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Exercising Control: The Longitudinal Influence of Exercise Intention Beliefs on Perceived Constraints in Older Adults with Osteoarthritis

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Abstract

Purpose of the study: Maintaining perceived psychological control in older adulthood is beneficial for health, well-being, and adjustment to chronic illness. Theoretically, control over specific, personally meaningful domains should inform general control beliefs. Thus, the objective of the present study was to examine perceived control over the exercise domain (operationalized as exercise intention belief) for its ability to predict general control beliefs in a sample of older adults with chronic illness over one year. Design and methods: Longitudinal survey responses from 133 older adults with osteoarthritis (OA) were examined. Results: Longitudinal hierarchical multiple regression analyses revealed that higher baseline exercise intention beliefs predicted a lower perception of constraints on control 9-12 months later, but did not predict changes in mastery beliefs. Implications: Results suggest that bolstering exercise intention beliefs may protect against age-related declines in psychological constraints on perceived control for older adults with osteoarthritis.

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Keywords: control beliefs, exercise, mastery

Exercising Control: The Longitudinal Influence of Exercise Self-Efficacy on Perceived Constraints in Older Adults with Osteoarthritis

Maintaining a sense of control in older adulthood is beneficial for physical and psychological health. For example, Lachman and Firth (2004) found that high psychological control beliefs were associated with fewer acute and chronic illnesses, better physical functioning, and better psychological health, while Gerstorf, Röcke, and Lachman (2011) found that control beliefs were longitudinally associated with better physical health. Ferreira and Sherman (2006) found that positive control beliefs were associated with higher life satisfaction and lower depressive symptoms, while several authors have noted the importance of control beliefs for adjustment to chronic pain (e.g., Rapp, Rejeski, & Miller, 2000). However, Lachman and Firth (2004) showed that older adults experience declines in beliefs in personal control over health and physical functioning with age. Lachman and Firth also found that older adults, compared to younger, felt they had less general control over their lives. These age-related changes in control may have important implications for older adults with osteoarthritis (OA), which is a chronic illness characterized by progressive joint degeneration, particularly of weight-bearing joints in areas such as the knee or hip (Arthritis Foundation, 2012). OA causes pain and disability for more than half of older adults (Creamer, 2000), and treatment strategies for OA symptoms, such as exercise, depend on performing behaviors that are under patients' behavioral control (Arthritis Foundation, 2012). Thus, maintaining a sense of control is imperative for the well-being of older adults with OA.

In a comprehensive review of the control beliefs literature, Skinner (1996) argued that control has three main components: agents-ends beliefs refer to the beliefs that an agent causes an outcome, means-ends beliefs refer to the beliefs that an action causes an outcome, and agents-

means beliefs refer to the beliefs that an agent has access to a behavior/can or will use a specific means to achieve an outcome. Addressing agents-ends beliefs, Lachman and Weaver (1998) conceptualize the sense of control as consisting of two elements: *mastery*, defined as a sense of personal ability and effectiveness at meeting goals, and *perceived constraints*, defined as beliefs about obstacles and factors beyond one's control that interfere with attaining goals. While mastery beliefs tend to be stable across the adult lifespan, cross-sectional analyses reveal that perceived constraints vary with age, with older adults perceiving more constraints on their control than younger and middle-aged adults perceive (Lachman & Firth, 2004). Mastery and perceived constraints describe a broad sense of perceived control over one's life in general. Agents-means beliefs, on the other hand, describe a person's perceived capabilities, competence, or behavioral intentions in a specific domain, such as health or cognition (Skinner, 1996). Thus, these beliefs should vary with personal experience in specific domains as well as across different domains of functioning. Theoretically, there should be interplay between the general sense of control and specific domains where control is exerted (Gerstorf et al., 2010). In particular, domains of control that are personally meaningful should evoke a strong impact on general control beliefs because they inform the sense of self/identity. Thus, increasing agents-means beliefs in relevant domains should lead to an increased sense of overall personal control.

Behavioral intentions such as agents-means beliefs convey a person's confidence in his or her likelihood of performing a specific activity. This construct builds upon self-efficacy, which is a person's perceived competence in a specific domain (Bandura, 1986), to include beliefs not only about access to a behavior, but also intentions to complete the behavior (Armitage & Conner, 2001). Exercise is an effective disease management option for older adults with OA, as it relieves pain, disability, and psychological symptoms associated with the condition (Hughes et

al., 2004). Although physical activity relieves OA symptoms, older adults with OA are a particularly sedentary segment of the population: 40% of men and 57% of women with knee OA are entirely inactive (Dunlop et al., 2011). Thus, enhancing exercise intention may be an efficacious strategy for managing OA symptoms because it promotes exercise behavior (Gecht, Connell, Sinacore, & Prochaska, 1996). While exercise intention has been established as an effective tool for promoting exercise behavior among middle-aged women (Fortier, Kowal, Lemyre, & Orpana, 2009) and older adults (Courneya, 1995), we examined its ability to predict general agents-ends control beliefs in the present study because boosting control beliefs among older adults with OA may be protective for their physical and mental health. Specifically, we predicted that higher exercise intention would predict higher mastery and lower perceived constraints, based on psychological theory of control beliefs (Gerstorf et al., 2010).

Method

Participants

Participants over 55 years of age with self-reported OA pain in the hip(s) and/or knee(s) on at least 3 days of the past week were recruited from the Boston metropolitan area. One hundred sixty older adults aged 58 to 94 years (M = 72.25, SD = 8.19) volunteered to participate at Time 1 (80.4% women). Most participants were Caucasian (90.1%), one-third were married (33.3%), participants were well educated (45.8% reported earning an Associate's Degree or higher), and the median annual income range was $20,001-$50,000. Eighty-three percent of participants were retained for the second wave of data collection 9 – 12 months later (Time 2 N = 133). There were no significant differences on any baseline variables between participants who were retained at Time 2 and those who were not.

Measures

Information regarding demographic control variables (age, gender, marital status, education, income, ethnicity, time since OA diagnosis, perceived OA symptoms, pain, and functional limitations) and more detail regarding the participants and procedure can be found in Luger, Cotter, and Sherman (2009).

Exercise Intention was measured with 7 items adapted from a scale developed by Lachman (1999) that measured how sure participants were that they would engage in the following physical activities in the next week: 1) light housework (e.g., dusting, washing dishes), 2) heavy housework (e.g., scrubbing floors, washing windows), 3) home repairs (e.g., painting, electrical work), 4) lawn work (e.g., gardening, snow removal), 5) walk outside for fun or exercise, 6) light sport or recreation (e.g., bowling, fishing), 7) strenuous sport or recreation (e.g., dancing, bicycling, swimming). Participants respond on a 5-point scale ranging from 0 (I do not usually do this activity), to 4 (Very sure I will do this activity), and scores are summed such that higher responses indicate stronger intention to exercise. Possible scores range from 0 to 28. Scores for the present sample reflect the possible range (Time 1 M = 16.88, SD = 6.06; Time 2 M = 16.10, SD = 6.09) with acceptable reliability (Cronbach's α Time 1 = .74; Time 2 α = .71).

Control Beliefs were measured with the Mastery and Perceived Constraints Scales (Lachman & Weaver, 1998). Mastery was measured with four items such as "I can do just about anything I really set my mind to." Perceived constraints were measured with eight items, such as "I have little control over the things that happen to me." Respondents indicate their level of agreement with items on a 7-point scale (1 = strongly agree, 7 = strongly disagree). Scores are summed with higher scores reflecting greater mastery or perceived constraints. Possible scores range from 4 to 28 for mastery and 8 to 56 for constraints. Scores for this sample reflect the possible range for mastery (Time 1: M = 21.38, SD = 4.32; Time 2: M = 21.46, SD = 3.98) and for constraints

(Time 1: M = 25.86, SD = 9.78; Time 2: M = 25.75, SD = 10.40). Lachman and Weaver report high internal consistency for both scales. Internal consistency was also high for the current sample (mastery: Time 1 α = .84, Time 2 α = .80; constraints: Time 1 α = .86, Time 2 α = .89).

Procedure

The survey was administered on the Windows research software MediaLab (Empirisoft), which presented individual questionnaires in random order (except demographics, which were always last). A researcher was available throughout the study to answer questions. Identical procedures were followed at both points of data collection.

Results

All variables were normally distributed and correlations were calculated between all variables (available upon request from the first author). Demographic variables were entered at Step 1 of all regression analyses to control for their relationships with mastery and perceived constraints. Time 1 mastery or Time 1 perceived constraints was also entered on Step 1 in order to examine longitudinal change in control beliefs.

As predicted, bivariate correlations revealed that higher Time 1 exercise intention was significantly associated with higher Time 1 mastery beliefs (r = .34, p < .001) and lower Time 1 constraints beliefs (r = -.25, p = .002). However, the regression model examining Time 2 mastery as the dependent variable (Total R^2 = .27, Adj. R^2 = .19, F(12, 170) = 3.36, p < .001) revealed that Time 1 exercise intention did not significantly explain changes in mastery over time after controlling for demographic characteristics and Time 1 mastery (see Table 1). Changes in mastery were entirely predicted by baseline mastery (β = .38, p < .001).

In the model predicting Time 2 perceived constraints (Total R^2 = .61, Adj. R^2 = .57, F(12, 107) = 14.01, p < .001, see Table 1) demographic characteristics and Time 1 constraints

accounted for 57.3% of the variance in Time 2 perceived constraints (52.9% adjusted), $F(11, 108) = 13.15$, $p < .001$. At this first step, lower education ($\beta = -.21$, $p = .002$) and higher baseline constraints ($\beta = .63$, $p < .001$) were predictive of higher perceived constraints over time. The addition of Time 1 exercise intention resulted in a significant change in R^2, $F(1, 107) = 10.61$, $p = .002$, and accounted for an additional 4% of the variance in Time 2 perceived constraints ($f^2 = .04$). Results suggest that perceived constraints are fairly stable over time, but that higher baseline exercise intention predicts fewer perceived constraints one year later ($\beta = -.22$, $p = .002$).

Discussion

The present results suggest that higher exercise intention may protect against age-related declines in control beliefs for older adults with OA. Results revealed that higher exercise intention was associated with fewer constraints on perceived control longitudinally, even after accounting for pain and demographic variables. Since the level of perceived constraints has been shown to be significantly higher for older adults compared to younger and middle-aged adults (Lachman, Rosnick, & Röcke, 2009), and because higher constraints beliefs are associated with poorer health and well-being (Lachman & Weaver, 1998), the present findings may represent a critical point of intervention during the aging process that could be protective for health.

The present results suggest that older adults with OA may look to salient domains of functioning to inform their overarching sense of control. The domain of physical activity may be particularly salient to older adults with OA, as OA can be a disabling condition for which exercise is a frequently-recommended treatment (Stitzlein Davies, 2011). A sense of confidence in ability to perform exercise and physical activities implies that specific setbacks can be overcome or do not matter, and may influence perceptions of abilities to conquer more global

barriers. Moreover, exercise participation may mediate the relationship between exercise intention and reduced constraints beliefs: those with higher exercise intention are more likely to engage in physical activity (Armitage & Conner, 2001), which reduces pain and enhances mobility (Hughes et al., 2004). Consequently, individuals who regularly exercise may perceive fewer constraints on control. Future research in this area should expand the model presented currently to include exercise participation as a possible mediator, thus deepening our understanding of how best to improve the lives of elders.

Contrary to our predictions, exercise intention did not significantly predict changes in mastery over time in the present study, reinforcing the dual-concept model of control beliefs in which mastery and perceived constraints are related yet separate aspects of control beliefs (Lachman & Weaver, 1998). Our results suggest that perceived constraints (as opposed to mastery) are the aspect of control susceptible to change. These results are consistent with previous work showing that mastery remains stable over time (Lachman & Firth, 2004).

Enhancing exercise intention and decreasing perceived constraints on control could provide two distinct benefits for older adults with OA. First, reducing perceived constraints may influence the types of behaviors that older adults with OA are selecting and allow them to remove barriers that may keep them from performing valued activities of daily living, such as caring for grandchildren or visiting with friends. Thus, reducing perceived constraints may allow older adults with OA to better enjoy their lives and maintain their independence over time. Second, enhancing exercise intention should bolster exercise behavior (Armitage & Conner, 2001), which should help to relieve OA symptoms in turn (Hughes et al., 2004).

There are some limitations to the present study. First, despite efforts to recruit a diverse sample of participants, the present sample was relatively homogeneous and healthy, reporting

high education and little pain, thus limiting generalizability beyond similar populations. Second, the effect sizes reported here are relatively small, suggesting that the clinical significance of the relationships should be further explored in future studies (Cohen, 1992). Finally, future studies should investigate the relationship of general control beliefs to behavioral intentions in multiple domains and with multiple samples. This may illuminate which domains of functioning best inform the sense of control for people facing different age-related challenges than OA. However, our results do suggest that some older adults facing the challenge of chronic illness are advantaged by exercise intention, an advantage that potentially has long-term impact on their well-being.

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Table 1

Summary of Longitudinal HMR Analyses Predicting Control Beliefs

	DV: T2 Mastery N = 119, R^2 = .27 (Adj. = 19), F (12, 107) = 3.36**						DV: T2 Constraints N = 119, R^2 = .61 (Adj. = .54), F (12, 107) = 12.75**					
	Step 1			Step 2			Step 1			Step 2		
	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β
T1 Mastery	.40	.08	.41**	.36	.09	.38**	-	-	-	-	-	-
T1 Constraints	-	-	-	-	-	-	.70	.08	.63**	.63	.08	.57**
T1 Age	-.01	.04	-.03	.00	.04	-.03	.10	.09	.08	.11	.09	.08
T1 Gender	-1.32	.87	-.14	-1.35	.87	-.14	1.20	1.81	.05	1.56	1.74	.06
T1 Ethnicity	-1.80	1.15	-.13	-1.83	1.15	-.13	-.94	2.39	-.03	-.82	2.29	-.02
T1 Marital Status	-.64	.75	-.08	-.69	.75	-.09	-.42	1.57	-.02	-.09	1.51	.00
T1 Education	-.82	.66	.11	.78	.66	.10	-4.29	1.37	-.21**	-4.24	1.31	-.20**
T1 Income	.01	.70	.00	-.02	.70	.00	-.53	1.48	-.03	-.65	1.42	-.03
T1 Pain	.04	.04	.12	.04	.04	.10	.08	.08	.09	.13	.08	.14
T1 OA Symptoms	.01	.08	.01	.02	.08	.04	-.04	.16	-.03	-.13	.15	-.08
T1 Functional Limitation	-.05	.04	-.15	-.05	.04	-.13	.04	.09	.05	.02	.08	.02
T1 OA Duration	1.03	.73	.13	1.04	.73	.13	.64	1.49	.03	.90	1.43	.04
T1 Exercise Intention	-	-	-	.04	.04	.09	-	-	-	-.26	.08	-.22*
Change Statistics	ΔR^2 = .27, F (11, 108) = 3.58**			ΔR^2 = .01, F (1, 107) = .94			ΔR^2 = .57, F (11, 108) = 13.15**			ΔR^2 = .04, F (1, 107) = 4.12**		

Note: * $p < .05$, ** $p < .01$. Gender was dichotomized such that 0 = male and 1 = female, marital status was dichotomized such that 0 = single, divorced, or widowed and 1 = married, ethnicity was dichotomized such that 0 = White and 1 = non-White, education was dichotomized such that 0 = some college or less and 1 = Associate's Degree or higher, annual household income was dichotomized such that 0 = less than $20,000 and 1 = $20,001 or more, and OA duration was dichotomized such that 0 = less than 2 years and 1 = 2 years or more.