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Goal Pursuit, Goal Adjustment, and Pain in Middle-Aged Adults Aging With Physical Disability

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Abstract

Objective: Aging with physical disability disrupts one's ability to achieve valued goals due to changes in symptoms and function. It is unclear how to cope optimally in this context. This study examined whether two possible strategies—tenacious goal pursuit (TGP) and flexible goal adjustment (FGA)—were associated with reduced pain interference and depressive symptoms and greater well-being, and protected against pain intensity, and FGA was more protective with increasing age and worse physical function. **Method:** Middle-aged adults with muscular dystrophy, multiple sclerosis, post-polio syndrome, or spinal cord injury (N = 874; M_{AGE} = 58.3 years, range = 46-68; $M_{DISEASEDURATION}$ = 26.2 years, range = 2-67) completed two questionnaires, a year apart. **Results:** TGP and FGA use was associated with greater well-being. FGA use predicted decreased depressive symptoms. Concurrent use of both predicted decreased pain interference. **Discussion:** Adults with disability employ a variety of goal management strategies.

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Findings support TGP and FGA as potential intervention targets for healthy aging with disabilities.

Keywords
pain, disability, psychological adaptation, goal management, aging

Individuals aging with physical disability may face unique condition-specific challenges (Molton & Yorkston, 2017; Verbrugge & Yang, 2002) in addition to common age-related changes in psychosocial circumstances, health, family or vocational roles, and functioning (Palgi, 2013; Terrill & Molton, 2018). Additionally, the demands required to manage a disabling condition may prompt the development or progression of secondary conditions, such as pain (Langley, 2011; Molton & Terrill, 2014), fatigue, and depressive symptoms (Cook, Molton, & Jensen, 2011; Lundström et al., 2017), all of which in turn can interfere with the attainment of important life goals and quality of life (Bombardier, Ehde, Stoelb, & Molton, 2010; Lang et al., 2015).

Disruption in the pursuit of life goals may cause individuals to reevaluate the effectiveness of their current goal attainment strategies (Maes & Karoly, 2005). Some individuals may choose to persist with a particular goal, while others may choose to adjust or abandon the goal altogether (Brandtstädter & Renner, 1990). Each strategy could have beneficial effects on psychosocial functioning.

When confronted with age and disease-related declines in function, individuals who choose to continue pursuing their goals by actively modifying their lifestyle, skills, environment, or self to support goal attainment (Coffey, Gallagher, Desmond, & Ryall, 2014) engage in tenacious goal pursuit (TGP). TGP has been associated with less depressive symptoms and anxiety; greater positive affect, optimism, and purpose in life; and better self-reported health in a variety of rehabilitation populations (Boerner, 2004; Coffey, Gallagher, Desmond, & Ryall, 2014; Esteve et al., 2018; Ramírez-Maestre et al., 2019; Van Damme, De Waegeneer, & Debruyne, 2016). However, successful use of this strategy may be contingent on the availability of the internal and external resources required for goal attainment. TGP has conceptual parallels to constructs such as grit (passion and perseverance for long-term goal pursuit; Duckworth, Peterson, Matthews, & Kelly, 2007) and hardiness (trait-level attitudes of commitment, control, and challenge; Kobasa, 1979). Grit and hardiness tend to reflect broad attitudes and values, while TGP refers to the specific means by which goals are managed through modification of self or environment to support goal attainment (Coffey, Gallagher, Desmond, & Ryall, 2014).

Alternatively, individuals who modify or disengage from blocked goals when situational constraints arise use flexible goal adjustment (FGA; Brandtstädter & Renner, 1990). This approach has also been associated with beneficial outcomes such as less depressive symptoms and anxiety and better physical function in individuals with multiple sclerosis (MS; Van Damme et al., 2016) and visual impairment (Boerner, 2004); greater positive affect, purpose in life, and optimism in individuals with lower limb loss (Coffey, Gallagher, Desmond, Ryall, & Wegener, 2014) and chronic musculoskeletal pain (Esteve et al., 2018; Ramírez-Maestre et al., 2018); and greater acceptance in persons with spinal cord injury (SCI; van Lankveld, van Diemen, & van Nes, 2011). Disengagement from goals might seem unfavorable; however, this process may be adaptive when goals are impractical or unattainable (e.g., Klinger, 1975; Roubinov, Turner, & Williams, 2015; Wrosch, Scheier, Miller, Schulz, & Carver, 2003). Other accommodative processes similar to FGA, such as psychological flexibility (capacity to adapt to situational demands to maintain functioning, balance important life domains, and commit to behaviors congruent with values) and acceptance (acknowledging and living as well as possible with a challenge rather than directly attempting to change or avoid it), have been linked to superior mental health and functioning (Kashdan & Rottenberg, 2010; McCracken & Vowles, 2014). However, one important difference between FGA and related constructs (including flexibility, acceptance, and accommodation) is that FGA refers to specific modification of goals rather than general adjustment of coping or outlook.

The benefits of one goal management strategy (e.g., TGP) might also depend on whether that strategy is combined with another goal management strategy (e.g., FGA). Some researchers have suggested that having a broad repertoire of strategies is needed for maximum benefit (e.g., Kelly, Wood, & Mansell, 2013; Martinent et al., 2017). Few have tested this hypothesis, but some empirical support exists: in a sample of older adults, participants high in both TGP and FGA evidenced the best outcomes with respect to depressive symptoms, life satisfaction, and perceived health (Bailly et al., 2016). Similar findings have been found in adults with polyarthritis (Arends, Bode, Taal, & Van de Laar, 2016) and SCI (van Diemen, van Nes, Geertzen, & Post, 2018). In contrast, other researchers have found that the beneficial effect of one strategy only occurs when the other is used less: In lower limb loss patients, greater FGA was associated with less negative affect only when TGP was low (Coffey, Gallagher, Desmond, et al., 2014).

There is a growing body of prospective research on TGP and FGA. In middle-aged and older adult community samples, greater TGP and FGA have been associated with decreased depressive symptomatology (Kelly et al., 2013; Martinent et al., 2017), and greater FGA has been associated with increased life satisfaction (Bailly, Gana, Hervé, Joulain, & Alaphilippe, 2014; Martinent et al., 2017), decreased hostility (Kelly et al., 2013), and better physical health (Kelly et al., 2013; Martinent et al., 2017). In rehabilitation samples, both TGP and FGA have been associated with better outcomes over time: greater TGP and FGA have been associated with better adjustment and quality of life in those with a new stroke (Darlington et al., 2007) and those with limb loss (Coffey, Gallagher, & Desmond, 2014; Coffey, Gallagher, Desmond, et al., 2014), and greater life satisfaction, less depressive symptoms, and anxiety in individuals with newly acquired SCI and brain injury (Brands, Stapert, Köhler, Wade, & van Heugten, 2015; van Diemen et al., 2018). Greater TGP and FGA have also been associated with decreases in disability in individuals with limb loss (Coffey, Gallagher, & Desmond, 2014; Coffey, Gallagher, Desmond, et al., 2014).

While the direct benefits of TGP and FGA on positive and negative outcomes have been documented (e.g., Brandtstädter, Wentura, & Greve, 1993; Heyl, Wahl, & Mollenkopf, 2007), it remains unknown whether TGP and FGA also act indirectly, as buffers against the impact of specific negative stimuli, such as chronic pain (Molton & Terrill, 2014). Few studies have examined TGP's buffering effects (Schmitz, Saile, & Nilges, 1996), though there is a theoretical basis for this question, as successful pain management generally involves both problem-focused coping efforts (i.e., TGP) and accommodative coping efforts (i.e., FGA). FGA has attenuated the associations between pain intensity and negative mood in samples with chronic pain (Schmitz et al., 1996) and limb loss (Coffey, Gallagher, Desmond, & Ryall, 2014). Moderating factors may clarify variations in the buffering effects of goal management. For example, factors associated with aging and disability may reduce resources required for TGP, engendering a preference for less TGP and more FGA over time (e.g., Brandtstädter & Renner, 1990). Thus, a beneficial buffering effect of FGA might only be apparent when resources are depleted (i.e., with increasing age and worse physical function). A few studies have found the protective effect of FGA was evident only under these circumstances (Heyl et al., 2007; Schmitz et al., 1996). Further research is needed to elucidate the protective effects of TGP and FGA on pain in rehabilitation samples over time, and investigate the role of age and disease-related factors in these relationships. Understanding how goal management strategies and age and disease-related factors are predictive of better functioning when faced with commonly experienced stressors like pain will allow us to better understand healthy aging in persons with physical disability, and inform therapeutic recommendations (e.g., choice of motivational enhancement to persist with current goals vs. modification of blocked goals through setting achievable goals).

The purpose of the present study was to examine how two goal management styles, TGP and FGA, are beneficial to individuals experiencing pain among adults aging with a physical disability. Specific study objectives were to determine if (a) TGP and/or FGA at Year 3 (Y3) of a longitudinal survey were linked to better outcomes (i.e., lower depressive symptoms, less pain interference, and greater well-being) at Year 4 (Y4), (b) the hypothesized benefit of one goal management strategy on outcomes at Y4 depended on the level of the other strategy at Y3, (c) TGP and/or FGA at Y3 protected against (i.e., moderated) the influence of pain intensity on key outcomes (pain interference, depressive symptoms, well-being) at Y4, and (d) age- and disease-related processes (physical function, as a proxy for disease burden) were related to choice of FGA over TGP strategies. We hypothesized that both TGP and FGA would be related to better outcomes at Y4, and also buffer (attenuate) the associations between pain intensity at Y3 and health outcomes at Y4. We additionally hypothesized that the anticipated moderation (buffering) effect of FGA would be stronger with increasing age and worse physical functioning. Objective 2 was exploratory and did not have directional hypotheses.

Method

Participants and Procedures

Participants were middle-aged community-dwelling adults recruited from the University of Washington Disability Registry and via print and web advertisements to participate in a longitudinal survey examining aging with a physical disability (see Bamer, Cook, & Amtmann, 2012). The key measures (TGP and FGA) of the current study were only administered in Y3 of this survey. The eligibility criteria for the study were 45 to 65 years of age, ability to read and understand English, and presence of chronic neurological condition associated with physical disability (SCI, muscular dystrophy [MD], MS, post-polio syndrome [PPS]). Only participants who completed surveys at Y3 (2011-2012) and Y4 (2012-2013) of the parent study were included in the current study (N = 874). The methods are described in greater detail elsewhere (see Bamer et al., 2012). In Y3, 1,032 surveys were mailed out, with 935 surveys returned. Of these, 874 completed surveys at Y4. The response rate for the present study was 90.6%. The University of Washington Human Subjects Division approved all study procedures.

Descriptive information about the sample (N = 874) can be found in Table 1. Mean age was 58.3 years (range = 46-68). Participants were primarily female (64%), non-Hispanic White (92%), and college-educated (58%) with median annual household income between US$56,000 and US$70,000. The

Table 1. Participant Characteristics.

Variable	*n* (%[a])	*M* (*SD*)
Sex		
Female	558 (64)	
Male	315 (36)	
Age (years)		58.31 (5.68)
45-54	261 (30)	
55-64	504 (58)	
65+	109 (13)	66.15 (0.72)
Race/ethnicity		
Non-Hispanic White	806 (92)	
Non-Hispanic Black	22 (3)	
Non-Hispanic American Indian/American Native	9 (1)	
Non-Hispanic Asian	4 (1)	
Non-Hispanic Pacific Islander	0 (0)	
Non-Hispanic more than 1 race	18 (2)	
Hispanic White	0 (0)	
Hispanic non-White	11 (1)	
Annual household income		
<US$25,000	142 (16)	
US$25,000-US$40,000	133 (15)	
US$41,000-US$55,000	99 (11)	
US$56,000-US$70,000	96 (11)	
US$71,000-US$85,000	59 (7)	
US$86,000-US$100,000	72 (8)	
>US$100,000	150 (17)	
Education		
9th grade or less	3 (<1)	
10th-11th grade	12 (1)	
High school graduate/GED	94 (11)	
Vocational/technical school	54 (6)	
Some college	211 (24)	
College graduate	267 (31)	
Graduate/professional school	232 (27)	
Marital status		
Married	553 (63)	
Non-married	321 (36)	
Rural designation		
Urban	693 (79)	
Rural	132 (15)	
Super rural	49 (6)	

(continued)

Table 1. (continued)

Variable	*n* (%[a])	*M* (*SD*)
Diagnosis		
Muscular dystrophy	166 (19)	
Multiple sclerosis	333 (38)	
Post-polio syndrome	161 (18)	
Spinal cord injury	214 (25)	
Time since diagnosis (years)		26.2 (18.4)
0-4	15 (2)	
5-9	132 (15)	
10-19	277 (32)	
20-29	163 (19)	
30-39	88 (10)	
40-49	29 (3)	
50-59	70 (8)	
60-67	90 (10)	
Baseline average pain intensity (0-10)[b] (Y3)		3.82 (2.40)
No pain (0)	85 (10)	
Mild (1-3)	335 (29)	
Moderate (4-6)	311 (36)	
Severe (7-10)	140 (16)	
PROMIS physical function[c] at baseline (Y3)		36.26 (10.34)
Goal management style at baseline (Y3)		
Flexible goal adjustment		37.05 (7.68)
Tenacious goal pursuit		34.60 (8.28)
Pain interference		
PROMIS Pain Interference[c,d] (Y3)		55.87 (9.04)
PROMIS Pain Interference[c,e] (Y4)		55.41 (9.65)
Clinically significant Y3-to-Y4 change (±5 units)	314 (36)	
Depressive symptoms		
PROMIS Depression[c] (Y3)		50.90 (8.94)
PROMIS Depression[c] (Y4)		50.23 (8.87)
Clinically significant Y3-to-Y4 change (±5 units)	356 (41)	
Ryff Scale of Psychological Well-Being[f] (Y4)		246.74 (39.27)

Note. Possible range: Y3 physical function, 9-100; average pain intensity, 0-10; Y3 pain interference, 41-78.3; Y3 and Y4 depressive symptoms, 41-79.4; flexible goal adjustment and tenacious goal pursuit, 0-60; Y4 pain interference, 41.6-75.6; Y4 well-being, 54-324. Y3 = Year 3; Y4 = Year 4. PROMIS = Patient Reported Outcome Measurement System; GED = General Education Development tests.

[a]Percentage may not add to 100 due to missing data and rounding error.

[b]Cutoff scores for pain intensity adapted from Hanley et al. (2006).

[c]*T*-score.

[d]Short form 6b version 1.0.

[e]Profile 29 version 2.0.

[f]Overall well-being medium form.

majority of participants were married (63%) and resided in urban areas (79%). Participants reported a diagnosis of MS (38%), SCI (25%), MD (19%), or PPS (18%). Mean disease duration was 26.2 years (range = 2-67). At Y3, 90% reported pain intensity greater than zero, and average pain intensity was mild-to-moderate (per Hanley et al., 2006, cutoffs; $M = 3.82$, $SD = 2.40$). Baseline mean pain interference scores were over 0.5 *SD* higher ($M = 55.87$, $SD = 9.04$) than those in the general U.S. population. Mean baseline physical function scores were nearly 1.5 *SD* lower than those in the normative population ($M = 36.26$, $SD = 10.34$). Mean baseline depressive symptomatology scores were comparable ($M = 50.90$, $SD = 8.94$) with those in the U.S. general population.

Measures

Demographic and disease-related information (Y3). Participants provided demographic information (sex, age, education level, income, race/ethnicity, marital status, rural designation) and disease-related information (diagnosis, disease duration).

Physical function (Y3). Physical function was measured using 12 items from the Patient Reported Outcome Measurement System (PROMIS) Physical Function for Mobility Aid Users item bank version 1.0 (Amtmann, Bamer, Cook, Harniss, & Johnson, 2010). Participants rated their ability to perform activities of daily living (e.g., putting on/taking off a coat, preparing simple meals) on a 0 (*unable to do*) to 5 (*without any difficulty*) Likert scale. Scores reflect a *T*-score metric ($M = 50$, $SD = 10$, where 50 = mean in the general U.S. population; Amtmann, Cook, Johnson, & Cella, 2011). Higher scores indicate better physical function. This item bank has been validated for use in adults with MS and SCI (Amtmann et al., 2011). Internal consistency for the scale in this sample was excellent (Cronbach's $\alpha = .94$).

Goal management style (Y3). TGP and FGA were measured, respectively, with the 15-item TGP subscale and 15-item FGA subscale from Brandtstädter and Renner's (1990) TGP and FGA Scales. To measure TGP, participants rated their agreement with statements representative of TGP (e.g., "When faced with obstacles, I usually double my efforts" and "To avoid disappointments, I don't set goals too high" [reversed]) on a 0 (*strongly disagree*) to 4 (*strongly agree*) Likert scale. Higher scores indicate greater TGP (range = 0-60). To assess FGA, participants rated their agreement with statements representative of FGA (e.g., "I adapt quite easily to changes in plans or circumstances" and "After a serious drawback, I soon turn to new tasks") on a 0 (*strongly* *disagree*) to 4 (*strongly agree*) Likert scale. Higher scores indicate greater FGA (range = 0-60). The internal consistency of both subscales was good (α_{TGP} = .85; α_{FGA} = .82). These scales have been used in studies of individuals with SCI (van Lankveld et al., 2011), MS (Van Damme et al., 2016), limb loss (Coffey, Gallagher, Desmond, & Ryall, 2014), and mixed chronic pain (Schmitz et al., 1996).

Pain intensity (Y3). Participants rated average pain intensity in the past week on a single-item 0 (*no pain*) to 10 (*pain as bad as you can imagine*) numerical rating scale (NRS). The reliability and validity of the NRS as a measure of pain intensity has been established in various samples of persons with pain (Jensen & Karoly, 2011), including persons with chronic neurological conditions.

Pain interference (Y3,Y4). The six-item PROMIS Pain Interference Short Form version 1.0 and the four-item PROMIS Pain Interference Profile-29 version 2.0 short form (http://www.healthmeasures.net; Amtmann, Cook, et al., 2010; Cella et al., 2010) were used to assess pain interference at Y3 and Y4, respectively. Participants rated level of pain interference in daily activities (e.g., "To what extent did pain interfere with work around home?") in the past 7 days. Pain interference scores reflect a *T*-score metric. The internal consistency of these measures was excellent (α_{Y3} = .96; α_{Y4} = .96). The PROMIS Pain Interference item bank has been validated for use in adults with chronic neurological conditions (Bamer et al, 2012; Cook, Bamer, Amtmann, Molton, & Jensen, 2012).

Depressive symptoms (Y3,Y4). The four-item PROMIS Profile–29 Depression short form version 2.0 (http://www.healthmeasures.net; Pilkonis et al., 2011; Teresi et al., 2009) assessed depressive symptoms. Participants rated how often they experienced each symptom (e.g., "I felt hopeless" and "I felt depressed") in the past 7 days. Depressive symptom scores were also computed on a *T*-score metric. Internal consistency of this measure at Y3 and Y4 was excellent (α_{Y3} = .91; α_{Y4} = .91). The PROMIS Depression item bank has been validated for use in chronic neurological conditions (Bamer et al., 2012).

Well-being (Y4). Well-being was assessed with the 54-item Ryff Scales of Psychological Well-Being medium form (Ryff & Keyes, 1995). Participants rated their agreement with items (e.g., "For me, life has been a continuous process of learning, changing, and growth" and "I like most aspects of my personality") on a 1 (*strongly disagree*) to 6 (*strongly agree*) Likert scale. The internal consistency of this scale in this sample was excellent (α = .93).

Data Analysis

Descriptive statistics (*M, SD*, skewness, kurtosis) for each study variable were computed to describe the sample and examine assumptions for the planned data analyses. Data from all participants, including those who did not report pain, were included. As a preliminary step, we conducted *T*-tests and correlation analyses (Pearson products for continuous variables; Spearman's rho for ordinal variables) to explore bivariate associations between the TGP and FGA variables and demographic and disease-related characteristics.

We utilized separate hierarchal multiple regression analyses for each of the three outcome measures (pain interference, depressive symptoms, well-being) to test the hypotheses. Predictor variables were centered prior to analyses. To identify covariates that could be confounds, we conducted *T*-tests and correlation analyses between the Y3 demographic and disease-related variables and Y4 outcomes. Variables that were significantly associated with the outcomes at the univariate level were entered at Step 1. Age and physical function were also entered at Step 1. For the depressive symptom and pain interference models, baseline values were entered at Step 2 so that each predictor entered thereafter predicted the *change* in outcome from Y3 to Y4, rather than the *amount* of outcome at Y4. For the well-being model, each entered predictor predicted the amount of well-being at Y4 because well-being was not assessed at Y3. Longitudinal associations were defined as associations involving more than one timepoint, regardless of whether the outcome controlled for baseline. Main effect terms for Y3 pain intensity, TGP, and FGA were entered at Step 3 (Step 2 for well-being), and two-way interaction terms were entered at Step 4 (Step 3 for well-being). Support for Objective 1's hypothesis would be indicated by significant main effects of TGP and FGA indicating greater well-being and decreases in pain interference and depressive symptomatology. A positive finding for Objective 2 would be indicated with a significant TGP × FGA interaction. We had no specific hypotheses for this objective, as it was exploratory. Support for Objective 3's hypothesis would be indicated by significant Pain Intensity × Goal Management Style interactions characterized by weaker associations between Y3 pain intensity and Y4 outcomes (i.e., slope coefficient closer to zero) for participants reporting higher TGP and/or FGA. We entered Pain Intensity × FGA × Age and Pain Intensity × FGA × Physical Function interaction terms at Step 5 (Step 4 for well-being). Support for Objective 4's hypothesis would be indicated with a significant three-way interaction characterized by a weaker association between Y3 pain intensity and the Y4 outcomes (i.e., slope coefficients closer to zero) in older participants reporting high FGA, relative to a stronger association in younger participants and older participants reporting low FGA and the same pattern of results for participants reporting low physical function and high FGA.

Results

Y3 TGP and FGA Bivariate Associations

Statistics for the TGP and FGA bivariate associations can be found in the appendix. Greater TGP was associated with male sex, higher annual household income, higher educational attainment, and residence in an urban area. Participants with SCI reported greater TGP compared to those with MS ($M_{\text{DIFFERENCE}} = 3.45$, $p < .001$) or MD ($M_{\text{DIFFERENCE}} = 3.13$, $p = .002$), and greater FGA than those with MD ($M_{\text{DIFFERENCE}} = 2.29$, $p = .02$). All other associations, including those with age and physical function, were not significant. Greater TGP was associated with higher FGA, $r(854) = .27$, $p < .001$.

Longitudinal Regression Analyses

Statistical values are presented in Table 2. There was no concern for bias due to multicollinearity, as the variance inflation factor (VIF) values approximately equaled 1, except for those associated with Y3 pain intensity (VIF = 2.28) and pain interference (VIF = 2.21) in the pain interference model.

Relationship of TGP and FGA with outcomes. Significant and marginally significant ($p < .10$) main effects of baseline (Y3) TGP were found for well-being and pain interference, respectively, at Y4: high TGP was associated with greater well-being and marginal decreases in pain interference. Significant main effects of baseline (Y3) FGA were found for well-being and depressive symptoms at Y4: high FGA was associated greater well-being and decreases in depressive symptomatology. The main effects of TGP on depressive symptoms and FGA on pain interference were nonsignificant.

Relationship of TGP × FGA with outcomes. A significant TGP × FGA interaction was found for pain interference: greater baseline TGP was associated with decreased pain interference when FGA was high, $t(705) = -3.31$, $p = .001$, whereas there was no association between TGP and pain interference when FGA was low, $t(705) = 0.27$, $p = .79$ (see Figure 1a). No significant TGP × FGA interactions were found for depressive symptoms or well-being.

Pain buffering effect of TGP and FGA. Contrary to our hypotheses, no support for buffering effects of baseline (Y3) TGP or FGA on the associations

Table 2. Hierarchal Regression Models Predicting Year 4 Pain Interference, Depressive Symptoms, and Well-Being from Year 3 Predictors ($N = 874$).

Outcome/Step/Predictor variable	R^2	ΔR^2	B	β
Pain interference				
Step 1	.140***	.140***		
Income[a]			−0.755	−.039
Education[b]			−1.589*	−.082*
Marital status[c]			−0.615	−.031
Rural designation[d]			2.019*	.087*
Post-polio syndrome diagnosis[e]			5.359***	.217***
Age			−0.114†	−.068†
Physical function			−0.249***	−.260***
Step 2	.548***	.408***		
Baseline pain interference			0.756***	.701***
Step 3	.571***	.024***		
Pain intensity			0.883***	.219***
FGA			−0.028	−.022
TGP			−0.058†	−.050†
Step 4	.582***	.011*		
FGA × TGP			−0.010**	−.072**
Pain Intensity × FGA			0.002	.003
Pain Intensity × TGP			0.021†	.045†
Pain Intensity × Age			0.005	.007
Pain Intensity × Physical Function			0.0003	.001
FGA × Age			0.003	.013
FGA × Physical Function			−0.006	−.042

(continued)

Table 2. (continued)

Outcome/Step/Predictor variable	R^2	ΔR^2	*B*	β
Step 5	.583***	.001		
Pain Intensity × FGA × Age			−0.002	−.025
Pain Intensity × FGA × Physical Function			−0.0004	−.009
Depressive symptoms				
Step 1	.065***	.065***		
Income[a]			−1.678*	−.94*
Education[b]			−0.248	−.014
Age			−0.096†	−.061†
Physical function			−0.189***	−.214***
Step 2	.465***	.400***		
Baseline depressive symptoms			0.655***	.655***
Step 3	.482***	.016***		
Pain intensity			0.184	.049
FGA			−0.151***	−.129***
TGP			−0.032	−.030
Step 4	.485***	.003		
FGA × TGP			0.0003	.002
Pain Intensity × FGA			0.017	.038
Pain Intensity × TGP			−0.008	−.020
Pain Intensity × Age			−0.024	.037
Pain Intensity × Physical Function			−0.013	−.037
FGA × Age			−0.002	−.012
FGA × Physical Function			0.001	.008

(continued)

Table 2. (continued)

Outcome/Step/Predictor variable	R^2	ΔR^2	B	β
Step 5	.485***	0.0003		
Pain Intensity × FGA × Age			0.001	.009
Pain Intensity × FGA × Physical Function			0.001	.018
Well-being[f]				
Step 1	.061***	.061***		
Income[a]			4.779	.061
Education[b]			8.718**	.109**
Marital status[c]			3.985	.049
Post-polio syndrome diagnosis[e]			8.672*	.086*
Age			0.451	.041
Physical function			0.462**	.117**
Step 2	.417***	.356***		
Pain intensity			−2.020***	−.123***
FGA			2.191***	.422***
TGP			1.501***	.309***
Step 3	.421***	.004		
FGA × TGP			−0.019	−.035
Pain Intensity × FGA			−0.091	−.046
Pain Intensity × TGP			−0.041	−.021
Pain Intensity × Age			0.007	.003
Pain Intensity × Physical Function			0.016	.010
FGA × Age			0.006	.007
FGA × Physical Function			−0.001	−.002

(continued)

Table 2. (continued)

Outcome/Step/Predictor variable	R^2	ΔR^2	*B*	β
Step 4	.421***	.0003		
Pain Intensity × FGA × Age			0.002	.005
Pain Intensity × FGA × Physical Function			−0.004	−.019

Note. FGA = flexible goal adjustment; TGP = tenacious goal pursuit.
[a]Where 0 = < US$56,000 and 1 = ≥ US$56,000.
[b]Where 0 = less than college degree and 1 = college degree or higher.
[c]Where 0 = not married and 1 = married.
[d]Where 0 = urban designation and 1 = rural designation.
[e]Where 0 = non-post polio syndrome diagnosis and 1 = post-polio diagnosis.
[f]Analysis contained four steps because well-being was not measured at Year 3.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

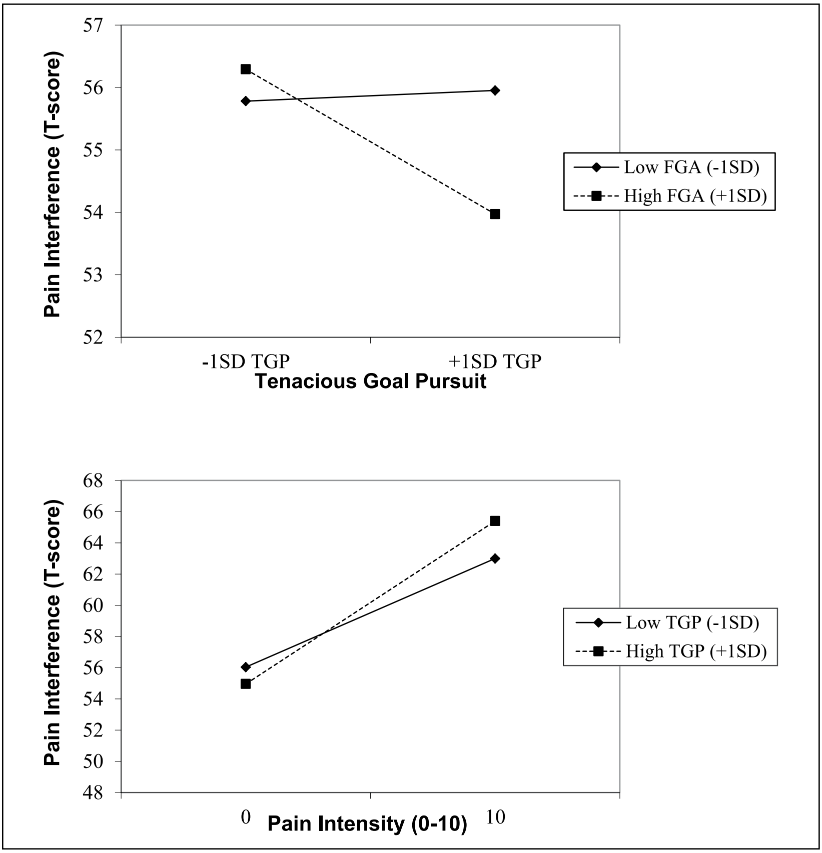

Figure 1. Moderating effects on pain interference: (a) FGA significantly moderates the negative association between Year 3 TGP and pain interference at Year 4 and (b) Year 3 TGP marginally ($p < .10$) moderates the positive relationship between pain intensity at Year 3 and pain interference at Year 4, controlling for demographic and disease-related covariates and pain interference at Year 3.
Note. FGA = flexible goal adjustment; TGP = tenacious goal pursuit.

between Y3 pain intensity and Y4 outcomes was found. A marginal moderating effect of TGP on the association between pain intensity and the pain interference was found; however, the nature of the interaction differed from what was hypothesized (see Figure 1b). At high pain intensity, participants reporting high TGP showed a greater increase in pain interference compared with participants reporting low TGP.

Pain buffering effect of FGA in older middle age and with worse physical function. Contrary to our hypotheses, no significant three-way interaction effects indicating buffering effects of FGA were found in participants reporting older middle age or worse physical function.

Discussion

The purpose of the present study was to examine whether two goal management styles, TGP and FGA, were beneficial for pain among middle-aged adults aging with physical disabilities. We examined the relationships between baseline TGP and FGA and three outcomes (pain interference, depressive symptoms, well-being) and found that TGP and FGA were differentially associated with positive outcomes 1 year later: high FGA was associated with decreases in depressive symptomatology, high TGP was marginally associated with decreases in pain interference, and both strategies were associated with greater well-being. We explored whether the beneficial contribution of one goal management strategy depended on the presence of the other and found that high TGP was associated with decreases in pain interference when FGA was high. We hypothesized that when pain was present, TGP and FGA would protect against the impact of pain, and a stronger protective benefit of FGA would be found in participants who were older or had worse physical functioning; however, neither goal management style buffered the associations between pain intensity and outcomes, regardless of age or level of physical functioning. A moderating effect of TGP on pain interference in the opposite direction than expected was found: participants reporting higher TGP showed a marginally stronger association between pain intensity and pain interference. To our knowledge, this study is among the first to examine longitudinal associations between goal management strategies, pain, and function in a large sample of middle-aged adults aging with physical disabilities. The composition of this sample represents a unique strength of the study, as it represents a growing population of individuals who are living longer with physical disabilities (Molton & Yorkston, 2017), in contrast with past prospective studies about physical disability, which have typically focused on the newly diagnosed or injured (e.g., Brands et al., 2015; Coffey, Gallagher, Desmond, et al., 2014).

When examined by diagnostic group, our sample reported comparable TGP and FGA (i.e., mean scores differing by <1 *SD*) to those found in samples comprised of individuals with MS (Van Damme et al., 2016), SCI (van Diemen et al., 2018; van Lankveld et al., 2011), and other conditions with rehabilitation needs such as limb loss (Coffey, Gallagher, Desmond, et al., 2014), stroke (Darlington et al., 2007), and acquired brain injuries (Brands et al., 2015). In our study, participants with SCI reported more FGA than those with MD, and more TGP than those with MD or MS. This finding suggests that there may be disease characteristics and/or other factors associated with SCI (e.g., non-progressive disease course, potentially better access to resources) that promote greater use of TGP and FGA.

Several but not all of the study hypotheses were supported. We hypothesized that both TGP and FGA would be beneficial across all outcomes; however, we instead found a pattern of differential relationships for outcome measures that controlled for baseline (and therefore examined how TGP and FGA associated with *changes* in outcome). In contrast, beneficial effects for both strategies were more likely if the outcome measures did not control for baseline. We found this pattern of results in our data and in prior research (e.g., Bailly et al., 2014; Darlington et al., 2007; Kelly et al., 2013; van Diemen et al., 2018). Thus, the unexpected findings in the current study may be due to how and when outcomes were assessed. More studies that examine relative change are needed to understand how goal management strategies potentially influence outcomes over time, as they would more directly inform interventions aimed at helping individuals age well with physical disability.

The significant association between greater baseline FGA and decrease in depressive symptoms corroborates longitudinal studies (Brands et al., 2015; Kelly et al., 2013; Martinent et al., 2017; van Diemen et al., 2018), and randomized controlled trials of acceptance and commitment therapy (ACT), which aim to reduce depressive symptoms by increasing psychological flexibility (Kashdan & Rottenberg, 2010). This finding may have potentially important clinical implications, as it suggests that the use of FGA may at best offset the development of depressive symptoms, and at minimum reflect a predisposition toward better mood outcome.

The lack of support for our hypothesis that TGP would predict improved depressive symptomatology and pain interference suggests that individuals with significant physical disabilities may require substantial resources if they are to depend on a TGP approach to goal management. We found support for this effect with respect to pain interference: TGP was only beneficial if FGA was also used, suggesting that determination must be paired with flexibility for optimal response to the challenges posed by chronic pain. This result is consistent with past research demonstrating that better outcomes were associated with the use of both strategies (Arends et al., 2016; Bailly et al., 2016; van Diemen et al., 2018) and qualitative studies suggesting that individuals with physical disabilities use both TGP and FGA (Dunne, Coffey, Gallagher, & Desmond, 2014). Adults with physical disabilities might benefit from coaching in using a combination of TGP strategies, such as adopting a determined attitude, seeking instrumental help, and continuing to participate in valued leisure activities, and FGA strategies, such as seeking emotional support when confronted with functional losses (Dunne et al., 2014). This finding also supports the use of ACT for pain management, as ACT involves processes consistent with both TGP (e.g., commitment to values-based action) and FGA strategies (e.g., pain acceptance, mindfulness; McCracken & Vowles, 2014).

For well-being, the finding that both TGP and FGA were associated with later psychological well-being was consistent with our hypotheses and past longitudinal research (Bailly et al., 2014; Brands et al., 2015; Coffey, Gallagher, Desmond, et al., 2014; Martinent et al., 2017). These findings contribute to the research literature by extending prior findings to community-dwelling individuals with physical disability. The findings also suggest there may be numerous methods of goal management associated with benefits in well-being. Using TGP, FGA, or varying combinations of both strategies may be similarly beneficial.

Neither TGP nor FGA showed protective effects in the face of pain, a nonsignificant finding that might be explained by the presence of other moderating variables. The buffering effect of TGP might not have been detected because we did not account for goal attainability (Brandtstädter & Rothermund, 2002). TGP of an unattainable goal such as elimination of chronic pain for those whose resolution is unlikely may ultimately have detrimental effects on functioning and well-being (Hadley & MacLeod, 2010; Serpell, Waller, Fearon, & Meyer, 2009). Our findings in the pain interference model support this idea: high TGP appeared to amplify the negative effect of pain, increasing pain interference when pain intensity was high. High TGP has similarly been found to magnify the negative association between environmental constraints (e.g., lack of access to facilities) and less well-being in adults in the general population (Brandtstädter et al., 1993). Relatedly, as an individual becomes more engaged in active goal pursuit, there is more opportunity for pain to interfere with function because of increased goal-directed activity.

The lack of evidence for FGA buffering effects may be explained by the presence of other moderating variables such as goal importance, goal substitutability, and availability of positive reappraisals (Brandtstädter & Rothermund, 2002). Successful use of FGA might be particularly challenging if blocked goals are central to an individual's identity and values, and not easily substituted or reappraised. As we did not assess these constructs, it is possible that we were unable to detect protective effects, as they may only be apparent for participants with greater reappraisal ability and/or whose goals were less important and more easily substituted.

While FGA played a prominent role in predicting better functioning over time across all outcomes in our mid-life sample, our moderation results did not support developmental theories of goal management that suggest accommodative strategies are more effective at improving outcomes when assumed age- and disease-related resources are low (Brandtstädter & Renner, 1990). The hypothesized protective effect of FGA might not have been detected due to the moderating factors described above, limited statistical power to detect effects, and/or the restricted age range of our sample (45-67 years).

In sum, the presence of main effects and lack of support for buffering effects against pain suggests that in this sample of adults with physical disabilities, goal management strategies may function through direct downstream effects on functioning, rather than by weakening the influence of pain intensity on functioning. The beneficial role of FGA in subsequent pain interference, depressive symptomatology, and well-being was highlighted in our study, and is consistent with theoretical models suggesting accommodative strategies with appropriate goal selection are important in mid-life (Baltes & Baltes, 1990). TGP appears to be beneficial for well-being and pain interference, though not under all circumstances: TGP appeared to have a beneficial downstream effect on pain interference when FGA was high; however, it also trended toward working in opposition of this effect when pain intensity was high. Thus, TGP may be double-edged, and more complicated to use effectively. Our findings suggest that the use of both strategies may be needed to function well.

From a clinical perspective, our findings suggest that interventions that directly target goal management through effective goal-setting, commitment enhancement via specific visualization techniques, problem-solving, and goal management reevaluation (Arends, Bode, Taal, & Van de Laar, 2017; Christiansen, Oettingen, Dahme, & Klinger, 2010) might also be effective at improving functioning and well-being in adults aging with physical disabilities. ACT and other interventions that facilitate evaluation of what is important or meaningful to the individual and provide an opportunity to adjust and choose goals that are attainable in the context of the challenges that are present (e.g., aging and physical disability) may be beneficial for mood, function, and well-being (Schrooten, Vlaeyen, & Morley, 2012).

There are limitations about the current study. First, there is some conceptual overlap between measures of TGP and FGA. Low TGP and high FGA—and conversely, high TGP and low FGA—may be difficult to distinguish from each other. Despite the use of these measures in several studies across multiple contexts and translations, two validation studies have suggested that these scales may have limited construct and factorial validity (Henselmans et al., 2011; Mueller & Kim, 2004). It is within this context that we describe our findings as preliminary, and urge further development and refinement of the TGP and FGA instruments to improve validity. Still, the fact that FGA, for example, predicted subsequent changes in depressive symptomatology over the span of a year—a significant period of time in which other factors could have influenced depressive symptomatology—supports the importance of these goal management constructs. Second, restricted age range, limited power, and the potential presence of unmeasured moderating variables (e.g., goal attainability, positive appraisals) may have obstructed the ability to detect the hypothesized buffering effects. In particular, incorporation of goal attainability into studies of TGP and FGA may also clarify the nature and usefulness of these two goal management strategies. Other limitations of the study include the fact that our sample was disproportionately female, White, and highly educated, and that data were correlational (limiting the ability to make causal inferences).

This study provides meaningful insight into the role of goal management strategies in predicting better functioning in middle-aged adults aging physical disabilities. The results suggest that high use of FGA is associated with decreases in depressive symptoms, high concurrent use of TGP and FGA are associated with decreases in pain interference, and high use of either strategy is associated with greater well-being over time. Results also suggested that TGP may be double-edged, potentially amplifying pain interference for individuals reporting high pain intensity. This study contributes to the goal management literature by extending findings to adults in a more chronic stage of physical disability, highlighting the difference in findings between longitudinal studies assessing later outcomes versus relative changes in outcomes, and providing stronger support for a beneficial compensatory function of TGP and FGA, rather than a protective function.

Appendix. Participant Characteristics Associated With Mean Flexible Goal Adjustment and Tenacious Goal Pursuit Scores ($N = 874$).

	Flexible goal adjustment			Tenacious goal pursuit		
Variable	$M \pm SD$		Test statistic[a]	$M \pm SD$		Test statistic[a]
Sex	Male (1): 36.94 ± 7.45	Female (0): 37.11 ± 7.81	$t(861) = -0.30$, $p = .77$	Male (1): 35.88 ± 8.35	Female (0): 33.84 ± 8.13	$t(861) = 3.52$, $p < .001$
Age			$r(862) = 0.06$, $p = .11$			$r(862) = -0.01$, $p = .70$
Race	White (1): 36.96 ± 7.70	Non-White (0): 38.50 ± 7.25	$t(861) = -1.35$, $p = .18$	White (1): 34.53 ± 8.32	Non-White (0): 35.39 ± 7.22	$t(861) = -0.68$, $p = .49$
Ethnicity	Hispanic (1): 39.82 ± 4.81	Non-Hispanic (0): 37.01 ± 7.70	$t(861) = 1.21$, $p = .23$	Hispanic (1): 36.00 ± 6.93	Non-Hispanic (0): 34.56 ± 8.28	$t(861) = 0.57$, $p = .57$
Income[b]			$r(741) = 0.01$, $p = .70$			$r(741) = 0.09$, $p = .02$
Education[b]			$r(861) = -0.01$, $p = .85$			$r(861) = 0.12$, $p<.001$
Married	Married (1): 36.83 ± 7.71	Non-married (0): 37.43 ± 7.62	$t(862) = -1.12$, $p = .26$	Married (1): 34.71 ± 8.27	Non-married (0): 34.40 ± 8.29	$t(862) = 0.54$, $p = .59$
Rurality[b] (higher = more rural)			$r(862) = -0.03$, $p = .41$			$r(862) = -0.07$, $p = .04$
Physical function			$r(862) = -0.11$, $p = .98$			$r(862) = 0.02$, $p = .55$
Diagnosis	MD: 35.66 ± 7.88 PPS: 37.77 ± 7.28	MS: 36.82 ± 7.75 SCI: 37.96 ± 7.55	$F(3, 860) = 3.36$, $p = .02$	MD: 33.68 ± 8.71 PPS: 35.18 ± 7.67	MS: 33.36 ± 8.52 SCI: 36.80 ± 8.28	$F(3, 860) = 8.68$, $p < .001$

Note. MD = muscular dystrophy; MS = multiple sclerosis; PPS = post-polio syndrome; SCI = spinal cord injury.
[a]*T*-test, Pearson product correlation, or ANOVA unless otherwise specified.
[b]Spearman rho. Possible range for flexible goal adjustment and tenacious goal pursuit, 0-60.

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Supplemental Material

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