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Self-efficacy: Implications for Physical Activity, Function, and Functional Limitations in Older Adults

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Abstract

Attenuating the physical decline and increases in disability associated with the aging process is an important public health priority. Evidence suggests that regular physical activity participation improves functional performance, such as walking, standing balance, flexibility, and getting up out of a chair, and also plays an important role in the disablement process by providing a protective effect against functional limitations. Whether these effects are direct or indirect has yet to be reliably established. In this review, the authors take the perspective that such relationships are indirect and operate through self-efficacy expectations. They first provide an introduction to social cognitive theory followed by an overview of self-efficacy's reciprocal relationship with physical activity. They then consider the literature that documents the effects of physical activity on functional performance and functional limitations in older adults and the extent to which self-efficacy might mediate these relationships. Furthermore, they also present evidence that suggests that self-efficacy plays a pivotal role in a model in which the protective effects conferred by physical activity on functional limitations operate through functional performance. The article concludes with a brief section making recommendations for the development of strategies within physical activity and rehabilitative programs for maximizing the major sources of efficacy information.

Keywords

physical activity; aging; self-efficacy; function; limitations; social cognitive theory

In all such associations, there has been evidence to suggest that self-efficacy is one of a number of potential mediators of the effects of physical activity on these psychological outcomes.

Biomedical advances and the practice of preventive health behaviors have resulted in an unprecedented growth in the older population of the United States, a trend projected to continue over the next several decades.¹ However, the addition of years to life is no guarantee that those years will be quality years, and there is considerable evidence to suggest that increasing the life span is also associated with decrements in function and increases in disability. It is well established that declines in physical function are an inevitable part of the aging process and are markers of disability risk.² In 2008, 64% of adults over 65 years of age reported limitations in at least 1 domain of physical function—walking, climbing, standing, sitting, stooping, reaching, grasping, carrying, and/or pushing.³ Although there was a decline in disability and functional limitation rates among older adults

during the 1990s,⁴ a recent report suggests that that trend has reversed.⁵ Indeed, using data from the American Community Survey and the National Nursing Home Survey, Fuller-Thompson et al⁵ reported a 9% relative increase in basic activities of daily living (ADL) limitations from 2000 to 2005. More than one third of adults aged 65 or older report limitations with basic ADLs, such as bathing and dressing.³ Such limitations are important risk factors for subsequent disability, institutionalization, the erosion of independent living, and compromised quality of life in older adults.⁶ The need to develop practical and scalable approaches for the prevention or attenuation of declines in function can therefore be considered a key public health priority.⁷

Physical activity interventions and the incorporation of physical activity into a healthy lifestyle represent at least 1 behavioral modality for possibly attenuating the effects of the aging process on functional limitations and disability and the attendant declines in quality of life. However, it is important to frame such associations within a theoretical framework.⁸ Doing so allows us to better understand why these associations might exist (ie, which factors might underlie any effects of physical activity on physical function and functional limitations), and in turn, practitioners can use such information to guide and implement programs designed for older adults. One such theoretical approach is social cognitive theory (SCT).^{9,10} Although consisting of a number of constructs associated with behavior change (ie, self-efficacy, outcome expectations, goals, facilitators, and impediments), self-efficacy, as the central active agent in SCT, has been consistently associated with physical activity, function, and well-being. Self-efficacy is conceptualized as one's beliefs in one's capabilities to successfully execute courses of action.⁹ In this review, we examine the literature that has focused on self-efficacy's relationship with physical activity, functional performance, and functional limitations in older adults. A social cognitive perspective of these relationships is depicted in Figure 1.^{11,12} We believe it prudent, however, to first provide a brief introduction to SCT and, in particular, the role played by self-efficacy in behavior change. Given that we are taking the position that physical activity effects on physical function and functional limitations are mediated in part by self-efficacy, we next provide a brief overview of the self-efficacy and physical activity relationship. This is followed by a review of the literature examining physical activity effects on physical function and functional limitations and the extent to which this relationship might be explained by the mediation of self-efficacy. We conclude with recommendations for future practitioners.

Social Cognitive Theory: A Brief Introduction

SCT^{9,10,13} provides the theoretical foundation that has served as the impetus for a considerable body of literature documenting the correlates and determinants of health behavior change. The core set of determinants underlying SCT (ie, self-efficacy, outcome expectations, goals, and facilitators/impediments) and the manner in which they are theorized to influence behavior have been clearly articulated by Bandura.¹³ The “active agent” in SCT is self-efficacy. Self-efficacy expectations are beliefs regarding the individuals' capabilities to successfully carry out a course of action¹⁴ and in lay terms may be considered as a situation-specific form of self-confidence. The situation-specific nature of self-efficacy is nontrivial because it is a characteristic that distinguishes efficacy cognitions from more stable, dispositional qualities of self-confidence and subjects them to external and internal influences making them ideal targets for manipulation¹⁵ and interventions.¹⁶ The primary sources of efficacy information include past performance accomplishments, or mastery experiences, social persuasion, social modeling, and the interpretation of physiological and emotional states.¹⁰ Efficacy expectations are theorized to influence the activities that individuals choose to pursue, the degree of effort they expend in pursuit of their goals, and the levels of persistence they demonstrate in the face of setbacks, failures, and difficulties. It is difficult to argue that choice, effort, and persistence are unrelated to the

successful adoption and maintenance of an exercise regimen, especially as one ages. Thus, self-efficacy would appear to be a very natural correlate of this complex health behavior, and indeed, it has been perhaps one of the most consistently reported correlates of exercise behavior and its outcomes.¹⁷

As noted earlier, self-efficacy has been demonstrated to influence a wide array of health behaviors.^{10,17} However, it is equally important to consider that behavioral outcomes associated with physical activity take the form of elements other than actual physical activity behavior itself. For example, there is a considerable literature detailing the effects of physical activity on psychological well-being in the form of anxiety,¹⁸ depression,¹⁹ affect,²⁰ and quality of life.¹¹ In all such associations, there has been evidence to suggest that self-efficacy is one of a number of potential mediators of the effects of physical activity on these psychological outcomes. In addition, there is a growing literature to suggest that physical activity plays an important role in the attenuation of functional limitations²¹ and the enhancement of functional performance in older adults.²² Again, there is evidence to suggest that self-efficacy may mediate this relationship. For example, self-efficacy mediated the influence of an exercise intervention on stair climbing in older adults with osteoarthritis of the knee.²³ Li et al²⁴ also showed a positive association between self-efficacy and physical function with improvements in older adults' self-efficacy for movement, as a function of tai chi practice, being associated with an attendant improvement in physical function. Finally, Seeman and her colleagues^{25,26} have reported self-efficacy expectations to be related to disability and functional declines and that self-efficacy influenced disability independent of physical abilities.

It is important, however, to demonstrate that the relationship between self-efficacy and physical activity is consistent before making inferences regarding self-efficacy's potential as a mediator of physical activity's effects on other health outcomes. The theoretical tenets of SCT are such that self-efficacy is hypothesized to be reciprocally related to physical activity behavior. That is, older adults with a higher sense of exercise self-efficacy are more likely to engage in physical activity, and in turn, successful exercise experiences are effective in building a more potent sense of efficacy. To this end, we now briefly review this literature. First, we consider the extent to which self-efficacy might act as a potential correlate or determinant of physical activity in older adults. We then consider the reciprocal relationship in which physical activity acts as a source of efficacy information—a vital relationship in exploring the potential mediating role of efficacy on physical function and functional limitations.

Self-Efficacy as a Determinant of Physical Activity

Self-efficacy has been demonstrated to be particularly influential in the adoption of physical activity^{17,27} because there appears to be greater opportunity to mediate behavior through cognitive control than when behavior has become more habitual.^{9,28} Moreover, the role played by self-efficacy in physical activity behavior appears to be quite consistent across ages and populations.²⁹ For example, McNeill et al³⁰ examined the influences of individual, social environmental, and physical environmental variables on physical activity in African American and Caucasian adults. They found that the social and physical environments had an indirect effect on physical activity through motivation and self-efficacy. What is interesting is that this association was stronger for activities of greater intensity—a finding that is in accord with SCT principles, which posit that self-efficacy had greater predictive ability under more challenging circumstances, assuming that the requisite skills and sufficient motivation are present. Castro et al³¹ have examined the correlates of physical activity in sedentary, ethnic minority women reporting that higher levels of self-efficacy were associated with participation in more physical activity. In a more recent study of

underprivileged women, Cleland et al³² found that women who were successful at achieving physical activity recommendations reported higher levels of self-efficacy for walking and vigorous physical activity. Indeed, those with high self-efficacy for walking, stronger intentions to be active, and a plan for activity were twice as likely to meet the physical activity recommendations compared with those women with low walking self-efficacy, low intentions, and no set physical activity routine.

However, self-efficacy is also implicated in the long-term maintenance of physical activity. For example, Oman and King³³ reported that higher levels of self-efficacy at baseline of a home-based physical activity trial among middle-aged and older adults were predictive of physical activity behavior at 2-year follow-up. Conversely, it has also been reported that decreases in physical activity self-efficacy in older adults were correlated with becoming inactive.^{34,35} Additionally, Schwarzer et al³⁴ have noted that self-efficacy was a determinant of exercise adherence at months 4, 8, and 12 in a sample of cardiac rehabilitation patients.

McAuley and colleagues^{28,36} have provided compelling evidence for the importance of self-efficacy as a predictor of long-term physical activity maintenance. They have reported data from 2-²⁸ and 5-year follow-ups³⁶ of a 6-month physical activity intervention for older adults (N = 174; mean age = 66.7 years at baseline). Those participants with stronger self-efficacy expectations at the end of the intervention were significantly more active at the 2-year follow-up, even when previous physical activity behavior was statistically controlled. At the 5-year follow-up, once again controlling for previous physical activity, self-efficacy continued to be a significant determinant of activity. Thus, it appears that self-efficacy plays an important role in the process of being physically active over the long term. It is also critical to note that self-efficacy remained a significant predictor of physical activity after controlling for previous behavior. This is consistent with McAuley's³⁷ and Bandura's^{10,38} position that under challenging circumstances (eg, long-term maintenance of behavior), higher-level cognitive control systems, such as self-efficacy, exert a significant influence on the execution of behavioral repertoires.

However, it is a central tenet of SCT that the nature of the relationship between self-efficacy and behavior is reciprocally determined. That is, efficacy expectations provide an important basis for the prediction of subsequent behavioral action but are also influenced by behavioral successes and failures.¹⁰ This latter aspect of the relationship is of vital importance when considering potential pathways from physical activity to functional limitations in older adults. Participation in physical activity can influence self-efficacy by acting as one of the principal sources of efficacy information, that is, by providing mastery or performance accomplishment experiences. Early evidence for this was provided in a study reporting the effects of both acute and chronic physical activity participation on several measures of self-efficacy for physical performance.³⁹ Middle-aged men and women completed measures of self-efficacy prior to and following a graded exercise test administered at baseline and at the end of a 5-month exercise trial. Both men and women demonstrated significant increases in self-efficacy following acute exercise. Interestingly, women, who had demonstrated significantly lower self-perceptions than men at baseline, made dramatic increases in efficacy during the exercise program, equaling or surpassing those of men. In another randomized controlled exercise trial examining the prediction of exercise behavior in older adults, McAuley et al²⁸ found that participants who exercised more frequently during the 6-month program had higher levels of social support and a more positive exercise experience, which led to enhanced self-efficacy. Additionally, mastery experiences associated with participation in tai chi exercise significantly increased self-efficacy to overcome barriers to tai chi.⁴⁰ Physical activity counseling related to self-efficacy has also been shown to increase physical activity participation, which in turn increased self efficacy for physical activity over the course of a 6-month intervention.⁴¹

In an effort to further understand the role of physical activity behavior in efficacy formation and effects on other aspects of well-being, a number of researchers have conducted experiments in which self-efficacy has been manipulated to be a function of physical activity performance information.^{15,42,43} In these experiments, participants have typically been randomly assigned to a high-or low-efficacy condition and efficacy expectations. They then engage in a single bout of exercise, typically an exercise stress test, and efficacy is manipulated by means of bogus feedback and graphs depicting contrived normative data.¹⁵ These manipulations have, in turn, successfully influenced affective responses, with participants in the high-efficacy group reporting more positive and less negative affect than did the low-efficacy group. Such findings suggest that self-efficacy is informed by the provision of physical activity mastery experiences and provides the necessary evidence to further examine how self-efficacy may mediate physical activity association with physical function and functional limitations in older adults.

Physical Activity, Aging, Function, and Functional Limitations

There is emerging evidence regarding the role played by physical inactivity in functional limitations and disability in older adults. Physical inactivity or sedentary behavior appear to exacerbate the impairments in physiological and structural systems that occur with the aging process⁴⁴ and, in turn, result in the accumulation of functional limitations and disability over time. It has been suggested that interventions designed to promote or maintain physical activity behavior among older adults might represent an effective strategy for attenuating functional decline and reducing the risk of disability in older adults.⁴⁵ For example, being physically active is associated with improved physical functioning activities such as walking, climbing stairs, getting up out of a chair, and so on. However, it is important to make a distinction between physical function and functional limitations.²² Physical functioning encompasses physical abilities, dexterity, and the capabilities to perform ADLs. Functional limitations typically manifest as self-reported frequency in restrictions, or difficulty in walking, lifting, or carrying, and rates of limitation in function and appear to be exacerbated by sedentary behavior.² Sedentary lifestyles compound the physiological impairments associated with the aging process.⁴⁵

Keysor and colleagues^{21,46} have conducted 2 major reviews of the association between physical activity and functional limitations and disability. In the earlier review, the most consistent observation was that more than half of the studies reported improvements in strength, aerobic capacity, flexibility, standing balance, and walking after exercise training in older adults. The effects of exercise on disability were less clear, with most studies reporting no improvement and a handful of studies reporting reduced physical disability as a function of physical activity. As noted by Keysor and Jette,⁴⁶ few of the studies reviewed actually targeted disability as a primary outcome of physical activity. Keysor²¹ used a best-evidence framework and included meta-analyses and systematic reviews of randomized controlled trials (RCTs) as well as individual RCTs and longitudinal observational studies to examine the protective effect of physical activity participation on the prevention and attenuation of functional limitations and disability in older adults. Again, this review clearly supported the position that exercise was associated with improvements in strength, aerobic capacity, and function, particularly walking. Additionally, although there was once more conflicting evidence regarding physical activity and disability outcomes, there was consistent evidence that physical activity plays an important role in the disablement process and has a protective effect against functional limitations.²¹ Those older adults who reported being more physically active had fewer functional limitations.

Conversely, recent evidence from the Veterans LIFE study⁴⁷ reported a physical activity intervention to have only a marginal influence on self-reported functional limitations and

disability. However, the nature of the intervention should be considered in the interpretation of this finding. The intervention was a multi-modal physical activity counseling program incorporating in-person baseline physical activity counseling to help tailor goals and determine limitations. Additionally, it included systematic telephone calls from a health counselor, automated telephone calls from the participant's primary care physician (PCP), and program endorsement when visiting the PCP. Although this intervention was able to increase minutes of moderate/vigorous physical activity and physical function (ie, gait speed), it is unclear from the reporting whether those individuals with greater improvements in physical activity and functional performance also reported fewer limitations and less disability. Such analyses would have been illustrative of the extent to which actual behavior change was associated with changes in compromised functioning.

Although being less physically active has been shown to be associated with more severe functional limitations in a large sample of community dwelling older women,⁴⁸ evidence suggests that a relatively small amount of activity (eg, walking 1 mile in a week) results in a significant slowing of the functional limitation trajectory over a 6-year period.⁴⁹ Earlier work from the Women's Health and Aging Studies indicated that the relative risk of disability was 5 times greater in older women with the poorest strength and balance compared with those with the best strength and balance.⁵⁰ Thus, the importance of incorporating strength and balance activities in physical activity programs for older adults is underscored. Indeed, findings from a recent systematic review and meta-analysis⁵¹ suggest that exercise programs that include balance activities and have a higher dose of activity are more effective in the prevention of falls in older adults. Such findings echo the importance of physical activity recommendations for older adults, which underscore the importance of activity regimens that include elements of flexibility, strength, and balance⁵² for maintaining independent living. Moreover, recent data from the Lifestyle Interventions for Elders Pilot (LIFE-P) testify to the efficacy of combining walking, strength training, balance, and behavioral skills training to enhance physical activity adherence and physical function in sedentary older adults at risk for disability.⁵³ Compared with a successful aging control group, participants in the physical activity condition demonstrated greater gains in physical activity and strength and improved their physical function performance, as assessed by timed measures of standing balance, gait speed, and rising from a chair.

Although Keysor²¹ has concluded that physical activity does indeed have a protective effect on functional limitations as we age, what is unclear is the extent to which this may be a direct effect—that is, completely attributable to physical activity—or an indirect effect—that is, a relationship that is explainable by other mediating variables. Understanding such relationships would be instrumental in the design of more effective interventions by targeting not simply exercise behavior but also the potential mediator variables in order to maximize beneficial effects on function and disability in older adults. Keysor²¹ and others^{12,23} have suggested that self-efficacy may be one such mediator.

Physical Activity, Functional Performance, and Functional Limitations: A Social Cognitive Perspective

Considerable evidence exists to suggest that efficacy expectations are associated with physical function performance.¹⁷ For example, Rejeski et al²³ reported that self-efficacy mediated the influence of an exercise intervention on stair climbing in older adults with osteoarthritis of the knee. In a prospective epidemiological trial examining the progression of disability in older adults with knee pain, self-efficacy was associated with declines in stair-climbing performance and self-reported disability at 30-month follow-up.⁵⁴ It is important to note that further analyses revealed that baseline levels of self-efficacy were important for predicting functional performance and disability when knee strength was low.

Such findings align well with the social cognitive perspective that self-efficacy demonstrates greatest predictive power under more challenging circumstances.^{9,10}

Seeman and her colleagues²⁶ provide longitudinal data from the McArthur Successful Aging studies, which suggest an important association between self-efficacy and changes in functional abilities and disability status. In both men and women, having a stronger sense of efficacy for performing instrumental activities at baseline conferred a protective effect on level of disability 2.5 years later. What is important is that the impact of self-efficacy on perceptions of functional decline was independent of actual physical abilities. This suggests that our views of what we may be limited in doing are shaped more by our perceptions of what we can do rather than by our actual abilities to carry out these actions. This is a perspective that is perfectly in accordance with SCT principles.¹⁰

Kempen et al⁵⁵ conducted a 2-year prospective study of disability change in a community sample (N = 575) of low-functioning older adults from the Netherlands. Their findings suggest that initial status of self-efficacy may be instrumental in the progression of disability in older adults. That is, individuals classified as having high efficacy at baseline reported significantly less disability progression over the 2-year period than did low- and medium-efficacy participants. Unfortunately, Kempen et al⁵⁵ did not report any data relative to physical activity status, and it is therefore not possible to determine the extent of the relationship between physical activity, self-efficacy, and disability. Fortunately, a number of studies exist that allow us to further examine the role played by physical activity in this relationship.

For example, physical activity and self-efficacy may be particularly important for the physical functioning of older individuals who are prone to fall-related injuries. Using a sample of older low-bone mass women (mean age = 79.3 years), Liu-Ambrose et al⁵⁶ reported that both self-efficacy and physical activity were significantly correlated with balance and mobility in a bivariate sense. However, only self-efficacy was an independent predictor of these important health outcomes in hierarchical regression models. Although cross-sectional in design, findings from this study are suggestive of the social cognitive position that physical activity effects on functional performance may be mediated by perceptions of personal efficacy.

One potential way to understand the relationship between physical activity and functional limitations may be through the pathways of self-efficacy and physical function performance. That is, more active individuals are likely to be more efficacious, which should lead to better physical functional performance. Being able to function better in one's environment would then be associated with fewer functional restrictions or limitations. This pattern of relationships is also consistent with the arguments made by Stewart²² regarding the role played by physical function performance in the disablement process. It is important to note that they also support a social cognitive perspective that perceptions of personal efficacy are important mediators of the physical activity and functional limitations relationship.

Although not much effort has been made to empirically examine the potential mediators of the physical activity and functional limitations relationship, a number of research groups^{12,24,36} have adopted a social cognitive perspective for examining self-efficacy and physical function performance as possible mediators in the association between physical activity and functional limitations among older adults. Li et al²⁴ tested a relatively simple social cognitive model in the context of a tai chi intervention for older adults (mean age = 72.8 years). Their conceptual model hypothesized that participation in tai chi would result in improvements in self-efficacy, which, in turn, would lead to improved physical function. Using a multisample latent growth curve approach they were able to compare the

hypothesized effects between the treatment condition (tai chi) and a control condition (waitlist). They report several findings of interest. First, rate of change (ie, treatment effects) for self-efficacy and function were influenced by initial status. That is, those with lower self-efficacy and lower physical function at baseline benefitted more from tai chi practice. More important, practicing tai chi led to the hypothesized increases in self-efficacy and subsequent improvement in physical function. It is important, however, to critically evaluate these findings in the context of how physical *function* was measured. Li et al used a health status measure that actually assessed *functional limitations*, a related but conceptually distinct construct from functional performance.^{2,22} In essence, the Li et al findings support self-efficacy as a mediator of physical activity effects on functional limitations. Moreover, they are in concert with data from other studies, which have suggested that physical activity interventions have a differential impact on older adults, with differing levels of self-efficacy.^{57,58}

Further support for such associations comes from the recently completed lifestyle intervention and independence pilot study (LIFE-P),⁵⁹ a multicenter pilot RCT examining the effects of a physical activity intervention (vs a successful aging condition) designed to prevent mobility disability in functionally compromised at-risk older adults. Recent evidence from this trial⁶⁰ provides further evidence for the physical activity–self-efficacy–function link. Results indicated that participants in the physical activity arm had significantly greater increases in self-efficacy for completion of a 400 m walk than did those participants in the successful aging condition. It is interesting to note that those individuals in the control condition with lower functional performance scores at baseline showed significantly greater reductions in self-efficacy across the intervention and follow-up. Finally, changes in self-efficacy were associated with changes in physical function across 12 months.

Such findings have been replicated and theoretically expanded by McAuley and his colleagues.¹² In a 24-month prospective observational study of older community-dwelling black and white women, McAuley et al demonstrated at baseline that physical activity was correlated with self-efficacy for exercise, efficacy for gait and balance, and physical function performance, and both measures of self-efficacy as well as physical functional performance were associated with functional limitations. Further analyses using structural equation modeling tested the social cognitive position that physical activity effects on functional limitations would be mediated by self-efficacy. Moreover, they tested Stewart's²² perspective that physical function performance should be considered as a separate step in the disability process and precede functional limitations. This is counter to many studies that have viewed functional performance and functional limitations as synonymous.^{2,22} McAuley and his colleagues found substantial support for their hypotheses, with self-efficacy serving as a mediating variable in the physical activity, physical function, and functional limitations relationship. Additionally, when self-efficacy was included in the model, the initially substantial relationship between functional performance and functional limitations was reduced by half. These relationships were independent of the influence of demographic and health status variables.

At the 24-month follow-up on the same sample, they used a panel model design to examine whether changes in the model constructs were related in the same manner across time.³⁶ As hypothesized, changes in physical activity over time were associated with residual changes in both exercise and balance self-efficacy. Changes in exercise and balance self-efficacy were, in turn, associated with residual change in physical function performance. Most important, changes in self-efficacy for both exercise and balance and physical function performance were associated with residual change in functional limitations. Thus, declines in physical activity led to reductions in self-efficacy over time. Consequently, this led to poorer physical function and an increase in functional limitations. Such findings offer

support for the social cognitive position that self-efficacy and physical function performance play a mediating role in the physical activity and functional limitations relationship. They also support Stewart's²² position that functional performance and functional limitations are not isomorphic constructs and that physical function performance should be considered a distinct step in the disablement process.⁶¹

Although there is a considerable literature examining the relationships among self-efficacy, physical activity, physical function, and functional limitations, there have been few efforts that consider all the components of the SCT framework in these relationships. Apart from self-efficacy, other SCT constructs include outcome expectations, goal setting and self-monitoring, and impediments and facilitators of behavior. Outcome expectations reflect beliefs that a given behavior will produce a specific outcome and have also been associated with physical activity,^{62,63} however, with less consistency than self-efficacy has been. Williams et al⁶³ concluded in their review that self-efficacy and outcome expectations are correlated constructs, and associations between positive outcome expectations and physical activity are stronger among older adults than among young to middleaged adults. A more limited focus has been applied to goal setting and self-monitoring, although the Guide-to-Health Trial⁶⁴ evaluated self-regulation, reporting that self-regulation mediated the effects of self-efficacy on physical activity and nutrition-related behaviors.^{65,66} Regarding facilitators and impediments to health behavior, Im et al⁶⁷ discuss how barriers are unique to the individual and therefore may be disparate in nature. Such barriers may include lack of time, feeling tired, feeling that one is active at their job, lack of motivation, or health problems. These barriers may be exacerbated if mobility issues are further hindered by the environment.⁶⁸ Clearly, there is an important void to be filled in the context of applying not just self-efficacy but other social cognitive constructs in our attempts to understand the physical activity and functional limitations relationship in older adults.

Self-Efficacy and Functional Limitations: What Can the Practitioner Do?

As previously noted, the United States is witnessing and an unprecedented growth in its older population; this increase in longevity is likely to be accompanied by further reductions in levels of physical activity and attendant declines in function and independent living. Incorporating physical activity into a healthy lifestyle and meeting public health guidelines for physical activity⁶⁹ is one approach that can help prevent age-related functional limitations and disability and enhance participation in ADLs. We have taken the position in this review that the salutary effects of physical activity on physical function performance and functional limitations are mediated by self-efficacy, a modifiable construct consistently associated with health behavior change.¹⁰ Thus, there are several avenues open to practitioners for enhancing self-efficacy by thoughtful physical activity programming. Bandura¹⁰ has identified 4 primary sources of self-efficacy information: mastery experiences, social modeling, social persuasion, and the interpretation of physiological and emotional responses. Each of these sources can easily and very effectively be targeted within physical activity and rehabilitation programs to maximize efficacy enhancement. For example, mastery experiences reflect previous successes that bolster one's confidence in his or her ability to succeed again. This is the most potent form of efficacy information. When beginning an exercise program, successes may well be outweighed by failures because of trying to do too much, too soon, resulting in disappointment and potentially injury. The setting of daily, challenging, but reachable goals for physical activity participation can be an effective method of ensuring regular successful experiences. Such successes lead to participants creating more challenging objectives for themselves, which in turn, are likely to boost efficacy still further. Exercise leaders, physical therapists, and rehabilitation specialists can further contribute to this source of efficacy information by creating an activity environment that challenges the older participant in such a way that with effort and

persistence, success is reachable. The end product of increased efficacy is improved physical functioning and reduced perceptions of which functional activities are limiting.

Social modeling involves watching similar others (ie, of the same gender, race, age, fitness level, etc) successfully complete a task. We often use this form of information to take stock of our own beliefs in our abilities when we have little or no experience in a particular behavior. Naturally, for older adults who have been sedentary for a considerable period of time, engaging in physical activity on a regular basis is replete with potential unknowns. Thus, the identification of other older adults of similar characteristics effectively and successfully carrying out physical activity regimens can provide a boost in self-efficacy simply by the comparative perspective that “If she can do it, so can I!” Social persuasion is by far the most commonly implemented strategy for enhancing self-efficacy and includes the motivation and support provided during or following successful completion of an exercise session. Although the exercise leader or therapist may be the most obvious individual to provide such information, it is also prudent to organize “buddy groups” within the activity program. These small groups of 2 to 4 individuals should be given the responsibility of assisting, monitoring, and encouraging each other throughout the exercise experience. We have found in our own trials that this strategy is particularly useful in assisting with attendance problems, moving on to more difficult series of activities, and generally keeping motivation levels high. Finally, the appropriate interpretation of physiological responses involves making the participant cognizant that changes in somatic states are often indicative of improving physical capabilities. That is, individuals engaging in physical activity programs after a considerable period of being sedentary are likely to experience the typical aches and pains associated with the taxing of the physiological system. Understanding that this is normal and reflective of the body adapting and becoming fitter and stronger helps the participant reinterpret these responses in a more positive sense, thereby enhancing self-efficacy.

In addition to these strategies, other approaches within the social cognitive framework have been found to be influential, including self-regulation, which has been shown to mediate the relationship between self-efficacy and physical activity.⁶⁵ Incorporating self-regulation techniques, including goal setting, self-monitoring, cues to action, and self-rewarding, into a physical activity intervention may improve the ability of older adults to be successful. Keys to successful goal setting include specificity and realism when embarking on a physical activity regimen. Useful self-monitoring techniques may include keeping a log or calendar of physical activity. Additionally, scheduling physical activity on a calendar in a visible location can later act as a cue to action. Finally, incorporating rewards into physical activity interventions can help build self-efficacy and encourage proper progression.

Although a comprehensive SCT model has rarely been applied in the context of the physical activity and functional limitations relationship, it is clear that self-efficacy, as a central SCT construct, plays an important role in the process of being physically active and is also an outcome of physical activity. This latter relationship is of particular importance in understanding the role played by physical activity in attenuating functional limitations. With thoughtful planning, creativity, and the realization that the same progressions, modifications, and exercises are not suitable for all older adults, practitioners can effectively construct physical activity programs that are challenging, enjoyable, and efficacy enhancing. Enhancements in self-efficacy are likely to be effective in facilitating daily activities involving ambulating, reaching, lifting, and generally taking control over one's physical environment. Successful physical performance is then theorized to reduce functional limitations. Preventing the exacerbation of functional limitations for our increasingly older populations has important implications for reducing subsequent disability, prevention of institutionalization, and enhancing quality of life as they age.

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Figure 1. Self-efficacy as a Mediator of the Association Between Physical Activity, Functional Performance, and Functional Limitations in Older Adults.