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THE RELATIONSHIP BETWEEN FUTURE TIME PERSPECTIVE AND MEMORY CONTROL BELIEFS IN OLDER ADULTS

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In studies with older adults, future time perspective (FTP) is most frequently assessed using the Carstensen and Lang FTP scale. However, it has been proposed that that this scale is actually composed of three interrelated subcomponents. Within a sample of 189 community-dwelling older adults (aged 60–85), we replicated a three-component structure. We also found that these subscales vary in their relationships to other measures of time perspective (i.e., future time attitudes and perceived life progress), and in their relationships to control beliefs about memory. These findings complement prior research documenting a link between FTP and control beliefs by showing that the magnitude of this association varies across FTP components. Understanding the interplay between FTP and memory control beliefs is also important as both predict important age-related outcomes and may be modifiable via intervention. The reciprocal relationship between these factors and the implications for successful aging are discussed.

Future time perspective (FTP) is a multifaceted construct that broadly refers to how people perceive and connect with the future. It is also a key factor that influences how we see ourselves, our goals, and our relationships (e.g., Andre, van Vianen, Peetsma, & Oort, 2018; Brothers, Chui, Diehl, & Pruchno, 2014). For example, FTP has been associated with life satisfaction, depression, health behaviors, retirement planning, and decision-making (e.g., Andre et al., 2018; Kooij, Kanfer, Betts, & Rudolph, 2018; Tasdemir-Ozdes, Strickland-Hughes, Bluck, & Ebner, 2016). The present analyses add to this by replicating a three-component model of FTP in older adults and by evaluating how those components relate to other measures of time perspective. We also examine how FTP relates to older adults' views about their own memory abilities, as Social-Cognitive Theory (Bandura, 1997, 2006) poses that our future expectations, our beliefs about our own abilities, and their interactions directly guide our goal-setting, motivation, and decision-making, and thus ultimately determine our behavioral outcomes.

FTP in Older Adults

Lewin (1939) first introduced the construct of FTP to the psychological literature and proposed that views about the future play an important motivational role in affecting our present goals

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and behavior. Lewin also proposed that views about time evolve with age, and that this is "one of the most fundamental facts of development" (Lewin, 1939, p. 879). Consistent with this, a large body of research has shown that FTP changes with age. There are changes in FTP during the transition from childhood to adolescence (e.g., Klineberg, 1967; Nurmi, 1991) and FTP continues to change across adulthood (e.g., Cate & John, 2007; Kotter-Grühn & Smith, 2011; Laureiro-Martinez, Trujillo, & Unda, 2017). For instance, as people get older they begin to realize that they are closer to death than they are to birth, and begin to see life more in terms of "years left to life" rather than in terms of "years since birth" (Neugarten, 1968).

Although it has long been acknowledged that FTP is a key psychological factor that varies with age, very few theoretical frameworks have directly incorporated this construct. One exception to this is Carstensen's Socioemotional Selectivity Theory (SST) of development (Carstensen, 2006; Carstensen, Isaacowitz, & Charles, 1999). This conceptualization of FTP captures the extent to which people see time as running out, and also the extent to which people expect future opportunities versus limitations. At one end of a continuum are people who see their futures as "expansive"; there are many years left to live and the future is full of opportunities. At the other end of the continuum are people who see their futures as "limited"; time is running out and there are future obstacles ahead. According to SST, the way people conceptualize the future affects how they prioritize goals. When people see the future as expansive they are more likely to prioritize knowledge-related goals and when they see the future as limited they are more likely to prioritize emotion-related goals (e.g., Carstensen, Fung, & Charles, 2003; Fung, Carstensen, & Lutz, 1999; Lang & Carstensen, 2002).

To measure this conceptualization of FTP, Carstensen and Lang (1996) developed the Future Time Perspective Scale. Using this scale, a large body of research has shown age-related changes in FTP across adulthood. Relative to younger adults, older adults tend to see their futures as temporally constrained with fewer opportunities (e.g., Kotter-Grühn & Smith, 2011; Fung et al., 1999; Lang & Carstensen, 2002; Tasdemir-Ozdes et al., 2016). Perceptions of FTP in turn are related to relationships (e.g., Lang, 2000; Lang & Carstensen, 2002), and affective experiences (e.g., Carstensen et al., 2003; Grühn, Sharifian, & Chu, 2016; Kotter-Grühn & Smith, 2011; Kozik, Hoppmann, & Gerstorf, 2015).

Even though SST conceptualizes FTP as a singular construct, a growing body of research has called this into question, differentiating between global and domain-specific FTP or considering different components of FTP (e.g., Andre et al., 2018; Kooij et al., 2018; Tasdemir-Ozdes et al., 2016; Zacher & Frese, 2009). For example, Cate and John (2007) suggested that there are two FTP components, with one focusing on perceived future opportunities and the other focusing on perceived future limitations. Their data have shown that these two components have distinct developmental trajectories. Subsequent research has also shown that two FTP components are differentially correlated with many constructs, such as experiences with ageism (Barber & Tan, 2018), subjective well-being and chronic stress (Kozik et al., 2015), and work motivations (Kooij, de Lange, Jansen, & Dikkers, 2013). In addition to the two FTP components proposed by Cate and John (2007), Brothers, Chui, Diehl, and Pruchno (2014) propose that there is a third FTP component, which is a sense of the future as ambiguous or uncertain. Cross-sectional data suggest each of these three components vary across younger, middle-aged, and older adults (Brothers, Chui, & Diehl, 2014). Other scholars have proposed alternate three dimensional solutions. For example, Kuppelweiser and Sarstedt (2014) suggest

that FTP consists of a focus on opportunities, a focus on life, and a focus on time (see also Kozik et al., 2019).

Three Component Model of FTP

Although there are multiple proposed models of FTP, in the current study we focus on a three-component FTP structure that was proposed by Rohr, John, Fung, and Lang (2017). Using exploratory structural equation modeling, and lifespan samples from several different world regions, they showed that the Carstensen and Lang (1996) FTP scale actually contains three interrelated, but distinct, subscales. Furthermore, they found that these subscales are differentially associated with other affective and time perspective variables. Described below, our first aim was to extend these findings in a new sample.

(1) Perceived Future Time Opportunity (Opportunity). This subscale measures perceived opportunities available within ones remaining lifetime. People who score high on this subscale see themselves as able to set new goals, make new plans, and pursue new opportunities. Rohr et al. (2017) demonstrated that FTP Opportunity scores related to higher levels of positive affect and openness to new experiences. Building upon this, we tested whether FTP Opportunity scores also relate to future attitudes. We hypothesized that people who see their futures as full of opportunities also have higher positive attitudes, and fewer negative attitudes, about the future.

(2) Perceived Future Time Extension (Extension). This subscale measures perceptions about how much time is available in the future. People who score high on FTP Extension see their futures as unlimited and expansive. Because of this, Rohr et al. (2017) found that FTP Extension scores strongly related to perceived position in the life course. People who saw themselves as subjectively further from birth (and therefore closer to death) had lower FTP Extension scores. We aimed to replicate this finding.

(3) Perceived Future Time Constraint (Constraint). This subscale assesses perceptions of future limitations. People who score high on this subscale feel that time is quickly narrowing and that this in turn is causing limitations and barriers for them. Scores on the FTP Constraint subscale are related to negative affect and neuroticism (Rohr et al., 2017). Building upon this, we tested whether FTP Constraint scores would also relate to more negative attitudes about the future. Furthermore, because the FTP Constraint subscale assesses perceived barriers due to the narrowing of time, we hypothesized that higher FTP Constraint scores would also relate to perceived position in the life course.

Memory Control Beliefs and Their Relationship to FTP

The second goal of this study was to examine how the three components of FTP proposed by Rohr et al. (2017) relate to older adults' memory control beliefs. Although there are a large number of definitions of control beliefs (see Skinner, 1996), they generally refer to the degree to which people feel capable of influencing their performance outcomes, as opposed to feeling that their outcomes are being dictated by chance or by powerful others (e.g., Bandura, 1993; Lachman, 1986; Rodin, Rennert, & Solomon, 1980; Skinner, 1995). However, control beliefs can also be particular about achievement in specific domains (e.g., Brandtstädter & Rothermund, 1994; Lachman & Weaver, 1998) and these domain-specific personal control

are theorized to better predict specific outcomes than global personal control beliefs because they directly moderate the impact of goals and behavior on performance (Bandura, 2006). Within the domain of memory, control beliefs include confidence that future declines are inevitable and also beliefs about whether memory can be improved via effort (e.g., Lachman, 1991; Lachman, Bandura, Weaver, & Elliott, 1995).

A large body of research has shown that memory control beliefs decline with age (e.g., Hertzog & Hultsch, 2000; Miller & Lachman, 1999). For instance, older adults are more likely than younger adults to believe that their memory abilities will inevitably get worse with time (e.g., Dark-Freudeman, West, & Viverito, 2006; Lachman et al., 1995). They are also less likely to believe that they have control over their memory abilities or that they can do anything to improve their memory functioning (e.g., Devolder & Pressley, 1992; Dixon & Hultsch, 1983; Lachman, 1991; but see Horhota, Lineweaver, Ositelu, Summers, & Herzog, 2012). This is problematic since memory control can affect the likelihood of successful aging; people with higher levels of memory control are more likely to successfully exert effort to improve their memory and these efforts can allow people to better maintain their cognitive functioning with age (e.g., Lachman, 2006; Lachman & Agrigoroaei, 2012; Miller & Lachman, 1999; West, Bagwell, & Dark-Freudeman, 2008). This is likely why memory control beliefs predict actual memory performance, particularly amongst older adults (for a review, see Maggio, Soubelet, Faure, & Fort, 2019), concurrently and over time (Windsor & Anstey, 2008).

Given that memory control beliefs are important predictors for successful cognitive aging, it is important to understand their antecedents. Some that have already been identified include age (see Lachman, Neupert, & Agrigoroaei, 2011) and cognition or cognitive declines (e.g., Elliott & Lachman, 1989; Payne, et al., 2017). However, one factor that has not yet been fully investigated is the role of FTP. Memory control beliefs reflect views about how memory functions both now but also in the future (see Soederberg & Lachman, 2000) and control beliefs more generally can be conceptualized as how people foresee their future selves in relation to the environment (Trommsdorff, 1994). Because control beliefs involve expectations and evaluations of the future self (Bandura, 1997) there should be a strong relationship between them and FTP. This would be consistent with research showing links between general locus of control and FTP (see Kooij et al., 2018). Although the majority of the studies examining the link between FTP and control beliefs have been conducted with adolescents, similar patterns have been reported with older adults; older adults who think frequently about the future also report feeling more in control over future events (Fingerman & Perlmutter, 1995) and over their health (Jacobs, Waddell, & Webb, 2011). Furthermore, one prior study reported a moderate correlation between older adults' FTP (as assessed via an overall score on the Carstensen and Lang FTP scale) and memory locus of control (r = .40; Allen, Hilgeman, & Allen, 2011).

As noted by Rohr et al. (2017), although subcomponents of FTP are interrelated, they may exert unique effects on outcomes of interest. One domain where this may occur is memory control beliefs. A moderate link between overall scores on the Carstensen and Lang FTP scale and memory control beliefs has been reported (Allen, et al., 2011). To extend this finding, as an exploratory aim, we evaluated whether the strength of this relationship varies across the three FTP components proposed by Rohr et al. (2017). On the one hand, memory control beliefs may be strongly linked to perceptions of future opportunities. People who score high on the FTP Opportunity subscale see themselves as able to set new goals, make new plans, and pursue new

opportunities. Within the domain of memory, they should similarly see themselves as able to set goals to improve their memory functioning and as being able to implement new memory strategies. Thus, high FTP Opportunity scores should be linked to high memory control beliefs. However, it is possible that memory control beliefs may also be strongly linked with perceptions of future constraints. People who score high on the FTP Constraint subscale perceive constraints and barriers within their future time. Within the domain of memory, they may also perceive age-related memory declines to be an inevitable future constraint that cannot be controlled or prevented. Finally, it is also possible that memory control beliefs are also linked to FTP Extension scores. Previous research has shown that a low perceived life expectancy is associated with a low sense of control (Kobayashi, Beekman, & Meisel, 2017). Building upon this, it is also possible that when people feel time is running out (i.e., score high on FTP Extension) they also feel less in control of their own memory abilities.

Study Overview

Our first goal was to examine how the three subcomponents of FTP proposed by Rohr et al. (2017) – FTP Opportunity, Extension, and Constraint – relate to positive and negative attitudes about the future and perceived progress in life. We hypothesized that: (1) Opportunity scores would relate to both positive and negative future attitudes, (2) Extension scores would relate to perceived life progress, and (3) Constraint scores would relate to both perceived life progress and negative future attitudes.

Our second, more exploratory, goal was to evaluate whether older adults' memory control beliefs are related to the three subcomponents of FTP proposed by Rohr et al. (2017). In evaluating this, we focused on beliefs that memory can be improved, that memory decline is inevitable, and whether strategies can effectively be used to improve current and future memory performance (see Lachman et al., 1995).

METHOD

Participants

Participants were 189 individuals between the ages of 60 and 85 (M = 69.99, SD = 6.08) who were recruited from existing databases of individuals interested in completing research studies related to aging issues in the San Francisco and Los Angeles areas. Of this sample, 138 participants were female, 50 were male, and 1 was intersex. Participants were predominately White (84.7%) but also reported the following racial and ethnic identities: 3.2% Asian, 5.8% Black, 0.5% Latinx, 1.6% Native American or Alaskan Native, 3.2% Biracial or Multiracial, 1.1% did not respond. Participants were predominantly well-educated: 0.5% had less than a high school education, 10.6% had a high school diploma or equivalent, 9.0% had a 2-year Associate's degree, 34.4% had a Bachelor's degree, 32.8% had a Master's degree, and 12.7% had a doctoral degree (M.D. or Ph.D.). When asked to rate their health on a 1 (*very poor*) to 9 (*excellent*) scale, they also self-reported being in very good health (M = 7.25, SD = 1.46).

Measures

Three Component Model of FTP

The Carstensen and Lang (1996) FTP scale was administered. On this 10-item scale, questions are answered on a 1 (*very untrue*) to 7 (*very true*) scale. Based upon Rohr et al. (2017), we divided the items into three subscales and calculated mean subscale scores (possible ranges = 1–7). The Opportunity subscale assesses expectations that one will make future plans and goals (α = .90, M = 4.73, SD = 1.36, observed range = 1.25–7). The Extension subscale assesses understanding about the length of the future (α = .81, M = 4.05, SD = 1.49, observed range = 1–7). The Constraint subscale assesses expectations of future limitations (α = .86, M = 3.40, SD = 1.55, observed range = 1–7). As in Rohr et al. (2017), scores on the three subscales were correlated. Opportunity scores correlated positively with Extension scores (r = .750, $p < .001$) and negatively with Constraint scores ($r = -.509$, $p < .001$). Extension scores correlated negatively with Constraint scores ($r = -.472$, $p < .001$).

FTP Attitudes

To assess future attitudes, we used the Adolescent and Adult Time Inventory (ATI) – Time Attitude Scale (Mello & Worrell, 2007). This 30-item scale consists of 6 different 5-item subscales, which assess positive and negative attitudes towards the past, present, and future. Items are answered on a 1 (*totally disagree*) to 5 (*totally agree*) scale, and the average response to each subscale was used in analyses (possible ranges = 1–5). In this study we focused only on attitudes about the future. Sample items are: *My future makes me smile* (Future Positive; α = .93, M = 3.66, SD = 0.77, observed range = 1.4– 5) and *I don't like to think about my future* (Future Negative; α = .81, M = 1.95, SD = 0.72, observed range = 1– 4.25). Although this scale was developed for use with adolescents, prior analyses using this same dataset show that this the scale has internal consistency and the same six-factor structure with older adults (Mello et al., 2016).

Life Progress

Using a measure based upon Cottle's (1976) Future Extension Line Test, participants used a sliding bar to report how far they had progressed in life. The left endpoint was labeled "beginning" and the right endpoint was labelled "end". Placement on this line was quantified on a 1 to 100 scale. One extreme outlier (with a value of 4) was removed from analyses in the Results section below. Of the remaining participants, scores ranged from 29 to 97, with an average of 71.29 (SD = 12.38).

Memory Controllability Inventory (MCI)

The MCI (Lachman et al., 1995) measures how people conceptualize their current memory abilities as well as their control over their own memory abilities. Within this 20-item scale, there are five subscales each consisting of 3 to 4 items. All questions are answered on a 1 (*strongly agree*) to 7 (*strongly disagree*) scale, and the average response to each subscale of interest was used in analyses (possible ranges = 1–7). Three subscales focus on participants'

memory control beliefs: The Potential Improvement subscale assesses confidence that strategies could be found to improve one's own memory abilities (e.g., *I can find ways to improve my memory;* $\alpha = .71$, $M = 5.48$, $SD = .98$, observed range = 2.33– 7), the Inevitable Decline subscale assesses beliefs that one's own memory will inevitably get worse with age (e.g., *No matter how much I use my memory, it is bound to get worse as I get older;* $\alpha = .72$, $M = 3.19$, $SD = 1.30$, observed range = 2– 7), and the Effort Utility subscale asks participants to rate the likelihood that they could improve their current memory abilities and postpone future declines, if they try harder (e.g., *If I use my memory often I won't lose it;* $\alpha = .76$, $M = 5.17$, $SD = 1.07$, observed range = 1– 6.67). As in prior studies (e.g., Jones, Whitbourne, Whitbourne, & Skultety, 2009; Lachman et al., 1995) there were significant correlations amongst these subscales. Potential Improvement scores were significant related to Inevitable Decline scores ($r = -.669$, $p < .001$) and Effort Utility scores ($r = .640$, $p < .001$). Inevitable Decline scores were also related to Effort Utility scores ($r = -.528$, $p < .001$).

Procedure

Older adult participants were recruited to complete an online study about time perceptions and were compensated with a $10 electronic gift card to Amazon.com. This dataset was collected in 2015. Approval for the data collection was obtained from the San Francisco State University Institutional Review Board (IRB). Approval for the analyses was obtained from the Georgia State University IRB. Although analyses of this dataset have previously been reported (Barber & Tan, 2018; Mello et al., 2016), neither of these involved comparing multiple measures of FTP nor involved the memory controllability variables. The data that support the findings of this study are available from the corresponding author, SJB, upon request.

RESULTS

We set our alpha level to .05 for all statistical tests. As noted above, in the following analyses we excluded one participant who was an extreme outlier on the life progress scale. Because we also use gender as a predictor, we also excluded the one participant who self-identified as intersex.

Confirming the Three Component Model of FTP

We first conducted a confirmatory factor analysis (CFA) in SPSS Amos version 25.0 to replicate the three-component model of FTP reported by Rohr et al. (2017). Maximum likelihood estimation was used to test a model with correlated constructs for Opportunity, Extension, and Constraints, specifying the factor loadings reported by Rohr et al. (2017). Six cases were excluded listwise for missing responses to one item (of ten) on the Carstensen and Lang (1996) FTP scale. Within this sample size (N = 183), the CFA model may be underpowered and χ^2 parameter estimates may be biased. However, imperfect "rules of thumb" and Monte Carlo simulations suggest this sample size may be sufficient for three-factor models with moderate to large factor loadings (Anderson & Berbeing, 1984; Wolf, Harrington, Clark, & Miller, 2015), and we report several indicators of model fit. The model was adjusted based

upon the modification indices: Three theoretically-reasonable correlations among within-factor uniquenesses were freely estimated. Overall model fit was adequate: Even though the chi-square test of goodness of fit was significant $\chi^2(29) = 57.70$, $p = .001$, the other CFA results indicated good model fit (CMIN/DF = 1.88, SRMR = .049, CFI = .975, TLI = .962, RMSEA = .074). Factor loadings were acceptable, ranging from .608 to .926. The three FTP constructs were correlated in the same pattern as the observed mean scores for the subscales. Additional details are available upon request.

Measures of Future Time Perspective

Having replicated the three-component model proposed by Rohr et al. (2017) we next tested how scores on our three FTP subscales (Opportunity, Extension, and Constraint) related to positive and negative attitudes about the future and to perceived progress in life. To do this, we conducted a series of hierarchical linear regressions predicting each of the three FTP subscale scores (Opportunity, Extension, and Constraint). We used a two-step approach in order to evaluate the unique variance in our outcome variables (the three FTP subscale scores) explained by our future time perspective predictors, above and beyond the effects from demographic variables. In the first step of each model, we entered the demographic variables of age, gender, self-reported health, and education. We also controlled for the other two FTP subscales. In the second step, we entered our three additional measures of time perspective. Our first two predictors were positive attitudes about the future and negative attitudes about the future as assessed by the Mello and Worrell (2010) ATI: Time Attitudes Scale. Our third predictor was the life progress scale (based upon Cottle, 1976). Tests for multicollinearity indicated that acceptable levels were present, with all Variance Inflation Factors less than 2.67 (O'Brien, 2007). For a summary of these regression models, see Table 1.

FTP Opportunity

The Opportunity subscale assesses views about whether or not the future will bring new possibilities and opportunities. In the first step of our analyses predicting Opportunity scores, 66.0% of the variance was explained. In the second step of the analysis, positive and negative attitudes about the future and perceived life progress were added as predictors. This significantly increased the amount of variance explained ($\Delta R^2 = .068$, $p < .001$). Consistent with our hypotheses, Opportunity scores were related to both positive and negative attitudes about the future. People who expected to make plans and pursue new opportunities in the future also tended to have positive, rather than negative, future attitudes. This complements the Rohr et al. (2017) finding that Opportunity scores relate to affective valence. In total, the second model accounted for 71.3% of the variance in Opportunity scores. It is also worth noting that the small ΔR^2 value in this analysis was not surprising given that we included FTP Extension and FTP Constraint scores as control variables in the first step of the analysis. Even after accounting for these aspects of FTP, changes in future attitudes were associated with small, but significantly reliable, changes in FTP Opportunity scores.

TABLE 1
Standardized Coefficients from Regression Models Predicting FTP Subscale Scores

	Opportunity		*Extension*		*Constraint*	
	Model 1	*Model 2*	*Model 1*	*Model 2*	*Model 1*	*Model 2*
Age	−.073	−.050	−.008	.051	−.069	−.117
Gender	−.078	−.089*	.097	.072	.010	.034
Education	.162**	.150**	−.142**	−.088	−.060	−.088
Health	.133**	.047	−.038	−.061	−.033	.010
FTP Opportunity	–	–	.741**	.598**	−.328**	−.169
FTP Extension	.651**	.461**	–	–	−.221**	−.128
FTP Constraint	−.156**	−.070	−.120*	−.069	–	–
Future Positive	–	.175**	–	.187*	–	−.009
Future Negative	–	−.209**	–	.041	–	.225*
Life Progress	–	−.083	–	−.191**	–	.232**

Note: Gender was entered as 1 for women and 2 for men.
** Coefficient significant at the .01 level (2-tailed)
* Coefficient significant at the .05 level (2-tailed)

FTP Extension

The Extension subscale assesses perceptions about how long their futures will last. At the first step of the analysis, the model explained 61.3% of the variance in Extension scores. Adding our key predictors in the second step of the analysis significantly increased the amount of variance in Extension scores explained (ΔR^2 = .034, p = .002) to 64.7%. Consistent with our hypotheses, the strongest predictor of Extension scores was perceived life progress. This replicates the prior results reported by Rohr et al. (2017). However, within this sample, Extension scores were also related to positive attitudes about the future. People who saw their futures as expansive in time also had more positive attitudes about the future.

FTP Constraint

The Constraint subscale assesses perceptions of future limitations and barriers due to a narrowing time window. At the first step of the analysis, the model explained 28.6% of the variance in Constraint scores. However, the addition of Future Positive, Future Negative, and Life Progress scores significantly increased the amount of variance explained to 34.1% (ΔR^2 = .055, p = .004). As predicted, Constraint scores were related to perceived life progress. People who perceived barriers due to a narrowed time window also saw themselves as further from birth and closer to death. Also as predicted, Constraint scores related to negative future attitudes. This is similar to the findings of Rohr et al. (2017) who found that the Constraint subscale was associated with negative affect, neuroticism, and depression.

Predicting Memory Control Beliefs

The second goal of this research was to examine how the three components of FTP – Opportunity, Extension, and Constraint – relate to memory control beliefs. To test this, we conducted a series of hierarchical linear regressions using our three memory control belief subscales (Potential Improvement, Inevitable Decline, and Effort Utility) as the outcomes. In the first step of each model we entered the demographic variables of age, gender, self-reported health, and education. In the second step of the model, we then entered our three components of FTP. This two-step approach allowed us to evaluate the unique variance in memory control beliefs explained by the three FTP subscales, above and beyond the effects from demographic variables. Tests for multicollinearity indicated that acceptable levels were present, with Variance Inflation Factors for our three FTP measures ranging from 1.39 to 2.87 (O'Brien, 2007). For a summary of these regression models, see Table 2.

Potential Improvement

The Potential Improvement subscale assesses participants' confidence that they can find and use strategies to improve their own memory abilities. The first model predicting Potential Improvement scores was significant ($p = .032$) but explained only 6% of the variance. The overall model was significantly improved by adding the future time perspective variables ($\Delta R^2 = .200$, $p < .001$). However, of the time perspective variables, only Opportunity scores significantly related to Potential Improvement scores. Participants who saw themselves as able to make new plans and pursue new opportunities in the future were also more likely to think they could improve their memory functioning. There was no significant relationship between Potential Improvement scores and Extension or Constraint Scores. In total, the second model accounted for 22.9% of the variance in Potential Improvement Scores.

TABLE 2
Standardized Coefficients from Regression Models Predicting Memory Control Beliefs

	Potential Improvement		*Inevitable Decline*		*Effort Utility*	
	Model 1	*Model 2*	*Model 1*	*Model 2*	*Model 1*	*Model 2*
Age	−.003	.064	−.017	−.086	.024	.100
Gender	−.158*	−.154*	.126	.126	.072	.072
Education	−.007	−.074	−.006	.060	−.072	−.147*
Health	.158*	.040	−.217**	−.091	.048	−.094
FTP Opportunity	–	.317**	–	−.270*	–	.292**
FTP Extension	–	.133	–	−.201	–	.220*
FTP Constraint	–	−.029	–	.081	–	−.118

Note: Gender was entered as 1 for women and 2 for men.

** Coefficient significant at the .01 level (2-tailed)

* Coefficient significant at the .05 level (2-tailed)

Inevitable Decline

The Inevitable Decline subscale assesses beliefs about whether memory declines are inevitable with age or not. The first step of the model was significant ($p = .011$) and explained 7.1% of the variance. The inclusion of the three FTP measures in the second model significantly increased the amount of variance explained ($\Delta R^2 = .214$, $p < .001$). Of the FTP subscales, the only significant predictor was Opportunity scores. People who saw themselves as able to make new plans and pursue new opportunities in the future were less likely to believe that memory declines were unavoidable. There was also a numeric trend for Extension scores to relate to Inevitable Decline scores ($p = .051$). Although not statistically significant, the pattern was that people who saw themselves as having limited years left to live were numerically more likely to see memory declines as inevitable. In total, 28.5% of the variance in Inevitable Decline scores was accounted for in the second model.

Effort Utility

The Effort Utility subscale assesses beliefs about whether memory performance is controllable through effort expenditure. The first step of our model predicting Effort Utility scores was not significant ($p = .783$), predicting only 1% of the variance. However, there was a significant increase in the amount of variance explained after including the FTP measures ($\Delta R^2 = .272$, $p < .001$). Both Opportunity scores and Extension scores were related to Effort Utility scores. People who saw their futures as full of new possibilities were more confident that they could exert effort to improve their memory functioning. Conversely, people who saw themselves as having limited years left to live were less optimistic about their abilities to use memory strategies effectively. This second model accounted for 28.2% of the variance.

DISCUSSION

How many opportunities await me in the future? How much longer will my future extend? Based upon the length of my future, how many constraints will I encounter? As in Rohr et al. (2017), we found that these three questions represent related, but conceptually unique aspects of future time perspective (FTP). More specifically, using a sample of community-dwelling older adults, a confirmatory factor analysis suggested that the Carstensen and Lang (1996) FTP scale consists of three highly interrelated, but distinct, constructs: Opportunity, Extension, and Constraint. This also adds to a growing body of research suggesting that there are multiple components of FTP (e.g., Brothers et al., 2014; Cate & John, 2007; Kozik et al., 2015; Zacher & Frese, 2009).

Further supporting a multiple component model of FTP, we also found that these three FTP subscales have distinct relationships with other aspects of time perception. The Opportunity subscale was related to attitudes towards the future. Older adults who saw themselves as able to make new plans and purse new opportunities in the future also had more positive, and fewer negative, attitudes about the future, which builds upon work from Rohr et al. (2017) illustrating that Opportunity scores relate to affective valence. We also replicated the positive relationship between Extension and life progress reported by Rohr et al. (2017). Older adults who saw their

futures as expansive in time also saw themselves as being relatively further away from death. Finally, extending Rohr et al.'s (2017) finding that Constraint scores relate to neuroticism and affective valence, in this study Constraint scores related to both perceived life progress and also to negative future attitudes. Older adults who saw a narrowing time window as a barrier also reported feeling relatively further along in their lifespan and were more negative in their future attitudes.

The second key finding from this study was that older adults' FTP Opportunity scores consistently related to their memory control beliefs. Older adults who saw themselves as being able to make and pursue new plans in the future (i.e., who scored high on the Opportunity subscale) also saw themselves as having more control over their memory. They were more likely to think that their own memory abilities could be improved, were less likely to think that their memory abilities would inevitably decline with age, and were more confident that they could effectively use strategies to improve their memory and offset declines. This is consistent with previous suggestions that high FTP Opportunity scores indicate a cognitively complex lifestyle where people are continuously learning and solving cognitive complex challenges (see Kozik et al., 2019). We also found weaker relationships between FTP Extension scores and memory control beliefs. Older adults who saw their futures as expansive in time were more confident in their abilities to effectively use memory strategies and were numerically less likely to think that memory declines are inevitable (although this failed to reach statistical significance, $p = .051$). In contrast, FTP Constraint scores were not significantly related to memory control beliefs. Taken together, these findings complement prior research documenting a link between FTP (as an overall score) and control beliefs (e.g., Allen, et al., 2011; Fingerman & Perlmutter, 1995; Kooij et al., 2018; Pulkkinen & Rönkä, 1994) and add to the literature by showing that the magnitude of this association is variable across FTP components.

These findings also support the idea that the Carstensen and Lang (1996) FTP scale has specific components with distinct associations with cognitive and affective processes (Rohr et al., 2017). In the current research we replicated the Rohr et al. (2017) three-component model. However, as noted earlier, other scholars have proposed alternate FTP subcomponents (e.g., Brothers et al., 2014; Cate & John, 2007; Rohr et al., 2017). To our knowledge only one prior study has directly compared models against one another: Using data from the Berlin Aging Study II, Kozik et al. (2019) found that the three-factor solution proposed by Rohr et al. (and used in the current study) produced a better model fit than a two-factor solution proposed by Cate and John (2007), but an alternate three-factor solution proposed by Kuppelweiser and Sarstedt (2014) produced the best model fit. However, the only difference in the structure of these three-factor models is whether the question *There is plenty of time left in life to make new plans* is considered part of the first or second FTP subcomponent (labelled as Opportunity and Extension by Rohr et al., but labelled as Focus on Opportunities and Focus on Life by Kuppelwieser and Sarstedt).[1] However, given that only the Rohr et al. (2017) solution has thus far been shown to also be invariant across cultural groups, future research is needed to evaluate the relative utility of these various multi-factor solutions.

Although there is still debate about the structure of FTP subcomponents, there are clear benefits of analyzing subcomponents of FTP. For example, as noted by Kuppelweiser and Sarstedt (2014) and by Kozik et al. (2019), a potential pitfall of relying upon a total FTP score is that associations between specific FTP subcomponent and outcomes could be missed, particularly if the FTP subcomponents have opposing relationships with the outcome of

interest. On a more practical note, delineating which subcomponents of FTP relate to an outcome of interest can in turn guide intervention targets: An intervention that is designed to enhance the number of opportunities people envision in their futures (FTP Opportunity) is likely very different than an intervention that is designed to expand the amount of time people expect to live (FTP Extension).

Building upon this, we can consider the implications of the current results for memory intervention studies. Prior research has shown that perceived control over memory tends to decline with age (e.g., Agrigoroaei, Neupert, & Lachman, 2013; Lineweaver & Hertzog, 1998; West & Yassuda, 2004) with older adults being more likely to attribute their memory performance to factors beyond their control, such as their biological age, luck, or the testing context (Devolder & Pressley, 1992; Lachman, Steinberg, & Trotter, 1987). However, memory control beliefs are modifiable with instruction, even for older adults (Agrigoroaei et al., 2013; Hastings & West, 2011; Lachman, Weaver, Bandura, Elliott, & Lewkowitz, 1992; Parisi, Gross, Marsiske, Willis, & Rebok, 2017; West et al., 2008; Wolinski et al., 2009), and this can lead to enhanced memory performance and subjective well-being (Agrigoroaei et al., 2013; Hutchens et al., 2013; Lachman et al., 1992; Maggio et al., 2019; West & Yassuda, 2004). Whereas prior studies have used cognitive restructuring and strategy training to improve memory control beliefs, our results suggest that memory control beliefs may also be improved by changing FTP. Furthermore, because we focused on the subcomponents of FTP (rather than on a total FTP score), our results suggest that the key intervention target should be perceptions that the future holds opportunities. In the current study, this was the FTP subcomponent most strongly tied to memory control beliefs.

Few prior studies have empirically tested interventions to change FTP. However, within a career context, a recent study used group discussions and class activities to promote younger adults' positive future attitudes and also their abilities to more clearly envision future career opportunities. This intervention improved FTP (as assessed via an overall score on the Carstensen and Lang FTP scale) and led to long-standing improvements in career decision-making self-efficacy (Park, Rie, Kim, & Park, 2018). In a similar way, interventions that teach older adults to see themselves as capable of pursuing new opportunities may also improve their FTP Opportunity scores and control beliefs (both generally and within the domain of memory). This in turn may also improve their memory performance.

It is also important to note that there is likely reciprocal and cyclical relationships between FTP, memory control beliefs, and memory performance (see also Lachman et al., 2011; Miller & Lachman, 1999). We have thus far discussed FTP as an antecedent of memory control beliefs; we propose that seeing the future as full of opportunities bolsters memory control beliefs, which in turn may enhance cognitive performance. However, other research has shown that experiencing age-related cognitive declines can have an adverse effect on memory control beliefs (e.g., Hutchens et al., 2013), and this may also reduce the number of future opportunities that people see for themselves. Consistent with this view, a recent meta-analysis modelled locus of control as an antecedent of FTP (Kooij et al., 2018). It is likely that both of these views are correct and that there are multi-directional relationships between these factors such that memory control beliefs are the antecedent as well as the consequence of FTP and also of memory performance. To test this, longitudinal studies are needed that examine these factors over time. Research is also needed to test whether experimental manipulations that have previously been shown to affect one of these factors also affect the others.

In further examining the relationship between FTP and memory control beliefs, future research should also consider the contributing role of other agentic traits, such as memory self-efficacy. Whereas memory control beliefs include both confidence that future age-declines are inevitable and beliefs about whether or not memory abilities can be improved via effort or strategies (Lachman et al., 1995), memory self-efficacy refers to people's perceptions of their present memory abilities – their confidence in their abilities to perform a specific memory task (Strickland-Hughes, West, Smith, & Ebner, 2016). In general, self-efficacy is theorized to be an important factor in predicting the amount of effort people expend on challenging tasks (Bandura, 1997, 2006), such as learning new information and acquiring and using memory strategies (Borkowski, Carr, Rellinger, & Pressley, 1990). It also moderates the impact of personal control beliefs on performance and other behavioral outcomes. For example, individuals with lower memory self-efficacy may limit themselves via reduced motivational processes (e.g., setting lower goals, limited persistence in light of challenge, benefiting less from training or feedback; Bandura, 2006; Payne et al., 2017; Strickland-Hughes et al., 2016; West et al., 2008), even if they have higher levels of memory control (West & Yassuda, 2004). Because of this, the benefits of having strong control beliefs are reduced for people with low self-efficacy.

Future research should also consider other aspects of control. In this study, we focused on control beliefs within the domain of memory. However, people also have control beliefs in other domains such as work, finances, relationships, and health (e.g., Lachman & Weaver, 1998). Given that the developmental trajectory of control beliefs varies across domains (e.g., Brandtstädter & Rothermund, 1994; Lachman & Weaver, 1998), it is possible that there are also domain differences in how FTP relates to control beliefs. Domains where there are age-related declines in control beliefs (such as control over memory, work, or health; Lachman & Weaver, 1998) may be strongly related to FTP (which also tends to decline with age). In contrast, domains where there is stability or improvement in control beliefs (such as perceived control over family relationships; Lachman & Weaver, 1998), there may be a weaker relationship with FTP. This would be consistent with Liao and Carstensen's (2018) suggestion that age-related decrements in FTP are gradual and may reflect awareness of subtle age-related losses in other domains. Indeed, research shows that older adults' FTP is more strongly tied to their awareness of age-related losses than to their awareness of age-related gains (Brothers, Gabrian, Wahl, & Diehl, 2016), particularly for people who hold essentialist beliefs about aging and believe these losses to be inherent and immutable (Weiss, Job, Mathias, Grah, & Freund, 2016).

We also recommend that future research evaluating the relationships between components of FTP, control beliefs, and other psychosocial factors include a more diverse sample of older adults. Participants in the current study were predominantly female, White, and well-educated. Even though this did not restrict the range of responses to our FTP or memory control belief measures, and even though we controlled for these demographic factors in our regression models, it is possible that the strength of the relationships reported here differ based upon participant characteristics. Future research is needed to test this, and also to determine the generalizability of these findings.

In summary, this work provides additional evidence for the multifaceted nature of FTP and extends limited prior research examining the relationships between older adults' FTP and memory control beliefs. Understanding the interplay between these factors is important as they both decline with age and both predict important outcomes – from memory

performance, to health and well-being, to longevity – yet may both be modifiable via intervention. Based upon our finding of a strong link between FTP Opportunity scores and memory control beliefs, we propose that interventions that teach older adults' to see themselves as capable of making new plans and pursuing new opportunities may be particularly effective at improving their memory control beliefs, which in turn may buffer them against age-related declines. This in turn would promote successful aging, which requires not only the maintenance of cognitive, physical, social, and affective functioning, but also the maintenance of a sense of control despite seeing time as limited (Schulz & Heckhausen, 1996).

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

Note

1. We repeated the analyses reported using the three-factor structure proposed by Kuppelweiser and Sarstedt (2014). For the future time perspective analyses, the results were almost identical to those reported here. However, a different pattern emerged for the memory control belief analyses. Potential Improvement, Effort Utility, and Inevitable Decline scores were all significantly predicted by Kuppelwieser and Sarstedt's Focus on Life subscale but not by their Focus on Opportunities subscale. This discrepancy is likely because the question "*There is plenty of time left in life to make new plans"* is more strongly correlated with memory control beliefs than are many of the other items on the Carstensen and Lang (1996) scale.

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