AN ABSTRACT OF THE DISSERTATION OF

Maria Kosma for the degree of Doctor of Philosophy in Exercise and Sport Science presented on July 18, 2003.

Title: Interactive vs. Non-Interactive Electronically Delivered Motivational Materials for Physical Activity Initiation and Enhancement among Adults with Physical Disabilities.

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Participation in physical activity has important health benefits among individuals with disabilities, whereas inactive lifestyles may lead to secondary limiting health conditions. However, few people with disabilities regularly participate in the recommended amount of health-related physical activities. Low rate of participation may be related to low motivation due to interconnected psychosocial factors. The Transtheoretical Model is a contemporary motivational theory incorporating several theoretical constructs that can facilitate physical activity initiation and adherence.

There is lack of empirical evidence related to the development and delivery of physical activity motivational programs toward people with disabilities. The current literature identifies the need for theory-driven and appealing physical activity intervention programs. Therefore, the purpose of this study was to compare web-based interactive (i.e., group discussions) vs. non-interactive physical activity motivational materials tailored to mainly inactive adults with physical disabilities. This was a true experimental design with two experimental and one control group.

The results of the study demonstrated that the intervention program was effective in increasing leisure-type physical activity for the experimental non-interactive group that received only the web-based materials (F (2, 72) = 3.3, p = .04). Similarly, statistical significance was approached for total physical activity scores (F (2, 72) = 2.8, p = .07) in the web only (i.e., non-interactive) group (Effect Size = .34) from pre- to post-intervention. On the contrary, the control group decreased their leisure-type physical activity level between pretest and posttest (Effect Size = -.30). There were neither statistically significant interaction nor main effects for processes of change, decisional balance, and self-efficacy. Lastly, the proportion of people in the web only group (59%) who progressed in their stages of change was higher than the proportion who progressed in the control group (27.6%) (χ^2 [1, N = 51] = 5.13, p = .02).

The results of this study partially support the development and delivery of web based physical activity motivational materials for the posited population. Such materials may be applicable to other populations of different disability types, ages, cultural and ethnic backgrounds.

Interactive vs. Non-Interactive Electronically Delivered Motivational Materials for Physical Activity Initiation and Enhancement among Adults with Physical Disabilities

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1 GENERAL INTRODUCTION

Two scholarly works aimed at enhancing the physical activity behavior of people with disabilities comprise this dissertation. The first chapter refers to a true experimental study with the purpose being the comparison of web-based motivational materials aimed at enhancing physical activity among adults with physical disabilities. These materials were developed based on a contemporary theoretical model, the Transtheoretical Model. Such empirical work can provide support for the second chapter that reflects an already published review paper on motivational physical activity strategies derived from educational and psychological theories and tailored to people with disabilities. Both projects are of significant importance in changing physical activity behavior among a frequently sedentary population. In this way, health and wellness may increase thereby limiting the likelihood of secondary health conditions that are associated with disability.

2 ELECTRONICALLY DELIVERED MOTIVATIONAL MATERIALS FOR PHYSICAL ACTIVITY AMONG ADULTS WITH PHYSICAL DISABILITIES

2.1 Introduction

The benefits of physical activity and/or exercise for individuals with disabilities have been widely reported by empirical studies and governmental agencies (e.g., Blinde & Taub, 1999; Centers for Disease Control and Prevention, [CDC], 1999). Increasing the number of individuals who meet the criteria of health-related physical activity is of paramount importance for health. In a 1997-survey, it was reported that only 12% of the adult population with disabilities participates in physical activity of moderate intensity, 5 days per week for 30 minutes each day (Healthy People, 2010). Although these data do not seem to differ drastically from the data of the same age-range non-disabled population (i.e., 16% participating in the recommended activity), there is a much higher percentage of adults with disabilities (56%) who do not participate in leisure-type physical activity compared to adults without disabilities (36%). Living a mainly inactive lifestyle may lead to secondary health conditions such as cardiovascular diseases (Rimmer & Braddock, 2002).

The low rate of engagement in regular physical activity among people with disabilities may be related to low motivation that seems to be associated with interconnected psychosocial dynamics such as attitudes toward equal opportunities for physical activity engagement (Kosma, Cardinal, & Rintala, 2002). Therefore, it is essential to increase motivation toward healthy, active lifestyles (Durstine, Painter, Franklin, Morgan, Pitetti, & Roberts, 2000). Motivational programs should be derived from sound theoretical models and tailored to individual needs in a friendly and

contemporary way. An approach, such as one tailored on the basis of the Transtheoretical Model (TM), may facilitate progress in this area (Burbank & Riebe, 2002; Kosma et al., 2002).

2.1.1 *Transtheoretical model*

Elements of the TM can be utilized in order to identify motivational strategies toward physical activity participation. The main dimensions of the TM are the stages of change, processes of change, self-efficacy, and decisional balance. In this introductory section, these constructs will be associated with physical activity behavior change. Motivational strategies toward physical activity and stage advancement can be derived from the processes of change, self-efficacy, and decisional balance.

It has been revealing that the construct of the stages of change attracts a significant amount of attention from scholars and educators. The number of stages of change varies across different studies. Within the physical activity domain, the most frequently studied stages of change include the precontemplation, contemplation, preparation, action, and maintenance stages (Cardinal, 1997). The conceptual definitions of some stages - especially for the precontemplation, preparation, and maintenance stages - vary across studies (Miilunpalo, Nupponen, Laitakari, Martila, & Raronen, 2000; Schumann et al., 2002). In the present study, precontemplation refers to lack of action and absence of consideration to regular physical activity within the next 6 months. In contemplation, individuals are not active, but they start thinking of engaging in the described physical activity routine within the next 6 months. In the preparation stage, individuals plan to start a regular physical activity program within

the next month. In addition, individuals in the preparation stage engage in some behavior change such as buying a pair of running shoes or going for an occasional run. However, this behavior is not sustained on a regular basis, but rather occurs infrequently. In the action stage, individuals follow the defined regular physical activity routine for less than 6 months, whereas in maintenance, the physical activity program is regularly sustained for more than 6 months. The movement across the stages is not necessarily linear, but rather cyclical with the potential of lapse and relapse (Cardinal, 1998; Miilunpalo et al., 2000).

Another dimension of the TM is the processes of change. Processes of change refer to certain cognitive and behavioral techniques that can be utilized to facilitate behavior change (Burkholder & Nigg, 2002). In physical activity, the 10 processes of change have been organized into two higher-order categories, cognitive (i.e., consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, and social liberation) and behavioral (i.e., counter conditioning, helping relationships, reinforcement management, self-liberation, and stimulus control; Prochaska & Velicer, 1997).

In the study of Marcus and colleagues (Marcus, Rossi, Selby, Niaura, & Abrams, 1992), both cognitive and behavioral processes of change reached the zenith in the action stage. In addition, the use of the cognitive and behavioral processes of change was similar between the contemplation and preparation (i.e., initiation of behavioral change) stages. This pattern of process usage suggests that cognitive and behavioral techniques are almost equally important to the initiation and maintenance of physical activity behavior (Marshall & Biddle, 2001).

Another cognitive construct of the TM is self-efficacy. In physical activity, self-efficacy is associated with the level of the self-belief that a physical activity task can be performed successfully (Bandura, 1997). Within the TM, self-efficacy is measured as the level of self-confidence to overcome certain perceived barriers in order to initiate and/or sustain the described physical activity routine. In the meta-analysis study of Marshall and Biddle (2001), self-efficacy was found to increase across the stages of change in an almost linear pattern. In particular, a moderate to large effect size was observed between action and maintenance, whereas a small to moderate effect size was identified between contemplation and preparation. Moderate changes in self-efficacy were assessed from precontemplation to contemplation and from preparation to action.

Lastly, the decisional balance model (Janis & Mann, 1977) suggests that the balance between the perceived benefits and costs of physical activity can provide an indication of ways to increase movement from the early to the late stages. Because the highest effect size in decisional balance has appeared during the transition from precontemplation to contemplation (Marshall & Biddle, 2001), the need to increase awareness of the positive effects of physical activity among precontemplators can be an essential part of intervention programs.

2.1.2 *Motivational programs*

In this section, certain motivational programs based on specific constructs of the TM will be reported. These programs have been identified or they can be recommended as effective on positive behavior change such as physical activity

participation for individuals without disabilities. Such motivational programs have been delivered either through the regular mail (i.e., print-based) or electronically.

It has been supported that stage-matched print-based materials aimed at increasing physical activity participation are more effective on behavior change than traditional non stage-matched materials such as those of the American Heart Association (AHA; Blissmer & McAuley, 2002; Marcus et al., 1998). Similarly, print-based written materials that reinforce health-related leisure-type physical activity have been reported more successful and cost-effective in changing physical activity behavior than traditional structured exercise programs (Cardinal & Sachs, 1995; 1996; Sevick, Dunn, Morrow, Marcus, Chen, & Blair, 2000).

Although print-based materials have been supported as effective on behavior change, the advances and appeal of technology initiated the need to examine the efficacy of web-based materials on physical activity participation. Information technology offers a friendly and appealing way to communicate by incorporating audio-visual and animated information, personal feedback, and personal communication (Tate, Wing, & Winett, 2001). Using the advances of the Internet, individual data can be collected automatically in order to administer individually tailored programs (Dirkin, 1994; Fotheringham, Owies, Leslie, & Owen, 2000; Marcus, Nigg, Riebe, & Forsyth, 2000; Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998). Print-based materials can only offer stage-matched information, whereas web-based programs can also be tailored to an individual level capturing personalized needs. Specifically, computer-based programs can reinforce individually oriented motivating strategies by formulating discussion groups (i.e., social support) through

which the program recipients can freely communicate and share diverse experiences and needs. As such, openness may increase and face-to-face social conformity may decrease (Fotheringham et al.; Marcus et al.).

Although very few studies have used the Internet to promote physical activity, and no studies have employed this technology among people with disabilities, it may be a useful tool to consider. For example, it has been supported that web-based, stage-matched, and individually-tailored (e.g., progress feedback) motivational strategies are more effective in enhancing physical activity of moderate intensity for healthy adults than print-based, standard, self-help materials provided by the AHA (Marcus, Bock, Pinto, Forsyth, Roberts, & Traficante, 1998). Computer-based motivational programs can be effective in positive behavior change such as enhancement of physical activity and healthy diet (Calfas et al., 2002; Napolitano et al., 2003).

Similarly, a web-based intervention program focusing on behavior change aspects was more effective in weight loss and decrease of circumference at the waist than a standard electronically-delivered program providing a list of education oriented web links (Tate et al., 2001). Additionally, a bulletin board was utilized in this study whereby participants could foster social support by posting messages and discussing appropriate topics with one-another. Extensive information is also provided in Appendix 1.

2.1.3 *Purpose of the Study*

The aforementioned motivational programs were directed to individuals without disabilities reinforcing the need of theory-oriented interventions that are specific to certain disability populations. Additionally, few web based physical activity programs have utilized behavior change theories (Doshi, Patrick, Sallis, & Calfas, 2003). As indicated, physical activity intervention programs are likely to be more successful if they are theory- and stage-oriented (i.e., programs tailored to individual stages of change), electronically delivered, and individually tailored (e.g., reinforcement of group interactions). Therefore, the purpose of this study was to develop and compare interactive vs. non-interactive, electronically delivered motivational materials tailored to adults with physical disabilities in mainly the initial stages of physical activity behavior change (i.e., precontemplation, contemplation, and preparation). This was a preliminary study, therefore the program duration was purposefully limited to one-month. DiClemente, Prochaska, Fairhurst, Velicer, Velasquez, and Rossi (1991) suggest that people can change behavior in one month.

2.2 Method

2.2.1 *Participants*

Upon receiving Institutional Review Board approval, a press release was utilized to recruit study participants. Specifically, the press release was distributed to several sites across the nation such as rehabilitation centers, electronic or print-based newsletters, hospitals, disability associations and offices, colleges, and personal contacts. Participant recruitment was also facilitated through the Rehabilitation Research and Training Center on Health and Wellness at Oregon Health and Sciences

University, Portland, Oregon. Participants were paid $2.00 for their involvement and they were also eligible for one of two randomly selected prizes of $50.

Approximately, 1165 individuals had expressed interest in participating in the study from which 303 qualified. From the 151 individuals who enrolled in the study, 75 people filled out the study questionnaires. Qualification criteria included health status, physical activity level, and age range. Specifically, the revised version of the Physical Activity Readiness Questionnaire (Cardinal & Cardinal, 2000; see Appendix 2) was delivered as a prescreening tool to secure adequate health status related to physical activity participation. Only inactive or irregularly active participants – classified within the precontemplation, contemplation, and preparation stages – were qualified to remain in the study. Physical activity stage status was measured during prescreening using Reed, Velicer, Prochaska, Rossi, and Marcus's (1997) self-report scale (see Appendix 3). In accordance with the American College of Sports Medicine (ACSM) guidelines (ACSM, 2000), the age-range of the participants was limited to 18-54 years (for females) and 18-44 years (for males) to minimize the likelihood of health-related risk factors associated with physical activity.

The participants of this study were adults (*M* age = 39 years, *SD* = 8.6) with physical disabilities who provided their informed consent. The main disability categories were spinal cord injury and other neurological disorders such as multiple sclerosis and cerebral palsy. Individuals with specific disability types such as intellectual and mental disorders were not recruited for this study.

2.2.2 *Measures*

Self-report standardized measures were utilized for this study. The main outcome study variable was health-related physical activity, whereas secondary outcome variables were stages of change, processes of change, self-efficacy, and decisional balance.

Health-related physical activity was measured using the 13-item Physical Activity Scale for Individuals with Physical Disabilities ([PASIPD]; Washburn, Zhu, McAuley, Frogley, & Figoni, 2002; see Appendix 4). The scale incorporates a variety of activities such as leisure-type, household, and work-related activities with intensity levels varying from mild to vigorous. A combined score of the intensity, frequency, and duration of the physical activities performed reflected participants' physical activity level as expressed in metabolic equivalents (METs). For example, a 4-MET intensity increase reflects the shift from moderate to strenuous physical activity.

Stages of change were assessed using the recommended scale of Reed, Velicer, Prochaska, Rossi, and Marcus (1997) (see Appendix 3). This is a categorical scale of a 5-choice response format. As recommended by Reed and colleagues, certain modifications have been incorporated in order for the scale to be physical activity and population specific. Specifically, in this study health-related physical activities of moderate intensity were promoted. Participants were encouraged to participate in such activities as walking, wheeling, and dancing daily for 30 minutes or longer. The activity duration (i.e., 30 minutes) could be obtained consecutively or in an additive manner of 15-minute increments throughout the day. Additionally -- and as recommended by Schumann et al. (2002) -- both a cognitive and a behavioral aspect

was included in the preparation stage. In particular, participants in the preparation stage were irregularly active but interested in future regular physical activity participation.

Processes of change were measured using a 30-item (15 cognitive and 15 behavioral) self-repot scale (Nigg, Norman, Rossi, & Benisovich, 1999; see Appendix 5). Participants responded using a 5-point Likert scale where 1 = "never" and 5 = "repeatedly." Therefore, the highest raw score was 150 and the lowest 30. An example of a cognitive process is "I read articles to learn more about physical activity"; whereas an example of a behavioral process is "I use my calendar to schedule my physical activity time." Within the present sample, the cognitive measure was found to be internally consistent at both pretest (α = .87) and posttest (α =.90). Similarly, the behavioral measure exhibited high internal consistency at both pretest (α = .87) and posttest (α = .88).

Self-efficacy was assessed using a 5-item self-efficacy scale (Marcus, Selby, Niaura, & Rossi, 1992; see Appendix 6). An example item is: "I am confident I can participate in regular physical activity when it is raining or snowing." Each item was weighed on a 5-point Likert scale where 1 = "not at all confident" and 5 = "very confident." Consequently, the highest raw score would be 25 and the lowest 5. In this study, the internal consistency of self-efficacy was high at both pretest (α = .76) and posttest (α = .83).

Lastly, decisional balance was measured using the 10-item (5 pros and 5 cons) decisional balance scale of Plotnikoff, Blanchard, Hotz, and Rhodes (2001) (see Appendix 7). A sample perceived pro item is "physical activity would help me reduce

or manage stress" and an example of a perceived con item is "physical activity would take too much of my time." The responses varied from 0 = "not at all" to 5 = "very much." In the present sample, the internal consistency of the pro scale was $\alpha = .82$ at pretest and $\alpha = .88$ at posttest, indicating high reliability. Contrary, the internal consistency of the con scale was moderate at both pretest ($\alpha = .57$) and posttest ($\alpha = .64$).

2.2.3 *Design*

This was a randomized control trial with two experimental and one control group. Baseline measures were taken, followed by the intervention program, and then post-intervention measures were obtained. From the 303 individuals who qualified for the study, 151 completed the baseline measures and 75 filled out the posttest study questionnaires. Following baseline assessment, participants were randomly assigned to each group.

Each of the experimental groups received a 4-week physical activity motivational program with a different lesson plan for each week. One of the experimental groups (interactive group) had the opportunity to participate in the study web-based discussion board to facilitate small group interactions. The other experimental group (web-only group) received the same physical activity motivational program, but did not have the opportunity to engage in discussions. Participants in the discussion group were randomly assigned within 7 subgroups (about 7 people per subgroup) to facilitate the discussion process. Guidelines about the ways to use the discussion board and structured weekly topics for discussion were provided. Such

topics included the identification and elimination of physical activity barriers, goal setting, reward system, and commitment to an active lifestyle.

The control group was an attention control group. During the experiment, this group received a "thought of the week" and encouraging messages through email to maintain their attention and interest in the study.

2.2.4 *Intervention*

The weekly intervention materials were targeted on physical activity initiation and increase. The motivational materials were developed using constructs of the TM. Specifically, a list of empirically tested physical activity barriers related to adults with physical disabilities was developed to facilitate behavior change (Rimmer, Rubin, & Braddock, 2000; Zhu, 2001). Certain ways to overcome the barriers were also suggested based on the constructs of the TM (e.g., social support, goal setting and physical activity monitoring, positive perceptions related to environmental and policy changes, role modeling, self-rewarding, and information about physical activity benefits). The program formatting was simple providing structured and easy-to-follow information (Krug, 2000).

The program materials were distributed to 13 experts for pilot testing. The panel of experts was asked to evaluate the effectiveness of the program using the Educational Materials Review Form Questionnaire (U.S. Department of Health and Human Services, 1989; see Appendix 8) and encouraged to provide additional feedback. From the panel of experts, 7 responded providing constructive feedback to improve the intervention program. The experts represented adults with physical disabilities, behavioral change scientists, adapted physical educators, health educators,

and distance education learning faculty. The final format of the 4-week intervention materials can be viewed at the following web links until 09/01/2004: http://www.disability-health.info/wk1_intro.htm, http://www.disability-health.info/wk2_a.htm, http://www.disability-health.info/wk3_a.htm, http://www.disability-health.info/wk4_a.htm. Each week's lesson was delivered to the experimental groups through email, and process evaluations were completed whereby each week's lesson was evaluated using a Likert scale. Specifically, participants were asked to rate how helpful the information of each weekly lesson was on a 5-point scale where "1 = very helpful" and "5 = not helpful at all." Additional weekly messages were delivered to the participants encouraging them to follow the web links and provide feedback for each lesson. In week 4, participants were asked to provide a summative evaluation related to the usefulness of the whole motivational program using a modified (i.e., user friendly) version of the Educational Materials Review Form Questionnaire.

2.2.5 *Hypothesis*

A hypothesis of this study was that both experimental groups were expected to improve their physical activity level to a higher degree than the control group.

2.2.6 *Research question*

The main research question of the study was the following: which of the two experimental groups (i.e., interactive vs. non-interactive) would exhibit higher physical activity levels following the intervention?

2.2.7 *Primary statistical analysis*

The Statistical Package for the Social Sciences (SPSS version 11) was used to analyze all data in the study. A 3 x 2 (group x time) mixed design repeated measures ANOVA was conducted to identify potential main effects and interactions in the change pattern of physical activity from pretest to posttest.

2.2.8 *Secondary statistical analysis*

A 3 X 2 (group x time) doubly-multivariate analysis was conducted to identify the effects of the motivational materials and time on the change pattern of processes of change, self-efficacy, and decisional balance. Chi-square analyses were used to examine change patterns in the stages of change from pretest to posttest.

2.3 Results

2.3.1 *Participant characteristics*

At baseline, 151 participants, enrolled in the study, completed the survey instrument, and were randomly assigned across groups as follows: web-based group (i.e., non-interactive) = 50 people (33%), web-based plus discussion group (i.e., interactive) = 51 people (33.8%), and control group = 50 people (33%). At posttest, there was a 50% response rate resulting in the following distribution of participants across groups: web-based group = 22 people (29.3%), web-based plus discussion group = 24 people (32%), and control group = 29 people (38.7%). It can be observed that the distribution rate of the participants across groups between pretest and posttest is almost similar, with the highest representation being in the control group. Dropout rates did not differ across groups (χ^2 [2, N = 151] = 2.2, p = .34).

Similarly, participants who remained in the study were not different in demographic characteristics from those who dropped (Table 2.1). Chi-square tests were performed for disability type, education, ethnicity, gender, health insurance, marital status, and stages of change. Independent-sample t-tests revealed no differences between study participants and those who dropped in age (t (149) = 1.3, p = .20), year of disability onset (t (102) = .23, p = .82), and income (t (43) = 1.5, p = .15). The mean age for the participants who remained in the study (n = 75) was 39 years (SD = 8.6) and the mean age for those who dropped (n = 76) was 37 years (SD = 8.6). Similarly, the average year of disability onset for the study participants (n = 55) was 21.4 (SD = 11.8) and the average year of disability onset for those who dropped from the study (n = 49) was 20.2 (SD = 11.2). Lastly, the average income for the participants who remained in the study (n = 24) was $37,250 ($SD$ = $32,244) and the average income for those who dropped (n = 21) was $25,258 ($SD$ = $21,000). Most of the participants were inactive, adult, female, Caucasian, well educated, and had health insurance. From those individuals who reported their annual income, a high range of responses can be observed with an average income value being close to a middle-class income.

Table 2.1. Demographic characteristics of study participants and dropouts

Variable	Participants ($n = 75$)	Dropouts ($n = 76$)	p
Disability type			.68
% Cerebral palsy	19	24	
% Multiple Sclerosis	21	17	
% Other [a]	27	27	
% Spinal Cord Injury	33	32	
Education			.29
% College graduate	49	43.4	
% Graduate degree	29	22.4	
% High school graduate	4	9.2	
% Some college/no degree	17	22.4	
Ethnicity			.89
% African American	5	4	
% Caucasian	89	87	
% Other [b] and N/A	5	9	
Gender			.11
% Female	72	83	
% Male	28	17	

Table 2.1. (Continued)

Health insurance			.12
% Yes	96	89.5	
% No	4	10.5	
Marital status			.86
% Divorced	13	17.1	
% Living together	8	9.2	
% Married	39	31.6	
% Separated	1.3	1.3	
% Single, never married	39	39.5	
Stage of change (baseline) [c]			.79
% Precontemplation	10	15.8	
% Contemplation	37	40.8	
% Preparation	33	30.3	
% Action	9	6.6	
% Maintenance	9	6.6	

[a] Other = amputation, muscular dystrophy, sensory impairments, etc.

[b] Other = Hispanic or Latino and American Indian or Alaskan.

[c] All participants reported being in Precontemplation, Contemplation, and Preparation at the prescreening, which occurred 4 months prior to baseline assessment.

2.3.2 *Physical activity change*

A 3 x 2 mixed design repeated measures ANOVA was calculated to examine the effects of the web-based materials and time on the total score of physical activity. The time x treatment interaction approached statistical significance (F (2, 72) = 2.8, p = .07), and the main effect for time (F (1, 72) = 1.1, p = .30) and treatment (F (2, 72) = 1.6, p = .20) were not significant. The means and standard deviations of the physical activity scores for pretest and posttest are reported in Table 2.2.

Table 2.2. Total physical activity scores between pretest and posttest

Time	Group	*n*	*M* (MET)	*SD*
Pretest	Web only [a]	22	13	12
	Discussion [b]	24	17.3	16.7
	Control	29	23.5	15
Posttest	Web only [a]	22	17.2	13
	Discussion [b]	24	20.2	12.3
	Control	29	20.6	16.9

[a] Web only = Experimental group that received only web-based materials.

[b] Discussion = Experimental group that received both web-based and discussion materials.

Although there were no statistically significant findings for total physical activity level, there was a significant time x treatment interaction effect (F (2, 72) = 3.3, p = .04) for the leisure-type physical activity sub-category of the PASIPD

questionnaire. As can be observed in Table 2.3, the experimental groups increased their leisure-type physical activity from pretest to posttest whereas a decrease appeared in the control group. The Tukey post-hoc analysis did not reveal any statistically significant differences in leisure-type physical activity across groups. There was neither statistically significant time x treatment interaction (Wilk's Λ (2, 72) = .97, p = .34), time (Wilk's Λ (1, 72) = .98, p = .25) nor treatment effect (F (2, 72) = .39, p = .67) for household physical activity. Similarly, there was neither statistically significant time x treatment interaction (Wilk's Λ (2, 72) = .99, p = .67), time (Wilk's Λ (1, 72) = .99, p = .78) nor treatment effect (F (2, 72) = 1.85, p = .16) for work related physical activity.

Table 2.3. Leisure-type physical activity scores between pretest and posttest

Time	Group	*n*	*M* (MET)	*SD*
Pretest	Web only [a]	22	4.6	4.5
	Discussion [b]	24	7.4	9.2
	Control	29	9.3	7.7
Posttest	Web only [a]	22	7.9	7.3
	Discussion [b]	24	8.5	6.4
	Control	29	6.9	7.8

[a] Web only = Experimental group that received only web-based materials.

[b] Discussion = Experimental group that received both web-based and discussion materials

As an adjunct to significance tests, effect sizes (ES) were calculated between pretest and posttest for both total and leisure-type physical activity across groups. Cohen (1969) suggested the following criteria to facilitate ES interpretation: a) small ES = less than .20, b) moderate ES = around .50 and c) large ES = higher than .80. The web-based group had a moderate increase in leisure-type (ES = .54) and a small increase in total (ES = .34) physical activity from pretest to posttest. The web-based group with the discussion board had a small increase in both leisure-type (ES = .14) and total (ES = .20) physical activity. The control group had a small decrease in both leisure-type (ES = -.30) and total physical activity (ES = -.18).

Taking the pretest scores into consideration, the web-based group had a moderate increase in total physical activity (ES = .50) at the posttest compared with the control group. The difference in total physical activity between the web-based and the discussion group (ES = .27) as well as between the discussion and the control group (ES = .25) was small at the posttest. For leisure-type physical activity, the difference between the web-based and the control group (ES = .27) as well as the difference between the web-based and the discussion group (ES = .25) was small at the posttest. Lastly, there was a small difference (ES = .04) in leisure-type physical activity between the discussion and the control group at the posttest.

2.3.3 *Secondary outcome variable change*

A doubly-multivariate analysis was conducted to examine potential effects of the intervention program and time on self-efficacy, decisional balance, cognitive and behavioral processes of change. There was neither a statistically significant time x treatment interaction (Wilks' Λ (8, 138) = .84, p = .14; power = .68), time (Wilks' Λ (4, 69) = .93, p = .26; power = .40), nor treatment effect (Wilks' Λ (8, 138) = .90, p = .54; power = .40) for the dependent variables. The means and standard deviations of each variable between pretest and posttest are reported in Table 2.4.

Table 2.4. Pretest and posttest descriptive statistics of secondary outcome variables

Variable	Time	Group	*n*	*M*	*SD*
Self-efficacy	Pretest	Web only [a]	22	15.7	4.5
		Discussion [b]	24	15.8	4.4
		Control	29	15.8	4.2
Self-efficacy	Posttest	Web only [a]	22	15.2	4.8
		Discussion [b]	24	16.3	3.8
		Control	29	15.4	4.0
Decisional Balance	Pretest	Web only [a]	22	9.8	6.7
		Discussion [b]	24	10.2	5.7
		Control	29	11.4	5.8
Decisional Balance	Posttest	Web only [a]	22	8.7	6.7
		Discussion [b]	24	12	6.6
		Control	29	10.8	3.9
Cognitive Processes	Pretest	Web only [a]	22	47.2	10.9
		Discussion [b]	24	50.8	10
		Control	29	50.5	8.1

Table 2.4. (Continued)

Cognitive Processes	Posttest	Web only [a]	22	45.7	12.4
		Discussion [b]	24	49.8	10.5
		Control	29	51.7	8.2
Behavioral Processes	Pretest	Web only [a]	22	36.5	11.3
		Discussion [b]	24	36.2	7.3
		Control	29	41.2	10.3
Behavioral Processes	Posttest	Web only [a]	22	38.7	12.4
		Discussion [b]	24	39.6	9.0
		Control	29	40.4	9.8

[a] Web only = Experimental group that received only web-based materials.

[b] Discussion = Experimental group that received both web-based and discussion materials

Overall, the stages of change did not change significantly across groups from pretest to posttest (χ^2 [4, N = 75] = 7.0, p = .14). However, when studied separately, the proportion of participants in the web only group (59%) that progressed from pretest to posttest was significantly higher than the proportion of individuals who progressed in the control group (27.6%) (χ^2 [1, N = 51] = 5.13, p = .02). This difference was also meaningful with a contingency coefficient of .30 (Fleiss, 1973). The stage of change distribution within each group at the end of the intervention can be observed in Table 2.5. As can be seen, most of the participants in the web only

group were distributed in the preparation and action stages. The stage distribution of the discussion group was almost equal from contemplation to maintenance. In the control group, most of the participants were distributed between the precontemplation and preparation stages with some individuals being identified in the maintenance stage.

Table 2.5. Stage of change distribution across groups at posttest

Stage of change	Web only ($n = 22$)	Discussion ($n = 24$)	Control ($n = 29$)
% Precontemplation	13.6	4.2	10.3
% Contemplation	18.2	29.2	34.5
% Preparation	31.8	20.8	34.5
% Action	27.3	25	3.4
% Maintenance	9.1	20.8	17.2

2.3.4 *Program evaluation*

Using a Likert scale with scores ranging from 1 (lowest score) to 5 (highest score), about 40 study participants evaluated the helpfulness of each weekly lesson with an average value of 3. Twenty-seven study participants provided their feedback on the whole program. Overall, the program was evaluated on a 5-point Likert scale (1 = lowest score; 5 = highest score) on its ease to use ($M = 4.4$, $SD = .69$), ease to understand ($M = 4.4$, $SD = .64$), helpfulness ($M = 3.4$, $SD = 1.4$), and ability to change

($M = 3.4$, $SD = 1.4$) and maintain physical activity ($M = 3.39$, $SD = 1.2$). Additionally, the program was rated as well organized ($M = 4.3$, $SD = .95$) with most of the respondents (74%) finding the program appropriate for national distribution among the posited populace. Most of the respondents expressed positive comments about the program such as its ease of use, appeal, race and gender representation of graphics, and appropriate tailoring to mainly inactive individuals. One participant expressed a concern applying the program to people with more severe disabilities.

2.4 Discussion

This study examined the efficacy of web-based and theory-driven motivational intervention to change the physical activity level of primarily inactive adults with physical disabilities. The mixed design repeated measures ANOVA analysis revealed a significant time x treatment interaction effect for leisure-type physical activity. There were neither statistically significant interaction nor main effects for total physical activity scores, which encompass leisure-type, household, and work-related activities. Similarly, univariate analyses did not reveal significant changes in household and work-related physical activity between pretest and posttest. This finding is not surprising because this study's motivational materials mainly recommended leisure-type activities rather than household or work-related tasks. In the study of Blissmer and McAuley (2002), their intervention program that focused on leisure-type physical activities did not have any effect on total physical activity levels either. Additionally, from the descriptive statistics (see Table 2.2), the web only (i.e., non-interactive) group had lower physical activity level than the interactive and

control group. Therefore, the change differences between pretest and posttest across groups may be hindered from pretest differences.

In this study, according to the ES, there was a moderate increase in leisure-type physical activity for the experimental group that received only the web-based materials. Contrary, there was a small decrease in leisure-type activities for the control group. Taken together, these findings partially support the efficacy of the web-based materials on leisure-type physical activity change.

The lack of difference in physical activity scores between the two experimental groups (i.e., interactive vs. non-interactive) may be attributed to the minimum number of messages posted on the bulletin board for the interactive group. Only 3 of the 7 discussion sub-groups exchanged a total of 6 messages on the bulletin board, although the discussion groups were prompted 3 times per week during the 4-week program delivery to engage in discussions. Similarly, constructive steps were taken to facilitate discussion among groups such as explicit report of the discussion topics and ways of interaction (J. Dorbolo, personal communication, March 23, 2003). Similar results have been reported by Tate et al. (2001). A reason for the low interaction rate may be related to degree of comfort to exchange personal experiences on the web with unfamiliar groups of people.

The doubly-multivariate analysis did not identify any significant changes of the processes of change, self-efficacy, and decisional balance across groups between pretest and posttest. This finding needs to be viewed cautiously because of the small sample size and the analyzed statistical power (< .80, Kraemer & Thiemann, 1987) as can be observed in the results section.

About 1165 participants were initially interested in the study; however, only 303 qualified to participate following the prescreening assessment. From those individuals, 151 filled out the baseline questionnaires with a 50% recruitment rate (i.e., participants remained in the study following prescreening; Sarkin, Marshall, Larson, Calfas, & Sallis, 1998). This low recruitment rate might have been caused by the amount of information provided to the participants during recruitment. The study design was a blind set up and thus participants entering the study were not aware of its actual purpose. The individuals who qualified to participate were mainly inactive, indicating the difficulty to motivate mainly inactive people to participate in a physical activity intervention program. Another potential reason for the low recruitment rate may be the time difference (i.e., 4 months) between recruitment and baseline assessment. Similarly, a 50% attrition rate was found between the pretest and posttest. The difficulties to recruit and maintain participants within health promotion programs have been widely recognized (e.g., Sarkin et al., 1998). In the study of Marcus et al. (1998), 58% of the participants responded to a 3-month physical activity intervention. In the present study, a potential explanation for the low response rate may be related to several factors such the degree to which the study sample was representative of the population, the high number of individuals who were screened out of the study, the small compensation rate for the participants, and degree of comfort to use the web. Although the response rate was low, the proportion of individuals who remained in the study was equally distributed across groups. Additionally, people who remained in the study had similar baseline characteristics as those who dropped from the study.

The high attrition rate led to a small sample size to complete complex analyses such as the doubly-multivariate design. Another study limitation was the limited time (i.e., 1 month) of the intervention program to verify its efficacy. However, from the onset the aim of this study was to conduct a preliminary assessment of the feasibility and efficacy of web-based physical activity materials among a unique and understudied population segment. Before investing even more resources (financial and otherwise) this initial step was felt to be important. The results of this study partially support the efficacy of the materials and encourage further investigation of such intervention programs to the population of interest. In the past, one-month motivational programs directed to enhance physical activity participation have also been identified as successful (e.g., Cardinal & Sachs, 1995, 1996). The low rate of message exchange between the study participants of the discussion sub-groups hinders result interpretation related to the effectiveness of interactive motivational materials. The program materials were stage-oriented matching in an inclusive manner the early stages of change. Non-inclusive and specific materials to each of the early stages of change may appear more effective on physical activity change than inclusive-based materials. Lastly, the homogeneity of the participants limits the generalizability of the results. The challenge to recruit and sustain under-representative and diverse populations (e.g., African-Americans) within health promotion studies has been recognized (Fitzgibbon et al., 1998). It seems that mainly Caucasian individuals with relatively high socioeconomic status tend to be interested in health promotion studies. In this study, only a few participants reported their annual salary. For those reporting

this information, middle-class income was reported (though the standard deviation is rather large).

Beyond the study limitations, it is important to recognize the project's uniqueness and strengths. This is the first true experimental design using web-based motivational materials toward physical activity for adults with physical disabilities. An additional strong methodological asset of the study was the content validation (i.e., use of the panel of experts) of the program as well as the participant process and summative assessment of program effectiveness. Overall, the study participants expressed positive comments regarding the content, appeal, and efficacy of the intervention program. Although the cost of the intervention program may seem high ($9,000), there were several benefits of web use. In particular, through the web, a large number of people were reached at times and places of convenience all across the nation. The chance to reinforce immediate social support was provided through the discussion board. The format of the intervention facilitated the delivery of immediate feedback to the participants related to the recognition of physical activity barriers and ways to overcome them. Additionally, the study data were integrated automatically to a data file for further analysis. This can decrease the time for and increase the accuracy of data entry. Lastly, the already developed study intervention can be easily modified and expand in a cost-effective manner for future research projects. The wide rate of participant reach within the whole nation who can benefit from such web-based intervention programs can compensate for perceived high initial costs of program development. This study partially managed to change physical activity behavior and

especially leisure-type activities for health and wellness among a sedentary population with disabilities.

The results of this study offer a unique contribution to future studies. The development and use of web-based physical activity motivational materials needs to continue in order to enhance positive behavior change. Advanced technology (e.g., artificial intelligence, expert systems design) can be used in future intervention programs to increase the development and efficacy of individually tailored programs. For example, such technological usage may facilitate the description of physical activity barriers and ways to overcome them on a personal basis. Similarly, physical activity barrier assessment in a qualitative manner can further facilitate the explanation of behavior change and thus increase the effectiveness of physical activity programs. The advances of technology can also be used to observe the number of individuals who follow web-based intervention programs and their time allocation on those interventions. In this way, physical activity change can be examined in accordance with actual program adherence. The length of the present program can expand to examine its efficacy over longer periods of time. Other health-related behavior change interventions such as smoking cessation, reproductive health, seat belt use, and elimination of alcohol and drug abuse can be integrated in a physical activity change program to facilitate the examination of health and wellness for people with disabilities using an interdisciplinary approach. Future studies should also examine the reasons that may hinder and facilitate group discussions on the web in order to examine their efficacy on behavior change. Lastly, further investigation of the efficacy

of web- vs. print-based materials on participant retention and behavior change is warranted.

3 MOTIVATING INDIVIDUALS WITH DISABILITIES TO BE PHYSICALLY ACTIVE

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3.1 Abstract

The benefits of exercise and/or physical activity among individuals with disabilities have been well documented. However, very few people with disabilities are active. In this paper, a series of contemporary theoretical models will be presented to facilitate the identification of strategies to increase individuals with disabilities' opportunities and motivation toward physical activity/exercise. These models can be empirically tested by researchers, and practitioners can be guided by the hypothesized relationships to determine optimal strategies for motivating physical activity participation. This blend of theory, research, and practice in adapted physical activity scholarship may result in fostering free choices and equal opportunities for active, healthy lifestyles among those in the disability community.

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3.3 Introduction

Increasing the number of individuals with disabilities who are physically active is a public health priority [United States Department of Health and Human Services (USDHHS), 2000]. However, few studies have confronted the challenging task of identifying strategies to increase physical activity participation among people with disabilities. In combination with a limited theoretical basis in adapted physical activity to guide empirical work, the task of determining ways to promote more opportunities and choices for physical activity is becoming even more imputing.

The purpose of this paper is to overview several theoretical models that address the phenomenon of motivation toward physical activity participation. As noted, few of the models have been tested for people with disabilities specifically. Regardless, many strategies to increase motivation can be derived from these models and this may provide a useful starting point for scholars and practitioners who work in adapted physical activity.

In this paper, and as proposed by DePauw (2000), disability is defined as a social construct. Therefore, inactivity among people with disabilities is viewed as the result of psychosocial dynamics (i.e., social minority model), which may render physical activity as undesirable, rather than as the outcome of disability per se (i.e., medical model).

3.3.1 *Physical activity benefits*

According to the Centers for Disease Control and Prevention (CDC, 1999), physical activity can be very beneficial for people with and without disabilities. Both physiological and psychological benefits can be obtained from regular physical

activity involvement. For example, regular physical activity (i.e., 3 or more days per week for 20 or more minutes) can increase health-related physical fitness such as cardiovascular endurance (CVE), muscle strength and endurance, and flexibility. Weight control, prevention of obesity and other health-related conditions such as cardiovascular disease, diabetes, colon cancer, hypertension, osteoporosis, and arthritis can all be reduced by physical activity. Psychological benefits such as decreased anxiety and depression may also be realized, with positive improvements in emotions, self-esteem, and self-confidence.

Women with disabilities such as spinal cord injury, limb deficiency, brain injury, post-polio, and spina bifida can utilize exercise and physical activity in order to increase self-control, psychological empowerment, and personal freedom. For the same populace, physical activity can optimize body-mind functioning, challenge disability stereotypes, and facilitate personal fulfillment (Guthrie, 1999).

Participation in sports and exercise can enhance self-esteem and strengthen athletic identity thereby reducing perceived negative external evaluations of one's body physique (Martin, 1999). Another positive effect of sports and exercise participation for college students with physical disabilities is enhanced perceived competence within and outside sport settings, social integration, and goal setting facilitation and accomplishment (Blinde & Taub, 1999).

Individuals with intellectual disabilities (ID) can increase vocational functioning (Eichstaedt & Lavay, 1992) and decrease inappropriate, stereotypical behaviors (Elliot, Dobbin, Rose, & Soper, 1994). Similarly, aerobic exercise has been

found to decrease depression and increase psychological well-being among individuals who experience major depressive episodes (Bosscher, 1993).

In spite of these benefits, only 23% of individuals with disabilities engage in regular physical activity, which is characterized by at least 20 minutes of exercise on 3 or more days per week (USDHHS, 2000). One reason for this situation might be low motivation to participate in regular physical activity. Therefore, it is of paramount importance to identify strategies to increase motivation toward healthy, active lifestyles (Durstine, Painter, Franklin, Morgan, Pitetti, & Roberts, 2000).

3.4 Motivational Theories

In this section, constructs derived from motivational, education-oriented theories will be reviewed, as well empirical studies that have tested these constructs among individuals with and without disabilities. Specific strategies to initiate and sustain motivation toward physical activity participation based on the theories/constructs will be suggested as well. A brief overview of each theory and its practical applications is presented in Table 3.1.

Table 3.1. Motivation physical activity theories among people with disabilities

Theory	Constructs	Purpose/Aim	Strategies
Achievement Goal Theory (Nicholls, 1989)	Task-Orientation Ego-orientation Mastery-oriented climates	Promote mastery-oriented climates for motivation	Task-oriented climates Control and time Self-evaluation
Competence Motivation Theory (Harter, 1978)	Perceived competence Reinforcement Social settings Self-determination	Ways to initiate and sustain intrinsic motivation	Social support Autonomy Realistic expectations
Socialization Model (Eccles & Harold, 1991)	Attitudes Successful expectations Achievement choices	Social constructs modification for achievement choices	Positive attitudes Infusion Equal opportunities Free choices

Table 3.1. (Continued)

Movement Confidence (Griffin & Keogh, 1991)	Movement confidence Movement competence Movement sense Activity participation	Positive movement experiences for motivation	Enjoyment Integration Social skills Positive attitudes Participation time
Social Cognitive Theory (Bandura, 1997)	Modeling Attention Retention Motivation Skills reproduction	Effective modeling for motivation and skill development	Task salience Eye contact Show and tell model Meaningful tasks Guided action
Transtheoretical Model (Prochaska & DiClemente, 1982)	Stages of change Processes of change Self-efficacy Decisional balance	Use of constructs to initiate and sustain motivation	Stage-matched programs Social support Success Reward, self-talk Leisure-time tasks Audience reach Equal opportunities

3.4.1 *Achievement goal and competence motivation theories*

Achievement goal theory (Nicholls, 1989) and competence motivation theory (Harter, 1978) are examined together in order to demonstrate how certain constructs of the theories can be interrelated and affect motivation for people with disabilities. On the basis of achievement goal theory (Nicholls, 1989), a person can be task (i.e., ability is perceived as self-improvement, learning, and mastery of skills) or ego (i.e., ability is perceived as outperforming others and socially comparing well) oriented. At the same time, one can be both task and ego oriented since these constructs are independent from each other. Following Nicholls' theory (1989), a task-oriented individual will more likely choose challenging tasks in sports, exert maximum effort, experience positive affect, and eventually persist in sports and exercise. However, an ego oriented individual might exhibit high perceived competence, choose challenging tasks, exert maximum effort and experience positive affect as long as winning is the outcome. If the ego oriented person is outperformed by others, then positive affect may decrease and persistence in sports cannot be assured. Similarly, a mastery motivational climate nurtures task-oriented individuals whereas a performance motivational climate nurtures ego oriented individuals (Kavussanu & Roberts, 1996).

Within the realms of competence motivation theory (Harter, 1978), competence motivation is a multidimensional construct that influences both the initiation of mastery attempts in particular achievement domains (e.g., cognitive, social, and physical) and the development of characteristic achievement behaviors such as perceptions of performance control (i.e., self-determination), perceived competence, and positive affect. If the mastery attempts are perceived as successful

through optimal challenges, the person will more likely receive positive reinforcement (i.e., supportive social settings) by significant others, exhibit high levels of perceived competence and a sense of internal control. Coupled with determining her/his own reward system, the individual should experience positive affect. Positive affect will then result in an intrinsically motivated person who uses internal criteria to evaluate success resulting in more mastery attempts. Readers are reminded, however, that perceived competence per se and supportive environments are not enough to enhance intrinsic motivation. Another important element of intrinsically motivated personalities is the perception of autonomy. Perception of autonomy refers to self-determination (Ryan & Deci, 2000).

Only a few studies have examined these constructs and their interrelationships among those with disabilities. For example, Causgrove Dunn (2000) studied potential relationships between goal orientations, perceived motivational climates, and perceived competence for youngsters with movement difficulties. Her study attempted to explain the reasons some children with movement difficulties exhibit high perceived physical competence (Causgrove Dunn & Watkinson, 1994) since other studies reveal the opposite (Rose, Larkin, & Berger, 1997). The findings of her study revealed that high task oriented youngsters with movement difficulties adopted a mastery-oriented climate, which was positively related to perceived competence. On the contrary, high ego oriented individuals adopted a performance climate, which was negatively related to perceived competence. However, ego orientation had a direct positive relationship with perceived competence, thus supporting Nicholls' model (1989).

Accordingly, if a student with movement difficulties is task oriented, he/she will prefer a mastery climate demonstrating high-perceived competence and so too may exhibit high intrinsic motivation to participate in physical activity. On the other hand, an ego-oriented individual may experience high-perceived competence as long as he/she socially compares well. In sum, high perceived performance climates nurturing ego perspectives in sports might result in low perceived competence and eventually dropout.

Beyond social settings and reinforcement, perceived competence and eventually motivation are influenced by other constructs. For example, the influence of integrated and segregated sports participation on perceived competence among women with mild to moderate ID has been investigated (Ninot, Bilard, Delignieres, & Solokowski, 2000). The findings revealed that both basketball and swimming groups who participated in segregated and integrated Special Olympics International exhibited decreased perceived athletic competence across 8-months of sports participation, although the development of sports specific skills and general self-esteem increased. Surprisingly, the integrated basketball group had lower perceived competence than the segregated one. This is contradictory to Harter's competence motivation theory (1978), which posits that successful experiences in sports can increase perceived competence. The authors indicated that the results of their study could be explained by the fact that the participants resided in segregated environments before sports participation where systematic encouragement and maximal success were provided. Thus, it is possible that these individuals overestimated their perceived

competence in the segregated environment and with the demands in integrated environment being higher, their perceived competence dropped.

Although high amounts of positive reinforcement can be negative, contingent based social reinforcement (i.e., praise) and self-recording (i.e., self-evaluation) can be effective for increasing the duration of a submaximal physical activities, at least among adolescents with ID (Deener & Horvat, 1995). In addition, providing preferred tokens (i.e., token economy) after the occurrence of a desirable behavior can be an effective type of reinforcement. Tokens are a form of reinforcement (e.g., gold stars, tangible rewards) that can be exchanged for effort, task accomplishment, and ability in increasing physical activity participation and persistence (Loovis, 2000).

In summary, in order to enhance motivation for individuals with disabilities, scholars and practitioners in the area of adapted physical activity should strive to establish mastery oriented motivational climates, which nurture task oriented individuals in order to increase their perceived competence, intrinsic motivation, physical activity adherence, and decrease attrition. Ego oriented climates may also be useful as long as there is a self-reference point (i.e., task orientation) cultivated.

Mastery oriented environments can be developed by offering challenging tasks that reinforce active involvement and equal opportunities. Allowing some control (i.e., autonomy) among participants in decision making, recognizing and rewarding individual effort, encouraging self-evaluation, allowing time for improvement, and introducing heterogeneous groups within activity settings can be some of the ways to decrease discrimination and foster mastery oriented climates and task oriented identities (Epstein, 1988). Promoting heterogeneous group arrangements by

integrating individuals with and without disabilities into the same physical activity settings should not diminish perceived competence or self-esteem by demanding unrealistic goals (Ninot, et al. 2000). Encouraging integrated environments with realistic expectations and self-evaluations without a decrease in general self-esteem can increase actual and perceived competence for individuals with ID. For example, a positive, moderate relationship has been found between actual and perceived basketball competencies among adolescent males with ID (Shapiro & Dummer, 1998).

3.4.2 *Socialization model*

According to the socialization model of Eccles and Harold (1991), personal expectations for success and the salience of sport achievement (i.e., self-determination) can be key mediators to activity choices for females and males. Some of the factors that influence the two key mediators are cultural stereotypes, behaviors and attitudes of the socializing agents, previous achievement related experiences, and an individual's goals. The focus in this paper will be on the attitudes and behaviors of the socializing agents (e.g., parents, instructors, and media) that influence activity choices (Cardinal, 2001; Cardinal & Cardinal, 2001). Negative attitudes may result in low success expectations and physical activity salience leading to sports attrition. In this case, the value of physical activity as a personal choice (i.e., self-determination) is influenced by the attitudes of the socializing agents. Negative attitudes may lead to physical activity devaluation if the choices seem forced rather than personally relevant or self-selected.

This certain path of the model has not been tested for individuals with disabilities. However, it has been supported that favorable attitudes toward teaching

individuals with disabilities in integrated and segregated settings can be influenced by several factors. Such factors have been identified as proper training and coursework in adapted physical activity, hands-on experience, gender (i.e., females tend to have more positive attitudes than males), and disability type (i.e., more negative attitudes towards severe disabilities) (Cardinal, 1992; Conatser, Block, & Lepore, 2000; Folsom-Meek, Nearing, Groteluscen, & Krampf, 1999).

As noted, disability is socially constructed within the realm of constantly changing sociocultural principles, ideas, and expectations. The socialization process into and through sports can differ between individuals with and without disabilities. The socialization model of Eccles and Harold (1991) identifies the importance of attitudes of the socializing agents to physical activity choices and future expectations. Positive attitudes toward teaching individuals with disabilities can increase motivation toward physical activity participation. Such positive attitudes can be derived from appropriate training of the adapted physical activity specialists (Conatser, et al. 2000; Folsom-Meek et al. 1999). Appropriate training in the area of adapted physical activity should not only be the responsibility of adapted physical educators, but also of all physical educators. This can be achieved by constantly and gradually integrating information regarding disability into the general physical education curriculum (i.e., infusion process). In that way, the disabilities culture can be exposed to all professionals without fostering a categorical approach (i.e., adapted physical education vs. general physical education) (DePauw, 2000).

Another important aspect of the Eccles and Harold (1991) model is self-determination. Physical activity participation should be a free choice given that

choices and ways to detect them are provided. Favorable attitudes toward physical activity participation and equal opportunities should be fostered within the disability community. In that way, self-determination can increase allowing engagement in personal directed decision-making without ill advised influences (Wehmeyer, Kelchner, & Richards, 1996; Deci & Ryan, 1985). Accordingly, increased self-determination can act as a mediator toward physical activity participation (Reid, 2000).

3.4.3 *Movement confidence*

Movement confidence may increase motivation in physical activity participation. According to the movement confidence model (Griffin & Keogh, 1982), movement confidence is the outcome of the interaction of movement competence and movement sense. Movement competence refers to perceived ability of adequacy on certain activity skills. Movement sense includes the perceived sensations (i.e., positive or negative) that may follow physical activity participation. For example, if participation in sport and exercise brings feelings of relaxation, excitement, and enthusiasm (i.e., movement sense) and contributes to mastery of skills (i.e., movement competence) then movement confidence increases. Movement confidence, in turn, can increase activity choices, physical activity participation and persistence, which are all elements of motivation. Increased physical activity participation provides experiences, which can impact movement competence and movement sense. Thus, motivation can be influenced in a cyclical process with movement confidence as a major mediator of behavior change and maintenance.

Individuals with physical, sensory, emotional, or social difficulties may experience negative consequences from physical activity participation (e.g., negative attitudes from peers, unsuccessful attempts, lack of enjoyment, segregation, limited time on task, injuries) resulting in low movement competence and perceived negative sensory expectations (e.g., fatigue, embarrassment, physical injury, muscle pain). These negative self-perceptions may lead to low movement confidence and eventually attrition (Maassen, 2001).

Scholars and practitioners in adapted physical activity should provide environments that reinforce successful experiences, optimal challenges, supportive integration, movement and social skill development, and enjoyment. Keogh, Griffin, and Spector (1981) proposed task variation and verbal or physical support to promote positive self-perceptions resulting in increased movement confidence, and thus greater motivation toward physical activity participation for disabled populations.

3.4.4 *Social cognitive theory*

Modeling coupled with reinforcement has been reported to increase time on task for children with autism (Igo, French, & Kinnison, 1997). Effective modeling can increase skill development and provide psychological benefits such as reduced anxiety and depression, reduced apprehension, and increased self-confidence and motivation (Bandura, 1997; Weiss, Ebbeck, & Wiese-Bjornstal, 1993).

According to Bandura's (1997) social cognitive theory, effective modeling can enhance attention to task relevant information and retention of the information as long as the individual is motivated and physically capable to reproduce the action. Several practical implications can be derived from this theory. For example, the salience of the

task and cognitive capacities of the observer can influence both attention and retention, thus maintaining eye contact and highlighting key points of the task are recommended instructional behaviors. Providing visual and verbal cues (i.e., "show and tell" model) can also increase both attention and retention (Maddalozzo, Stuart, Rose, & Cardinal, 1999). Exhibiting enthusiasm, explaining the importance of learning certain skills, and providing tasks with meaningful outcomes can further increase motivation. Lastly, measuring physical skills before physical activity participation can provide information about present level of performance. For individuals with limited physical skills, appropriate modifications, vicarious experiences, and guided action can make the task achievable thereby enhancing efficacy expectations and motivation (Bandura, 1997; Weiss et al., 1993).

3.4.5 *Transtheoretical model*

As stated earlier, lack of motivation can hinder participation toward physical activity. Motivational programs can be developed based on certain theoretical models such as the transtheoretical model (TM). All constructs of this model will be analyzed since they may play an important role in identifying motivational strategies. While the TM has not yet been applied to people with disabilities, a federally funded, multi-site research team is currently investigating the utility of this model within the physical activity domain. This work is being coordinated through the Rehabilitation Research and Training Center on Health and Wellness for People with Disabilities located at Oregon Health Science University. Furthermore, there is state and federal support for this model suggesting that it may be a catalyst for increasing motivation among disabled populations.

The stages of change are one dimension of the TM. There are five commonly acknowledged stages of change within the physical activity domain: (a) precontemplation, (b) contemplation, (c) preparation, (d) action, and (e) maintenance. Stages of change introduce an enduring dimension to change. That is, stages can be both stable and dynamic in nature. Adherence in a certain stage might last for long periods of time (i.e., stability), but there remains an openness (i.e., dynamic nature) to change (Cardinal, 1997b; Prochaska & Marcus, 1994).

Initially, the stages of change were used in psychotherapy for the termination or control of negative behaviors such as alcoholism and smoking (DiClemente & Hughes, 1990; O'Connel & Velicer, 1988; Prochaska & DiClemente, 1982; Prochaska, Velicer, DiClemente, & Fava, 1988). The same stages of change have been proposed for physical activity (Cardinal, 1995a, 1995c, 1995d; Cardinal, 1998b). According to their behavior and intention toward physical activity, an individual can be classified in one of the above stages of change (Cardinal, 1997a). Thus, physical activity level can be determined with regards to the stages of exercise behavior change (Cardinal, 1995c; Marcus, Selby, Niaura, & Rossi, 1992).

The earliest stage (i.e., precontemplation) characterizes someone who is not active and does not think of being active in the near future (i.e., within the next 6 months). During the contemplation stage, people are thinking of engaging in physical activities in the next 6 months, but have not tried to take action. In the next stage (i.e., preparation), individuals are planning to take action in the next 30 days and maybe have participated in some exercises, but not regularly. Persons in the action stage have been participating in regular physical activity for less than 6 months. In the

maintenance stage, the characteristic behavior is participation in regular physical activities for more than 6 months (Cardinal, 1995c; Cardinal, 1997a; Gorely & Gordon, 1995; Marcus & Simkin, 1993; Marcus et al., 1992).

In addition to the above stages, a sixth stage has been proposed called the termination stage (Prochaska & DiClemente, 1984). During this stage, people have established their behavior so well that it cannot change. This stage had been proposed relative to the elimination of negative behaviors (e.g., smoking cessation, substance abuse) and it may take 5 years to develop (Prochaska & Marcus, 1994; Prochaska & Velicer, 1997). However, in terms of maintaining a positive behavior such as physical activity for a lifetime, the termination stage has been relabeled "transformed" (Cardinal, 1999). To date, only a limited amount of evidence is available to support the possibility of a transformed stage within the physical activity domain (Cardinal & Levy, 2000).

Another dimension of the TM is the processes of change. These are specific activities and strategies that facilitate behavior change over time (Prochaska, Velicer, Guadagnoli, Rossi, & DiClemente, 1991). The 10 processes of change have been combined in two categories, the cognitive (e.g., consciousness raising, dramatic relief, self-reevaluation, and social liberation) and the behavioral (e.g., counter conditioning, contingency management, helping relationships, and stimulus control) (Prochaska et al., 1988; Prochaska, et al., 1991).

With regards to stages of exercise behavior change, it has been emphasized that people in the action stage use cognitive and behavioral processes more frequently than people in preparation do. In maintenance, the utilization of cognitive techniques

decreases, whereas the application of behavioral techniques remains the same as for those in action. In the precontemplation stage, both cognitive and behavioral processes are employed significantly less than in the later stages. Lastly, in preparation, behavioral strategies are utilized more than in contemplation, whereas cognitive techniques are preferred to the same degree as in contemplation (Marcus, Rossi, Selby, Niaura, & Abrams, 1992). This trend of processes of change utilization is different from the one found in smoking cessation. In quitting smoking, people in the early stages focus on the cognitive processes of change, whereas people in the late stages focus on the behavioral processes of change (Prochaska & Marcus, 1994).

The stages of exercise behavior change have been examined in conjunction with two other constructs of the TM (i.e., self-efficacy and decisional balance). Self-efficacy has been defined as one's level of self-confidence in accomplishing a specific behavior in a given situation (Bandura, 1997). In other words, one's belief to perform a specific behavior becomes a reality by the actual performance of the behavior. Within the physical activity domain, self-efficacy is a major determinant of one's stage of change for exercise. The highest scores in self-efficacy have been observed in the maintenance stage whereas the lowest have generally been reported in the precontemplation stage (Cardinal, 1997a; Marcus et al., 1992; Mutrie & Caddell, 1994; Wyse, Mercer, Ashford, Buxton, & Gleeson, 1995).

Based on the decisional balance model (Janis & Mann, 1977), the perceived benefits (i.e., pros) and costs (i.e., cons) of a behavior can affect whether one adopts a new behavior. In relation to the stages of exercise behavior change, individuals who are physically active (i.e., action and maintenance stages) perceive more benefits of

physical activity than those in the early stages (i.e., precontemplation/contemplation) (Marcus & Owen, 1992; Marcus, Rakowski, & Rossi, 1992; Naylor, McKenna, Barnes, & Christopher, 1995; Plotnikoff, Blanchard, Hotz, & Rhodes, 2001).

In summary, individuals can be classified into specific stages of change based on their physical activity level and/or intention to be physically active. Constructs such as the processes of change, self-efficacy, as well as the benefits and costs of physical activity can affect one's transition from the lower stages to the higher stages of change, as well as the prevention of relapse (Cardinal, 1998a).

3.5 Motivational Programs and Practical Implications

In this section, varying motivational programs that have been identified or can be recognized as effective on positive behavior change such as physical activity participation will be briefly reported. While clearly informed by the general motivational theories initially introduced in this paper, the majority of the intervention programs to be summarized are primarily based on the TM. Furthermore, these programs have been recommended to enhance motivation toward physical activity participation for the non-disabled. However, certain practical implications can be derived from these programs and the model itself for people with disabilities.

The stages of exercise behavior change can provide valuable information for identifying the proper intervention strategies for participation in physical activity (Blair, Dunn, Marcus, Carpenter, & Jaret, 2001; Cardinal, 1995; Wright, Patterson, & Cardinal, 2000). For example, it has been reported that a self-directed, goal oriented, 50-day intervention program was helpful in progressing people from the lower to the

higher stages of change among 1,192 employees (Cole, Leonard, Hammond, & Fridinger, 1998).

Cardinal and Sachs (1995d, 1996) examined the effectiveness of mail-delivered, stage-matched, self-instructional, personalized written strategies for improving women's leisure-time physical activity behavior and stage of change for exercise. Three groups (two experimental and one control) comprised mainly of African American women were examined. The group that received a stage tailored lifestyle exercise packet showed the most improvement in leisure-time exercise behavior and advancement through the stages of change for exercise following the intervention and at 6-month follow-up.

Another motivational transition program called Project GRAD (Graduate Ready for Activity Daily) was implemented to motivate senior undergraduate students to initiate or maintain physical activity after graduating from college (Sallis, et al., 1999). The program was stage-matched and it was developed on the basis of the processes of change, self-efficacy, and decisional balance. Results revealed that only for women was the program effective in enhancing strength and flexibility exercises and progressing participants from precontemplation and contemplation to action and maintenance.

Key components of a national campaign called "Ready. Set. Physical Activity is Everywhere you Go", to promote regular moderate physical activity for all people (*including people with disabilities*) has been developed by the Centers for Disease Control and Prevention (CDC, 2001) using components of the TM. This campaign can assist health professionals, educators, and local and state authorities to identify the

target population and provide accurate and positive messages regarding physical activity participation. The first step of the campaign is to identify the target audience on the basis of the stages of change. Once the population's exercise stages have been identified, certain social marketing techniques are recommended to reach the audience. Using appropriate channels to reach the audience, stage-matched behavior change techniques are then employed in order to facilitate participants' progression from the early to the more advanced stages of change. Lastly, meaningful community and/or worksite events can be conducted in order for physical activity to become more enjoyable and available to everyone (CDC, 1999).

In a similar vein, the increasing percentages of young people who are overweight has led to the development of recommendations for the promotion of age-appropriate, meaningful, and enjoyable physical activities among youth (Cardinal, Engels, & Zhu, 1998; CDC, 2001; Corbin, 2002). Certain strategies have been identified and recommended such as barrier identification, education of parents and guardians as physical activity promoters for their children, and quality physical education programs incorporating both extracurricular and recreational exercise programs. (Cardinal, Engels, & Smouter, 2001; Wright et al., 2000).

The motivational programs derived from constructs of the TM offer scholars and practitioners in adapted physical activity with numerous practical ideas about physical activity motivation for individuals with disabilities. General strategies applied to non-disabled populations may also be applicable to people with disabilities (Blair et al., 2001). For example, people with physical disabilities may be able to be classified in the stages of change according to their physical activity level. Level of self-efficacy,

personal beliefs about the pros and cons of physical activity, and certain processes of change may then be manipulated to affect the initiation or maintenance of physical activity participation.

As with non-disabled populations, stage-matched, goal-oriented, and self-directed intervention programs, which utilize certain processes of change (i.e., cognitive and/or behavioral) can be developed and employed to help people with disabilities. Encouraging successful (i.e., self-efficacy) leisure-time physical activities rather than structured exercise may also enhance physical activity participation. Stress management techniques, social support, education, imagery (i.e., self-reevaluation), skill mastery, reevaluation of pros and cons of desired behavior (e.g., regular physical activity), positive self-talk, and problem solving can be some of the processes of change applied to people with disabilities. For desirable behavior change among people who are classified as being in the low stages of change, enough time for program administration should also be considered (Sallis et al., 1999).

3.5.1 *Putting it all together*

As an example, an identified group of people with physical disabilities in the precontemplation stage can be consulted to determine their barriers towards physical activity behavior change, as well as be educated on the value of regular physical activity participation. Individual goals, skill mastery, and successful experiences can then be employed to increase the participants' self-confidence which may, in turn, lead them to choosing to live healthy, active lifestyles. The preferences and constraints of the target audience should, of course, be considered in order to organize and deliver audience appropriate physical activity programs. Toward this end, social marketing

techniques such as the designation of small and homogeneous groups (e.g., adults with spinal cord injuries), as well as recognition of the times, places, and states of mind in which motivation is most likely to occur should be emphasized. Interviews on local TV or radio stations, and announcements of developed programs in the local newspaper can be ways to communicate with the targeted audience. Developing a web site with stage-matched behavior change strategies can be another way of disseminating useful information.

3.6 Conclusion

Physical activity is very important in maintaining health and functional capacity. However, there is a low rate of participation among individuals with disabilities compared to people without disabilities (USDHHS, 2000). Low participation in physical activity may not be an entirely independent choice, but rather a compulsory action promoted by societal and cultural dynamics. The challenging task of scholars and practitioners in the field of adapted physical activity is to heighten awareness about the health benefits of physical activity by increasing choices and thus motivation toward physical activity participation. A non-categorical approach (DePauw, 2000) incorporating several theoretical models should be undertaken in order to understand and recognize the needs and culture of individuals with disabilities.

4 GENERAL CONCLUSION

Health-related governmental agencies have increased awareness of the health benefits of physical activity participation and yet the high proportion of people with disabilities who follow mainly inactive lifestyles. Based on such reports, the two scholarly works presented herein were conducted. The first study provides empirical evidence of the effectiveness of web-based motivational materials on physical activity initiation and increase among adults with physical disabilities. The second review-based work explores theory-driven physical activity motivational strategies for individuals with disabilities. Additional review-based and empirical evidence is of necessity to facilitate the understanding of physical activity behavior change and increase of quality of life for such understudied populations as people with disabilities.

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APPENDICES

Appendix 1

Extended Literature Review

Introduction

The benefits of physical activity and/or exercise for individuals with disabilities have been reported by an abundance of studies and governmental agencies (Blinde & Taub, 1999; Centers for Disease Control and Prevention, [CDC], 1999). Increasing the number of individuals who meet the criteria of health-related physical activity is of paramount importance for health. In a 1997-survey, it was reported that only 12% of the adult population with disabilities participates in physical activity of moderate intensity, 5 days per week for 30 minutes each day (Healthy People, 2010). Although this data does not seem to differ drastically from the data of the same age-range non-disabled population (i.e., 16% participating in the recommended activity), there is a much higher percentage of adults with disabilities (56%) who do not participate in leisure-time physical activity compared to adults without disabilities (36%). Living a mainly inactive lifestyle may lead to secondary health conditions such as cardiovascular diseases (Rimmer & Braddock, 2002).

The low rate of engagement in regular physical activity among people with disabilities may be related to low motivation that seems to be associated with interconnected psychosocial dynamics such as attitudes toward equal opportunities for physical activity engagement (Kosma, Cardinal, & Rintala, 2002). Therefore, it is essential to increase motivation toward healthy, active lifestyles (Durstine, Painter, Franklin, Morgan, Pitetti, & Roberts, 2000). Motivational programs should be derived from sound theoretical models and tailored to individual needs in a friendly and contemporary way. An approach, such as one tailored on the basis of the

transtheoretical model (TM), may facilitate progress in this area (Burbank & Riebe, 2002; Kosma et al., 2002).

Transtheoretical model

Elements of the TM can be utilized in order to identify motivational strategies toward physical activity participation. The main dimensions of the TM are the stages of change, processes of change, self-efficacy, and decisional balance. In this introductory section, these constructs will be associated with physical activity behavior change. Motivational strategies toward physical activity and stage advancement can be derived from the processes of change, self-efficacy, and decisional balance.

It has been revealing that the construct of the stages of change attracts a significant amount of attention from scholars and educators. The number of stages of change varies across different studies. Within the exercise domain, the most frequently studied stages of change include the precontemplation, contemplation, preparation, action, and maintenance stages (Cardinal, 1997a). The conceptual definitions of some stages - especially for the precontemplation, preparation, and maintenance stages – vary across stages (Miilunpalo, Nupponen, Laitakari, Martila, & Raronen, 2000; Schumann et al., 2002). In the present study, precontemplation refers to lack of action and absence of consideration to regular physical activity within the next 6 months. In contemplation, individuals are not active, but they start thinking of engaging in the described physical activity routine within the next 6 months. In the preparation stage, individuals plan to start a regular physical activity program within the next month. In addition, individuals in the preparation stage engage in some behavior change such as

buying a pair of running shoes and going for an occasional run. However, this behavior is not sustained on a regular basis, but rather occurs infrequently. In the action stage, individuals follow the defined regular physical activity routine for less than 6 months, whereas in maintenance, the physical activity program is regularly sustained for more than 6 months. The movement across the stages is not necessarily linear, but rather cyclical with the potential of lapse and relapse (Cardinal, 1998; Miilunpalo et al., 2000).

Another dimension of the TM is the processes of change. Processes of change refer to certain cognitive and behavioral techniques that can be utilized to facilitate behavior change (Burkholder & Nigg, 2002). In exercise, the 10 processes of change (Table, 1) have been organized into two higher-order categories, cognitive (i.e., consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, and social liberation) and behavioral (i.e., counter conditioning, helping relationships, reinforcement management, self-liberation, and stimulus control) (Prochaska & Velicer, 1997). Conceptually, and as identified in the studies of smoking cessation (e.g., Prochaska & DiClemente, 1983), individuals tend to use cognitive techniques in the initial stages (i.e., precontemplation and contemplation) and behavioral techniques in the later stages. Therefore, the behavioral processes of change would start to appear in the preparation stage where the first behavioral attempts are initiated (Jordan & Nigg, 2002).

In the exercise domain, the use of the processes of change across the stages of exercise change varies, indicating a more complex pattern of process usage than what has been proposed with other health behaviors (e.g., smoking cessation). For example,

in the study of Marcus, Rossi, Selby, Niaura, & Abrams (1992) both cognitive and behavioral processes of change reached the zenith in the action stage. In addition, the use of the cognitive and behavioral processes of change was similar between the contemplation and preparation (i.e., initiation of behavioral change) stages. This pattern of process usage suggests that cognitive and behavioral techniques are almost equally important to the initiation and maintenance of exercise behavior. The differences in the use of the processes of change among separate behaviors might be associated with several factors such as validity issues of the scales used and/or different conceptualization and/or application of the processes of change constructs to exercise behavior change. For example, although Marcus and colleagues generalized the two higher-order constructs model of the processes of change to exercise behavior (first adopted to smoking cessation), the authors recognized the high relationship (r = .908) between the two latent factors, indicating further inquiry of the meaningfulness of separating the processes of change between two distinct categories. It can be argued that beyond the behavioral and cognitive categories, affective techniques (e.g., dramatic relief and self-reevaluation) may comprise the different processes of change as well. Instead of clustering the distinct processes of change within separate higher-order factors, maybe it would be more valuable to identify the usage of the most common techniques and their interrelations across the different stages of change to facilitate the development of effective motivational programs. Therefore, in this study, the different conceptually based mechanisms derived from certain processes of change will be *one* of the sources to be utilized in order to develop the stage-matched motivational materials.

Table 1. Processes of change and their operational definitions

Processes of Change	Operational Definition
Consciousness Raising	Seeking and/or receiving information about exercise
Dramatic Relief	Emotional reactions while encountering the negative effects of inactivity
Environmental Reevaluation	Consideration of the personal influences to others by following an active or inactive lifestyle
Self-Reevaluation	Emotional and health consequences considering an active or inactive lifestyle
Social Liberation	Personal beliefs/notice of societal changes to facilitate active lifestyles
Counter Conditioning	Using exercise as a way to relax, relieve tension, and escape from daily routines
Helping Relationships	Seeking/receiving social support to facilitate physical activity participation
Reinforcement Management	Goal setting and self-rewarding after exercising
Self Liberation	Self-belief and commitments to initiate physical activity or keep on exercising
Stimulus Control	Establishing certain cues/prompts to promote Exercise

Another cognitive construct of the TM is self-efficacy. In exercise, self-efficacy is associated with the level of the self-belief that a physical activity task can be performed successfully (Bandura, 1997). Within the TM, self-efficacy is measured as the level of self-confidence to overcome certain perceived barriers in order to initiate and/or sustain the described exercise routine. In the meta-analysis study of Marshall and Biddle (2001), self-efficacy was found to increase across the stages of change in a non-linear pattern. In particular, a moderate to large effect size was observed between action and maintenance, whereas a small to moderate effect size was identified between contemplation and preparation. Moderate changes in self-efficacy were assessed from precontemplation to contemplation and from preparation to action.

Lastly, the decisional balance model (Janis & Mann, 1977) suggests that the balance between the perceived benefits and costs of exercise can provide an indication of ways to increase movement from the early to the late stages. Because the highest effect size in decisional balance has appeared during the transition from precontemplation to contemplation (Marshall & Biddle, 2001), the need to increase awareness of the positive effects of exercise among precontemplators can be an essential part of intervention programs. One key aspect of such motivational programs is the relative representation of the perceived benefits and costs of exercise when decisional balance is assessed. A current development and validation of a decisional balance scale (Plotnikoff, Blanchard, Hotz, & Rhodes, 2001) reinforces the identification of psychometrically sound constructs in order to facilitate effective program development. The decisional balance scale of Plotnikoff and colleagues can

hold promise for health promoters given that certain recommendations and additional modifications relevant to the population of interest are addressed (Cardinal, 2002).

Motivational programs

In this section, certain motivational programs based on specific constructs of the TM will be reported. These programs have been identified or they can be recommended as effective on positive behavior change such as physical activity participation for individuals without disabilities. Such motivational programs have been delivered either through the regular mail (i.e., print-based) or electronically.

It has been supported that stage-matched print-based materials aimed at increasing physical activity participation are more effective on behavior change than traditional non stage-matched materials such as those of the American Heart Association (AHA; Blissmer & McAuley, 2002; Marcus et al., 1998). In addition, such print-based materials have been reported as effective in progressing healthy adults from the early to the late stages of changes with the ultimate goal being physical activity initiation and maintenance. The motivational strategies incorporated in those materials were derived form the constructs of the TM. Such strategies include awareness of physical activity benefits, self-rewarding, goal setting, social support, and schedule structuring to fit exercise routines (Marcus, et al., 1992; Sallis, et al., 1999).

Very few studies (e.g., Cardinal & Sachs, 1995; 1996), which have utilized print-based written materials, reinforced health-related physical activity of moderate intensity rather than vigorous exercise (including a randomized control trial). The studies of Cardinal and Sachs (1995; 1996) were also directed to minority populations

such as African Americans and revealed that stage-tailored strategies focusing on lifestyle physical activity were influential on physical activity enhancement and stage advancement following the intervention (31 days) and at 6-month follow-up. Additionally, a lifestyle-based physical activity program of moderate intensity has been reported to be more cost-effective than a traditional structured exercise program (Sevick, Dunn, Morrow, Marcus, Chen, & Blair, 2000).

Although print-based materials have been supported as effective on behavior change, the advances and appeal of technology initiated the need to examine the efficacy of web-based materials on physical activity participation. Web-based information can approach a large number of individuals at any time and place. For example, home-based programs and individually tailored feedback can be instantly delivered eliminating the costs of face-to-face counseling and lack of information dissemination in a wide range of audience (e.g., people with disabilities) that may avoid or cannot afford individual counseling. Information technology offers a friendly and appealing way to communicate by incorporating audio-visual, animated information, personal feedback, and personal communication (Tate, Wing, & Winett, 2001). Using the advances of the Internet, individual data can be collected automatically in order to administer individually tailored programs (Dirkin, 1994; Fotheringham, Owies, Leslie, & Owen, 2000; Marcus, Nigg, Riebe, & Forsyth, 2000; Marcus, Owen, Forsyth, Cavill, & Fridinger, 1998). Print-based materials can only offer stage-matched information, whereas web-based programs can also be tailored to an individual level capturing personalized needs. Specifically, computer-based programs can reinforce individually oriented motivating strategies by formulating

discussion groups (i.e., social support) through which the program recipients can freely communicate and share diverse experiences and needs. As such, openness may increase and face-to-face social conformity may decrease (Fotheringham, et al.; Marcus, et al.).

Although very few studies have used the Internet to promote physical activity, and no studies have employed this technology among people with disabilities, it may be a usable tool to consider. Very few studies have used the Internet to promote physical activity. For example, it has been supported that web-based, stage-matched, and individually-tailored (e.g., progress feedback) motivational strategies are more effective in enhancing physical activity of moderate intensity for healthy adults than print-based, standard, self-help materials provided by the AHA (Marcus, Bock, Pinto, Forsyth, Roberts, & Traficante, 1998). Specifically, the experimental group that received the web-based and individually tailored program dedicated more time per week to engage in physical activity following the intervention than the control group that received the self-help, print-based, standard materials. In addition, more individuals in the experimental than in the control group met the (CDC)/American College of Sports Medicine (ACSM) physical activity criteria for health and reached the action stage by the end of the 6-month program. Self-efficacy increased for both groups whereas decisional balance remained stable without group differences.

In another study (Calfas et al., 2001), a computer-based motivational program called Patient-centered Assessment and Counseling on Exercise plus nutrition (PACE+) was directed to patients of four major health-care settings in San Diego in order to enhance moderate and/or vigorous exercise as well as healthy nutrition habits.

The results revealed that the program was effective in enhancing physical activity and healthy dietary behaviors especially for those groups who targeted the specific behavior change (e.g., enhancing moderate physical activity or consuming more vegetables/fruits daily).

A web-based intervention program focusing on behavior change aspects was more effective in weight loss and decrease of circumference at the waist than a standard electronically-delivered program providing a list of education oriented web links (Tate et al., 2001). Additionally, a bulletin board was utilized in this study whereby participants could foster social support by posting and discussing appropriate topics with one-another.

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Appendix 2

Physical Activity Readiness Questionnaire

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?

   YES NO

2. Do you feel pain in your chest when you do physical activity?

   YES NO

3. In the past month, have you had chest pain when you were not doing physical activity?

   YES NO

4. Do you lose your balance because of dizziness, or do you ever lose consciousness?

   YES NO

5. Do you have a bone or joint problem that could be made worse by a change in your physical activity?

   YES NO

6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?

   YES NO

7. Do you know of any other reason why you should not do physical activity?

   YES NO

Appendix 3

Stages of Change Questionnaire

Instruction: Have you been *regularly* participating in physical activities of *moderate intensity* such as walking (with crutches, canes, braces, or prostheses), off-road pushing, ball games (e.g., double tennis, softball, golf), recreational swimming, cycling, arm cranking, dancing and other similar activities? Activities that are primarily sedentary, such as bowling, playing golf with a cart, and passive stretching, would not be considered physical activity. REGULAR PHYSICAL ACTIVITY = 5 DAYS OR MORE PER WEEK FOR 30 MINUTES OR MORE DAILY.

Note: the accumulation of 30 minutes of daily activity can be obtained *consecutively* or in an *additive manner* of two separate 15-minute activity sessions.

- Yes, I have been for more than 6 months.
- Yes, I have been, but for less than 6 months.
- Not regularly, but I engage in such activities occasionally and plan to start on a regular

  basis within the next month.
- No, but I'm thinking of starting in the next 6 months.
- No, and I am not thinking of starting in the next 6 months.

Appendix 4

Physical Activity Scale for Individuals with Physical Disabilities

Instructions: This questionnaire is about your current level of physical activity and exercise. Please remember there are no right or wrong answers. We simply need to assess your current level of activity.

Leisure Time Activity

1. During the past 7 days how often did you engage in *stationary activities* such as reading, watching TV, computer games, or doing handicrafts?
    1. Never (Go to question #2)
    2. Seldom (1-2 days)
    3. Sometimes (3-4d)
    4. Often (5-7d)

    What are these activities?

    On average, how many hours per day you spend in these *stationary activities*?
    1. Less than 1 hr
    2. 1 but less than 2hr
    3. 2-4hr
    4. More than 4hr
2. During the past 7 days, how often did you *walk, wheel, and push outside your home other than specifically for exercise*. For example, getting to work or class, walking the dog, shopping, or other errands?
    1. Never (Go to question #3)
    2. Seldom (1-2d)
    3. Sometimes (3-4d)
    4. Often (5-7d)

On average, how many hours per day did you spend wheeling or pushing outside your home?

1. Less than 1 hr
2. 1 but less than 2hr
3. 2-4hr
4. More than 4hr

3. During the past 7 days, how often did you engage in *light sport or recreational activities* such as bowling, golf with a cart, hunting or fishing, darts, billiards or pool, therapeutic exercise (physical or occupational therapy, stretching, use of a standing frame) or other similar activities?

1. Never (Go to question #4)
2. Seldom (1-2d)
3. Sometimes (3-4d)
4. Often (5-7d)

What are these activities?

On average, how many hours per day did you spend in these *light sport or recreational* activities?

1. Less than 1 hr
2. 1 but less than 2hr
3. 2-4hr
4. More than 4hr

4. During the past 7 days, how often did you engage in *moderate sport and recreational* activities such as doubles tennis, softball, golf without a cart, ballroom dancing, wheeling or pushing for pleasure or other similar activities?
    1. Never (Go to question #5)
    2. Seldom (1-2d)
    3. Sometimes (3-4d)
    4. Often (5-7d)

    What are these activities?

    On average, how many hours per day did you spend in these *moderate sport and recreational* activities?
    1. Less than 1 hr
    2. 1 but less than 2hr
    3. 2-4hr
    4. More than 4hr
5. During the past 7 days, how often did you engage in *strenuous sport and recreational*

    activities such as jogging, wheelchair racing (training), off-road pushing, swimming, aerobic dance, arm cranking, cycling (hand or leg), singles tennis, rugby, basketball, walking with crutches and braces, or other similar activities?
    1. Never (Go to question #6)
    2. Seldom (1-2d)
    3. Sometimes (3-4d)
    4. Often (5-7d)

On average, how many hours per day did you spend in these *strenuous sport or recreational* activities?

1. Less than 1 hr
2. 1 but less than 2hr
3. 2-4hr
4. More than 4hr

6. During the past 7 days, how often did you do any exercise *specifically to increase muscle strength and endurance* such as lifting weights, push-ups, pull-ups, dips, or wheelchair push-ups, etc.?

1. Never (Go to question #7)
2. Seldom (1-2d)
3. Sometimes (3-4d)
4. Often (5-7d)

What are these activities?

On average, how many hours per day did you spend in these exercises to *increase muscle strength and endurance*?

1. Less than 1 hr
2. 1 but less than 2hr
3. 2-4hr
4. More than 4hr

Household Activity

7. During the past 7 days, how often have you done any *light housework* such as dusting, sweeping floors or washing dishes?

    1. Never (Go to question #8)
    2. Seldom (1-2d)
    3. Sometimes (3-4d)
    4. Often (5-7d)

    On average, how many hours per day did you spend doing *light housework*?

    1. Less than 1 hr
    2. 1 but less than 2hr
    3. 2-4hr
    4. More than 4hr

8. During the past 7 days, how often have you done any *heavy housework or chores* such as vacuuming, scrubbing floors, washing windows or walls, etc.?

    1. Never (Go to question #9)
    2. Seldom (1-2d)
    3. Sometimes (3-4d)
    4. Often (5-7d)

On average, how many hours per day did you spend doing *heavy housework or chores*?

1. Less than 1 hr
2. 1 but less than 2hr
3. 2-4hr
4. More than 4hr

9. During the past 7 days, how often have you done *home repairs* like carpentry, painting, furniture refinishing, electrical work, etc.?

1. Never (Go to question #10)
2. Seldom (1-2d)
3. Sometimes (3-4d)
4. Often (5-7d)

On average, how many hours per day did you spend doing *home repairs*?

1. Less than 1 hr
2. 1 but less than 2hr
3. 2-4hr
4. More than 4hr

10. During the past 7 days, how often have you done *lawn work or yard care* including

mowing, leaf or snow removal, tree or bush trimming, or wood chopping, etc.?

1. Never (Go to question #11)
2. Seldom (1-2d)
3. Sometimes (3-4d)
4. Often (5-7d)

On average, how many hours per day did you spend doing *lawn work*?

1. Less than 1 hr
2. 1 but less than 2hr
3. 2-4hr
4. More than 4hr

11. During the past 7 days, how often have you done *outdoor gardening*?

1. Never (Go to question #12)
2. Seldom (1-2d)
3. Sometimes (3-4d)
4. Often (5-7d)

On average, how many hours per day did you spend doing *outdoor gardening*?

1. Less than 1 hr
2. 1 but less than 2hr
3. 2-4hr
4. More than 4hr

12. During the past 7 days, how often did you *care for another person* such as children, a

dependent spouse, or another adult?

1. Never (Go to question #13)
2. Seldom (1-2d)
3. Sometimes (3-4d)
4. Often (5-7d)

On average, how many hours per day did you spend *caring for another person*?

1. Less than 1 hr
2. 1 but less than 2hr
3. 2-4hr
4. More than 4hr

Work-Related Activity

13. During the past 7 days, how often did you *work for pay or as a volunteer*? (Exclude

work that mainly involved sitting with slight arm movement such as light office work, computer work, light assembly line work, driving bus or van, etc.)

1. Never (Go to END)
2. Seldom (1-2d)
3. Sometimes (3-4d)
4. Often (5-7d)

On average, how many hours per day did you spend *working for pay or as a volunteer*?

1. Less than 1 hr
2. 1 but less than 4hr
3. 5 but less than 8hr
4. 8hr or more

Appendix 5

Processes of Change Questionnaire

The following experiences can affect the physical activity habits of some people.Think of similar experiences you may be currently having or have had during the past month. Then rate how frequently the event occurs by circling the appropriate number. Please answer using the following 5-point scale.

1	2	3	4	5
Never	Seldom	Occasionally	Often	Repeatedly

1. I read articles to learn more about physical activity.....1 2 3 4 5
2. I get upset when I see people who would benefit from physical activity but choose not to be active 1 2 3 4 5
3. I realize that if I don't do physical activity regularly, I may get ill and be a burden to others.....1 2 3 4 5
4. I feel more confident when I do physical activity regularly.....1 2 3 4 5
5. I have noticed that many people know that physical activity is good for them..... 1 2 3 4 5
6. When I feel tired, I make myself do physical activity anyway because I know I will feel better afterwards.....1 2 3 4 5
7. I have a friend who encourages me to do physical activity when I don't feel up to it 1 2 3 4 5
8. One of the rewards of regular physical activity is that it improves my mood..... 1 2 3 4 5
9. I tell myself that I can keep doing physical activity if I try hard enough..1 2 3 4 5
10. I keep a set of physical activity clothes with me so I can do physical activity whenever I get the time 1 2 3 4 5

11. I look for information related to physical activity 1 2 3 4 5
12. I am afraid of the results to my health if I do not do physical activity...1 2 3 4 5
13. I think that by doing physical activity regularly I will not be a burden to the health care system.....1 2 3 4 5
14. I believe that regular physical activity will make me a healthier, happier person 1 2 3 4 5
15. I am aware of more and more people who are making physical activity a part of their lives 1 2 3 4 5
16. Instead of taking a nap after work, I do physical activity 1 2 3 4 5
17. I have someone who encourages me to do physical activity.....1 2 3 4 5
18. I try to think of physical activity as a time to clear my mind as well as a workout for my body.....1 2 3 4 5
19. I make commitments to do physical activity 1 2 3 4 5
20. I use my calendar to schedule my physical activity time 1 2 3 4 5
21. I find out about new methods of being physically active.....1 2 3 4 5
22. I get upset when I realize that people I love would have better health if they did physical activity.....1 2 3 4 5
23. I think that regular physical activity plays a role in reducing health care costs..... 1 2 3 4 5
24. I feel better about myself when I do physical activity.....1 2 3 4 5
25. I notice that famous people often say they do physical activity regularly.....1 2 3 4 5

26. Instead of relaxing by watching TV or eating, I take a walk or do physical activity.....1 2 3 4 5
27. My friends encourage me to do physical activity.....1 2 3 4 5
28. If I engage in regular physical activity, I find that I get the benefit of having more energy.....1 2 3 4 5
29. I believe that I can do physical activity regularly.....1 2 3 4 5
30. I make sure I always have a clean set of physical activity clothes..... 1 2 3 4 5

Appendix 6

Self-efficacy Questionnaire

Directions: Listed below are 5 statements designed to assess your *belief* in your ability to engage in *moderate regular physical activity* under various circumstances or conditions. Please evaluate each statement as it applies to you and your situation. Please CIRCLE your response to each statement.

1. I am confident I can participate in regular physical activity when I am tired.

Not at all Confident	Not Confident	Uncertain	Confident	Very Confident
1	2	3	4	5

2. I am confident I can participate in regular physical activity when I am in a bad mood.

Not at all Confident	Not Confident	Uncertain	Confident	Very Confident
1	2	3	4	5

3. I am confident I can participate in regular physical activity when I don't have time.

Not at all Confident	Not Confident	Uncertain	Confident	Very Confident
1	2	3	4	5

4. I am confident I can participate in regular physical activity when I am on vacation.

Not at all Confident	Not Confident	Uncertain	Confident	Very Confident
1	2	3	4	5

5. I am confident I can participate in regular physical activity when it is raining or snowing.

Not at all Confident	Not Confident	Uncertain	Confident	Very Confident
1	2	3	4	5

Appendix 7

Decisional Balance Questionnaire

Directions: Listed below are 10 statements designed to assess your *beliefs* regarding some of the positive and negative aspects of physical activity. Please CIRCLE your response to each statement.

1. Physical activity would help me reduce tension or manage stress.

0	1	2	3	4	5
Not at all					Very much

2. I would feel more confident about my health by getting physical activity.

0	1	2	3	4	5
Not at all					Very much

3. I would sleep better.

0	1	2	3	4	5
Not at all					Very much

4. Physical activity would help me have a more positive outlook.

0	1	2	3	4	5
Not at all					Very much

5. Physical activity would help me control my weight.

0	1	2	3	4	5
Not at all					Very much

6. I am too tired to get physical activity because of my other daily responsibilities.

0	1	2	3	4	5
Not at all					Very much

7. Physical activity would take too much of my time.

0	1	2	3	4	5
Not at all					Very much

8. I would have less time for my family and friends if I participated in physical activity.

0	1	2	3	4	5
Not at all					Very much

9. I'd worry about looking awkward if others saw me being physically active.

0	1	2	3	4	5
Not at all					Very much

10. Getting physical activity would cost too much money.

0	1	2	3	4	5
Not at all					Very much

Appendix 8

Educational Materials Review Form

	Excellent				Poor
Production Quality:	5	4	3	2	1

(Comments)

Content:	5	4	3	2	1

(Comments)

Credibility:	5	4	3	2	1

(Comments)

Ability to Attract Attention:	5	4	3	2	1

(Comments)

Ability to convey information:	5	4	3	2	1

(Comments)

Ability to Change Attitudes:	5	4	3	2	1

(Comments)

Ability to Elicit Appropriate Action:	5	4	3	2	1

(Comments)

Appropriate for National Distribution ___YES ___NO ___Limited Use (describe)

_____

Overall Rating:	5	4	3	2	1

(Specify any particular strengths/weaknesses)

Recommend your further consideration (e.g., promotion, replication, purchase, adaptation, testing or evaluation)? _____YES _____NO

Please explain recommendation: