Strength Training in Older Adults: Does Desire Determine Confidence?

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This study investigated conceptually relevant determinants of change in self-efficacy beliefs related to muscular strength in a prospective study design. Results suggested that older adults’ desire for muscular strength is an important determinant of changes in self-efficacy for strength. Studies involving older adults in strength training and physical rehabilitation should explore the development of behavioral interventions that target increases in such motives to be used in conjunction with these programs.

Strength training is an effective intervention for combating sarcopenia (Seguin & Nelson, 2004) and functional decline (Tucker & Allen, 2002), which are common among older adults. However, it has been evident for some time that the decision to either engage in physical activity (McAuley, 1992) or to perform functional tasks (Rejeski, Craven, Ettinger, McFarlane, & Shumaker, 1996) is dependent, in part, on self-efficacy beliefs. These latter research findings are consistent with the influential role that self-efficacy theory has had on understanding a broad range of human activities (Bandura, 1986).

Self-efficacy beliefs evolve from mastery experiences, social modeling, social or verbal persuasion, and interpretations of the physiological sequelae of behavior (Bandura, 1986). On the basis of these principles, McAuley and colleagues (McAuley, Courneya, Rudolph, & Lox, 1994) found that a self-efficacy intervention for older adults coupled with standard physical activity produced better adherence than physical activity alone. Research on telephone-based counseling has also found that outcome expectations related to fitness are predictive of adherence to physical activity (Brassington, Atienza, Perczek, DiLorenzo, & King, 2002), reinforcing the well-known fact that incentives are important determinants of behavior (Bandura, 1986). In this article, we hypothesize that desire for task competence contributes to the formation of self-efficacy beliefs. That is to say, desire is a determinant of efficacy that deserves attention along with the classic four sources originally discussed by Bandura.

The position that desire is a source of self-efficacy can be argued from two different perspectives. First, people engage in volitional behavior because it is self-relevant; it has subjective meaning and importance to the individual. Loewenstein (Hoch & Loewenstein, 1991; Loewenstein, 1996) has emphasized that fluctuations in desire are key to understanding self-regulatory failure. From a social cognitive perspective, one can argue that baseline levels of desire and changes in these motives across time will influence (a) the selection of mastery experiences, (b) effort and persistence, and (c) the resultant change in task-relevant capacities. In this manner, desire influences the quality of one’s mastery experience and, thus, judgments related to task efficacy. Second, Kirsch (1995) has shown that both real and hypothetical incentives affect efficacy ratings for approaching tasks that involve psychological or physical discomfort. People are more willing to tolerate the burden associated with behavior when the outcome is highly desired. As Cervone and his colleagues (Cervone, Mor, Orom, Shadel, & Scott, 2004) have argued, in addition to Bandura’s (1986) approach to understanding sources of efficacy, another mode of inquiry is to examine internal cognitive structures that contribute to self-appraisal.

Therefore, in this study we examine theoretically relevant determinants of change in self-efficacy among older adults who participated in strength training for 6 weeks. Potential determinants included baseline self-efficacy, baseline desire, change in desire, and baseline and change in lower extremity strength.

METHODS

Participants

We recruited older men and women (N = 42) from the local community by means of newspaper ads. Exclusion criteria included psychiatric illness, systematic heart disease, active cancers, severe problems with vision or hearing, low cognitive function, alcoholism, the inability to walk unassisted, or involvement in either a formal weight training or aerobic exercise program.

Study Design

Participants completed baseline assessments, and we then randomized them to one of two weight training treatments: traditional strength training or traditional strength training coupled with a group-mediated behavioral intervention (Rejeski et al., 2003) designed to enhance attitudes and beliefs related to strength training. The strength training protocol for the two
groups was identical. Each group participated in center-based strength training two times each week and engaged in home-based weight training once a week for 6 weeks. Posttreatment assessments followed the 6-week training period. Assessments included lower leg strength, self-efficacy, and desire for strength. Our study goal was to examine potential determinants of change in self-efficacy beliefs independent of treatment assignment. Thus, we included treatment as a covariate. Because of the importance of mobility disability in public health, all measures in this brief report focus on lower extremity function.

Measures

Self-efficacy for lower leg extension strength.—Participants were asked about their confidence to successfully lift different amounts of weight in a lower leg exercise. Participants sat on a bench with five different weights in front of them on a table. The weight increments were 5, 7.5, 12.5, 20, and 25 lb (1.9, 2.8, 4.7, 7.5, and 9.3 kg) for men and 2.5, 7.5, 10, 15, and 20 lb (0.9, 2.8, 3.8, 5.6, and 7.5 kg) for women. Participants performed one repetition with the dominant leg on the lightest weight and then completed questions related to that weight. Participants were asked to lift the weight 2, 4, 6, 8, and 10 times. After the five questions were answered in response to the lightest weight, the participants lifted the next highest weight once, and so on. We calculated the leg extension self-efficacy score by averaging responses across the five different weights and five different repetitions; thus, there were a total of 25 separate ratings. The alpha reliability coefficient for the measure was \( \alpha = 0.95 \).

Desire for physical strength.—Following the efficacy measure, participants reported their level of desire for the ability to lift each weight six times. Answers to the questions ranged from 0 to 4, with 0 = no desire whatsoever, 1 = low desire, 2 = moderate desire, 3 = strong desire, and 4 = very strong desire. We averaged the responses across the five weights to create a total score. The alpha reliability coefficient for this measure was \( \alpha = 0.88 \).

Leg extension strength.—After participants completed the efficacy and desire questionnaires, they participated in a test of muscular endurance that involved sitting on a bench and completing a lower leg extension by using a single weight lifted as many times as possible. The weight differed between participants and represented a weight that they had lifted once and were moderately confident that they could lift 10 times. We then computed a strength score by multiplying the weight in pounds by the number of repetitions completed. This type of strength assessment is commonly used to evaluate muscular endurance, and we chose it because we did not want to risk injuring participants with lifts that involved a one-repetition maximum (Franks & Howley, 1989).

Procedures

Participants reported to the laboratory. We first had them complete an informed consent and the Physical Activity Readiness Questionnaire. If there were no medical conditions of concern to us, then participants completed baseline assessments and we randomized them to treatment.

The 6-week training regimen consisted of two center-based training sessions and one home-based training session each week. Participants were provided with dumbbells and Therabands as well as exercise guidelines to facilitate home-based training. During center-based training, participants performed exercises by using both free weights and Nautilus brand machines. Training involved two sets of the following 12 exercises: chest press, seated row, bent-over row, overhead press, lateral side raise, bicep curl, triceps extension, leg extension, leg curl, leg press, and calf raises.

Statistical Analyses

To examine potential determinants of change in self-efficacy beliefs related to lower extremity strength, we used a general linear model procedure. After creating difference scores for the self-efficacy measure by subtracting baseline values from 6-week follow-up assessments, we performed an analysis of covariance, controlling for treatment assignment, baseline self-efficacy scores, and gender. Subsequently, we considered the baseline desire for lower extremity strength scores, change in desire scores that were due to the strength training regimen, baseline strength in the lower extremity, and change in strength as potential determinants of change in self-efficacy. Note that because baseline self-efficacy scores were part of the model, change in self-efficacy represents a residualized change score.

Results

There were 4 participants, 2 in each group, who had to drop out of the strength training program. The causes consisted of personal illness or unexpected caregiving burdens.

Demographics and Checks on Intervention Efficacy

Participants’ mean (± SD) age was 70.5 (± 5.3) years; their body mass index was 26.66 (± 5.40), and 68.4% were women. There were 2 participants who were African American; the others were Caucasian. The most common chronic health conditions were arthritis (47.4%) and hypertension (42.1%). All patients were sedentary, participating in less than 1 bout of walking each week, and none were involved in a formal strength training program. At baseline, self-efficacy scores for strength were 79.10 (± 21.47), improving \((p < .05)\) to 87.48 (± 17.03) at the time of follow-up testing. The same pattern was true \((p < .05)\) for desire for strength, 3.18 (± 0.90) to 3.48 (± 0.86), and lower leg strength, 720.78 (± 360.57) to 1019.37 (± 463.16).

Regression Analysis

The regression analysis for change in self-efficacy was statistically significant, \(F(8, 37) = 15.23, p < .001\), with an adjusted \(R^2 = .765\). Table 1 provides the standardized beta coefficients for each potential determinant along with the respective \(p\) and partial \(R^2\) values for each variable. An examination of Table 1 reveals that each of the proposed determinants had a significant independent relationship with
change in self-efficacy for lower extremity strength. Clearly, the most important determinant was a low baseline self-efficacy score. Beyond this most obvious finding, individuals who experienced the greatest change in self-efficacy were those who (a) desired to be stronger at the onset of the program, (b) experienced greater change in desire with training, (c) had greater leg strength at baseline, and (d) experienced greater strength changes with training.

**DISCUSSION**

To our knowledge, this is the first study to demonstrate that older adults’ desire for strength-related competence is prospectively related to change in self-efficacy. McAuley and colleagues (McAuley, Jerome, Marquez, Elavsky, & Blissmer, 2003), employing structural equation modeling, found that exercise frequency, social support, and exercise-related affect predicted between 44% and 47% of the variance in barriers self-efficacy and 32% of the variance in self-efficacy related to exercise maintenance. However, these investigators did not examine sources of change in self-efficacy related to a performance-based outcome such as strength efficacy.

Whereas it is beyond the scope of this brief report to explain why desire for task competence was prospectively related to change in task efficacy, future research should explore two possibilities. Specifically, baseline levels of desire or change in desire may influence the effort or persistence exhibited in mastery experiences. Clearly, the quality of one’s mastery experience is a primary source of self-efficacy (Bandura, 1986). Additionally, as an internal cognitive structure (Cervone et al., 2004), desire may directly influence efficacy beliefs; for example, people may be more likely to believe that they can surmount the challenges of coping with the demands of a task and will possess higher levels of task-related competence when the task has high versus low incentive value (Kirsch, 1995).

There are two additional issues that deserve comment. These include the fact that the focus of the current study was on task-related efficacy and that participants with lower initial leg strength made the greatest improvement on this outcome. First, as we have already suggested, desire may have its influence on task efficacy through its effects on coping efficacy. Therefore, future study designs should adopt a more comprehensive social cognitive approach to the study of both physical activity behavior and physical disablement. Second, the fact that participants with lower levels of leg strength made the largest gains in self-efficacy with training was expected, as older adults with low initial physiological capacities have been consistently found to experience the greatest improvements in function with training (Shephard, 1997).

In conclusion, this study found that desire for task competence and positive change in this motive with training were prospectively related to change in task efficacy among older adults involved in a short-term strength training program. The data suggest that more attention should be given to the study of desire within a social cognitive framework. Additional research is needed to examine whether desire for physical competence can be enhanced through cognitive-behavioral interventions and whether such changes are related to adherence and to improvements in various mental health outcomes.

| Table 1. Results of Regression Analysis on Change in Self-Efficacy |
|-----------------|-----------|----------|---------|
| Variable        | Standardized β | Partial R² (%) | p       |
| Baseline self-efficacy | -0.81     | 53.0      | <.0001  |
| Baseline strength    | 0.318     | 4.5       | .014    |
| Change in strength   | 0.286     | 7.2       | .003    |
| Baseline desire      | 0.372     | 8.0       | .002    |
| Change in desire     | 0.447     | 13.9      | <.0001  |

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**REFERENCES**


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