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Relationship between Beliefs, Motivation and Worries about Physical Activity and Physical Activity Participation in Persons with Rheumatoid Arthritis

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Abstract

Objective—To determine the relationship between beliefs, motivation, and worries about physical activity and physical activity participation in persons with rheumatoid arthritis.

Methods—A cross-sectional study used baseline data from 185 adults with rheumatoid arthritis enrolled in a randomized clinical trial assessing the effectiveness of an intervention to promote physical activity. Data included patients' self-reported beliefs that physical activity can be beneficial for their disease, motivation for physical activity participation, worries about physical activity participation, and average daily accelerometer counts of activity over a week's time. Body mass index, gender, age, race, and disease activity were measured as potential statistical moderators of physical activity.

Results—Physical activity participation was greater for those with higher scores on scales measuring beliefs that physical activity is beneficial for their disease (p for trend= 0.032) and motivation for physical activity participation (p for trend= 0.007) when adjusted for age, gender, body mass index, race, and disease activity. There was a positive but non-significant trend in physical activity participation in relation to worries.

Conclusion—Stronger beliefs that physical activity can be helpful for managing disease and increased motivation to engage in physical activity are related to higher levels of physical activity participation. These data provide a preliminary empiric rationale for why interventions targeting these concepts should lead to improved physical activity participation in adults with rheumatoid arthritis.

Keywords

arthritis; physical activity; health beliefs; health motivation; health worry

Among persons with arthritis, engaging in physical activity can help maintain or increase mobility, improve function, decrease pain, and decrease disability.¹ Many individuals with arthritis are sedentary.² Less than 25% of US adults engages in the amount of physical activity recommended by the Centers for Disease Control and Prevention (CDC) and the American Academy of Sports Medicine.³ A sedentary lifestyle is associated with cardiovascular disease, osteoporosis, decline in physical function (strength, endurance, flexibility), and an increased risk of all-cause mortality.^{4,5} Many people with rheumatoid arthritis (RA) are active at a level considered too low to maintain good health,⁶ and physically inactive people with RA have significantly worse cardiovascular disease risk compared to those who are active.⁶

Persons with arthritis may have disease-related reasons for their low activity levels. For example, joint symptoms have been cited as a barrier to *exercise*, a special subset of general physical activity.² Lack of advice from health care providers to be physically active and lack of available arthritis-specific exercise programs have been identified as needs.⁷ Inactivity in persons with arthritis has also been associated with older age, lower education and having functional limitations. Additionally, inactivity has been associated with having anxiety or depression and needing special equipment for activity participation.²

To describe and assess the multiple influences on persons with arthritis' physical activity participation, we applied the Interaction Model of Client Health Behavior (IMCHB) which incorporates both intrapersonal and contextual variables (see Figure 1). The model has been used successfully to explain a wide variety of health behaviors⁸⁻¹⁰ and to identify the moderators and mediators of behaviorally-related health outcomes.¹¹⁻¹³ We used indicators of modifiable cognitive (beliefs), motivation (perceived competence), and affective (worries) constructs within the IMCHB to examine their potential association with physical activity participation in our study sample.

The IMCHB shares several concepts in common with other health behavior models, such as the Health Belief Model, Transtheoretical Model, and Social Learning Theory. A more extensive discussion of how these models informed the IMCHB can be found at (Cox, 1982)¹⁴. The IMCHB is broader in theoretical scope than Bandura's model as it contains both motivation and affect as constructs separate and distinct from cognitive processing variables. In addition, self-efficacy is only one component of intrinsic motivation; other components that contribute to motivation and which can be targets for intervention include choice, autonomy, and self-determinism.

The interrelationships between beliefs, motivation, and worries are complex. Each factor contributes to behavior change; they are measurable and can be manipulated. The development of interventions that target these potential predictors, moderators and/or mediators of physical activity have the potential to increase physical activity participation.

Beliefs about the benefits of physical activity¹⁵ must be informed by an understood rationale for performing the behavior; this rationale includes simultaneous *beliefs* of the benefits of performing the behavior and the consequences of not performing the behavior. Positive health *beliefs* and knowledge¹⁰ ultimately help the person to formulate goals and to establish a sense of competency for engaging in a behavior. Goal setting and the *belief* that one has the skills to engage in the prescribed behavior represent the foundation for *motivation* to participate in the behavior.¹⁶ Finally, a positive affect related to the behavior and or

consequences of the behavior is the third component that supports behavior change. The elimination of fears, *worries*, or concerns about participating in the behavior ultimately is derived from positive health beliefs and adequate knowledge about the benefits and risks of behavior participation.¹⁴

Currently, there is a knowledge gap in persons with RA regarding the relationship between beliefs, motivation, and worries about physical activity in relation to physical activity participation. The objective of this study is to determine if higher perceptions of beliefs that physical activity can be beneficial (cognitive appraisal), higher motivation for physical activity (perceived competence), and higher levels of worry that not doing physical activity can be detrimental (affective response) are associated with higher levels of physical activity participation in a sample of patients with RA.

MATERIALS AND METHODS

Design

Study participants were adults with RA enrolled in a randomized controlled trial (RCT) assessing the effectiveness of an intervention to promote physical activity.¹⁷ Baseline cross-sectional data were used to examine the association between beliefs, motivation, and worries about physical activity with their physical activity participation. The protocol received institutional review board approval and all study participants provided written informed consent.

Participants

The eligibility criteria for participation included (1) diagnosis of RA based on the 1988 ACR criteria,¹⁸ (2) age 18 years or older, (3) ability to understand spoken English, (4) ability to perform basic self-care, and (5) ability to walk household distances (at least 50 feet). Exclusion criteria included (1) contraindication to physical activity due to comorbid condition including a history of peripheral vascular disease, spinal stenosis, residual lower extremity neuromuscular effects of stroke, major signs or symptoms suggestive of pulmonary and cardiovascular disease, (2) total joint replacement surgery within the past 12 months, (3) planned total joint replacement in the subsequent 24 months, and (4) plans to relocate away from the area in the next two years. Participants were recruited through practicing rheumatologists at two clinical centers at a single academic institution.

Measures

DEPENDENT MEASURE—Physical activity was objectively measured at baseline using a GT1M Actigraph accelerometer. This small uniaxial accelerometer measures vertical acceleration and deceleration. The validity and reliability of the accelerometer under field conditions have been established in many populations including persons with arthritis.¹⁹ Accelerometer output is an activity count, which is the weighted sum of the number of accelerations measured over a time period (e.g. in this case 1 minute), where the weights are proportional to the magnitude of measured acceleration. The outcome was the average daily accelerometer counts, calculated as explained below.

Trained research personnel initialized each accelerometer and gave instructions at an in-person visit, on how to position and wear the accelerometer. The unit was continuously worn during waking hours for 7 consecutive days except during water activities (only 5% of participants reported doing water activities); it was placed on a belt at the natural waistline on the right hip in line with the right axilla. Uniform scripted instructions were given on the wear and positioning of the accelerometer. At the end of the 7-day monitoring period,

participants returned the accelerometers to the research center; data were downloaded using the manufacturer's software, and were checked to verify recorded data.

INDEPENDENT MEASURES—IMCHB background variables measured at the baseline interview include body mass index (BMI), gender, age, race/ethnicity, and disease severity. BMI was calculated using height and weight measured at the time of the baseline visit [weight (kg)/height (m)²]. Gender, age, and race/ethnicity (White, African American, Asian, Hispanic or Other) were collected by telephone interview. Disease severity (using the calculated Clinical Disease Activity Index (CDAI) score²⁰) was based on joint swelling and pain as well as patient and clinician global assessment performed at the time of the baseline visit.

Constructs of the IMCHB dynamic variables of cognitive appraisal, motivation, and affective response were tested using instruments developed specifically for this trial and measured at the baseline interview.

Beliefs related to physical activity (Cognitive Appraisal) were measured using 12 items designed to allow the patient to rate their beliefs about being physically active on a four point scale from “does not describe me at all”, to “describes me exactly” (0–3). Examples of questions include addressing beliefs related to physical activity and stress or pain management and beliefs about what physical activity helps me to do. Summative scores ranged from 0 to 36; higher values represent more positive beliefs about engaging in physical activity. In this RA sample, the score had Cronbach's alpha of 0.89.

Motivation for physical activity (Perceived Competence) was measured using 6 items that ask the patient to rate the extent of their confidence in maintaining an active lifestyle on a four point scale from “not at all confident”, to “completely confident” (1–4). This scale was developed from the Perceived Competence Scale.^{21,22} Examples of questions address confidence in the ability to maintain a physically active lifestyle even with joint symptoms, or feeling tired, fatigued, or pain or having other demands on their time. Summed scores ranged from 6 to 24; higher values represent greater confidence in ability to maintain a physically active lifestyle. Cronbach's alpha in this RA sample for this score was 0.89.

Life worries (Affective Response) was measured using 7 items that ask the patient to rate their concerns about general life issues: ability to do things they enjoy, not being able to work, needing to have someone take care of them, difficulty being sexually active, losing their independence, being able to keep up with their friends and having a major health event like a heart attack or a stroke. Each question consists of three parts: whether the item worried them, whether that worry affected their level of physical activity, and whether that worry increased their level of physical activity. The questionnaire was based on the Social Functioning Scale.²³ Responses are summarized into a score that ranges from –7 to +7; higher positive values represent a more positive affective response to physical activity. Cronbach's alpha in this RA sample for this score was 0.80.

Statistical analyses

Accelerometer data from each participant were analytically filtered to identify non-wear periods (a period the monitor was potentially removed) during a day and days with sufficient wear time to be included for analysis. Non-wear periods were defined as 90 minutes with zero activity counts (allowing for two interrupted minutes with counts < 100).²⁴ A valid day of monitoring was defined as 10 or more wear hours in a 24-hour period.²⁵ For this study, we included only participants who had 4 or more valid days of monitoring. These methods are consistent with accelerometer methodology used in the general population and have been validated in RA.^{24,25} The primary physical activity outcome of the study was the average

daily counts obtained during the seven consecutive day monitoring period. The daily counts for each participant were collected over the 7 days and then the average daily counts for each participant were calculated including only valid days.

To assess the relationship of physical activity with each dynamic variable of the IMCHB, multiple linear regression was performed with the dynamic variables categorized in low, medium, and high for both unadjusted and adjusted background factors, such as BMI, gender, age, race and disease severity (CDAI). A graded relationship was evaluated by a linear trend test across the three categorized groups of the dynamic variables. All statistical analyses were performed using SAS, version 9.2.

RESULTS

Study recruitment occurred September 2005 – February 2010. A total of 272 persons with RA were screened for study eligibility criteria; of these 185 were randomized into the clinical trial. The most common reasons for exclusion prior to randomization were health issues (n= 13), planned surgery (n=5), and scheduling difficulties (n=95). Among the 185 randomized participants, the majority were white women, between the ages of 45 and 65 years, college educated, with a mean BMI of 28 kg/m², and with a mean disease activity score (CDAI) of 11.8 (mild-moderate disease activity). (Table I). Dynamic variable scores including the range, mean, standard deviation, and median are summarized in Table 1. The sample was evenly distributed throughout the tertiles for the beliefs and motivation variables. For life worries, the majority of the patients fell into the medium category (0).

The relationship between dynamic variables and physical activity behavior is summarized in Table 2. As beliefs about the benefits of physical activity increased, physical activity participation also increased. This relationship persisted even after adjusting for age, gender, BMI, and disease severity (p for trend= 0.032). Increased motivation for physical activity was also related to greater physical activity participation. This trend represented a significant graded relationship with and without statistically controlling for age, gender, BMI, and disease severity (p for trend= 0.007). Although increased levels of worry about disease status were positively related to greater physical activity participation, the trend was not significant.

DISCUSSION

In this study, physical activity participation was significantly associated with beliefs about the benefits of physical activity and with motivation for physical activity. As positive beliefs and motivation related to physical activity increased, physical activity participation significantly increased independent of age, gender, race, BMI, and disease severity. While increased worries about physical activity were associated with increased physical activity participation, the relationship was not significant.

The relationship between physical activity, health beliefs, health motivation, and health worries has not been extensively reported in the arthritis literature. In persons with RA, more autonomous regulation (intrinsic motivation) as measured by the Treatment Self-Regulation Questionnaire was found to be a significant determinant of self-reported physical activity.²⁶ In addition, self-reported lack of motivation was identified as the most frequently mentioned barrier to self-reported physical activity participation for persons with RA.²⁷

Beliefs, motivation and worry, however, have been documented as strong predictors of physical activity participation in other adult populations with chronic illness. For example, a study of young adult survivors of childhood cancer found that being physically active was associated with higher scores for autonomous motivation, lower levels of worry and

perceptions of fewer barriers to physical activity (cognitive appraisal-beliefs).¹³ Similarly, among adult survivors of childhood cancer, physical activity participation was strongly influenced by motivation, worry/affect, and concerns/beliefs related to their diagnosis and treatment.^{28,29} Beliefs about physical activity were found as a core theme influencing physical activity behavior in persons with multiple sclerosis. In addition, conflicting beliefs about physical activity being beneficial or harmful played a role in creating tension when considering physical activity engagement in this population.³⁰ Motivation was found to be a strong predictor of self-reported physical activity among persons with type 2 diabetes.³¹ Reporting of greater health worry predicted lower levels of self-reported participation in physical activity in a sample of older adults.³² Given the differences in life circumstances between patients with these particular chronic diseases and those with arthritis, future studies identifying the relationship between physical activity, health beliefs, health motivation, and health worries are needed to help inform interventions to influence these concepts for the larger arthritis population.

There were some limitations to this study that must be considered. First, the physical activity experience of adults with RA participating in an RCT may be different from the general population of RA patients. However, a self-reported measure of time spent on physical activity measured in this study (25.5 hours/week) and an RA community sample (23.1 hours/week) were similar.³³ Also, the instrument used to measure affective response may not have accurately assessed RA patients' worries and concerns about physical activity participation. The emphasis of the affective response measure was more reflective of general life concerns. There is a need to develop valid and reliable instrumentation to assess worry, fears, and concerns specific to this population and to physical activity participation. Despite these limitations, strengths of this study include the use of an objective measure, accelerometry, for capturing physical activity. In addition, clinical implications of this study include an ability to identify targets for intervention and the targets suggest a tailored intervention that can influence health beliefs, health motivation, and health worries.

In conclusion, this study shows higher levels of physical activity participation in adults with RA are related to stronger beliefs that physical activity can be helpful for managing disease and to increased motivation to engage in physical activity. These data provide a preliminary empiric rationale for why interventions targeting these concepts should lead to improved physical activity participation in persons with RA. This finding supports the development of physical activity interventions that focus on strengthening health beliefs and motivation to engage in physical activity.

SIGNIFICANCE AND INNOVATION

- We applied the Interaction Model of Client Health Behavior to physical activity behavior in persons with rheumatoid arthritis
- Self-report measures of motivation for being more physically active and beliefs that physical activity is beneficial were positively associated with objectively measured physical activity participation
- The findings indicate that health promotion interventions that in the long run increase motivation for increasing physical activity and beliefs about the benefits of physical activity may lead to increased physical activity participation in persons with rheumatoid arthritis

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Appendix

PHYSICAL ACTIVITY MANAGEMENT FOR CLIENTS WITH ARTHRITIS

PERCEIVED COMPETENCE FOR PHYSICAL ACTIVITY

INSTRUCTION:

The next section is statements about how confident you are that you can maintain an active lifestyle. You should tell me if you are not at all confident, somewhat confident, fairly confident, or completely confident. Please refer to response set 6.

RESPONSE CHOICES:

1	2	3	4
Not at all	Somewhat	Fairly	Completely
confident	confident	confident	confident

1. I feel confident in my ability to maintain a physically active lifestyle **even if my joints are bothering me**. Would you say you are...
2. I feel confident in my ability to maintain a physically active lifestyle **even if I'm feeling tired and fatigued**. Would you say you are...
3. I feel confident in my ability to maintain a physically active lifestyle **even if I have pain**. Would you say you are...
4. I feel confident in my ability to maintain a physically active lifestyle **even if I have other demands on my time**. Would you say you are...
5. I feel confident in my ability to maintain a physically active lifestyle **even if the weather is bad**.
Would you say you are...
6. I feel confident in my ability to maintain a physically active lifestyle **even if my family and friends don't encourage me**. Would you say you are...]

AFFECTIVE RESPONSE QUESTIONNAIRE

INSTRUCTIONS:

I am going to read you a list of issues that people sometimes worry about. I want to know if this is something you worry about and whether or not that worry affects your level of daily physical activity. Everyone is different. You may not worry about these things at all or you may be only quite concerned about one or two of these things. That's fine. There are no right or wrong answers; we are simply interested in knowing what is true for you. If something doesn't apply to you, just tell me that.

1. **Are you worried about** not being able to do the things you enjoy doing?

2=N/A

0=No

1=Yes --- If yes, does this worry affect your level of physical activity?

0=No

1=Yes -- If yes, does this worry increase your level of physical activity? 0=No

1=Yes

2. **Are you worried about** not being able to work at your job?

2=N/A

0=No

1=Yes --- If yes, does this worry affect your level of physical activity?

0=No

1=Yes -- If yes, does this worry increase your level of physical activity? 0=No
1=Yes

3. Are you worried about needing to have someone else to take care of you?

2=N/A

0=No

1=Yes --- If yes, does this worry affect your level of physical activity?

0=No

1=Yes -- If yes, does this worry increase your level of physical activity? 0=No

1=Yes

4. Are you worried about having difficulty being sexually active?

2=N/A

0=No

1=Yes --- If yes, does this worry affect your level of physical activity?

0=No

1=Yes -- If yes, does this worry increase your level of physical activity? 0=No

1=Yes

5. Are you worried about losing your independence?

2=N/A

0=No

1=Yes --- If yes, does this worry affect your level of physical activity?

0=No

1=Yes -- If yes, does this worry increase your level of physical activity? 0=No

1=Yes

6. Are you worried about not being able to keep up with your friends?

2=N/A

0=No

1=Yes --- If yes, does this worry affect your level of physical activity?

0=No

1=Yes -- If yes, does this worry increase your level of physical activity? 0=No

1=Yes

7. Are you worried about having a major health event like a heart attack or a stroke?

2=N/A

0=No

1=Yes --- If yes, does this worry affect your level of physical activity?

0=No

1=Yes -- If yes, does this worry increase your level of physical activity? 0=No

1=Yes

COGNITIVE RESPONSE QUESTIONNAIRE

INSTRUCTIONS:

I would like you to tell me how well each of the following statements describes your thoughts about being physically active. Remember, we are talking about everyday physical activity like walking at a brisk pace, carrying laundry upstairs, walking instead of riding, using the stairs instead of taking the elevator, or playing golf. It may also include things like going to the gym or riding an Exercycle. Please refer to response set 7. Your response choices are: does not describe me at all, does not describe me very well, describes me fairly well, or describes me exactly.

- 1. In my experience, I sleep more soundly when I have been more physically active:

0=Does not describe me at all
1=Does not describe me very well
2=Describes me fairly well
3=Describes me exactly

- 2. In my experience, my arthritis flares are under better control when I am physically active

0=Does not describe me at all
1=Does not describe me very well
2=Describes me fairly well
3=Describes me exactly

- 3. In my experience, I have more energy when I have been regularly physically active

0=Does not describe me at all
1=Does not describe me very well
2=Describes me fairly well
3=Describes me exactly

- 4. In my experience, I can manage pain better when I am more physically active

0=Does not describe me at all
1=Does not describe me very well
2=Describes me fairly well
3=Describes me exactly

5. In my experience, physical activities are a good way to spend more time with my family or friends

0=Does not describe me at all
1=Does not describe me very well
2=Describes me fairly well
3=Describes me exactly

6. In my experience, being more physically active helps me have a more positive outlook on life

0=Does not describe me at all
1=Does not describe me very well
2=Describes me fairly well
3=Describes me exactly

7. In my experience, it is easy to find time for physical activities

0=Does not describe me at all
1=Does not describe me very well
2=Describes me fairly well
3=Describes me exactly

8. In my experience, I feel less stressed when I am physically active

0=Does not describe me at all
1=Does not describe me very well
2=Describes me fairly well
3=Describes me exactly

9. In my experience, I am more organized and focused when I am more physically active

0=Does not describe me at all
1=Does not describe me very well
2=Describes me fairly well
3=Describes me exactly

10. In my experience, I enjoy being physically active more than sitting still (like reading, playing cards).

0=Does not describe me at all
1=Does not describe me very well
2=Describes me fairly well
3=Describes me exactly

11. In my experience, my joints feel better when I am more physically active

- 0=Does not describe me at all
- 1=Does not describe me very well
- 2=Describes me fairly well
- 3=Describes me exactly

12. In my experience, it's easy to find ways to be physically active in my everyday life.

- 0=Does not describe me at all
- 1=Does not describe me very well
- 2=Describes me fairly well
- 3=Describes me exactly

PHYSICAL ACTIVITY BEHAVIOR FRAMEWORK

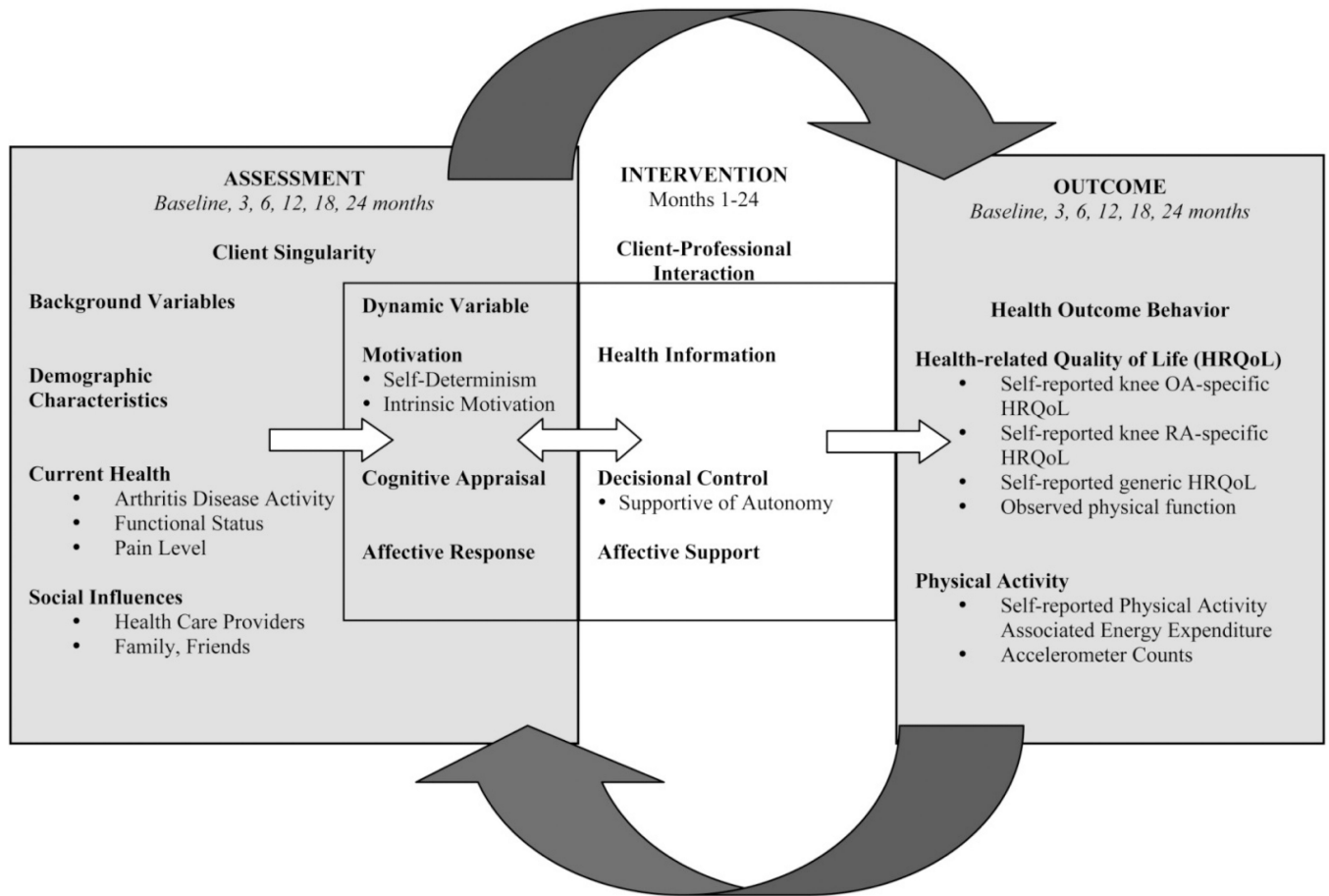


Figure 1. Physical Activity Framework based on the Interaction Model of Client Health Behavior (IMCHB) revised 2003. Adapted with permission of the Oncology Nursing Society. From Cox, CL. (2003). A model of health behavior to guide studies of childhood cancer survivors. *Oncology Nursing Forum*, 30(5), p. E93.

Table 1

Baseline characteristics and dynamic variables

Variables	n	%
Baseline Characteristics		
Sociodemographics		
Gender		
Female	155	84
Male	30	16
Race		
White	134	72
African American	22	12
Asian	9	5
Hispanic	18	10
Other	2	1
Age mean (SD)	55	(14)
Health factors		
BMI mean (SD)	27.98	(6.61)
CDAI mean (SD)	11.82	(10.85)
Dynamic Variables		
Beliefs (range 0–36), mean (SD)	23.1 (6.6)	median 23
Low (0–20)	61	35
Medium (21–25)	57	33
High (26–36)	57	33
Motivation (range 6–24), mean (SD)	17.4 (4.01)	median 18
Low (6–15)	58	31
Medium (16–19)	74	40
High (20–24)	53	29
Worries (range –7~ +7), mean (SD)	–0.007 (1.52)	median 0
Low (–7~ –1)	24	17
Medium (0)	105	73
High (1~ +7)	14	10

SD=standard deviation

Unadjusted and Adjusted Mean (SE) of Average Daily Accelerometry Counts over week for Dynamic Variables in Low, Medium, High Scores

Table 2

Dynamic Variables	Average Daily Accelerometry Counts Mean (SE)	Dynamic Variables			p-value for Trend
		Low	Med	High	
Belief	Unadjusted	202099 (13641)	193403 (13641)	270218 (13767)	0.001
	Adjusted*	205840 (21950)	188914 (20883)	247424 (20572)	0.032
Motivation	Unadjusted	197234 (14448)	212810 (12635)	258907 (14589)	0.003
	Adjusted*	192208 (21213)	211446 (20886)	247639 (21192)	0.007
Worries	Unadjusted	202315 (23155)	238523 (10611)	253057 (28360)	0.168
	Adjusted*	195624 (31880)	222725 (21054)	243833 (37519)	0.181

* Adjusted for Age, Gender, BMI, race, and CDAL.