

Self-efficacy and its application in the treatment of knee osteoarthritis: a critical review

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Abstract

Symptomatic knee osteoarthritis, a prevalent progressively disabling disease affecting one or both knee joints requires extensive self-management. Self-efficacy, a psychological attribute generally denoting one's perceived belief about their ability to successfully perform a particular behavior, including health behaviors, is a significant predictor of psychological well-being, adherence to prescribed treatments, and pain coping mechanisms in persons with various forms of chronic disease, including arthritis. This paper examines the available peer-reviewed research published over the last 35 years detailing: i) the concept of self-efficacy, ii) the relationship between self-efficacy and adjustment to arthritis, iii) the research concerning self-efficacy in the context of knee osteoarthritis disability, and iv) some promising approaches for promoting the wellbeing of adults with knee osteoarthritis through the application of self-efficacy theory and other approaches. Based on this data, directions for future research and practice are offered.

Introduction

The arthritic diseases constituting a broad array of painful musculoskeletal and/or systemic conditions that can affect one or more joints, as well as the blood vascular and neurological systems, are commonly associated with symptoms of unrelenting pain, fatigue, anxiety, depression, as well as progressive functional, occupational and social limitations. As a result, these disorders are extremely debilitating and in the absence of a cure for any form of arthritis, adults with one or more of these conditions are often advised to carry out one or more self-management strategies in order to minimize their disability and maximize their independence and life quality.¹

However, are individuals with disabling arthritis always able to confidently meet their

day-to-day demands, plus the manifold task demands imposed on them by having to actively participate in their own management processes? Moreover, do they suffer from diminished self-confidence in one or more areas and are those with more confidence likely to have better health outcomes than those with less confidence, regardless of disease status, as shown in the literature for a variety of chronic diseases? Indeed, if the strength of one's personal confidence or self-efficacy beliefs, which are amenable to enhancement, are consistently impaired and can predict how much effort people will expend on tasks, and how persistent they will be in the face of challenges, obstacles, and aversive experiences,^{2,4} will more emphasis on assessing and fostering self-efficacy result in better health outcomes for individuals with arthritis in general, and for individuals with knee osteoarthritis, in particular? Given that self-efficacy is a well-studied psychological factor in the context of intervening upon a variety of chronic health-related challenges, including arthritis, but that most clinical studies on arthritis and self-efficacy focus on inflammatory or mixed forms of arthritis, where the types of pain or pathology among other factors might differ considerably, this paper set out to explore the literature detailing the association between the construct of self-efficacy and the symptoms of osteoarthritis in general, and knee joint osteoarthritis, in particular. This particular focus was taken firstly, because osteoarthritis is the most prevalent form of arthritis, and painful disabling knee osteoarthritis, the most common form of this condition, affects many older adults, where it is anticipated the role of self-efficacy perceptions in the context of maximizing coping efforts will potentially be magnified in light of the dual challenges posed by the disease, as well as the aging process. Second, in the specific case of knee osteoarthritis, where unrelenting pain, limited aerobic capacity, muscle weakness, joint instability, joint stiffness and swelling, along with a variety of comorbid health conditions, obesity, gait and sleep disturbances, plus work-related limitations and poor cognitive functioning may all co-exist,⁵ the ability to self-manage the disease, especially through exercise, as is commonly advocated,⁶ may prove extremely problematic. Third, since self-efficacy is amenable to quantification and can be boosted accordingly, it seemed reasonable to anticipate that an in-depth exploration of this construct could be especially valuable in the context of improving our understanding of the psychological features of knee osteoarthritis on health outcomes and in refining current clinical efforts to maximize the outcomes for this common chronically disabling and commonly incurable irreversible health condition, especially for those that may not be eligible or receive a total

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knee joint replacement to relieve their pain.

However, even though a reasonably large body of related research makes it apparent that painful disabling knee osteoarthritis is likely to reduce the individual's sense of personal efficacy, as a whole,⁵⁻⁷ as well as their ability to meet specific challenges, quite markedly,⁷ the application of this knowledge for promoting a clear understanding of all factors that influence the well-being of knee osteoarthritis sufferer's remains relatively limited in this author's view. Indeed, knee osteoarthritis, which has specific causative and risk factors appears to be conceptually underestimated as an important public health issue as it is often accepted that this age associated disorder is inevitable. Moreover, while there is emerging research on this topic, there are variations in how often mental health issues, which can often accompany this disease, are measured clinically, and in the related research data bases, little emphasis has been placed on the importance of understanding the overlapping impact of mental and physical health in this condition. Furthermore, there seems to be no distinctive or unified body of research that can help clinicians better understand the strengths and weaknesses of the pertinent research and how to apply this research to intervene optimally in the context of chronically painful knee osteoarthritis, which according to World Health Organization data reported by Petrella *et al.*⁸ is poised to become among the top four causes of disability in women and to be among the top eight causes in men. To bridge this gap, this descriptive paper briefly reviews: i) the concept of self-efficacy, both general and

domain-specific, plus the research linkage between self-efficacy and arthritis-related symptomatology; ii) studies examining self-efficacy in the context of knee osteoarthritis, including the nature of the studies, the methods used to assess self-efficacy, possible shortcoming of the studies, and what these findings denote; and iii) some possible self-efficacy enhancing strategies that might be used in efforts to maximize outcomes in the clinical management of knee osteoarthritis. The paper concludes with some directives for practice as well as future research.

Materials and Methods

To obtain the desired data, research embedded in an array of peer-reviewed publications located in the Cinahl, Ovid Medline, Proquest, PsycINFO, PubMed and Social Science Citation databases over the years 1980-June 4, 2011 were examined. That is, relevant peer-reviewed scientific papers published in the English language that fell under the key search terms: *arthritis*, *knee*, *intervention*, *knee osteoarthritis*, *osteoarthritis*, *rehabilitation*, and *self-efficacy* were identified and retrieved. The goal was to use these studies and their findings to highlight the importance of routinely examining self-efficacy in the clinical or surgical setting using appropriate tools and in devising appropriately tailored interventions to advance the scope of effective rehabilitation strategies for adults with knee osteoarthritis in line with current recommendations by Bierma-Zeinstra and Verhagen.⁹ To supplement this published information, some of this researcher's own findings as related to self-efficacy perceptions in the context of knee osteoarthritis are included. To limit the boundaries of this exploration, articles were only included if they adequately represented one of the three overarching themes of this paper and were rejected if they did not fall into one of these themes. All articles were read several times and the desired data were extracted and systematically tabulated to examine trends, and variations in the literature. All forms of self-efficacy were included, such as self-efficacy for pain control, and self-efficacy for managing other arthritis symptoms. No specific focused or meta-analysis could be conducted however, due to the highly varied data base, and variety of terms used in the literature to describe pain and other self-efficacy attributes such as pain self-efficacy, self-efficacy for pain beliefs, self-efficacy expectations and self-efficacy for pain control. Moreover, some studies focused on non-surgical patients, others on surgical patients, and the instruments used to measure self-efficacy were generally inconsistent across studies. As a consequence of the

lack of depth in any one area of this topic in the prevailing literature, all related papers and levels of research as categorized by Oxford Best Practices Criteria (I-V) were deemed acceptable, although an attempt was made to only examine prospective studies to determine which methods are potentially useful for boosting self-efficacy in this population.

Results

The Ovid Medline (1948-2011) data base lists 13,282 articles that can be identified by the key word self-efficacy. It lists 290 articles that focus on self-efficacy and arthritis; 137 on self-efficacy and osteoarthritis; and 37 in self-efficacy and knee osteoarthritis. The key search results for PubMed (1980-2011, English language) revealed 599 papers on the general topic of arthritis and self-efficacy, 235 on osteoarthritis and self-efficacy, with the majority of 200 papers being published since 2000, 15,012 papers on the topic of knee osteoarthritis, of which 137 included the term self-efficacy and where 117 of these were published since 2000, with 21 using the term self-efficacy in the context of intervention outcomes. Cinahl, 1985-June 4, 2011 had 8189 articles using self-efficacy as a key word; 209 for self-efficacy and arthritis; 105 for osteoarthritis and self-efficacy; 60 for self-efficacy and knee osteoarthritis. PsycINFO had 14 articles on self-efficacy and knee osteoarthritis, but no unique information. After downloading and examining pertinent data that met the review criteria, from the 24,540 PubMed items and 8189 Cinahl articles that contained the term self-efficacy, these data were categorized into four predominant themes as follows.

Self-efficacy theory: background and concept

In the 1970's Albert Bandura,² a well-known researcher and psychologist, began to examine the concept of self-efficacy, which refers to one's personal belief in his or her ability to successfully organize and implement a specific task, under different contextual situations. Based on this research, Bandura observed self-efficacy perceptions, which can be strengthened, potentially explained the discrepancy between people having knowledge about a skill and the actual performance of this skill. Over the years, Bandura's research has shown important links between multiple behaviors and self-efficacy perceptions and that the strength of one's self-efficacy beliefs can influence their motivation levels, thought patterns,

moods, emotional reactions and attitudes. Moreover, self-efficacy perceptions can mediate the capacity and willingness to elicit behaviors that influence health and promote wellbeing, despite disconfirming experiences. This research further supports the view that self-efficacy judgments can determine the extent to which a person will be disabled as well as whether they will perform the adaptations needed to deal with one or more chronic illnesses and their treatments.

In addition, this work points to how much effort will be expended on a task - and for how long - in the face of obstacles and aversive experiences.^{2,3} Accordingly, since 1977, it has been increasingly evident that self-efficacy beliefs are powerful predictors and/or mediators of a variety of health-related behaviors and practices. Indeed, because self-efficacy beliefs can predict the amount of effort and perseverance expended in reaching a goal, plus the development and selection of goals and goal-directed behaviors, they have become of immense importance in the context of influencing health outcomes among people with chronic illnesses. In addition, to measure overall confidence and beliefs, it has been possible to develop instruments to estimate the nature of the individuals' self-perceptions to manage their challenges across different health situations with a fair degree of accuracy. This set of behavior specific beliefs, is generally distinct from the perceived general self-efficacy or global confidence an individual may exhibit, in the context of life in general, and may be a neglected area of relevance to arthritis care and research efforts. However, this paper will report on the available literature on this topic, which focuses almost exclusively on domain-specific self-efficacy attributes.

Self-efficacy and arthritis: general observations

Although psychological assessments and treatments are less common than physical approaches used to treat arthritic conditions, as detailed in the results of the present article search, the prevailing literature houses a fairly large volume of studies published over the last two decades that show a significant relationship exists between pain and disability as experienced by adults with inflammatory arthritis or a combination of one or more arthritic conditions, and the construct of self-efficacy. In this context, arthritis self-efficacy, a term commonly used to describe the magnitude of the ability to self-manage the disease as denoted by three self-efficacy domain subscales related to pain, function and other disease symptoms has specifically been shown to predict the rheumatoid arthritis patients'

health status and adherence to health recommendations,^{10,11} plus the prevailing degree of depression,¹² fatigue,¹³ daily pain ratings, coping efficacy,¹⁴ coping capacity,¹⁵ analgesic usage,¹⁶ pain behaviors and health outcomes.¹⁷⁻¹⁹ Another related body of research shows physical activity participation, often crucial for promoting wellbeing among arthritis patients can be influenced significantly by the prevailing level of self-efficacy for the desired activity.²⁰ Importantly, self-efficacy is also found to influence resilience,²¹ the extent of psychological distress and emotional wellbeing, functional ability, and fatigue states.^{22,23} Moreover, correlational analyses have shown significant associations between changes in self-efficacy (particularly total self-efficacy) and changes in selected measures of depression, pain, health status, and disease activity of cases with rheumatoid arthritis,²⁴ as well as

medication adherence, which may have a profound bearing on arthritic disease status,^{25,26} and its immense health costs.²⁶

Self-efficacy and osteoarthritis: findings from studies on knee osteoarthritis

Overview of research issues and findings

As with the studies discussed above for arthritis in general, the related self-efficacy literature can be categorized in terms of its relationship to pain, disability, and cognitive attributes, and its role in both conservative as well as surgical treatment approaches in the context of osteoarthritis in general, and to a lesser degree in the context of knee osteoarthritis, the most common form of the

disease. However, although considerable progress has been made since 2000 to conduct more specific research on osteoarthritis and self-efficacy, specific knowledge remains limited as data are frequently presented as an admixture of summary data from cases of inflammatory arthritis, and/or osteoporosis cases. As well, several studies focusing on osteoarthritis and self-efficacy have examined various forms of this condition simultaneously, so the individual associations relevant specifically to knee osteoarthritis are hard to discern. Indeed, although knee osteoarthritis is the most prevalent form of this condition, only slightly more than fifty percent of the available reports in the self-efficacy and osteoarthritis literature focus solely on samples of knee osteoarthritis and aspects of self-efficacy in relation to this condition.

Unfortunately, in addition to the compara-

Table 1. Selected studies demonstrating significant relationships between self-efficacy levels, several behavioral factors, and disease outcomes among samples of adults with knee osteoarthritis using different approaches.

Domain	Authors	Level research evidence (I-V)*	Sample size	SE measure**	Finding
Function	Baker <i>et al.</i> ²⁷	I	46	Ewart's scale for: lifting, stairs, jogging, walking, pushups	Gait SE correlated with knee strength
	Focht <i>et al.</i> ²⁸	II	316	Walking SE (0-100) Stairclimb SE (0-100)	SE mediated function
	Maly <i>et al.</i> ²⁹	IV	54	ASE function subscale	Task SE explained a high degree of functional ability and was related to stiffness, strength, and depression
	Rejeski <i>et al.</i> ³⁰	IV	79	Task-specific SE	SE predicted stair climbing, lifting/carrying ability; influenced ability/difficulty perceptions, movement rate. SE and performance relationships were similar to physiological measures
	Sharma <i>et al.</i> ³¹	II	285	ASE function scale	SE is protective against poor outcomes
Pain	Creamer <i>et al.</i> ³²	IV	69	ASE pain scale	Inverse correlations exist between disability and pain SE
Pain + Function	Bennet <i>et al.</i> ³³	IV	39	ASE subscales	Those with lower function SE may respond better to glucosamine than those with high SE
	Harrison ³⁴	IV	50	ASE subscales	Functional SE + balance account for 74% variance in function. Pain SE correlates with pain, functional difficulty and SE
	Keefe <i>et al.</i> ³⁵	IV	130	20-item ASES	Adaptive pain coping correlates with SE
	Khan <i>et al.</i> ³⁶	IV	134	SE managing recovery 5-item modified ASES	Emotional support increases SE for recovery, problem support weakens SE belief
	McKnight <i>et al.</i> ³⁷	II	254	ASE combined scales	Catastrophizing predicted SE; SE mediated between catastrophizing/physical function
	Morone <i>et al.</i> ³⁸	IV	88	Chronic Pain SE Scale	Gait speed is related to SE -78.18±13.8 on (0-100) scale
	Pells <i>et al.</i> ³⁹	IV	174	ASE pain subscale	Pain SE accounted for 14% of variance in pain; Function SE accounted for 10% variance in disability; SE for eating control accounted for 28% variance in eating behaviors
	Wright <i>et al.</i> ⁴⁰	IV	275	20-item ASES	Higher SE is linked to lower pain and better function through resilience

ASE/S, arthritis self-efficacy Scale; SE, self-efficacy. *Levels of Research Evidence as adopted by American Academy of Orthopaedic Surgeons, September 2004: I=high quality randomized controlled trial/systematic review; II=prospective study/systematic reviews with inconsistent results; III=case control; retrospective study; review of level II studies; IV=case series; V=expert opinion. **Participants indicate their certainty to perform particular tasks (relating to pain management and 9 relating to function) on a 10 point scale, ranging from very uncertain (score of 1) to very certain (score of 10). For each subscale, the mean of the respective items was taken as the total score.

tively small number of specific reports on this topic in the available literature, in light of the prevalence of this condition, a cursory overview of the available research reveals a wide array, rather than any consistent research approach that focuses on understanding a specific self-efficacy domain that can be readily synthesized and analyzed for trends. Moreover, within the more common domains studied, many have been studied in the context of cross-sectional or observational studies, several differing types of self-efficacy have been examined, and no consistently applied terminology or uniform measurement approach can be observed among these published works (Table 1). However, as outlined in the available literature and in Table 1,²⁷⁻⁴⁰ as in studies conducted on cases with inflammatory arthritis, the relationship between the chief categories of pain, function, and other symp-

tom management self-efficacy and the extent of the pain and function experienced among adults with knee osteoarthritis,²⁶ seems to be a consistently significant one, regardless of the attribute measured, the research design, terminology used or the sample size and its characteristics. In another application, Keefe *et al.*³⁵ who studied 40 men and women with knee osteoarthritis, found participants with higher pain self-efficacy scores responded more favorably to artificial pain stimuli than those with lower pain self-efficacy scores, suggesting that efforts to enhance pain self-efficacy may improve a patient's subjective perception of their condition. Moreover, improving the ability to self-manage pain may improve the functional ability of adults with knee,²⁶ as well as the extent of activity participation.³⁵ Other related research shown in Table 1 confirms that a significant relationship between the

magnitude of the self-efficacy beliefs held by adults with knee osteoarthritis and their pain and mobility scores,³⁸ and can explain up to 21% of the variance in the performance ability of adults with painful disabling knee osteoarthritis, especially those challenged by muscular weakness of the lower extremities.³⁰⁻⁴¹

In addition, another domain of self-efficacy termed coping self-efficacy is found to mediate between excessive pain catastrophizing and its effect on physical functioning among individuals with early knee osteoarthritis,³⁷ suggesting an additional avenue for intervening early on in the disease process to allay dysfunction. As outlined in Figure 1, there may also be reciprocal influences between self-efficacy perceptions and life satisfaction,⁴² sleep rates, often disturbed in older adults with knee osteoarthritis,⁴³ and the ability to maintain a healthy weight and pursue healthy eating

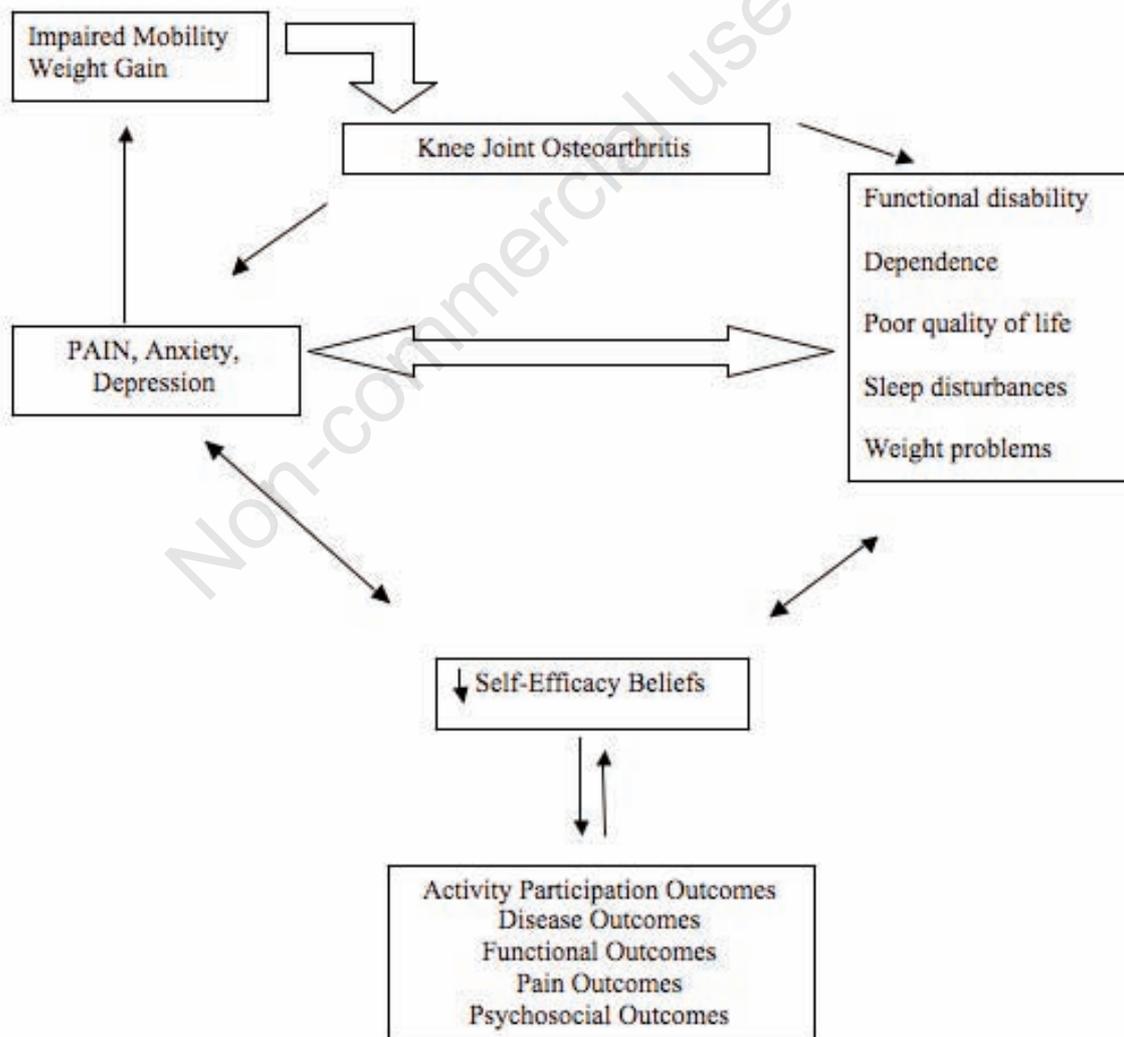


Figure 1. Hypothetical model of interrelationships between knee osteoarthritis and self-efficacy beliefs.

behaviours ($P<0.0001$), especially in the overweight or obese adult with knee osteoarthritis,³⁹ that could influence disease progression and outcomes. This is supported by a fairly substantive body of research reporting higher level, rather than lower level self-efficacy beliefs are positively correlated with better functional outcomes among adults with knee osteoarthritis as detailed in Table 1.⁴⁴⁻⁴⁹

Moreover, in addition to the global impact of the disease per se, several disease-associated factors are found to reduce the individual's self-efficacy for one or more important day to day behaviours, including declines in knee strength capacity and pain coping ability.

As a result, a compelling number of studies reveal that individual's with knee osteoarthritis and poor self-efficacy for one or more desirable self-management practices, may have less ability to adjust to their condition,⁴⁰ lower motivation for exercise, often seen as a potentially essential intervention component for people with knee osteoarthritis,⁵⁰ plus heightened pain and functional disability,^{28,32,40} and

depression levels, which can serve as a mediator of exercise and dietary efforts,⁵¹ than more confident cases.

Consequently, efforts to assess clinical correlates known to impact self-efficacy, as well as efforts to directly assess, monitor and strengthen a client's self-efficacy are likely to enhance the health outcomes of any particular individual with this condition.³⁰ However, since self-efficacy perceptions are commonly behaviour specific, and adults with this condition often need to undertake multiple tasks, it seems likely that successful efforts in this regard will be contingent on understanding where self-efficacy perceptions are especially suboptimal. As well, in light of the considerable clinical diversity that can prevail among cases diagnosed as having knee osteoarthritis, a very careful analysis of the individual's personal perceptions about their condition and their ability to manage this is desirable given some individuals may clearly be more confident than others and individuals themselves may be quite confident in one behavioural domain,

and not another. For example, an individual confident about undertaking walking and stair-climbing in efforts to enhance function,²⁸ may not have the confidence needed to resist eating in efforts to control their weight,^{39,52} the confidence for assistive device usage,⁵³ the confidence to self-manage pain and the confidence they can prevent excessive functional declines.^{34,54} Additionally, a careful initial discussion with the affected individual may provide a better understanding of the person's intra-individual beliefs including their outcome expectancies and/or motivation to comply with recommendations as well their views on barriers and appropriate and adequate incentives or resources needed to permit self-efficacy beliefs to translate into desired activities.^{30,34} Nonetheless, it seems apparent, that even if the strength of a patient's self-efficacy beliefs are not necessarily the same across samples or within the same samples when different behavioural attributes are considered, data in Table 2 indicate many individuals with a diagnosis of knee osteoarthritis are likely to

Table 2. Table depicting variations in the self-efficacy measurement approaches and their outcomes as identified by mean scores and their standard deviations recorded for different samples of adults with knee osteoarthritis in the context of correlational and comparative studies.

Authors	Knee osteoarthritis sample	Self-efficacy instrument	Mean scores
Allen <i>et al.</i> ⁵⁵	221 African Americans 270 Caucasians	8-item ASE (1-10 point scale)	5.5 African-Americans 6.0 Caucasians
Bennett <i>et al.</i> ³³	N=39; av. age=53.6±13.1	ASES pain ±function	Pain=5.84±1.84 Function=8.17±1.69
Focht <i>et al.</i> ²⁸	N=316; 4 groups	Stair climbing SE Walking SE (10-100)	Educ grp=70.24±28.75 Educ grp=67.88±31.95
King <i>et al.</i> ⁵⁶	N=14; av. age=48.35±6.51	3 ASE scales (0-10)	Pain=6.45±2.23 Function=8.37±0.86 Other=7.66±1.54
Keefe <i>et al.</i> ⁵⁷	N=130	3 ASE scales (10-100)	Pain=59.97±18.98 Function=75.07±20.00 Other=67.02±17.09
Lamb <i>et al.</i> ⁵⁸	N=121; av. age=68±8.5	Pain ± function SE	Pain =27±10.24 Function=35.1±12.34
Morone <i>et al.</i> ³⁸	N=88; av. age=71.5±5.4	Chronic pain SE scale (0-100)	CPSE=78.18±13.3
Murphy <i>et al.</i> ⁵⁹	N=54 E=26; av. age=74.8±7.3 C=28; av. age=75.8±7.1	ASES combined scores (1-10)	Pain ± other E=7.2±1.8 C=6.9±1.
Rawiworrakul <i>et al.</i> ⁶⁰	N=53 E=25; av. age=58.8 C=28; av. age=60.6	SE for exercise scale (0-10)	SEE E=5.0±2.15 C=5.77±1.91
Shen <i>et al.</i> ⁶¹	N=48, av. age 64.4±8.3; 88% F	Chronic pain SE Scale (0-100)	Pain=60.3±37.4 Function=67.3±40.1 Other=63.1±37.3
Shlenk <i>et al.</i> ⁶²	N=26; av. age=53.2±9.8; 99%F E=13 C=13	Exercise SE scale (0-100)	E=57.8±22.2 C=60.3±32.7
Wu <i>et al.</i> ⁶³	N=259 E-114 cases, av. age 67.27±10.05 C=91 cases, av. age 68.18±11.21	ASES - pain ± other (0-10)	Pain=33.02±11.27 E 32.55±12.20 C Other=42.19±14.30 E 44.74±12.30 C

Av, average; ASES, arthritis self-efficacy scale; C, control; Educ, educational; E, experimental; Grp, group; SE, self-efficacy.

be less than fully confident about performing one or more of those behavioural tasks likely to influence their disability.

Measurement considerations

While the importance of self-efficacy in self-management of knee osteoarthritis seems well-supported as outlined above, the utility of any measurement approach in this regard is likely to be dependent on, in part, the nature of the instrument used to assess self-efficacy, plus the method applied to summarize these results. For example, the use of a summary score to assess a patient's specific confidence profile may obscure precisely where an individual's confidence is limited and hence what is needed to specifically foster optimal outcomes, as suggested by results of McKnight *et al.*³⁷ That is, using cumulative scores to examine the magnitude of a client's behavioral-specific self-efficacy beliefs may fail to highlight just how challenged individuals' with this condition can become in certain spheres-despite their knowledge of the benefits that the tasks recommended will benefit them, as well as knowing how to carry out the task. Furthermore, since the three Arthritis Self-Efficacy Subscales most commonly used in the

research on arthritis are not perfectly correlated as shown by Keefe *et al.* and King *et al.* those applying these measurement strategies should perhaps remain cognizant of this potential limitation when using these data to design programs.^{10,27,35} In addition to the above, more work to better examine and capture the vastly different domains of behavior that can impact knee osteoarthritis and the extent of this impairment is especially indicated in order to examine if intervention programs will benefit from focusing on multiple rather than single self-efficacy enhancing strategies.³⁰

To support this statement, we recently re-examined data from a previously published study that showed distinct variations in perceived self-efficacy beliefs among community-dwelling cases with knee osteoarthritis older than 60 years of age with mild to moderate unilateral or bilateral knee joint osteoarthritis (Table 3), and where the individual and mean self-efficacy scores tend to vary relative to extent of disease, gender and nature of the arthritis self-efficacy scale domain.⁵¹⁻⁶⁴ Also noteworthy was that the item to total correlations examined separately for each domain, were found to vary from $r=0.664-0.797$, $P<0.01$ for pain self-efficacy domain scores and from $r=0.682-0.870$, $P<0.01$ for the other symptoms self-efficacy domain scores. Moreover, not all items on the 5-item pain self-efficacy subscale

were significantly correlated with a traditional measure of pain intensity known as the visual analogue scale, suggesting they might be capturing separate elements of the subjective pain experience. As well, among the 11 arthritis self efficacy survey item responses (5 for pain and 6 for other symptoms management), compared between a representative sample of those women deemed healthy and those with a past history of cardiovascular disease, a very common problem in this population, those with a comorbid health condition had less overall confidence in these domains (71.75 ± 5.50 vs 78.33 ± 6.07 , respectively). Other data revealed cases with knee osteoarthritis may be more vulnerable to poor outcomes if they have depressive symptoms as measured by the Center for Epidemiologic Studies Depression Scale, which were more strongly related to their total self-efficacy scores than their actual pain experiences ($r=-0.75$, $P=0.001$; $r=-0.28$, $P=0.069$, respectively), as well as to their item scores (items 1, 2 and 3 on pain self-efficacy subscale and items 3, 5, and 6 on the other symptoms self-efficacy scale) (Table 4).

In summary, and in the context of applying the knowledge about the role of the relationship of self-efficacy to our understanding of the pathogenesis of knee osteoarthritis, as well as its treatment, research shows this construct has a consistent relationship with a

Table 3. Descriptives of n=28 cases knee osteoarthritis 60 years and older, drawn randomly from a larger study sample of 100 cases and highlighting variations in magnitude of the mean and range of 5 item scores for pain self-efficacy and 6 items of other symptoms self-efficacy subscale of the arthritis self-efficacy instrument (range 10-100) and trends based on disease classification.

Variable	Mean±SD	Range	95% CI	P value
Age year	73.71±7.00	61-89	71.00-76.43	
Body mass index	28.4±3.70	21-35	26.9-29.8	
% Female	82			
% Unilateral cases	65			
Pain SE (10-100)	69.00±20.27	26-100	61.36-76.93	
Items: How certain are you-you can				
1. Decrease your pain quite a bit	62.86±30.90	10-100	50.88-74.84 *	
2. Continue most of your daily activities	68.57±27.18	10-100	58.03-79.11	
3. Keep pain from interfering with sleep	69.29±28.79	10-100	58.12-80.45	
4. Reduce your pain in small way without medication	74.82±26.44	10-100	64.57-85.07	
5. Reduce your pain in a large way without medication	73.39±26.39	10-100	63.16-83.63	
Disease classification				0.360
1. Unilateral	66.33±19.7	26-100	56.52-76.15	
2. Bilateral	73.80±21.34	40-100	59.39-89.01	
Other SE (10-100)		40-100	66.15-82.44	
Items: How certain are that you can:				
1. Control your fatigue	75.71±25.738	20-100	66.73-85.69	
2. Be active without aggravating your condition	70.00±31.032	10-100	57.97-82.03 *	
3. Help yourself feel better if blue	76.43±28.312	10-100	65.45-87.41	
4. Manage pain during daily activities	75.71±22.678	40-100	66.92-84.51	
5. Manage symptoms and do things you enjoy	72.14±28.068	10-100	61.26-83.03	
6. Deal with frustration of arthritis	71.07±29.356	10-100	59.69-82.45	
Disease classification				0.375
1. Unilateral	70.68±21.7	43-100	59.85-81.52	
2. Bilateral	78.50±22.32	40-100	67.33-94.27	

CI, confidence interval; SE, self efficacy; SD, standard deviation. *Items where low self-efficacy was most evident.

variety of knee osteoarthritis symptoms, and signs of depression, poor coping skills, harmful eating behaviors, and physical performance deficits.^{29,46} Engel *et al.*⁶⁴ too, found self-efficacy beliefs predicted the extent of gains in physical and mental health in adults recovering from total knee replacement surgery, a common intervention for adults with end-stage knee osteoarthritis. Low self-efficacy may also explain poor outcomes of knee osteoarthritis cases with comorbid health problems such as cardiovascular disease and depression.

However, even though studies such as those outlined in Table 1 provide a rationale for examining and intervening upon the attribute of self-efficacy among adults with knee osteoarthritis, self-efficacy scores obtained from different samples show self-efficacy levels may not be uniformly affected, even when the same instrument approach is utilized (Table 2). Moreover, even though average self-efficacy scores as outlined in Table 2 depict that knee osteoarthritis cases are commonly less than fully confident in general about their ability to control pain and other salient disease associated behaviors, as indicated by large standard deviation scores, some individuals may be extremely unconfident, while others may be completely confident. That is, in addition to revealing less than optimal confidence on similar domains, and different levels of confidence on different domains, different subgroups of individuals with this condition can display varying rather than uniform patterns of behavioral self-confidence that should be examined and considered in the selection and delivery of long-term health recommendations.

In light of the powerful connection consistently observed between knee osteoarthritis outcomes and self-efficacy levels, it appears more research and discussion directed towards adopting a universally validated and agreed upon standardized set of measurement approaches to define self-efficacy deficits is clearly imperative, as are studies of the role of self-efficacy beliefs among knee osteoarthritis cases with various degrees of disability and sites of pathology. In addition, at present it is not presently clear if cases in the samples studied to date all had a sole diagnosis of knee osteoarthritis, or if they suffered from osteoarthritis of other joints, other forms of arthritis, and/or comorbid conditions, all of possible importance in explaining the observed findings and their implications. In addition, since many studies did not disclose whether they used radiographic assessments of knee osteoarthritis, and other did not use functional tools to assess function, given that self-efficacy beliefs related to self-management practices for knee joint osteoarthritis are likely to be especially impacted among certain disease subgroups, and not others, and to occur in distinctive rather than in all behav-

ioral domains, more attention to the clinical and functional presentation of the individual would help to ascertain in what instances self-efficacy enhancing interventions are most indicated. Moreover, identifying why self-efficacy is diminished, and targeting those determinants of suboptimal self-efficacy perceptions, directly, and as early as possible, could be especially helpful for younger adults, and those with unilateral, rather than bilateral joint disease.⁵¹ To achieve better outcomes and heighten motivation for self-management practices, tailoring management directives in light of gender differences,⁴¹ as well as health status differences that influence self-efficacy, especially in group-related therapeutic situations, where not all group members will be equally unconfident, and some may be fully confident, is also recommended.

Self-efficacy enhancing interventions and knee osteoarthritis

Two approaches can enhance self-efficacy, a theory-based approach and a non-theory based approach. Among the theory-based approaches, several reports detailing the outcomes of the Arthritis Self-Management Program (ASMP), have consistently shown participants with arthritis can experience significant early and sustained pain and functional improvements post-intervention.^{65,66} These positive changes also include experiencing less depres-

sion, more exercise participation, a heightened ability to relax and self-manage behaviors.^{63,67} Moreover, the program reduces medical services usage and enhances the individual's perception of control, and health status.⁶⁸ Since these improvements have been replicated in many different studies and settings, they appear generalizable across different laboratories.⁶⁹⁻⁷³ The associated self-efficacy enhancing strategies used by the program developers of skills mastery, modeling, symptom reinterpretation, and persuasion,⁷⁴ have been well validated by Bandura.⁷⁵

Among the atheoretical approaches, a number of recent studies have shown simply participating in an intervention program is better than standard treatment for influencing self-efficacy outcomes for people with osteoarthritis (Table 5),^{27,28,52,56,58,76-84} although this finding is not universal as outlined by Hansson *et al.*,⁸⁵ Shen *et al.*,⁶¹ and Murphy *et al.*⁵⁹ However, as indicated by findings of Braden *et al.*⁷⁰ and Lorig and Gonzalez for people with different forms of arthritis,⁸⁶ specific self-efficacy enhancing strategies can be expected to have a greater impact on an individual's sense of confidence than those achieved vicariously, thereby potentially augmenting his or her health status to a greater degree than programs without any tailored and targeted self-efficacy enhancement strategies *per se*.

In accordance with the results of Braden *et al.*⁷⁰ Lorig and Holman,⁶⁶ and Lorig and Gonzalez,⁸⁶ 12 years after implementing the ASMP, this approach conducted by Kovar *et al.*⁸⁷ in a hospital setting significantly influenced function among patients with disabling knee

Table 4. Mean±standard deviation of overall scores plus item scores for the 5 arthritis self-efficacy subscales of pain and the 6 other symptoms self-efficacy items categorized by gender showing a possible trend whereby males perceive less pain self-efficacy in general, but greater confidence to manage other symptoms than females, despite similarities in age and body mass index.

	Females N=23	Males N=5	P value
Age year	74.1±1.4	72±4.1	0.556
Body mass index	27.9±.8	29.9±1.7	0.289
% Unilateral	69	40	0
Overall PSE scores (10-100)	69.83±21.40	65.20±15.27	0.652
PSE1	60.87±32.6	72.0±21.67	0.476
PSE2	67.4±28.80	74.0±19.49	0.631
PSE3	70.43±28.04	64.0±35.07	0.659
PSE4	76.74±27.03	66.00±24.08	0.421
PSE5	75.00±26.24	6.00±28.81	0.500
Overall OSE scores (10-100)	71.80±21.8	81.20±23.08	0.394
OSE1	74.35±26.94	82.00±20.49	0.557
OSE2	66.5±31.99	86.0±21.90	0.209
OSE3	75.22±29.37	82.0±24.9	0.636
OSE4	73.04±22.45	88.00±21.68	0.186
OSE5	70.43±28.2	80.0±21.16	0.500
OSE6	72.56±27.02	70.00±42.42	0.394

OSE, other self-efficacy; PSE, pain self-efficacy.

osteoarthritis, as well as pain. As part of this study of 47 adults with moderate to severe knee joint osteoarthritis, ages 40 to 89, the author's strove to enhance the participant's self-efficacy and task mastery by exposing them to all four primary experiential sources believed to underpin self-efficacy. They also adopted a step-by-step approach to the program that was organized into four temporal phases for purposes of promoting skill acquisition and maintenance.

Compared to the control condition, the walking self-efficacy intervention yielded clinically meaningful improvements in the participants' walking endurance. The program also yielded significant positive effects in the experimental participants' perception of their physical ability as indicated by the physical activity subscale of the Arthritis Impact Measurement Scale (AIMS). The AIMS scale scores for the participant's ability to manage their arthritis-related

symptoms other than pain, were also significantly improved for the intervention subjects. In addition, women with arthritis who received the intervention experienced substantial improvements in their ability to manage other arthritis-related symptoms as assessed by Lorig *et al.*'s Arthritis Self-efficacy Scale.¹⁰

As underscored by Rejeski *et al.*,³⁰ the aforementioned approach seems to be a good one because self-efficacy beliefs are likely to have a profound effect on the ability to maintain a viable level of function among older adults with knee pain, especially those challenged by muscular weakness of the lower extremities and chronic disabling osteoarthritis of the knee. To this end, varying additional strategies have been documented in the literature for heightening self-efficacy perceptions including the use of written materials, mutual aid and peer support, telephone interviews and a motivational videotape.

A comprehensive rather than a uni-dimensional approach does seem indicated for improving osteoarthritis self-efficacy attributes as observed by Hansson *et al.*⁸⁵ who found patient education alone had no effect on the self-efficacy of patients treated in a primary care setting. In particular, exercise, in addition to group education rather than simply including brainstorming and feedback may be helpful,^{76,85} as may a program aimed at promoting independent self-management that incorporates concepts of self-efficacy enhancement theory more definitely.⁶³

Thus, Piyakhachornrot *et al.*,⁷⁹ who developed an integrated health education program including exercise based on self-efficacy theory that aimed to enhance self-efficacy expectations among patients with knee osteoarthritis showed positive results in a recent quasi experimental study. In terms of mastery experiences, patients were trained to precisely

Table 5. Selected methods found to impact self-efficacy and knee osteoarthritis symptoms in prospective studies.

Authors	Experimental design	Key self-efficacy related results
Baker <i>et al.</i> ²⁷	46 cases aged 55 or older were randomly assigned to home-based resistance training or control interventions (nutrition education)	SE measured on 5 scales including lifting, stairclimbing, walking, jogging, and pushups improved 34.1% in the experimental group and 2.0% in the control group
Focht <i>et al.</i> ²⁸	The arthritis, diet, and activity promotion program was applied for 18 months to 316 overweight or obese older adults with symptomatic knee OA	Mobility-related SE increased significantly
Hopman-Rock and Westhoff ⁷⁶	Exercise and education was applied to cases with either hip or knee OA for 6 weeks	Moderate increases in SE were noted and lasted up to 6 months
Hughes <i>et al.</i> ⁷⁷	Multi-component physical activity program followed by a home-based program and followed for 6 months assessed in part by the efficacy for exercise subscale of 3 items, and a score on the 10-point scale was divided by 3	Relative to control subjects, there was an increase in exercise efficacy at 2 months, and at 6 months, this was significantly higher compared to control group where this value declined
Kim <i>et al.</i> ⁷⁸	An aquarobic exercise program and patient education program lasting 60 minutes for 36 sessions was held 3 times per week for 22 cases of knee OA and 29 controls plus 22 with other forms of OA	SE as assessed by an adapted ASES tool consisting of 14 items on a 10 point Likert scale increased from 1124.87 to 1251.46 after the intervention; while the control group dropped from 1166.00 at baseline to 1018.65 on post test
King <i>et al.</i> ⁵⁶	14 young adults underwent high intensity isokinetic training 3 times per week for 12 weeks	High intensity exercise training produced increases in the ASES function domain, from 8.37±0.86 to 8.80±0.65
Lamb <i>et al.</i> ⁵⁸	Chronic disease management program for 121 cases with severe OA	Pain and function SE increased among other factors
Piyakhachornrot <i>et al.</i> ⁷⁹	73 middle aged adults with knee OA were assigned to one of two intervention groups that received integrated health education and exercises, SE expectations were promoted through a theory based 4 step approach	Mean SE expectation scores assessed on a 15-item questionnaire with total scores ranging from 0-30 increased from baseline to 8 weeks and 12 weeks
Rawiworrakul <i>et al.</i> ⁶⁰	Women were exposed to a community-based exercise program to support self-efficacy strategies twice weekly for 12 weeks among an experimental group, but not in a control group	Increased SE for exercise, severity symptoms and physical performance was detected at week 4 for the experimental group, but not at week 12
Rejeski <i>et al.</i> ⁵²	Aerobic or resistance training or health education programs were applied to 357 older adults with knee OA	Both exercise treatments increased SE for stair climbing
Wang <i>et al.</i> ⁸⁰	Prospective, single-blinded, randomized controlled trial of Tai Chi for 40 individuals with symptomatic tibiofemoral OA 60 min held twice weekly for 6 weeks	Program resulted in improved SE on a 1-5 point scale and this was maintained at 24 and 48 weeks
Yip <i>et al.</i> ^{81,82}	Randomized theory-based self-management trial with exercise component with 120 participants followed for 16 weeks, then 1 year	At 16 weeks arthritis SE improved in most domains; and at one year pain SE increased; as did other symptoms SE for experimental group, along with reduced pain and medical visits

ASES, arthritis self-efficacy scale; OA, osteoarthritis; SE, self-efficacy.

carry out their exercise regimens. They received demonstrations on how to do this and watched a patient with a similar condition carry this out. They were specifically encouraged to engage in exercise or perform activities related to reducing knee symptoms they had learned. To reduce emotional arousal they discussed and shared strategies for reducing barriers to exercise and participants were trained until they felt confident to exercise.

Other factors may influence the degree of success of any program designed to enhance a knee osteoarthritis patient's confidence to self-manage their disease. These include the extent of any prevailing pain and mood disorder, concurrent disease activity and/or severity, health or age status,⁸⁸ stages-of-change profiles among patients and the interventionist's or intervention approach.^{57,89,90} In addition, optimal health outcomes might be specifically enhanced by the appropriate education of spouses, significant family members and caregivers,^{83,91} the implementation of individually tailored goal-directed exercise programs,^{62,92,93} and mutuality, rather than paternalism in goal setting.⁹² Social persuasion, physiological feedback, and problem solving may be equally highly beneficial,^{62,93} as may breaking down goals into achievable steps, followed by graduated opportunities to achieve task mastery.^{62,92-95} Discussions concerning previous adverse experiences with the behavior in question, along with an appropriate action plan plus simulations of the desired behavior are potentially helpful as well.^{96,97}

In particular, interventions guided by self-efficacy theory may produce more robust effects than those that are not even though few comparative studies exist to support this view. Alternately, since each probably has its own place in the rehabilitation process, the clinician can carefully examine where confidence is lacking in the context of the clinical presentation of the disease, so they can effectively tailor their recommendations accordingly.

Discussion and Conclusions

Knee osteoarthritis, a prevalent costly health condition is commonly associated with pain and functional disability. To retard the progression of and/or reduce the magnitude of the disability arising from this incurable condition, where joint changes alone do not predict symptoms,^{32,40} and where overlapping physiological, physical, and psychosocial risk factors can prevail,⁵⁴ the affected individual may need to carry out one or more novel intervention strategies on a consistent basis despite the presence of unrelenting pain and discomfort. These strategies may include but are not limited to:

- Exercise.
- Weight reduction.
- Joint protection and energy conservation strategies.
- Use of assistive devices.
- A variety of medication regimens.
- Home and workplace modifications.
- The application of electrotherapeutic devices.

Fortunately, an increasing body of evidence supports a key role for investigating and intervening upon intra-individual factors that may inhibit motivation for participating in or carrying out one or more of the above mentioned self-management or adaptive strategies and others.^{34,41} In particular, efforts to boost self-efficacy for achieving a desired goal, including exercise, function and pain self-efficacy,^{31,33} may causally influence the ability of the patient to both adjust to and successfully manage their knee osteoarthritis and its attendant pain and disability.^{30,34,65} Additional research reveals that efforts to raise a client's self-efficacy may also predict depression and enhance the facility of adults with osteoarthritis to inhibit or discontinue unfavorable behaviors plus the adoption and maintenance of generally favorable health behaviors, especially physical activity.^{14,15,30,98,99}

Thus, despite the inherent limitations in cross-sectional research, the possibility that those who have been studied already have acceptable self-efficacy,⁵⁸ and the fact that some aspects of self-efficacy for managing knee osteoarthritis may not improve over time despite attempts to enhance this,⁷⁷ taken as a

whole, the available evidence strongly suggests that regardless of numbers of affected joint sites, and assessment approach, the extent of one's self-efficacy beliefs can tentatively predict who may or may not benefit from a specific mode of treatment and thus steps to address confidence issues should not be overlooked in the context of managing knee osteoarthritis as discussed by Bennett *et al.*³³ Since self-reported disability in individuals with knee osteoarthritis is strongly related to pain, and anxiety, among other treatable factors,³² and these can both be influenced by the magnitude of the individuals self-efficacy beliefs, routinely assessing the magnitude and specificity of these beliefs and intervening accordingly to maximize any significant deficit over time may help clinicians to offset the totality of the disability experienced by these individuals as a result of reduced confidence levels, especially if tailored in light of recent symptoms and demographic characteristics.^{77,100}

In this regard, as outlined by Fitzgerald and depicted in Figure 2,⁴⁸ carefully construed timely efforts to examine and raise suboptimal self-efficacy beliefs, especially where these are low, will predictably yield important and beneficial outcomes among cases with symptomatic knee osteoarthritis, including higher life satisfaction,⁴² reduced pain and stiffness,^{46,79} and higher function.^{34,46,79} Additionally, a careful assessment of self-efficacy followed by multi-component interventions to specifically enhance this is predicted to favorably influ-

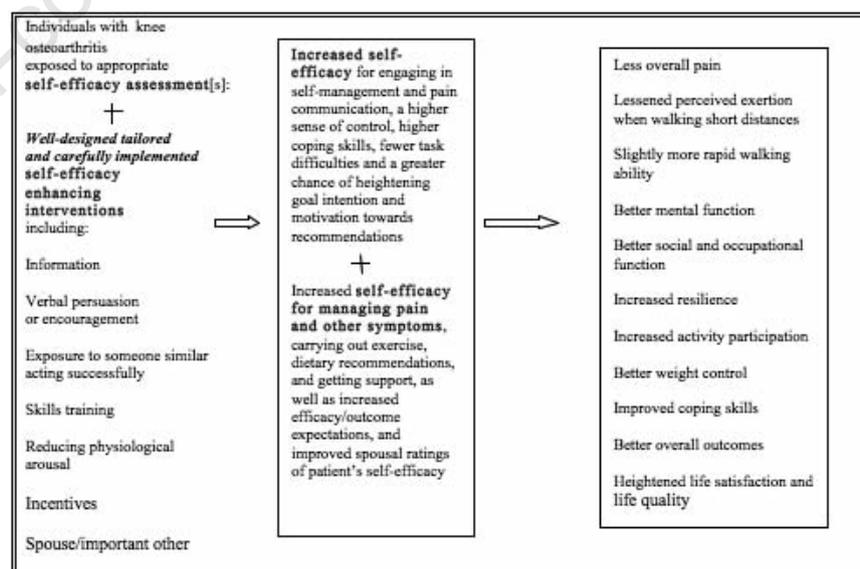


Figure 2. Logic model of proposed outcomes of self-efficacy theory based interventions and others as applied to the management of adults with knee osteoarthritis. Sources: Bandura²; Dekker *et al.*⁵²; Danush *et al.*⁹⁰; Keefe *et al.*⁷⁷; Maly *et al.*³⁷; Mann and Goberman-Hill¹⁰²; Pattayakorn *et al.*⁹²; Piyakhachornro *et al.*⁷⁴; Porter *et al.*⁹⁶; Rawiworrakul *et al.*¹⁰¹; Rejeski *et al.*²⁹; Wang *et al.*⁹⁴

ence knee osteoarthritis outcomes as outlined in Figure 2. Moreover, research suggests those younger than 60 years of age, and those with comorbid health conditions, and clinical depression might be especially assisted to overcome their challenges using this approach.

Although no one mode of intervention has been deemed superior to another, interventions that follow Bandura's systematic strategy appear to generate consistently positive outcomes,^{2,34} although other approaches listed in Table 5 including interventions that focus on pain communication processes,¹⁰¹ as well as decreasing the factors producing low self-efficacy beliefs, such as knee muscle weakness may be helpful.³⁴ Including the patient as well as family members and important others in the rehabilitation process, reducing maladaptive pain coping strategies,³⁵ and intervening early to minimize excessive catastrophizing is also indicated.^{37,57}

However, to enable adults with knee osteoarthritis to experience a higher life quality than those presently attainable, despite their pathology, research efforts to examine these premises using more domain specific tools and long-term measurement approaches are highly recommended. As well, since the optimal mode of intervention for enhancing self-efficacy in the context of knee osteoarthritis subpopulations is not known, more comparative research to examine the efficacy and/or nature of failures of those approaches reported in Table 5 as regards self-efficacy outcomes is recommended as well. Meantime, health professionals are strongly encouraged to routinely assess and examine the global self-efficacy beliefs of their knee osteoarthritis clients as well as employ or develop behavior-specific self-efficacy scales such as the coping efficacy scale to derive specific guidelines for better targeted treatments (e.g. Wang *et al.*).¹⁰² Remaining cognizant of the fact self-efficacy is a complex construct with potential gender and racial differences in self-efficacy beliefs, and is likely to be differentially influenced by age, will be helpful as well.^{34,55} Salient variations in disease presentation and related perceptions should be recognized and interventions should be targeted and tailored accordingly, as discussed by Murphy *et al.*¹⁰⁰ Finally, the consistent use of functional outcome measures,⁴⁶ radiographic assessments,³⁴ and measurements of opioid activation,¹⁰³ as well as researching which patients with knee osteoarthritis are potentially predisposed to low self-efficacy for a particular behavior, and what constitutes the most beneficial mode of providing information to raise confidence early on in the management process,¹⁰⁴ which has not been studied, might be especially valuable.

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