.	People watch
5.	Talk on the phone with a friend
6.	Learn a new language
7.	Make someone a birthday card
8.	Watch the news
9.	Go shopping
10.	Have coffee with family
11.	Get a massage
12.	Tell your life history
13.	Spend time with a teacher
14.	Go to a museum
15.	Attend a religious service
16.	Paint
17.	Play with an animal
18.	Volunteer
19.	Watch a new TV show
20.	Read old cards
21.	Garden

22.	Enjoy your favorite meal
23.	Dance with a family member
24.	Listen to songs from your youth
25.	Try a new restaurant
26.	Go to an art gallery
27.	Listen to a politician give a talk
28.	Read about a successful person
29.	Take a cooking class
30.	Play a game with friends
31.	Attend a sports game
32.	Try a music lesson