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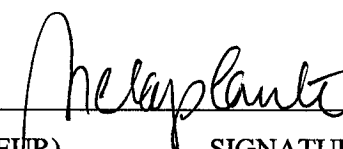
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Interventions on Physical Activity Behavior, Stage Transition, and
Hypothesized Mediators of Change – Test of a Stage Model

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THE EFFECTS OF STAGE-MATCHED, STAGE-MISMATCHED, AND STANDARD CARE
INTERVENTIONS ON PHYSICAL ACTIVITY BEHAVIOR, STAGE TRANSITION, AND
HYPOTHESIZED MEDIATORS OF CHANGE – TEST OF A STAGE MODEL

by

Marie-Claude Laplante

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ABSTRACT

The present study tested (1) the validity of the transtheoretical model [TTM] and its prediction that stage-matched interventions are more effective than stage-mismatched interventions at promoting stage transition, and (2) the hypothesized theoretical mediators of regular physical activity and adjacent stage progression. Sedentary or insufficiently active adults ($N = 190$) recruited through corporate email newsletters were randomized to receive either a stage-matched, stage-mismatched, or standard care intervention. Stage-matched interventions were designed to alter hypothesized theoretical mediators of adjacent stage progression for regular moderate-intensity physical activity through print-based materials. This experimental study focused on two stage transitions, from *contemplation* to *preparation* and from *preparation* to *action*. Physical activity behavior, stage transition, and hypothesized theoretical mediators of physical activity participation and forward transition between adjacent stages were assessed at baseline and 8-week follow-up (83% retention rate). Based on results from a preliminary cross-sectional study ($N = 1,172$) that examined patterns of differences between adjacent stages (discontinuity patterns) on theoretical constructs hypothesized by the TTM to differ across stages, it was hypothesized that an increase in the perceived benefits and a decrease in the perceived costs of regular physical activity mediated progression from *contemplation* to *preparation* whereas an increase in self-efficacy and behavioral processes of change were hypothesized to mediate progression from *preparation* to *action*. Results revealed significant increase in physical activity behavior and stage progression across all conditions. Stage-matched, stage-mismatched, and standard care interventions produced equivalent results in terms of adjacent stage progression, physical activity participation, and proportion of individuals meeting CDC/ACSM guidelines at post-intervention follow-up. Behavioral processes of change were the only theoretical constructs to consistently predict progression to the next stage in the sequence for individuals in the preparation stage and increase in physical activity behavior for individuals in the

contemplation and preparation stage. None of the theoretical constructs predicted adjacent stage progression for individuals in the contemplation stage. Preliminary evidence does not support the matching of interventions to stage in the context of regular physical activity and challenges the notion that stages of change, or at least a subset of them, are qualitatively distinct.

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THE EFFECTS OF STAGE-MATCHED, STAGE-MISMATCHED, AND STANDARD CARE
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Regular physical activity is clearly associated with reduced risk of all-cause mortality (Blair, Kohl, Barlow, Paffenbarger, Gibbons, & Macera, 1995; Paffenbarger, Hyde, Wing, Lee, Jung, & Kampert, 1993), cardiovascular disease (Wannamethee & Shaper, 2001), ischemic stroke (Gorelick et al., 1999), non-insulin-dependent diabetes (Helmrich, Ragland, Leung, & Paffenbarger, 1991), hypertension (Whelton, Chin, Xin, & He, 2002), colon cancers (Giovannucci, Ascherio, Rimm, Colditz, Stampfer, & Willett, 1995), osteoporosis (Kohrt, Snead, Slatopolsky, & Birge, 1995), fall-related injuries (Cummings et al., 1995), anxiety (Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991), and depression (Camacho, Roberts, Lazarus, Kaplan, & Cohen, 1991). Contemporary physical activity recommendations advise the accumulation of 30 minutes or more of moderate intensity activity on most, if not all, days of the week to reduce health risks (U. S. Department of Health and Human Services [USDHHS], 1996). Despite well-documented health benefits, approximately 75% of the Canadian and U.S. population (Bruce & Katzmarzyk, 2002; Center for Disease Control and Prevention [CDC], 2001) are inactive or insufficiently active. Given the benefits of regular physical activity and the high prevalence of physical inactivity, there is a need to develop and evaluate interventions designed to promote adoption and maintenance of regular physical activity (National Center for Health Statistics [NCHS], 1999).

Stage Theory of Health Behavior

One approach that has attempted to understand and to influence health behavior change is the transtheoretical model [TTM] (Prochaska & DiClemente,

1983; DiClemente, Prochaska, Fairhurst, & Velicer, 1991). From initial development in smoking research and psychotherapy, the TTM has been applied to the cessation of unhealthy behaviors and the adoption of preventive health behaviors, including physical activity adoption. The TTM is predicated on the assumption that health behavior change involves movement through a series of distinct stages of change (Prochaska & DiClemente, 1983; DiClemente et al., 1991). The model classifies individuals into five stages of motivational readiness to change, varying from *precontemplation* (i.e., no intention to be active in the next 6 months), to *contemplation* (i.e., intending to be active in the next 6 months), to *preparation* (i.e., intending to be active in the next 30 days), to *action* (i.e., regularly active for less than 6 months), and finally to *maintenance* (i.e., regularly active for more than 6 months). Although stage transition is theorized to be predominantly forward and sequential, regression to an earlier stage can happen (Prochaska, DiClemente, & Norcross, 1992). Stage skipping, however, is not expected (Prochaska, DiClemente, Velicer, & Rossi, 1992).

On the basis of the tenets of the TTM, individuals in each stage differ in terms of the strategies and techniques they use when attempting to change their behavior (behavioral and experiential processes of change; Prochaska & DiClemente, 1983), their level of confidence in their ability to successfully perform a specific behavior and resist temptation to relapse (self-efficacy; Bandura, 1977), and their appraisal of the benefits and costs of adopting the new behavior (decisional balance; Janis & Mann, 1977). These constructs have been hypothesized to interact with each other in order to modify health behaviors and promote stage progression.

Many of the most familiar theoretical models of health behavior are based on the premise that health behavior change is best conceptualized as a continuum of action likelihood. Such an approach implies a “two-stage” model of health behavior

change (i.e., from inactive to active) and a search for correlates that influence action. For example, the theory of planned behavior is based on the assumption that intention is an immediate determinant of physical activity behavior and that intention, in turn, is predicted from attitude, subjective norms, and perceived behavioral control (Ajzen, 1991; Courneya, 1995; Hausenblas, Carson, & Mark, 1997). Given the single prediction rules generated by continuum theories, an intervention that would integrate mediators hypothesized to influence action is expected to be similarly effective for all individuals and as such, matching interventions to specific audiences is unnecessary.

The appeal of understanding and explaining health behavior change as proceeding through a series of distinct (qualitatively different) stages lies in its ability to matching of interventions to individuals (because individuals in different stages have different needs) and the sequencing of interventions (because the stages have a temporal order) (Weinstein, Rothman, & Sutton, 1998). Stage models offer the prospect of increased predictive value of future health behaviors, predicated on their ability to identify and alter the particular mediators involved in specific forward stage transitions. Because of the prospect of more effective health promotion interventions, the TTM has gained enormous popularity over the last 20 years among both researchers and health promotion practitioners.

Criticisms of Stage Theories of Health Behavior

Although the TTM has intuitive and heuristic appeal, it is not without criticism. In recent years, aspects of the TTM and the scientific rigor of the research based on it have come under scrutiny. Some have rejected stage-based theorizing of human behavior altogether on conceptual grounds (Bandura, 1997a, 1997b), whereas others have expressed conceptual and methodological concerns over existing empirical evidence (Weinstein, Rothman, et al., 1998).

Some of the major critiques of the TTM identified in the literature pertain to the explanatory utility of the model and the scientific rigor of the research associated with the model. First, it has been suggested that a stage model provides descriptive rather than explanatory accounts of behavioral change, which severely limits its predictive capacity (Bandura, 1997a; Bunton, Baldwin, & Flynn, 1999; Davidson, 1992, 1998; Littell & Girvin, 2002; Sutton, 2000a, 2001; Weinstein, Rothman, et al., 1998). The classification system of the TTM (i.e., staging algorithm) is based on description of their disposition, not an understanding of the correlates of their readiness to change (e.g., the TTM would “predict” that contemplators are ready to change because they have been identified as ready to change). If this criticism is accurate, the “stages of change” construct is tautological and is of limited utility as an explanatory device. Second, the classification system in a stage model places factors that vary on a continuum into discrete categories (stages) whose division is arbitrary (Bandura, 1997a; Bunton et al., 1999; Davidson, 1998; Littell & Girvin, 2002; Sutton, 2000a, 2001; Weinstein, Rothman, et al., 1998). It has been argued that the first three stages in the TTM are differences in degree of intention while subsequent stages are gradations of duration of behavioral adoptions rather than differences in kind. By not being genuinely discrete, these arbitrary stages or “pseudostages” lose their explanatory value. Third, behavioral change may not occur in an ordered and linear fashion as a stage model suggests (Bandura, 1997a; Bunton et al., 1999; Davidson, 1992, 1998; Littell & Girvin, 2002). Fourth, scientific investigations have tended to focus on attempts to confirm the model, rather than to test its validity (Bunton et al., 1999; Davidson, 1998; Sutton, 2000a, 2001; Weinstein, Rothman, et al., 1998). Similarly, the process studies completed have directed at confirming the framework of the TTM in the way it has been described, rather than testing whether behavior change can be explained or predicted using a stage model and the hypothesized theoretically-driven mediators of change.

While critiques about the assumptions of invariance and the irreversible sequence have been challenged themselves by proponents of the TTM (Prochaska & Velicer, 1997a) and by others (Sutton, 2001; Weinstein, Rothman, et al., 1998), some of the problematic elements highlighted about the internal validity of a stage model remain and are of concern. Notably, the importance of the distinction between “true stages” and “pseudostages” cannot be overstated. If the stages, or a subset of them, are in reality pseudostages (e.g., continuous process), there is no reason to expect different factors to influence different stage transitions and hence, no basis for matching interventions to stage (Sutton, 2001).

Defining Properties of a Stage Theory of Health Behavior

According to Weinstein, Rothman, and colleagues (1998), four criteria must be met to establish a true stage theory of health behavior. First, a classification system must be established to define the stages. Thus, an individual may be classified into only one stage at a time. Second, there must be an ordered sequence through which an individual proceeds through the stages. Third, there must be common barriers to change faced by individuals in the same stage. Thus, individuals can be helped by similar interventions. Finally, individuals in different stages must face different barriers. Thus, different factors will influence different stage transitions. One implication of this criterion is that using different interventions as individuals progress through the stages will be most beneficial. Using these four criteria as a framework, the empirical evidence confirming or disconfirming the validity of the TTM as a stage model of health behavior, as it pertains to the physical activity literature, are reviewed next.

Criteria 1. A Classification System to Define Stages

The research on the TTM and physical activity has supported the first criteria for a stage theory. It has been documented that current physical activity adoption algorithms can classify individuals into discrete stages (Herrick, Stone, & Mettler,

1997; Marcus, Pinto, Simkin, & Audrain, 1994; Marcus, Rossi, Selby, Niaura, 1992; Marcus, Selby, Niaura, & Rossi, 1992; Marcus & Simkin, 1993; Potvin, Gauvin, & Nguyen, 1997; Reed, Velicer, Prochaska, Rossi, & Marcus, 1997). Because staging algorithms place individuals in mutually exclusive stage categories a priori, this precludes problems associated with overlap between stages. However, a classification system such as the one proposed by the TTM may be mimicked by “pseudostages” that create arbitrary classification schemes out of a continuum. Using different time periods would lead to a different allocation of individuals to stages and to a different stage distribution. Further, there exist no theoretical grounds or empirical findings that indicate that the 6-month or 30-day time frame is an appropriate basis for defining the stages (Velicer, Hughes, Fava, Prochaska, & DiClemente, 1995). The use of arbitrary time periods for the classification system challenges the assumption that the stages as measured by the staging algorithms are qualitatively distinct (Bandura, 1997a; Sutton, 2000a, 2001).

Accurate stage recognition is also essential to the validity of a stage model. Based on current epidemiological data, staging algorithms for physical activity appear to overestimate the number of individuals engaging in regular physical activity. Aggregated stage distribution data across several studies ($N = 68,580$) indicated that 14% of individuals are in precontemplation, 16% in contemplation, 23% in preparation, 11% in action, and 36% in maintenance (Marshall & Biddle, 2001). Thus, staging algorithms appear to identify twice as many physically active individuals as currently estimated by epidemiologic prevalence estimates (i.e., 25% of the population; CDC, 2001). Several moderators influencing stage distribution have been identified including age, setting, country, sampling method, recruitment method, and physical activity criterion used for stage classification (Marshall & Biddle, 2001). The latter has been a serious methodological limitation of past research in the context of physical activity because staging algorithms using different definitions of physical activity have been used across studies. Ultimately,

the predictive value of any stage models depends on accurate stage recognition and the validity of the staging algorithm (Bunton et al. 1999).

Criteria 2. An ordering of Stages

Longitudinal research designs can be used to test the prediction that individuals pass through stages in the sequence hypothesized by the TTM. This criterion does not entail that stage progression is either inevitable or irreversible, that a unique sequence to action is possible, or that individuals must spend a predetermined or minimum length of time in any given stage (Weinstein, Rothman, et al., 1998). Rather, if a substantial majority of individuals follows the specified sequence, a stage model can be regarded as valuable even if other pathways to action are possible.

A number of studies have found that stage of change at baseline predicts physical activity adoption at follow-up. For example, in an observational study (Armstrong, Sallis, Hovell, & Hofstetter, 1993), individuals in the contemplation stage for regular physical activity were nearly twice as likely as individuals in the precontemplation stage to progress to the action stage (46% vs. 24%) during the first six months. Similarly, in a recent observational study (Plotnikoff, Hotz, Birkett, & Courneya, 2001), individuals in the preparation stage for regular physical activity were three times as likely as individuals in the precontemplation stage to progress to the action stage (48% vs. 16%) during a 6-month period. Individuals in the contemplation stage were twice as likely as those in the precontemplation stage to progress to the action stage (34% vs. 16%). Such evidence can be interpreted as supporting the assumptions of the TTM that the stages are temporally ordered (Weinstein, Rothman, et al., 1998), with the contemplation stage being “closer” to action than precontemplation. However, on its own, such stage effects do not provide strong evidence for a stage model. Nevertheless, these findings do suggest

that stage measures may be of practical value in measuring progress toward physical activity adoption.

To date, no studies on physical activity adoption have described the stability and movement between adjacent stages or have measured stage membership on more than three occasions. In a longitudinal study of physical activity behavior (Marcus, Simkin, Rossi, & Pinto, 1996), four patterns of stage transition over a period of six months were derived from 78% of participants in a worksite health promotion project. The patterns consisted of participants who became active (defined as progressing to the preparation, action, or maintenance stage) (26%), those who became less active (15%), and those who did not change over time (stable sedentary, 32%; stable active, 27%). However, no data were reported on transitions between adjacent stages across time. In the context of smoking cessation, there currently is little empirical evidence of sequential transitions between stages (see Littell & Girvin, 2002 for a review), although relatively little empirical research has been completed on that aspect of the model.

Although progression to the next adjacent stage in the sequence implies a stage process, such a path is also consistent with a pseudostage model. Small naturally occurring shifts along a continuum are conceivably more common than large shifts, so one would expect progression to nearby pseudostages to be more likely than progression to distant pseudostages (Weinstein, Rothman, et al., 1998). Further, stage transitions will be missed if the interval between measurements is too long or people move rapidly through the stages. As such, it seems inadvisable to argue that evidence of skipped stages invalidate the idea of a stage model; the intermediate stages might have been overlooked (Weinstein, Rothman, et al., 1998). Overall, sequence data may not be very conclusive regarding the existence of a stage process for health behavior change.

Criteria 3. Common Barriers to Change facing Individuals in the Same Stage

The majority of TTM studies have used a cross-sectional research design to examine how participants classified into different stages compared on theoretically-relevant variables. A number of cross-sectional studies have documented that individuals within the same stage of change face similar barriers, hold similar beliefs about exercise, and use similar strategies to change their thoughts, feelings, and behavior (Marcus, Eaton, Rossi, & Harlow, 1994; Marcus et al., 1996). When examining cross-sectional data, patterns of differences that would argue against a stage model of health behavior include no differences across stages on theoretically-relevant variables, linear change patterns from one stage to the next, and a similar pattern of differences for all variables (Weinstein, Rothman, et al., 1998).

Self-efficacy appears to successfully differentiate between individuals at most stages (Marcus, Eaton, et al., 1994; Marcus & Owen, 1992; Marcus, Selby, et al., 1992; Marshall & Biddle, 2001; Nigg & Courneya, 1998). While less salient in the earlier stages, self-efficacy has been shown to increase as one progress through the stages (Cowan, Logue, Milo, Britton, & Smucker, 1997; Herrick et al., 1997; Marcus, Selby, et al., 1992). However, the magnitude of these increases may not be equal (Marshall & Biddle, 2001). While some have concluded the relation between self-efficacy and stages to be linear (Marcus & Simkin, 1994; Prochaska & Marcus, 1994; Reed, 1999), others have recently suggested that the patterns of differences is non-linear across stages (Marshall & Biddle, 2001), with effect sizes characterized as moderate (precontemplation to contemplation), small to moderate (contemplation to preparation), moderate (preparation to action), and moderate to large (action to maintenance).

In the context of physical activity, reviews of empirical studies using a cross-sectional design have concluded that the perceived benefits (pros) of change

generally increase across the stages and often peak in action (Reed et al., 1997). Conversely, the perceived costs (cons) usually decrease with advancing stage. Preparation appears to be the stage at which potential gains are in balance with the perceived losses (Buxton, Wyse, & Mercer, 1996; Reed et al., 1997). Pros and cons are suggested as important for predicting the transitions between precontemplation, contemplation, and preparation, but less so for action and maintenance (Buxton et al., 1996; Prochaska & Marcus, 1994; Reed et al., 1997). However, results from a recent meta-analysis of empirical applications of the TTM in the physical activity domain suggested that perceived benefits of change increase whereas perceived disadvantages of becoming physically active decrease for every forward stage transition (Marshall & Biddle, 2001). As predicted by the TTM, the largest and most robust effect size was evident from precontemplation to contemplation for both the pros and cons. The remaining stage transitions were characterized by small effects.

The processes of change have been organized into two higher order constructs: experiential and behavioral (Prochaska, Velicer, DiClemente, & Fava, 1988). The general consensus across health behavior change is that experiential processes are more important during the early stages, with behavioral processes important at later stages (Reed et al., 1997; Biddle & Nigg, 2000; Prochaska, DiClemente, & Norcross, 1992). To date, however, these conclusions in the area of physical activity adoption are offered with limited empirical evidence to support them. Examination of the suitability of the processes of change for physical activity behavior has yielded a correlation coefficient between experiential and behavioral processes of .91 (Marcus, Rossi, et al., 1992), a finding that actually argues against a two-factor model. Recent meta-analytic findings (Marshall & Biddle, 2001; Rosen, 2000) suggested that experiential processes tend to peak during action and behavioral processes during maintenance. However, contrary to predictions, the behavioral processes of change showed the sharpest increase in use from

precontemplation to contemplation and from preparation to action. Further, individuals used all ten processes of change when trying to modify their physical activity behavior and 9 of the 10 processes followed similar patterns of change across the stages. These findings suggest that the distinction between the higher order constructs (experiential and behavioral) may not be worth preserving in the physical activity domain.

Overall, data from cross-sectional studies suggest that linear change patterns across the five stages are generally not observed. Rather, notable change patterns appear evident between the precontemplation and contemplation stage. The next largest change patterns appear evident between the preparation and action stage. It is noteworthy that no obvious patterns of difference have emerged for the stage transition between the contemplation and preparation stage and between the action and maintenance stage. While it is tempting to conclude from these data that physical activity adoption may be better explained by a three-stage process (from no intention to be active to intending to be active, and from intending to be active to being active), it is important to consider that cross-sectional differences between stages may be unrelated to change over time. A change pattern between adjacent stages (e.g., increase in self-efficacy between the preparation and action stage) may be interpreted either as a consequence of stage transition or as a causal factor influencing the likelihood of stage transition (Sutton, 2001). Unlike the first interpretation, only the latter one has direct implications for intervention. Overall, based on earlier cross-sectional data, causal paths between stage transition and theoretically-relevant constructs remain unclear.

Research designs differ substantially in their capacity to discriminate between continuum and stage ideas. Even though key theoretical constructs should differ across stages, such differences can also be attributed to pseudostages. Because pseudostages conceal an underlying continuum, individuals

at different places along this continuum may “*have different standing on the variables that go into the equation that creates this continuum*” (p. 295) (Weinstein, Rothman, et al., 1998). Overall, cross-sectional designs provide a weak test of the validity of stage models.

Studies using prospective research design can be used to test the hypothesis that different causal factors are crucial at different stages. When using such a research design, analyses exploring adjacent stage progression are of particular interest. To date, no studies have examined theoretical mediators of stage transitions for physical activity in this way.

Few studies have examined the influence of theoretical mediators hypothesized by the TTM on physical activity behavior following stage-matched interventions (Calfas, Sallis, Oldenburg, & Ffrench, 1997; Dunn, Marcus, Kampert, Garcia, Kohl, & Blair, 1997; Nichols, Wellman, Caparosa, Sallis, Calfas, & Rowe, 2000; Pinto, Lynn, Marcus, DePue, & Goldstein, 2001; Sallis, Calfas, Alcaraz, Gehrman, & Johnson, 1999). A review of these studies (Lewis, Marcus, Pate, & Dunn, 2002) concluded that behavioral processes of change have received the most consistent support for mediating the relationship between theory-based physical activity interventions and physical activity behavior. Self-efficacy has received mixed support as a theoretical mediator. Overall, there was no clear support for experiential processes of change and the pros and cons of change as mediators in physical activity studies. However, these studies only have focused on attempting to explain change in physical activity behavior, not transitions to the next adjacent stage in the hypothesized sequence.

A recent study examined the mediators hypothesized by the TTM to promote forward stage transition in the context of physical activity adoption. Plotnikoff and colleagues (2001) studied movement among the stages for regular vigorous

physical activity in a large untreated population-based sample ($N = 683$) over two consecutive six-month periods. Their analyses were stratified by baseline stage and focused on transitions out of a stage (to any subsequent stages); not transitions to the next stage in the sequence. Self-efficacy, pros, and behavioral processes of change predicted forward transition from the contemplation stage. Predictors of stage transition from precontemplation and from preparation yielded inconsistent results. While none of the hypothesized mediators were predictive of stage transition out of the precontemplation or preparation stage after the first six months, self-efficacy, pros, and behavioral processes for precontemplation and self-efficacy and cons for preparation predicted forward stage transition at the 12-month follow-up. The use of more stringent criteria for interpreting findings (such as a $p < .01$ alpha level given the number of predictions examined and as consistent findings across both time periods) would have resulted in none of the hypothesized mediators predicting forward stage transition. Based on these results, the authors called into question the appropriateness of the TTM as a predictive agent of future physical activity behavior.

Overall, recent critical examinations of stage models have resulted in a greater awareness of a crucial limitation of the TTM. The TTM is not entirely clear and consistent in specifying, or hypothesizing, the specific theoretical mediators that influence transitions between each pair of adjacent stages. Marcus, Eaton and colleagues (1994) postulated that self-efficacy, and the costs and benefits of exercise are related to physical activity behavior only indirectly, through the mediation of stages of change. Using structural equation modeling, 43% of the variance in the stage of change construct was explained by self-efficacy, pros, and cons, and 24% of the variance in physical activity was explained by the stage of change construct. Direct paths from self-efficacy, pros, and cons to physical activity behavior were not significant. However, data for this model were taken from a sample that was already highly active at baseline (average of 370 minutes of

moderate intensity physical activity per week), the experiential and behavioral processes of change were not tested in the mediation analyses, and the model was specified for overall change in behavior; not for specific transitions between adjacent stages. A well-specified stage model should specify, or at least hypothesize, a causal model for each forward stage transition (Sutton, 2001). Indeed, this is a prerequisite for developing and testing stage-matched interventions.

Criteria 4. Different barriers to Change Facing Individuals in Different Stages

If the factors producing stage transition were the same regardless of an individual's stage, a single intervention would be similarly effective for all. A stage model would be unnecessary; a continuum model would be sufficient (Weinstein, Rothman, et al., 1998). To justify the claim that health behavior change follows a stage process, some of the hypothesized mediators must be of greater importance at certain stages than at others. A different set of mediators influencing different stage transitions is a key assumption of stage models. While some mediators may be important at every stage, there must be some mediators that do not show a consistent linear increment or decrement across stages. A discontinuity pattern would be expected for some of the mediators hypothesized by the TTM (Sutton, 2001).

Weinstein, Rothman, and colleagues (1998) argued that stronger evidence that health behavior change follows a stage process would be to demonstrate consistently in experimental studies that stage-matched interventions are more effective than stage-mismatched interventions (i.e., matched to a different stage) in moving individuals to the next stage in the sequence. The crucial test is for an interaction between baseline stages and interventions. If the stages of physical activity adoption are in reality pseudostages (e.g., continuum model), a stage-

mismatched intervention should still result in behavior change because individuals in each stage are facing similar barriers to change.

Studies based on the TTM have compared stage-matched interventions with standard care (action-oriented) interventions for physical activity promotion. Initial research has found that interventions based on the stages of change typically outperform action-oriented interventions (that are arguably stage-mismatched for individuals in the pre-action stages) (e.g., Goldstein et al., 1999; Marcus, Bock, Pinto, Forsyth, Roberts, & Traficante, 1998; Peterson & Aldana, 1999), although a number of studies have reported no significant differences between stage-matched interventions and standard care (Cardinal & Sachs, 1996; Naylor, Simmonds, Riddoch, Velleman & Turton, 1999). However, past studies usually have only kept track of overall change in physical activity behavior (e.g., proportion of individuals meeting CDC/ACSM guidelines) and have not focused on transitions between adjacent stages. Further, few studies have examined whether stage-matched interventions successfully influence targeted mediators and whether hypothesized mediators influence physical activity behavior. By and large, a comparison of staged-matched interventions to standard care does not provide the kind of information needed as evidence for or against the validity of a stage model of health behavior.

To date, only three studies have compared the effectiveness of matched and mismatched interventions using a stage perspective. In the area of smoking cessation, two studies of stage-matched versus stage-mismatched interventions were located (Dijkstra, DeVries, Roijackers, & van Breukelen, 1998; Quinlan & McCaul, 2000). Neither found clear support for the stage model predictions.

Quinlan and McCaul (2000) contrasted the effectiveness of precontemplation materials (stage-matched), action-oriented materials (stage-mismatched), and an

assessment-only condition in 92 college smokers who expressed no interest in quitting in the upcoming six months (precontemplation stage). The stage-matched intervention consisted of activities designed to encourage smokers to think more about quitting smoking whereas the stage-mismatched intervention consisted of action-oriented information and activities intended for smokers who are ready to quit smoking. Intervention participants completed two activities at pretest in a small group and the remaining activities (two activities weekly) at home over a 2-week period. Results indicated that contrary to expectations, individuals in the precontemplation stage who received the stage-mismatched intervention reported more subsequent quit attempts than those who received a stage-matched intervention or no intervention at 1-month follow-up. Individuals who received the stage-matched intervention were not more likely to demonstrate forward stage transition when compared to those who received the mismatched intervention. Indeed, there was a trend for more individuals in the stage-mismatched condition to have advanced at least one stage and to report stronger intentions to quit in the next one to six months than those in the stage-matched intervention. Overall, data from this well-designed study consistently failed to support the predictions that stage-mismatched interventions would be either outperformed by stage-matched interventions or ineffective at promoting smoking cessation.

Similar results were reported by Dijkstra and his colleagues (1998). This stage-matched versus stage-mismatched intervention study compared the effectiveness of individually tailored letters designed either to increase the benefits and reduce the costs of quitting (outcome information) or to enhance self-efficacy, or both, to an assessment-only condition among smokers ($N = 1,100$) classified in the immotive, precontemplation, contemplation, or preparation stage. On the basis of two earlier cross-sectional studies (DeVries & Backbier, 1994; Dijkstra, DeVries, & Bakker, 1996), it was hypothesized that immotives (e.g., no intention to change in the next five years) would benefit most from outcome information only,

preparers from self-efficacy enhancing information only, and precontemplators and contemplators from both type of information. It should be noted that it is unclear how the authors arrived at their predictions on the basis of findings from the referenced studies and the tenets of the TTM – in neither cited study was a distinction made between precontemplators and immotives nor was there evidence that smokers in any of these stages would benefit from combined information. Based on theoretically-derived hypotheses, results showed only weak evidence for a beneficial effect of stage-matched intervention. Stage-matched and stage-mismatched interventions produced equivalent results in terms of intention to quit, stage advancement, and cessation rates at a 10-week follow-up for individuals in the immotive, precontemplation, and contemplation stage. For individuals in the preparation stage, a stage-matched intervention resulted in more 7-day cessation attempts than a stage-mismatched intervention. Overall, there was no clear evidence that stage-matched interventions were more effective than stage-mismatched interventions, at least in the short term.

Only one study to date has attempted to compare the effects of stage-matched and stage-mismatched interventions in the area of physical activity adoption. Blissmer and McAuley (2002) tested the comparative efficacy of stage-matched, stage-mismatched, standard care, and control interventions to promote regular physical activity levels in 196 college personnel over 16 weeks. Participants were classified in one of the five stages of change using a long-form lifestyle algorithm relative to accumulating moderate intensity activity on most days of the week and randomly assigned to one of four study conditions. The stage-matched condition consisted of a personalized stage-matched cover letter and a stage-matched manual designed to increase the use of stage-appropriate experiential and behavioral processes of change. The stage-mismatched condition consisted of the same stage-specific manuals and personalized letters, but participants received only manuals for stages different from their own current stage. The standard care

condition consisted of manuals on physical activity developed by the American Heart Association whereas participants in the control condition received a general health pamphlet. All participants received a manual and cover letter on a monthly basis over a 3-month period.

After controlling for gender, a repeated-measures MANCOVA revealed a significant main effect for time. However, study conditions did not differ over time on an index of MET-hours expended for a typical week during the previous month. Based on effect sizes, there was little to no change in “total activity” in the matched and standard care conditions, whereas there were small effect size declines in the mismatched and control conditions. With regard to “life-span activity”, there were small to moderate effect size increases in both the standard care and stage-matched interventions, whereas the mismatched and control interventions experienced no change. Based on these findings, the authors concluded that stage-matched interventions “*clearly outperformed*” stage-mismatched interventions (p. 187).

The authors’ conclusion of “*the superiority of stage-matched intervention versus the mismatched intervention*” (p. 181) appears overstated given the data presented and the limitations of the study. First, the main finding from this study was that stage-matched and staged-mismatched conditions resulted in similar changes in physical activity behavior across study conditions. Their conclusion about the superiority of stage-matched interventions appears solely based on the examination of effect sizes across study conditions. Second, no data were provided on stage progression and change in physical activity based on participants’ stage at baseline. Examination of stage transition would have been a more appropriate outcome measure to test the validity of a stage model, as intended by the authors. Third, the majority of participants were in the action or maintenance stage at baseline (10% and 47%, respectively). Thus, in contrast with previous studies that

found no significant difference between stage-matched and mismatched interventions, the majority of participants in this study were already physically active. Limited increase in physical activity level is expected from a sample of participants who was physically active on a regular basis at baseline. Fifth, allocation of manuals in the mismatched condition was determined randomly and no information was reported about the sequencing of interventions or about the proportion of participants, within baseline stage, who received an intervention mismatched to an earlier stage versus to a later stage, which limits the interpretability of results. Finally, it appears that the stage-matched interventions focused primarily on influencing processes of change and that as such, key mediators hypothesized by the TTM to influence specific stage transition (i.e., self-efficacy, pros, and cons) were omitted. Thus, the power of stage-matched and stage-mismatched interventions at influencing specific stage transitions and physical activity behavior cannot be fully assessed from this study.

Overall, most of the research conducted to date on the TTM has tended to focus on attempts to confirm the model rather than to test the validity of the TTM as a stage model of health behavior. Most studies supporting the TTM have compared individuals at different stages on theoretical constructs believed to differ by stage or examined the stages individuals move through on their way to action. As noted previously, results from correlational studies can be explained by “pseudo-stages models” and a better test of a stage model consists of an experimental design in which stage-matched and mismatched interventions to individuals’ current stages are contrasted, and stage transition to the next stage in the sequence is examined. Only three studies to date have used the required experimental design to test whether health behavior change occurs through a series of stages. Results from two of these studies in the context of smoking cessation failed to provide clear evidence for the superiority of stage-matched over stage-mismatched interventions, although any generalizations from these studies might be limited to

the behavior, baseline stage(s) examined, and content of the stage-matched and stage-mismatched interventions. Limited knowledge about the validity of stage models can be derived from the study contrasting stage-matched and stage-mismatched interventions for the promotion of regular physical activity given the limitations of the study.

Rationale for the Present Study

Given the health benefits of regular physical activity and the high prevalence of physical inactivity, there is a need to develop and evaluate interventions designed to promote the adoption of regular physical activity (NCHS, 1999). Stage models of health behavior, such as the TTM (Prochaska & DiClemente, 1983), postulate that people move through a series of qualitatively distinct stages on their way to physical activity adoption and that the most effective intervention will be one that is “matched” to the individual’s current stage of change (Weinstein, Rothman, et al., 1998). The TTM offers the prospect of increased predictive value of future health behaviors, predicated on its ability to identify and alter the mediators hypothesized to promote specific stage transition. Although the TTM has intuitive and heuristic appeal, it is not without criticism. Critics suggest that, like all stages models, the TTM oversimplifies the complexities of behavioral change by imposing artificial categories on continuous processes (Bandura, 1997a; Davidson, 1992, 1998; Sutton, 2000a), and that by not being genuinely discrete, these arbitrary stages or “pseudostages” lose their explanatory value. The importance of the distinction between “true stages” and “pseudostages” cannot be overstated. If the stages, or a subset of them, are in reality pseudostages (e.g., continuum process), there is no reason to expect different mediators to predict different stage transition and hence, no basis for matching interventions to stage (Sutton, 2001).

Studies using experimental designs contrasting stage-matched and stage-mismatched (i.e., matched to a different stage) interventions are the only unequivocal way to distinguish between true stages and pseudostages. If the stages of physical activity adoption are in reality pseudostages, a stage-mismatched intervention should still result in behavior change because individuals in each stage are facing similar barriers to change. Only three studies to date (Blissmer & McAuley, 2002; Dijkstra et al., 1998; Quinlan & McCaul, 2000) have used a stage-matched versus stage-mismatched experimental design to test whether health behavior change occurs through a series of stages. Results from these studies have failed to provide clear evidence for the superiority of stage-matched over stage-mismatched interventions, although any generalizations from these studies might be limited to the behavior, baseline stage(s) examined, content of the stage-matched interventions, and by the limitations of these studies.

The Present Study

This research was stimulated by recent criticisms that stage models of health behavior place factors that vary on a continuum into discrete categories whose division is arbitrary. If the stages are not genuinely distinct, there is no reason to expect different mediators to influence different stage transitions and hence, there is no basis for matching interventions to stage – the appeal of a stage perspective. Thus, this study tested the validity of the TTM and its prediction that stage-matched interventions are more effective than stage mismatched interventions at promoting stage transitions. A rigorous experimental research test of a stage model was seen as crucial to differentiate true stages from pseudostages and to test the fundamental idea that different issues are important at different stages.

The present study examined the effectiveness of stage-matched interventions versus stage-mismatched interventions and standard care for physical activity participation and adjacent stage transition among a group of sedentary or

insufficiently active adults over a period of 8 weeks. This study focused on two stage transitions: from *contemplation* to *preparation* and from *preparation* to *action*. Focusing on these stage transitions was deemed important given that recent epidemiological data estimate that 75% of the adult population is inactive or insufficiently active (Bruce & Katzmarzyk, 2002; CDC, 2001) and that 74% of this segment of the population is classified in the contemplation or preparation stage for regular physical activity (Marshall & Biddle, 2001). An intervention matched to the contemplation stage and an intervention matched to preparation stage using the hypothesized mediators specific to each stage transition for physical activity adoption were developed. Crossing these two theory-based interventions with two stage transitions created two conditions in which the interventions were matched and two in which they were mismatched. This represented the core of the design of this study, although the stage-matched interventions also were tested against standard care for physical activity adoption, given that the added complexity of implementing a stage-matched intervention can be justified only if it significantly outperforms an effective standardized intervention (Weinstein, Rothman, et al., 1998).

Adjacent stage transition was deemed the primary outcome measure, given that this study aimed at testing the validity of a stage model (i.e., the TTM), and that this measure is by definition an appropriate outcome measure for participants in all stages (Velicer, Rossi, Prochaska, & DiClemente, 1996). To better understand the effect of theory-based physical activity interventions on physical activity behavior and stage transition, this study also examined whether the stage-matched interventions successfully influenced hypothesized theoretical mediators and whether the hypothesized theoretical mediators influenced physical activity behavior and adjacent stage transition.

Given the limitations of previous research and the lack of specificity of the TTM about the mediators of transitions between adjacent stages, a cross-sectional study examining patterns of differences and associations between theoretical constructs and adjacent stages for regular moderate-intensity physical activity was first conducted to generate hypotheses about the theoretical mediators associated with specific stage transitions. Examination of such patterns was also regarded as providing preliminary evidence about the existence of a true stage model (as opposed to a pseudostage model) (Sutton, 2000b). A secondary goal of this study was to determine the feasibility and acceptability of measures, recruitment procedures, questionnaire administration via the internet, and expected participation level in an intervention study promoting regular physical activity adoption among sedentary or insufficiently active individuals. Then, based on the findings from this cross-sectional study, stage-matched interventions were developed and contrasted against stage-mismatched interventions and standard care for regular physical activity using a randomized prospective design. For each baseline stage, theoretical mediators of adjacent stage progression and physical activity behavior were also examined for individuals in the contemplation and preparation stage for regular moderate-intensity physical activity.

STUDY 1

OVERVIEW

Most research related to the transtheoretical model [TTM] (Prochaska & DiClemente, 1983) has used cross-sectional design in which individuals are classified in stages of change for a specific health behavior and then compared on theoretically-relevant constructs hypothesized to differ between stages. Future behavior change is hypothesized to be directly predictable from these stages, and the stages are also thought to provide important information relevant to matching interventions to individuals' level of behavioral intention to adopt a new behavior. Theoretically-relevant constructs based on the TTM include self-efficacy (Bandura, 1977), the experiential and behavioral processes of change (Prochaska & DiClemente, 1983), and the perceived benefits (pros) and costs (cons) of adopting a new behavior (Janis & Mann, 1977). Differences between stages on these theoretical constructs have usually been taken to support the notion of the existence of qualitatively different stages.

In recent years, concerns have grown over the validity of the TTM as a stage model of health behavior (Bandura, 1997a; Bunton et al., 1999; Davidson, 1998; Littell & Girvin, 2002; Sutton, 2000a; Weinstein, Rothman, et al., 1998). One of the most serious criticisms is that the TTM imposes artificial categories (e.g., stages) on a continuous process (i.e., behavioral intention to change) (Bandura, 1997a; Davidson, 1992, 1998; Sutton, 2000a), and by not being genuinely discrete, these arbitrary stages, or pseudostages, lose their predictive value of future behavior.

While research designs differ greatly in their ability to distinguish between stage and continuum processes, an examination of change patterns between *adjacent* stages generated by cross-sectional data can be used to formulate

hypotheses to test the validity of a stage model of health behavior using a prospective design. When examining cross-sectional data, patterns of differences that would argue against a stage model of health behavior include no differences across stages on theoretical constructs, linear change patterns from one stage to the next, and a similar pattern of differences for all theoretical constructs (Weinstein, Rothman, et al, 1998).

Previous research is not conclusive in specifying, or hypothesizing, the specific theoretical mediators that influence transition between each pair of adjacent stages in the context of regular physical activity. The general consensus across health behavior is that the perceived pros and cons and the experiential processes of change are more important during the early stages, with self-efficacy and the behavioral processes of change more important at later stages (i.e., action and maintenance) (Biddle & Nigg, 2000; Buxton et al., 1996; Cowan et al., 1997; Marcus, Selby, et al., 1992; Prochaska, DiClemente, & Norcross, 1992; Prochaska & Marcus, 1994; Reed et al., 1997). While these findings may be interpreted as evidence of distinct change patterns between the pre-action stages and the action stages, the presence of distinct patterns of differences between adjacent stages within the pre-action stages and between the action and maintenance stage remains unclear.

The absence of specification of a causal model for each forward stage transition seriously undermines the value of the TTM as a predictive agent of health behavior change and complicates the development of stage-matched interventions aimed at promoting transition to the next stage in the sequence. The absence of empirical evidence demonstrating that specific theoretical constructs are associated with specific stage transitions also challenges the notion that a set of qualitatively distinct stages underlies the path toward action for regular physical activity adoption.

The goal of this study was to determine whether sufficient preliminary evidence as to the existence of qualitatively distinct stages can be derived from cross-sectional data to justify the implementation of a rigorous experimental test of a stage model in the context of regular physical activity. The present study examined patterns of differences across adjacent stages of regular moderate-intensity physical activity for self-efficacy, pros, cons, experiential processes of change, and behavioral processes of change among a large cross-sectional sample. Examination of change patterns across adjacent stages is regarded by some (Sutton, 2000b) as diagnostic of a true stage model (as opposed to a pseudostage model). Based on guidelines by Weinstein, Rothman, and colleagues (1998), the following criteria were used to evaluate evidence about the existence of pseudostages: linear change patterns from one stage to the next (e.g., absence of discontinuity patterns), similar patterns of differences for all theoretical constructs, and no differences across stages on any of the theoretical constructs. To generate hypotheses about the theoretical mediators associated with forward stage transition (which are necessary to design and test stage-matched interventions), the associations between theoretical constructs and sets of adjacent stages were also investigated. Specifically, this study set out to determine which theoretical constructs predicted being in one stage compared to being in the next stage in the sequence. Finally, a secondary goal of this study was to determine the feasibility and acceptability of measures, recruitment procedures, questionnaire administration via the internet, and expected participation level in an intervention study promoting regular physical activity adoption among sedentary or insufficiently active individuals.

METHOD

Participants and Procedures

The study population consisted of employees at a large telecommunication company located in Ottawa, Canada. Participants were recruited in February 2000 via a corporate email newsletter inviting them to take part in an internet-based study examining physical activity patterns and attitudes about regular physical activity of moderate intensity. Questionnaires completion was carried out via the internet and included measures of stage of change for regular physical activity, physical activity behavior, theoretical constructs based on the TTM (e.g., self-efficacy, pros and cons of regular physical activity, and experiential and behavioral processes of change) associated with regular physical activity adoption, and demographic information. Employees' participation in this study was anonymous and voluntary.

Measures

Stages of change. Stage of change for physical activity was assessed using a 5-item staging algorithm for regular moderate-intensity physical activity. This instrument has been shown to have adequate test-retest reliability (Kappa index = .78 over a two week period) (Marcus, Selby, et al., 1992) and concurrent validity with the well-established seven-day Physical Activity Recall Questionnaire (Marcus & Simkin, 1993). For the current study, the algorithm measuring readiness to adopt regular moderate-intensity physical activity was used. The following detailed definition of regular physical activity was employed as part of the staging algorithm:

"People can be physically active by doing many different types of exercise (walking, cycling, swimming, etc...) and each of these activities can be done using different levels of exertion. A moderate level of exertion means that you would not feel strain during the activity, and for an activity to be considered regular, you would participate in it at least four days a week, for at least 30 minutes a day".

Definitions of stages were based on results from a study by Reed and colleagues (1997) that compared the validity and reliability of eight staging algorithms for regular physical activity. The precontemplation stage was defined as individuals who did not engage in regular physical activity (according to the above definition) and did not intend to do so within the next six months. Participants who indicated that they were planning to start engaging in regular physical activity in the next six months were considered to be in the contemplation stage, and those who indicated they were planning to start in the next 30 days were considered to be in the preparation stage. Participants were classified in the action stage when they reported engaging in regular physical activity of at least moderate intensity for less than six months. Maintenance stage was defined as individuals reporting regular physical activity of at least moderate intensity for six months or more.

Self-efficacy. Self-efficacy for regular moderate physical activity was measured using a slightly modified version of the Self-Efficacy Scale (Marcus, Selby, et al., 1992), which represents areas of negative affect, resisting relapse, and making time for physical activity. Participants are asked to endorse each of the 8-item instrument using a 5-point Likert-type scale ranging from 1 “*not at all confident*” to 5 “*extremely confident*”. Higher scores indicate a higher confidence in one’s ability to persist exercising in various situations. Prior studies have shown an alpha coefficient of .82 for this scale and scores have been shown to significantly differentiate individuals at most stages of motivational readiness for physical activity adoption (Marcus, Selby, et al., 1992). In the present study, Cronbach’s alpha was .87.

Decisional balance. Decisional balance was measured using a shortened 10-item inventory assessing perceived benefits and costs of regular moderate physical activity participation (Marcus, Rakowski, Rossi, 1992). Each item is rated on a 5-point Likert-type scale with 1 being “*not at all important*” and 5 being “*very*

important". Higher scores on the pros scale indicate perceptions of high benefits from adopting regular physical activity, whereas high scores on the cons scale indicate perceptions of high costs from adopting regular physical activity. In this study, Cronbach's alpha was .77 for the Pros scale and .73 for the Cons scale. Correlation between the two scales was -.10. This measure has previously been shown to have good internal consistency (cons = .79, pros = .95) (Marcus, Rakowski, et al., 1992).

Processes of change. A shortened version of the processes of change questionnaire for physical activity adoption originally developed by Marcus, Rossi and their colleagues (1992) was used. Five behavioral processes of change (e.g., techniques which are used to modify behaviors) and five experiential processes of change (e.g., strategies which have the effect of creating favorable attitudes toward change) involved with the adoption of regular physical activity were assessed by 21-items pertaining to the frequency of occurrence of a number of situations during the past month (see Table 1). Each item is rated on a 5-point Likert-type scale with 1 being "*never*" and 5 being "*very often*". A high score on a process scale indicates frequent utilization of this strategy over the last month. In this study, Cronbach's alpha was .80 for experiential processes of change and .87 for behavioral processes of change. Correlation between the two scales was .63. In previous studies, internal consistency coefficients for the ten process scales were generally high (.62 to .88) and external validity of the ten process scales using discriminant function analysis revealed that the process scales accurately classify individuals in the five stages of motivational readiness for physical activity adoption (Marcus, Rossi, et al., 1992)

Physical Activity Behavior. Participants are asked to report the number of times in the past month they engaged in any of the following 23 activities: walking for exercise, jogging/treadmill, aerobic dance, machines at home, golf,

Table 1. Description of experiential and behavioral processes of change

Process of change	Description
<i>Experiential Processes</i>	
Consciousness raising	Learning about the problem behavior
Dramatic relief	Expressing feelings about the problem behavior
Environmental reevaluation	Evaluating how the problem behavior affects others
Social liberation	Environmental support for changing the problem behavior
Self-reevaluation	Determining how one thinks about oneself with respect to the problem behavior
<i>Behavioral Processes</i>	
Counterconditioning	Substituting alternative behaviors for the problem behavior
Helping relations	Talking about the problem behavior with people who care
Reinforcement management	Rewarding oneself for changing the problem behavior
Stimulus control	Control of situations and other causes which trigger the problem behavior
Self-liberation	Making a commitment to change the problem behavior

canoeing/kayaking, ice skating, ice hockey, swimming, tennis, squash/racquetball, cycling, bowling, rollerblading, basketball, soccer, curling, yoga, weight training, badminton, volleyball, and martial arts. Duration is assessed by asking how many minutes on average they did the activity each time. Respondents' participation across individual activities was transformed into an index of total energy expenditure, which represents and summarizes their overall participation in physical activities per day in the previous month. Total energy expenditure was calculated using the following formula:

$$\begin{aligned} \text{Energy Expenditure} &= \Sigma (N \times D / 60 \text{ minutes per hour} \times \text{METS} / 30 \text{ days per month}) \\ &= \Sigma (N \times D \times \text{METS} / 1800) \end{aligned}$$

Where:

N = number of times the activity was performed in the past month

D = average duration, in minutes, of the activity

METS = energy cost of activity, expressed as kilocalories expended per kilogram of body weight per hour of activity (kcal/kg/hr)

The MET value for each activity was derived from the Compendium of Physical Activities (Ainsworth et al., 1992). For this study, the MET value corresponding to the “general” intensity level for each activity (as reported in the Compendium of Physical Activities) was used in the calculation of the energy expenditure scores. This approach was adopted given that participants were not asked to specify the intensity level of their activities, and that people tend to overestimate the intensity, frequency, and duration of their activities (Duncan, Sydeman, Perri, Limacher, & Martin, 2001; Matt, Garcia, Primicias, Frericks, & De Faria, 1999; Montoye, Kemper, Sarris, & Washburn, 1996). To obtain the average duration in minutes of each activity reported by participants, the following protocol was followed: a duration of ≤ 15 minutes was assigned an average duration of 13 minutes; a duration of 16-30 minutes was assigned an average duration of 23 minutes; a duration of 31-60 minutes was assigned an average duration of 45 minutes; and a duration of ≥ 60 minutes was assigned an average duration of 60

minutes. This method of assigning an average duration is consistent with the methodology used in the Ontario Health Survey (OMH, 1990).

The *Stanford Usual Activity Questionnaire* (Sallis et al., 1985) estimates the level of participation in “habitual” or “lifestyle” physical activity behaviors (e.g., climbing some stairs instead of taking the elevator). A 5-point score was derived from the estimation of five habitual moderate intensity behaviors. A validation and reliability study by Jacobs et al. (1993) found this questionnaire to be valid ($r = .23$) and reliable ($r = .77$).

Barriers to regular physical activity. Participants were asked to list up to five barriers preventing them to engage in physical activity of at least moderate intensity on a regular basis.

Demographics. Demographics measured were gender, age, marital status (which was dichotomized as married/common law or non-married), smoking status, education level (which was dichotomized as high school/technical degree or college degree), and responsibility for the care of children under the age of 16. Additional heart-health information collected on participants (based on self-report) included weight and height, dieting status, being told by a health professional to increase their physical activity level, and current enrollment in a fitness center. A body mass index [BMI] was calculated for each respondent by dividing the weight (in kilograms) by the height (in meters) squared. The National Institutes of Health (1998) identify overweight as a BMI of 25-29.9 kg/m², and obesity as a BMI of 30 kg/m² or greater. A BMI between 18.5 and 24.9 kg/m² is considered in the healthy weight zone.

Statistical Analyses

Prior to the analyses, variables were examined for missing values and fit between their distribution and the assumptions of univariate and multivariate analyses using procedures suggested by Tabachnick and Fidell (1996) and by Stevens (1990). The proportion of variables with missing values was negligible. A group mean (e.g., by stage) was calculated from available data and used to replace missing values prior to analysis. Alternatively, cases with several missing values were deleted from subsequent analyses. Raw scores for univariate outliers (Z scores $> \pm 3.29$) were replaced with a value that was three standard deviations deviant from the group mean. Using Mahalanobis distance with $p < .001$, no cases were identified as multivariate outliers. Assumptions for the analysis of variance (e.g., normality, homogeneity of variance, and independence of observations) were met. For the logistic regressions, ratio of cases relative to the number of predictor variables was adequate. There was no reason to suspect a problem with too many empty cells or with outcome groups perfectly predicted by variables on the other outcome variables. No multicollinearity was evident given that the analyses showed no problem with convergence nor were the standard errors for parameters exceedingly large. Examination of residuals for outlying cases in the solution showed no score in excess of ± 3.29 .

For demographic characteristics, ANOVAs were used to compare continuous variables and chi-squares were used to compare categorical variables. In addition to raw scores, standardized T -scores ($M = 50$, $SD = 10$) for the TTM theoretical constructs were reported in accordance with previous studies. ANOVAs were used to compare individuals across stages on self-efficacy, pros, cons, and experiential and behavioral processes of change. The Tukey procedure was used following significant ANOVAs to examine pairwise group comparisons.

Consistent with the ordinal nature of the dependent variable, stages of change, additional analyses consisted of a series of four logistic regressions. The number of regression models was equal to the number of categories of the outcome variable minus one. Because the outcome variable is ordered, the first model examined the predictors associated with cases being above the first (lowest) category (e.g., precontemplation), and the second model examined the predictors associated with cases being above the second category (e.g., contemplation), and so forth. Logistic regression is a popular alternative to discriminant function analysis because it provides data on relative risks and is nearly assumption-free (Tabachnick & Fidell, 1996).

For each independent variable in the model (e.g., self-efficacy, pros, cons, experiential processes of change, and behavioral processes of change), the logistic regression analysis assessed the odds of an individual being in one stage compared to being in the adjacent stage. In these analyses, stage was dummy-coded (e.g., Model 1: *precontemplation* = 0 vs. *contemplation* = 1; Model 2: *contemplation* = 0 vs. *preparation* = 1; Model 3: *preparation* = 0 vs. *action* = 1; and Model 4: *action* = 0 vs. *maintenance* = 1) allowing for a ready determination of theoretical constructs that may be useful in designing stage-matched interventions to facilitate stage progression. This analytical approach is based on the assumption that comparing data from participants in a given stage to data from participants in lower and higher stages combined is of limited utility for designing stage-matched interventions. Stage-matched interventions ought to promote movement from lower to higher stages and as such, should be based on results comparing individuals in lower stages with those in higher stages only. Additionally, the TTM argues that stage transition is primarily forward and sequential (Prochaska, DiClemente, & Norcross, 1992), and that stage skipping is not expected (Prochaska, DiClemente, Velicer et al., 1992). Thus, based on theoretical grounds, the dependent variable “stages of

change” was dummy-coded so as to assess the theoretical constructs associated with being in one stage compared to being in the previous stage in the sequence.

The ten individual processes of change were also examined through logistic regression analyses to clarify the associations between individual processes of change and adjacent stages. Results of all logistic analyses are reported as odds ratios (OR). For example, an OR of 2.0 indicates that, on average, an individual who increases one unit on a particular mediator (e.g., self-efficacy) would double his or her odds of adjacent stage progression. All analyses were conducted using SPSS (version 10.0). Statistical significance was set at an alpha level of .01.

RESULTS

Participants Characteristics

Of the 11,659 employees subscribed to the corporate email newsletter, 1,172 completed the study; a 10% participation rate¹. Participants were on average male (65%), young ($M = 35$), educated (82% had a university degree), married or living in common law (65%), with no children (67%), and physically active on a regular basis (63%). With regard to physical activity patterns, 11% of participants were classified in the precontemplation stage, 11% in the contemplation stage, 15% in the preparation stage, 12% in the action stage, and 51% in the maintenance stage for regular physical activity of moderate intensity. Individuals in the action and maintenance stage reported significantly higher energy expenditure than individuals in the pre-action stages ($ps < .0001$). Individuals in the maintenance stage also reported the presence of more “lifestyle” physical activity behaviors than those in the precontemplation stage ($p < .001$). There were no other statistical differences across stages on physical activity behavior. Table 2 provides a description of participant characteristics by stages of change for regular physical activity.

The five most prevalent barriers to regular physical activity were identified as lack of time, work commitment, bad weather, fatigue/lack of energy, and lack of motivation/willpower by 54%, 35%, 28%, 24%, and 22% of participants, respectively. With the exception of individuals in the precontemplation stage, there was little variability among the five most prevalent barriers to regular physical

¹ The corporate email newsletter used for recruitment purposes was sent to all employees at once resulting in a large proportion of individuals interested to participate in the study attempting to access simultaneously the internet site for the study (515 participants had completed the study within the first two hours of recruitment). The heavy internet traffic resulted in extremely slow loading up of web pages and ultimately, in the University of Ottawa server to crash and remain inoperable for several hours. As such, the participation rate may not be a clear gauge of actual interest in study participation or stage distribution for regular physical activity of moderate intensity.

Table 2. Demographic characteristics of a cross-sectional sample by stage of change for regular physical activity

Variables	Stage of Change					Adjacent Stage Comparison
	Precontemplation (n = 132)	Contemplation (n = 132)	Preparation (n = 169)	Action (n = 146)	Maintenance (n = 582)	
% male	70.0	68.9	62.9	52.1	66.2	PC,C,P,A<M
Mean age (SD)	37.6 (8.9)	35.0 (8.4)	36.1 (8.3)	32.8 (8.3)	34.5 (8.8)	PC,C,P>A,M
% married	74.6	71.2	69.2	62.8	60.8	-
% responsible for the care of children	53.4	42.0	39.4	26.4	26.6	PC,C,P>A,M
% college degree	82.3	82.3	76.3	80.6	82.6	-
% smoker	7.6	7.6	9.4	8.9	5.6	-
% healthy weight zone	48.8	45.8	32.3	40.3	56.7	PC,C>P,A<M
% currently on a diet to lose weight	6.8	14.4	24.7	36.3	14.6	PC<C<P<A>M
% told by a health professional to increase their physical activity level	21.5	27.5	36.1	27.6	5.5	PC,C,P,A>M
% enrolled in a fitness center	27.5	33.6	54.7	76.6	73.3	PC,C<P<A,M
Stanford lifestyle activity behaviors (SD)	1.78 (1.22)	1.96 (1.07)	2.12 (1.17)	2.07 (1.15)	2.25 (1.24)	-
Total energy expenditure (SD)	1.10 (1.21)	0.81 (0.73)	1.13 (1.16)	2.06 (1.43)	3.30 (2.02)	PC,C,P<A<M

Note. All comparisons were made using chi-square tests or ANOVAs. Post hoc comparisons were made using the Tukey procedure. Comparisons between *adjacent* stages that were statistically significant are shown using a < or > symbol. If differences between *adjacent* stages were not statistically significant, a comma was used. A dash (-) means no significant differences between any of the *adjacent* stages. PC= Precontemplation, C= Contemplation, P= Preparation, A= Action, M= Maintenance.

activity across stages. For individuals in the precontemplation stage, children and family commitments (25%), lack of interest in physical activity (21%), and absence of an exercise partner (20%) were identified as the most prevalent barriers to regular physical activity in addition to lack of time (64%) and work commitment (25%) (see Table 3).

Comparison of Theoretical Constructs across Stages

Table 4 displays cross-sectional data for self-efficacy, perceived benefits (pros) and costs (cons) of regular physical activity, and experiential and behavioral processes of change across stages. An increase in self-efficacy for regular physical activity was generally observed across the stages ($F[4, 1,156] = 112.85, p < .0001$). As shown in Figure 1, there were no significant differences in self-efficacy between precontemplation, contemplation, and preparation, but there was a significant increase between preparation and action ($p < .0001$) and a further significant increase between action and maintenance ($p < .0001$).

The perceived benefits of regular physical activity increased across stages ($F[4, 1,163] = 39.01, p < .0001$) whereas the perceived costs of regular physical activity decreased ($F[4, 1,161] = 112.01, p < .0001$). As can be seen in Figure 2, the crossover for regular physical activity (i.e., equal perception of benefits and costs) was observed to occur in both the preparation and action stage. The only significant increase between adjacent stages for the perceived benefits of regular physical activity was from the contemplation to the preparation stage ($p < .0001$). The perceived costs of regular physical activity, on the other hand, showed a significant linear decrease between contemplation and maintenance ($ps < .001$).

Table 3. Barriers to regular physical activity per stage of change

Barriers (%)	Stages of Change					Average
	PC	C	P	A	M	
Lack of time	64	57	66	55	48	54
Work commitment	25	27	28	44	39	35
Weather	18	28	28	27	31	28
Fatigue/ lack of energy	13	24	28	33	24	24
Lack of motivation/ willpower	18	28	40	28	15	22
Illness/ injury	16	15	18	21	20	18
Children/ family commitments	25	21	22	19	15	18
Lack of exercise partner	20	21	19	18	12	15
Location of gym (too far)	12	21	15	19	13	15
Lack of interest for physical activity	21	21	17	8	7	12
Laziness/ procrastination	9	15	20	6	7	10
Cost	15	18	12	11	7	10
Other more important priorities	11	10	10	15	7	9
Social commitments	4	2	6	3	10	7
Concern about looking weird	7	14	13	9	2	6
Inconvenient hours of operation of fitness facility	2	2	4	13	6	5
Household responsibilities	5	7	4	5	4	4
Do not know how to get started	4	8	6	6	2	4
Negative mood (depression/ stress)	2	3	5	3	2	3
No change in fitness condition	5	2	4	5	2	3
Other	9	4	7	7	6	6

Note. PC = precontemplation ($n = 132$), C = contemplation ($n = 132$), P = preparation ($n = 169$), A = action ($n = 146$), M = maintenance ($n = 582$)

Table 4. Means and standard deviations for self-efficacy, pros, cons, and experiential and behavioral processes of change by stage for regular physical activity

Variables	Stage of Change				
	Precontemplation (<i>n</i> = 132)	Contemplation (<i>n</i> = 132)	Preparation (<i>n</i> = 169)	Action (<i>n</i> = 146)	Maintenance (<i>n</i> = 582)
Self-Efficacy	2.69 ± 0.88	2.55 ± 0.59	2.80 ± 0.59	3.16 ± 0.59	3.58 ± 0.65
Pros	2.73 ± 0.98	3.05 ± 0.89	3.62 ± 0.75	3.53 ± 0.76	3.61 ± 0.83
Cons	2.49 ± 0.77	2.57 ± 0.72	2.30 ± 0.67	1.95 ± 0.63	1.61 ± 0.54
Experiential POC	2.27 ± 0.71	2.52 ± 0.58	2.75 ± 0.64	2.86 ± 0.61	2.80 ± 0.70
Behavioral POC	1.86 ± 0.72	2.12 ± 0.62	2.43 ± 0.58	3.04 ± 0.58	3.08 ± 0.69

Note. Statistical analyses were conducted on the standardized *T*-scores. Means and standard deviations are reported for comparisons with other studies that have used raw scores.

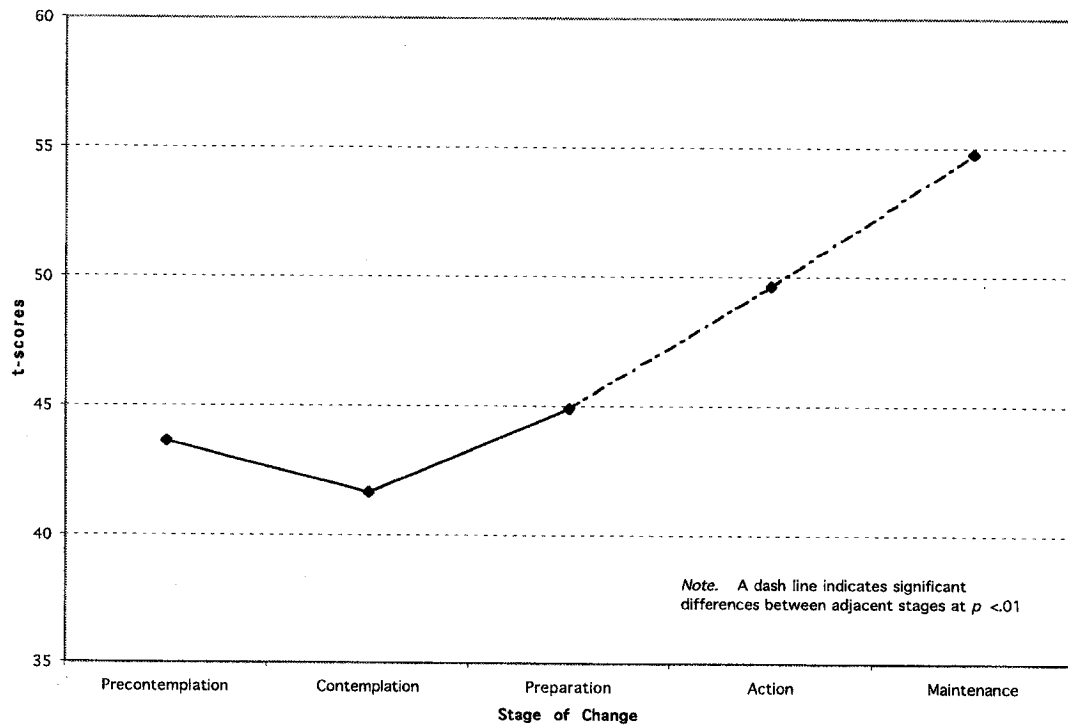


Figure 1. Cross-sectional data on self-efficacy for regular physical activity by stage of change.

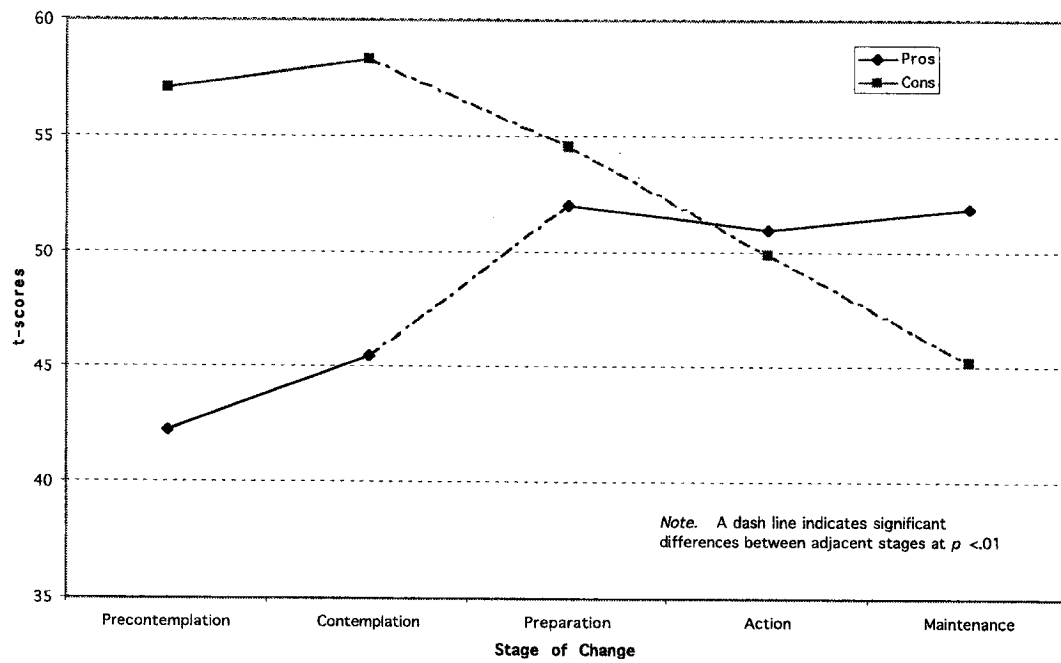


Figure 2. Cross-sectional data on the benefits (pros) and costs (cons) of regular physical activity by stage of change.

The behavioral and experiential processes of change showed a similar linear increase across the stages, with experiential processes of change being used more frequently in the pre-action stages ($ps < .0001$), and behavioral processes of change being used more frequently in the action and maintenance stage ($ps < .0001$) (see Figure 3). However, a differential pattern of change for experiential and behavioral processes emerged between adjacent stages. In this study, the behavioral processes ($F[4, 1,153] = 139.26, p < .0001$) increased significantly in use between contemplation and action ($ps < .0001$). Despite a linear increase across the stages, however, the experiential processes of change showed no significant increase in use between any adjacent stages. Finally, the experiential processes of change ($F[4, 1,160] = 20.92, p < .0001$) were used significantly more frequently in the action and maintenance stage than in the precontemplation and contemplation stage ($ps < .0001$).

Associations between Theoretical Constructs and Adjacent Stages

None of the theoretical constructs were found to be significant predictors of being in the contemplation stage rather than in the precontemplation stage. Logistic regression analyses revealed that the perceived benefits and costs of regular physical activity were significantly associated with being in the preparation stage rather than in the contemplation stage. Theoretical constructs related to being in the action stage rather than in the preparation stage were behavioral processes of change and self-efficacy. As can be seen in Table 5, individuals who scored higher (by one unit) on the behavioral processes of change measure were almost eight times more likely to be classified in the action stage rather than in the preparation stage. Finally, self-efficacy and the perceived costs of regular physical activity were significantly associated with being in the maintenance stage rather than in the action stage.

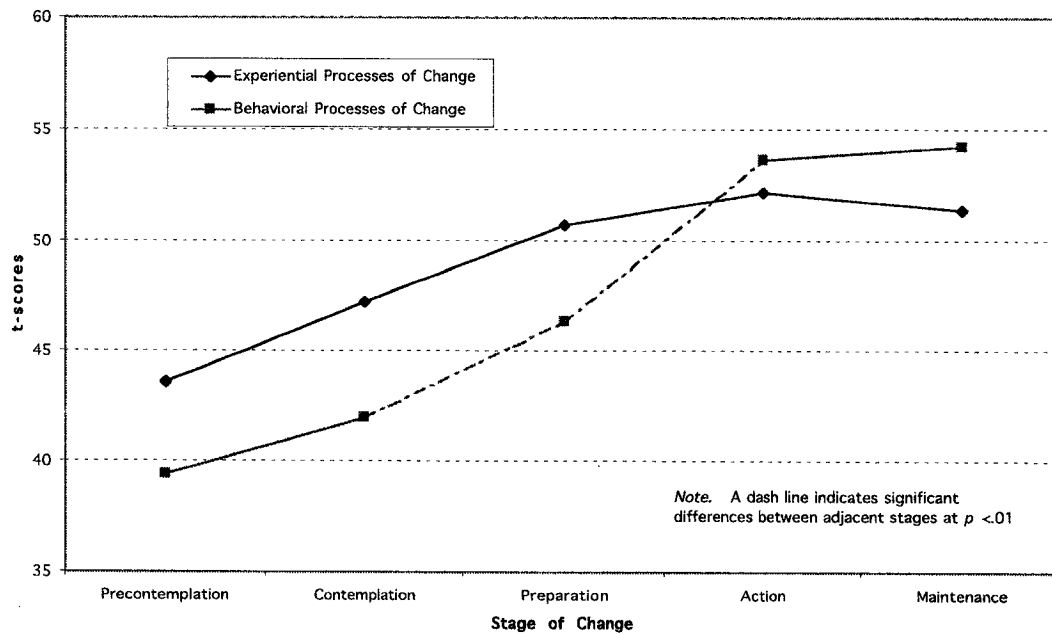


Figure 3. Cross-sectional data on the experiential and behavioral processes of change for regular physical activity by stage of change.

Table 5. Distinction between adjacent stages as a function of the TTM theoretical constructs

Variables	Stage Distinction							
	Precontemplation vs. Contemplation (<i>n</i> = 263)		Contemplation vs. Preparation (<i>n</i> = 301)		Preparation vs. Action (<i>n</i> = 313)		Action vs. Maintenance (<i>n</i> = 720)	
	<i>OR</i>	<i>95% CI</i>	<i>OR</i>	<i>95% CI</i>	<i>OR</i>	<i>95% CI</i>	<i>OR</i>	<i>95% CI</i>
Self-efficacy	0.70	0.47-1.03	1.18	0.73-1.90	1.86**	1.14-3.04	2.26***	1.59-3.21
Pros	1.27	0.91-1.76	2.07***	1.46-2.95	0.68	0.46-1.01	1.19	0.90-1.58
Cons	1.13	0.78-1.63	0.59**	0.40-0.87	0.73	0.46-1.16	0.54***	0.39-0.75
Experiential POC	1.16	0.70-1.94	0.97	0.58-1.62	0.54	0.31-0.96	0.74	0.50-1.09
Behavioral POC	1.54	0.96-2.48	1.74	1.04-2.89	7.85***	4.35-14.18	0.96	0.65-1.42

Note. OR = odds ratio; CI = confidence interval

** *p* < .01. *** *p* < .001

Examining individual experiential and behavioral processes of change, logistic regression analyses showed that more frequent use of *consciousness-raising* was associated with being in the contemplation stage rather than in the precontemplation stage. None of the individual processes were found to be significant predictors of being in the preparation stage rather than in the contemplation stage. A comparison of individuals in the preparation and action stage revealed that those in the action stage used *counterconditioning*, *helping relations*, and *reinforcement management* more frequently in the previous month. Processes of change related to being in the maintenance stage rather than in the action stage were *dramatic relief*, *consciousness raising* and *counterconditioning*. As can be seen in Table 6, three of the four comparisons between adjacent stages yielded odds ratios smaller than zero, suggesting that a lower use of certain processes was also associated with stage distinction. The means and standard deviations for the five experiential and the five behavioral processes of change across stages are displayed in Table 7.

Feasibility of Intervention Study

With regard to participation in an intervention study on physical activity adoption, 43% of the participants indicated that they were interested to very interested in participating in an intervention study on physical activity adoption. Participants in the preparation stage were the most likely to express an interest in participation in an intervention study (67.4%) whereas those in the precontemplation stage were the least likely (26.2%). Of interest for the proposed intervention study, 63% of participants in the contemplation stage and 76% of those in the preparation stage indicated being moderately to very interested in participating in an intervention study on physical activity promotion.

Table 6. Distinction between adjacent stages as a function of experiential and behavioral processes of change

Variables	Stage Distinction							
	Precontemplation vs. Contemplation (<i>n</i> = 263)		Contemplation vs. Preparation (<i>n</i> = 301)		Preparation vs. Action (<i>n</i> = 313)		Action vs. Maintenance (<i>n</i> = 725)	
	<i>OR</i>	<i>95% CI</i>	<i>OR</i>	<i>95% CI</i>	<i>OR</i>	<i>95% CI</i>	<i>OR</i>	<i>95% CI</i>
Consciousness- Raising	1.80**	1.15-2.81	0.88	0.62-1.27	0.75	0.52-1.09	1.46**	1.11-1.90
Dramatic Relief	0.82	0.49-1.14	1.20	0.91-1.59	0.78	0.58-1.04	0.63***	0.52-0.77
Environmental Reevaluation	0.95	0.69-1.31	1.01	0.76-1.34	0.59**	0.43-0.81	1.16	0.93-1.45
Social Liberation	0.71	0.51-1.00	0.85	0.64-1.14	1.05	0.76-1.45	0.88	0.70-1.11
Self-Reevaluation	1.47	1.01-2.13	1.22	0.85-1.75	1.00	0.63-1.57	0.72	0.53-0.97
Counter- Conditioning	0.58**	0.40-0.85	1.43	1.03-1.98	2.17***	1.54-3.06	1.61***	1.26-2.06
Helping Relation	1.06	0.62-1.80	1.05	0.69-1.60	1.85**	1.21-2.83	0.86	0.66-1.12
Reinforcement Management	1.11	0.72-1.73	0.94	0.65-1.35	2.16***	1.41-3.30	0.80	0.60-1.05
Stimulus Control	1.03	0.68-1.57	1.09	0.76-1.57	1.08	0.73-1.58	1.44	1.08-1.92
Self-Liberation	1.40	0.95-2.07	1.48	1.04-2.11	1.15	0.78-1.69	0.73	0.56-0.95

Note. OR = odds ratio; CI = confidence interval

** $p < .01$. *** $p < .001$

Table 7. Means and standard deviations for experiential and behavioral processes of change by stage of change

Variables	Stage of Change				
	Precontemplation (<i>n</i> = 131)	Contemplation (<i>n</i> = 132)	Preparation (<i>n</i> = 169)	Action (<i>n</i> = 144)	Maintenance (<i>n</i> = 584)
Consciousness- Raising	1.71 ± 0.79	2.12 ± 0.75	2.32 ± 0.90	2.57 ± 0.90	2.75 ± 1.02
Dramatic Relief	2.22 ± 1.04	2.39 ± 0.89	2.63 ± 1.04	2.45 ± 1.02	2.01 ± 1.02
Environmental Reevaluation	2.00 ± 1.02	2.23 ± 0.99	2.47 ± 1.00	2.45 ± 1.03	2.64 ± 1.12
Social Liberation	2.71 ± 0.84	2.64 ± 0.93	2.71 ± 0.93	2.91 ± 0.99	2.91 ± 1.00
Self-Reevaluation	2.73 ± 1.14	3.25 ± 0.93	3.62 ± 0.92	3.91 ± 0.75	3.69 ± 0.95
Counter- Conditioning	1.96 ± 0.99	1.91 ± 0.90	2.26 ± 0.86	2.99 ± 0.85	3.29 ± 0.95
Helping Relation	1.46 ± 0.63	1.64 ± 0.67	1.80 ± 0.70	2.24 ± 0.82	2.26 ± 0.87
Reinforcement Management	2.06 ± 0.96	2.46 ± 0.94	2.81 ± 0.94	3.63 ± 0.90	3.53 ± 0.99
Stimulus Control	1.95 ± 0.87	2.17 ± 0.86	2.50 ± 0.89	3.00 ± 0.84	3.16 ± 0.91
Self-Liberation	2.09 ± 1.10	2.63 ± 0.87	3.09 ± 0.91	3.70 ± 0.88	3.54 ± 1.07

DISCUSSION

The present study examined patterns of differences between adjacent stages for regular physical activity on theoretical constructs hypothesized by the TTM to differ between stages. Examination of such patterns can be regarded as providing preliminary evidence about the existence of a true stage model (as opposed to a pseudostage model) (Sutton, 2000b). This study also set out to examine associations between theoretical constructs and adjacent stages, which is necessary to formulate hypotheses about the theoretical mediators associated with specific stage transitions and to design and test stage-matched interventions using a prospective design.

Examination of Change Patterns between Adjacent Stages

Examination of change patterns between adjacent stages on theoretical constructs revealed three primary findings. First, there were “discontinuity patterns” (patterns that do not show consistent increments or decrements across stages) between the pre-action stages and the action stages for self-efficacy and the perceived benefits of regular physical activity. A discontinuity pattern was also noted for the behavioral processes of change between the preparation and the maintenance stage. Second, the experiential processes of change and the perceived costs of regular physical activity showed a linear relation across stages. Third, there were no significant differences between the precontemplation and the contemplation stage on any of the theoretical constructs.

Discontinuity patterns were observed between the pre-action stages and the action stages for self-efficacy and the perceived benefits of regular physical activity—a finding consistent with narrative reviews (Biddle & Nigg, 2000; Prochaska & Marcus, 1994). One assumption of a stage model is that different theoretical constructs are important at different stages (Weinstein, Rothman, et al.,

1998). The discontinuity pattern found in this study implied that self-efficacy is important for individuals who have expressed a behavioral intention to become physically active (preparation) or who have recently become physically active (action), but less so for individuals who do not intend to change their behavior in a foreseeable future (precontemplation or contemplation). Similarly, an increase in the perception of benefits of regular physical activity appeared mostly beneficial for individuals in the early stages, and seemed to be of little relevance to those who are already physically active. Such patterns of differences are consistent with the underlying assumptions of a stage model.

An additional discontinuity pattern was observed between the preparation and the maintenance stage for the behavioral processes of change. Behavioral processes of change increased linearly across stages and then leveled off during the maintenance stage. This finding is consistent with the literature, which has shown a stabilization of processes of change use among individuals in the maintenance stage (Marcus, Rossi, et al., 1992). It is also supported by empirical evidence that suggest that initiating behavioral change involves different factors than those associated with maintaining behavioral change (Litt, Kleppinger, & Judge, 2002; Marcus et al., 2000). To the extent that discontinuity patterns indicate the existence of qualitatively distinct stages (Sutton, 2001; Weinstein, Rothman, et al., 1998), results from the present study can be interpreted to support the notion that preparation and action are genuine stages qualitatively distinct from another.

Linear change patterns from one stage to the next were observed for the perceived costs of regular physical activity and the experiential processes of change. While the perceived costs of regular physical activity declined linearly across stages, the experiential processes of change did not differ significantly between any adjacent stages. A linear pattern across stages implies that the perceived costs of regular physical activity are important at all stages. Thus, this

pattern appears inconsistent with the stage model assumption that different causal factors are important at different stages (Sutton, 2001), and appears more diagnostic of a continuum model. However, it is conceivable that some theoretical constructs may be important at every stage, as long as there are some constructs that do not show a consistent linear increase or decrease across stages (Weinstein, Rothman, et al., 1998). In the present study, the experiential processes of change did not appear to be instrumental in distinguishing between any pairs of adjacent stages of change for regular physical activity. This finding is supported by results from prospective studies, which consistently failed to provide evidence that experiential processes of change are associated with stage transition (Lewis et al., 2002).

No significant differences were observed on any of the theoretical constructs between the precontemplation and contemplation stage. Data from the present study did not support the notion that precontemplation and contemplation should be distinguished from each other as separate stages in the context of regular moderate-intensity physical activity. Regression analyses examining the association between theoretical constructs and being in contemplation rather than in precontemplation also supported this finding. These findings are noteworthy and appear inconsistent with the tenets of the TTM and previous research. The TTM postulates that the experiential processes of change and the perceived benefits and costs of regular physical activity are most important during the early stages, although there are no clear specifications about which theoretical constructs should differentiate the precontemplation from the contemplation stage and the contemplation from the preparation stage. A recent meta-analysis of empirical applications of the TTM in the physical activity domain found that the most pronounced change in the perceived benefits and costs were evident from precontemplation to contemplation (Marshall & Biddle, 2001). The meta-analysis aggregated data from studies using different definitional criteria for staging

algorithms, and only two of the 68 independent samples used a definition of regular physical activity similar to the one used in this study. No data on theoretical constructs across stages were reported in these studies to allow for comparison with the present findings. Given the complexity of physical activity behavior, the use of different criterion in defining physical activity behavior is likely to result in different outcomes and different mediators associated with behavioral change. It also may be necessary to consider the possibility of floor effects to explain the absence of differences between precontemplation and contemplation, although examination of raw scores on the various theoretical constructs suggests the presence of room for additional variability in scores. The use of modified measures of theoretical constructs may also have contributed to the differences with findings from the literature. Response rate was low, and individuals who agreed to participate in this study likely had a more positive attitude towards the topic of the study, as illustrated by the high proportion of individuals in the action and maintenance stage. This positive selection bias may have reduced the differences observed between individuals in adjacent stages (e.g., precontemplation and contemplation stage). Finally, it may be that precontemplation and contemplation, as currently defined by the TTM, are not two qualitatively distinct stages in the context of regular physical activity of moderate intensity.

In summary, there were mixed evidence based on the criteria outlined by Weinstein, Rothman, and colleagues as to the existence of five qualitatively distinct stages for regular physical activity. Rather, empirical evidence mostly were consistent with the presence of a “pre-action” stage and an “action” stage. None of the data supported the existence of the precontemplation stage. Only modest evidence for a distinction between contemplation and preparation and between action and maintenance were observed based on patterns of differences between adjacent stages on the TTM theoretical constructs.

Associations between Theoretical Constructs and Adjacent Stages

The regression analyses compared individuals in one stage with those in the next adjacent stage in the sequence for regular physical activity. Underlying this approach are the assumptions that unique patterns of theoretical constructs are associated with the different stages of change and that distinct stage patterns offer guidelines for matching interventions to an individual's stage of change. Results from the present study revealed different patterns of associations between theoretical constructs and adjacent stages of change for regular physical activity.

Consistent with the predictions of the TTM, the perceived benefits and costs of regular physical activity differentiated contemplation from the preparation stage whereas self-efficacy and the behavioral processes of change differentiated preparation from the action stage. Behavioral processes of change, notably counterconditioning, helping relations, and reinforcement management, were highly significant in distinguishing preparation from action ($OR = 7.85$), which may be interpreted as indicative of the importance of implementing behavioral strategies when initiating behavioral change. These results are also consistent with accumulating empirical evidence suggesting that behavioral processes of change are likely mediators of physical activity adoption (see Lewis et al., 2002 for a review).

Self-efficacy and the perceived costs of regular physical activity differentiated action from the maintenance stage. This is consistent with findings from the smoking cessation literature suggesting that self-efficacy may be predictive of stage progression during the action and maintenance stages (Prochaska & Marcus, 1994). The finding that the perceived costs of regular physical activity differentiated action from maintenance, however, is contradictory to the tenets of the TTM, as the model predicts a decrease in importance of the perceived costs of regular physical activity in the later stages (Buxton et al., 1996; Prochaska & Marcus, 1994; Reed, 1999). It may be that in the physical activity

domain, the costs of regular physical activity remain salient as individuals start engaging in physical activity on a regular basis. Indeed, there was a pattern in this study for individuals in the maintenance stage to report fewer barriers to regular physical activity than individuals in the action stage. In one of the few studies examining theoretical predictors of exercise maintenance (Bock, Marcus, Pinto, & Forsyth, 2001), individuals who met CDC/ACSM guidelines for physical activity at 12-month follow-up reported higher self-efficacy, behavioral processes of change use, and positive mood, but also fewer barriers to physical activity than those who no longer met CDC/ACSM guidelines. Most of the literature on the TTM has focused on the transition from the pre-action stages to the action stage, and there is little empirical data to support the predictions of the TTM regarding specific theoretical constructs associated with the transition from the action to the maintenance stage.

Hypotheses about Theoretical Mediators of Adjacent Stage Transition

The appeal of a stage model of health behavior lies in the belief that different factors are important at different stages and hence, the prospect of designing stage-matched interventions. Results from this study can be used to hypothesize which theoretical constructs based on the TTM need to be emphasized in the development of stage-matched interventions designed to produce stage progression. On the basis of the present findings, it is hypothesized that a stage-matched intervention for individuals in the contemplation stage should promote an increase in the perceived benefits of regular physical activity and a decrease in the perceived costs of regular physical activity. A stage-matched intervention for individuals in the preparation stage should provide self-efficacy enhancing information and promote the use of behavioral processes of change. An additional focus should be placed on increasing the use of counterconditioning, helping relations, and reinforcement management in designing an intervention matched to the preparation stage. To promote progression from the action to the maintenance stage, a stage-matched intervention should focus on increasing self-efficacy level

and decreasing the perceived costs of regular physical activity. Consciousness-raising and counterconditioning should also be the target of a stage-matched intervention to the action stage.

Patterns of differences across stages require careful interpretations when based on cross-sectional data given that it may not translate into behavioral change over time. A discontinuity pattern between adjacent stages (e.g., increase in self-efficacy between the preparation and action stage) may be interpreted either as a consequence of stage transition or as a causal factor influencing the likelihood of stage transition (Sutton, 2001). Unlike the first interpretation, only the latter one has direct implications for intervention. For example, self-efficacy is strongly influenced by successfully performing the target behavior (e.g., exercising) (Bandura, 1997a), and individuals in the action stage are, by definition, engaging in regular physical activity successfully. If the increase in self-efficacy between the preparation and the action stage is primarily a consequence of performing the behavior successfully, then, there is no reason to believe that the provision of self-efficacy enhancing information would result in behavioral change or stage progression. Finally, the relevance of these findings for populations other than the present sample of respondents is also undetermined.

Feasibility and Acceptability of Intervention Study

The use of a corporate email newsletter within a large worksite resulted in an efficient strategy to reach a large number of individuals for participation into an internet-based study. However, the simultaneous access to the study website by several hundred individuals resulted in a substantial loss of potential participants. Future implementations of this recruitment protocol should be modified so as to reduce the number of individuals receiving the email newsletter simultaneously. For example, the newsletter could be sent to subsets of employees over a period of several days rather than to all employees at once.

Questionnaires completion via the internet proved to be an efficient approach to accurate data collection. Overall, the shortened adapted measures of the TTM theoretical constructs for regular physical activity showed adequate internal consistency. Cronbach's alphas across measures varied between .73 and .87. The use of a staging algorithm using a precise definition of regular physical activity of moderate intensity resulted in approximately 60% of the sample classified in the action or maintenance stage. These data conflict with previous epidemiological work suggesting that the proportion of individuals meeting guidelines for regular physical activity is nearer 25% (CDC, 2001). However, these results are similar to stage distribution data for physical activity recently compiled for meta-analytic purposes (Marshall & Biddle, 2001), which found that about half of the total sample was in the action or maintenance stage. Data also paralleled findings that stringent criterion for regular physical activity (e.g., 30 minutes a day, 4-7 days a week) stage the highest proportion of individuals in the maintenance stage compared to less stringent criterion (Marshall & Biddle, 2001).

The primary measure of physical activity behavior in this study used "average" duration of time spent engaging in various activities over a 1-month period and did not provide information about the intensity level at which each activity was performed. In addition, limited data is available about the validity and reliability of this measure. Given that the staging algorithm used in this study specifies the minimum duration and intensity level at which physical activities should be performed, the use of a physical activity questionnaire measuring duration and intensity level of each activity seems warranted. Further, standardized and validated measures of physical activity behavior would increase the validity of study findings (Dishman, Oldenburg, O'Neal, & Shepard, 1998) and would likely result in a more accurate estimation of individuals' physical activity behavior. Finally, the use

of several measures of physical activity behavior would allow for consideration of consistency of associations across measures.

In the present study, approximately 26% of participants were classified either in the contemplation or preparation stage and between 63% and 76% of them indicated an interest in participation in an intervention study on physical activity adoption. Stages of change have been shown to be a reliable indicator of recruitment and retention rates in intervention studies across health behaviors (Prochaska & Velicer, 1997b). For example, in an intensive proactive recruitment protocol² for participation in a smoking cessation program (Lichtenstein & Hollis, 1992), 35% of smokers in precontemplation signed up for the program, 3% showed up, and 2% completed the program. With a combination of smokers in the contemplation and preparation stage, 65% signed up, 15% showed up, and 11% finished. Such findings suggest that there may be a need to use tailored recruitment procedures that match the stage individuals are in to achieve an adequate sample size. Then, the focus should shift to the retention of study participants, because a significant proportion of initial participants will likely be lost to follow-up.

Qualifications

There are some qualifications to this study. First, the present analyses were limited to some extent by both the study population – volunteers for a physical activity study – and by the fact that the measures used for defining stages of change for regular physical activity and the theoretical constructs were not identical to those initially proposed by Marcus and colleagues (Marcus, Rakowski, et al., 1992; Marcus, Rossi, et al., 1992; Marcus, Selby, et al., 1992). Second,

² Physicians spent time with each smoker to get them to sign up for a smoking cessation program. If that did not work, a nurse spent 10 minutes persuading each smoker to sign up, followed by 12 minutes with a videotape and health educator, and even a proactive counselor call if necessary.

demographic differences across stages might have accounted for some of the patterns of differences between adjacent stages. That is, what appeared as differences between stages on theoretical constructs might in fact have been due to differences in age, marital status, or childcare responsibilities. Third, despite the large sample size of this study, the overall response rate limits the ability to generalize from these results. Fourth, the staging algorithm used in this study measured regular physical activity of moderate intensity. Most prior work in the domain of physical activity and the TTM has focused on vigorous physical activity and research has shown that different correlates are associated with engaging in physical activity at different intensity levels (Hovell, Sallis, Hofstetter, Spry, Faucher, & Caspersen, 1989).

Conclusion

Given the cross-sectional research design used in this study, differences between adjacent stages on TTM theoretical constructs should not be interpreted as causal factors of stage transition. Further, merely observing that different theoretical constructs have different change patterns across stages does not offer conclusive evidence for either a stage model or a continuum model of health behavior (Weinstein, Rothman, et al., 1998). However, findings from the present study can be used to hypothesize the theoretical mediators of progression to the next stage in the sequence for regular physical activity. Research using more rigorous designs (e.g., longitudinal and experimental research designs) is needed to determine the influence of self-efficacy, experiential and behavioral processes of change, and the perceived benefits and costs of regular physical activity in promoting forward stage transition, to evaluate the effectiveness of stage-matched interventions, and to determine the existence of qualitatively distinct stages of change for regular physical activity.

STUDY 2

OVERVIEW

This research was stimulated by recent criticisms that stage models of health behavior place factors that vary on a continuum into discrete categories (termed stages) whose division is arbitrary. If the path to action is best explained by a continuum model (e.g., stages are not genuinely distinct), there is no reason to expect different mediators to influence different stage transitions and hence, no basis for matching interventions to stage – the appeal of a stage perspective.

The present study aimed to test the validity of the TTM by contrasting the effectiveness of stage-matched interventions versus stage-mismatched interventions and standard care for regular moderate-intensity physical activity adoption among a group of sedentary or insufficiently active adults over a period of eight weeks. This study focused on two stage transitions: from *contemplation* to *preparation* and from *preparation* to *action*. Using both theory and cross-sectional findings from Study 1, an intervention matched to the contemplation stage and an intervention matched to preparation stage using the hypothesized mediators specific to each stage transition for physical activity adoption were developed. Adjacent stage transition was deemed the primary outcome measure. This study also examined whether the stage-matched interventions successfully influenced hypothesized theoretical mediators and whether hypothesized theoretical mediators influenced physical activity behavior and adjacent stage transition.

On the basis of the tenets of the TTM, it was hypothesized that individuals in the contemplation stage who received a stage-matched intervention would be more likely to advance to the next stage in the sequence and possibly reports higher level of physical activity than those who received a stage-mismatched or standard care intervention. It was also hypothesized that individuals in the preparation stage who

received a stage-matched intervention would be more likely to advance stages and report higher level of physical activity than those who received a stage-mismatched or standard care intervention. Increase in physical activity behavior among individuals in the contemplation and preparation stage was hypothesized on the basis of meta-analytic findings indicating that transitions between “inactive” stages are associated with significant changes in physical activity level (Marshall & Biddle, 2001) (effect size of .54 and of .85 for contemplation to preparation and for preparation to action, respectively).

Additional hypotheses accompany the data analysis. Based on findings from Study 1, an increase in the perceived benefits of regular physical activity and a decrease in the perceived costs of regular physical activity were hypothesized to mediate progression from the contemplation to the preparation stage. Given that adjacent stage progression for individuals in the preparation stage inevitably involve an increase in physical activity level, theoretical mediators of forward stage transition and increased physical activity behavior were not expected to differ for individuals in the preparation stage. As such, an increase in self-efficacy and behavioral processes of change were hypothesized to mediate progression from the preparation to the action stage and increase in physical activity behavior.

METHOD

Recruitment Procedures

Employees at four participating worksites were recruited via a corporate email newsletter to determine their interest to participate in a study on physical activity promotion. Worksites consisted of two telecommunication organizations and one financial organization located in Ottawa, Ontario, and one health care organization located in Saint John, New Brunswick. Each worksite had a similar intranet communication infrastructure and sent weekly corporate email newsletters to their employees.

Two groups of individuals were explicitly invited to participate in this study: sedentary or insufficiently active individuals who were planning to incorporate regular physical activity into their lifestyle within the next 6-months (*contemplation stage*) and those planning to incorporate regular physical activity into their lifestyle within the next 30-days (*preparation stage*). The recruitment email explained that participation was limited to the completion of questionnaires and the receipt and reading of intervention materials. The recruitment protocol specified that participants did not have to change their physical activity patterns unless they chose to do so. Interested individuals were invited to visit a website that provided additional information about the study, determined eligibility for study participation, and included a consent form. The website was developed so that individuals who met criteria for study participation and provided consent to participate were prompted to complete questionnaires via the internet whereas individuals who did not meet eligibility criteria were redirected to a webpage explaining the reasons they did not qualify for study participation. Individuals who did not provide consent for study participation were redirected to the homepage of the website. All contact with participants was conducted via the internet with webpages and email correspondence.

Exclusionary criteria for the study included: (a) coronary heart disease; (b) orthopedic problems; (c) presence of a medical condition that would prevent or make exercise at a moderate level of exertion unsafe (as determined by the Physical Activity Readiness Questionnaire clearance questionnaire (Thomas, Reading, & Shepard, 1992)); (d) age under 18 or over 64; (e) accumulation of more than 90 minutes of endurance (cardiovascular) type of activity, of at least moderate intensity, weekly; or (f) classification in the precontemplation, action, or maintenance stage for regular physical activity of at least moderate intensity. All participants had access to a computer and an internet connection and had a corporate email address. Given the nature of the recruitment, it was not possible to determine the number of interested individuals who did not participate in the study due to exclusionary criteria, extensive internet traffic on the website, or other reasons.

Design

Following baseline assessment, stratified by baseline stages of change for regular physical activity of moderate intensity, eligible participants were randomly assigned to one of three interventions: an intervention matched to the contemplation stage, an intervention matched to the preparation stage, or a standard care intervention, creating a 2 (baseline stage: contemplation or preparation) X 3 (intervention: intervention matched to the contemplation stage, intervention matched to the preparation stage, standard care) factorial design. Participants were mailed the intervention material that was consistent with the randomization process within two to five days of the completion of the baseline assessment. Intervention material was sent to participants via each worksite's internal mail system. Questionnaire completion was carried out via the internet at baseline and six week following the initial completion of questionnaires.

The questionnaires included measures of stage of change, physical activity behavior, and hypothesized mediators based on the TTM (e.g., self-efficacy, decisional balance, processes of change) associated with physical activity adoption. Data collected via the internet was received electronically by the first author. At the end of six weeks, participants were contacted via email to prompt them to complete questionnaires identical to their initial study package. In an effort to reduce participant attrition, participants failing to complete questionnaires within seven days were contacted again via email and reminded to complete questionnaires. The same procedure was repeated on up to two occasions, if necessary. This study was approved by the University's Human Research Ethics Committee, and all participants provided informed consent.

Interventions

The stage-matched interventions were based on principles and findings from physical activity and behavioral science. The physical activity goals (when relevant) were derived from national guidelines such as those in the Surgeon General's report (USDHHS, 1996). The behavioral science component was based on the TTM (Prochaska & DiClemente, 1983). A cross-sectional study on physical activity behavior and correlates of physical activity adoption among employees at a participating worksite (i.e., Study 1), focus groups with employees classified in the contemplation or in the preparation stage, and a review of theoretically-relevant variables hypothesized to influence stage transitions were used to guide the development of the two stage-matched interventions. In addition, the stage-matched interventions were independently reviewed by three individuals with extensive knowledge and experience in the application of the TTM to ensure adequate operationalization of the stage-matched material, appropriate vulgarization of the concepts presented, and to avoid overlap of theoretical constructs across the two stage-matched interventions.

Intervention matched to the contemplation stage. The intervention matched to the contemplation stage consisted of a 41-page manual entitled *Thinking about Change?* Written activities as part of the manual focused on reducing ambivalence with respect to the adoption of regular physical activity by identifying the perceived benefits and costs of regular physical activity specific to each individual, using cognitive restructuring principles to address barriers about getting regular physical activity, and completing the decision-making process toward regular physical activity. Specific intervention components were primarily designed to change hypothesized mediators of change that is, increasing the pros and decreasing the cons of regular physical activity. Specific suggestions for starting a physical activity routine (action-oriented) were not provided in this manual.

Intervention matched to the preparation stage. The intervention matched to the preparation stage consisted of a 45-page manual entitled *Getting Ready for Change?* It focused on increasing the use of behavioral processes of change and self-efficacy level for regular physical activity. The manual emphasized the importance of viewing regular physical activity as a healthy alternative to unhealthy behaviors (e.g., counterconditioning), making a commitment to adopt a physically active lifestyle, increasing self-efficacy for the adoption of regular physical activity, and developing a detailed written plan about incorporating regular physical activity of moderate intensity into one's lifestyle (e.g., reinforcement management, helping relationship). In addition to the focus on changing hypothesized mediators of adjacent stage progression relevant to the preparation stage, this manual contained specific physical activity guidelines (derived from national guidelines such as those in the Surgeon General's report (USDHHS, 1996)) and was oriented toward the adoption of a physical activity routine.

Standard care. The standard care intervention consisted of the *Physical Activity Guide to Healthy Active Living* (28-pages) developed by Health Canada and

the Canadian Society for Exercise Physiology. The manual provided a list of physical activity (type, intensity, frequency) as well as a brief list of the benefits of physical activity and the health risks of inactivity. Several examples of how different individuals have built physical activity into their daily life are provided. Overall, the emphasis of the manual was on knowledge acquisition rather than behavioral change principles. This manual was selected to represent the type of action-oriented material that is currently available for the public. Since “standard care” for physical activity is typically no intervention, the provision of an “active” action-oriented intervention was considered a rigorous test of the hypothesis.

A copy of the three manuals used in this study can be found in Appendix 1.

Measures

Stages of change. Stage of change for physical activity was assessed using a 5-item staging algorithm for regular moderate-intensity physical activity. This instrument has been shown to have adequate test-retest reliability (Kappa index = .78 over a 2-week period) (Marcus, Selby, et al., 1992) and concurrent validity with the well-established seven-day Physical Activity Recall Questionnaire (Marcus & Simkin, 1993). The following detailed definition of regular physical activity was employed as part of the staging algorithm:

“People can be physically active by doing many different types of exercise (walking, cycling, swimming, etc...) and each of these activities can be done using different levels of exertion. A moderate level of exertion means that you would not feel strain during the activity, and for an activity to be considered regular, you would participate in it at least four days a week, for at least 30 minutes a day”.

Definition of stages has varied across studies and has implications for the staging of individuals. Thus, the definition of stages and the response format for assessing stages were based on results from a study by Reed et al. (1997) that examined the validity and reliability of eight staging algorithms for regular physical

activity. Participants who indicated that they were planning to start engaging in regular physical activity (according to the above definition) in the next 30 days were considered to be in the preparation stage, and those who indicated they were planning to start in the next six months were considered to be in the contemplation stage. Participants were considered to be in the action stage when they reported engaging in regular physical activity of at least moderate intensity at follow-up (but for less than six months).

The primary outcome measure was stage transition. *Forward stage transition (any)* was assessed by dichotomizing changes in stage: forward transition was scored as 1, versus no transition or backward transition, which was scored as 0. *Reaching the action stage* was assessed by dichotomizing changes in stage: reaching the action stage was scored as 1, versus no transition or backward transition, which was scored as 0. *Forward adjacent stage transition* was also assessed by dichotomizing changes in stage: forward adjacent transition was scored as 1, versus no transition or backward transition, which was scored as 0. Participants that progressed by more than one stage at follow-up were excluded from these analyses.

Modified TTM measures of self-efficacy, decisional balance, and the behavioral and experiential processes of change, based on existing TTM measures of physical activity have been developed and validated for the Canadian population (Plotnikoff et al., 2001). Interviews were conducted in the community to confirm, add, and reword Marcus and colleagues' existing measures of these constructs.

Self-efficacy. Self-efficacy for regular moderate-intensity physical activity was measured using a slightly modified version of the Self-Efficacy Scale (Marcus, Selby, et al., 1992), which represents areas of negative affect, resisting relapse, and making time for physical activity. Participants are asked to endorse each of the

8-item instrument using a 5-point Likert-type scale ranging from 1 “*not at all confident*” to 5 “*extremely confident*”. Higher scores indicate a higher confidence in one’s ability to persist exercising in various situations. Cronbach’s alpha was 0.80. Prior studies have shown an alpha coefficient of this scale is 0.82.

Decisional balance. Decisional balance was measured using a shortened 10-item inventory assessing perceived benefits and costs of regular moderate physical activity participation (Marcus, Rakowski, et al., 1992). Each item is rated on a 5-point Likert-type scale with 1 being “*not at all important*” and 5 being “*very important*”. Higher scores on the pros scale indicate perceptions of high benefits from adopting regular physical activity, whereas high scores on the cons scale indicate perceptions of high costs from adopting regular physical activity. Cronbach’s alpha was 0.71 for the Pros scale and 0.67 for the Cons scale. Correlation between the scales was not significant ($r = -.05$). This measure has previously been shown to have good internal consistency (cons = .79, pros = .95) (Marcus, Rakowski, et al., 1992).

Processes of change. A shortened version of the processes of change questionnaire for physical activity adoption originally developed by Marcus, Rossi, et al. (1992) was used. Five behavioral processes of change (e.g., counterconditioning, helping relationships, reinforcement management, self-liberation, and stimulus control) and five experiential processes of change (e.g., consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, and social liberation) involved with the adoption of regular physical activity were assessed by 21-items pertaining to the frequency of occurrence of a number of events during the past month. Each item is rated on a 5-point Likert-type scale with 1 being “*never*” and 5 being “*very often*”. A high score on a process scale indicates frequent utilization of this strategy over the last month. In the present study, Cronbach’s alpha was .78 for the experiential processes of change scale and

.81 for the behavioral processes of change scale. Correlation between the two scales was .52.

Physical activity behavior. The self-administered portion of the National Health Interview Survey [NHIS] (Kriska & Caspersen, 1997) was used to assess the frequency and duration of physical activity behaviors. Respondent are asked to report the number of times in the past two weeks they engaged in any of the following 24 activities: walking, jogging/running, aerobic dance, biking/exercise cycle, stair climbing, gardening/ yard work, stretching/yoga, weightlifting, swimming, tennis, golf, bowling, baseball/softball, handball/racquetball/ squash, downhill skiing, cross-country skiing, water skiing, basketball, volleyball, soccer, football, ice hockey, ice skating, and martial arts. Duration is assessed by asking how many minutes they did the activity each time. Test-retest reliability of this measure has been found to be 0.77 (Sarkin, Nichols, Sallis, & Calfas, 2000).

Two indicators of physical activity level were calculated using data obtained from the NHIS: (1) *Meeting CDC/ACSM 4d/wk¹, 30 min/bout*: whether or not the participant met CDC/ACSM guideline for minimal physical activity- a sum of 8 bouts of 30 minutes or more in the past 2 weeks met the criterion. Meeting the CDC/ACSM guideline was scored as 1, and not meeting the guideline was scored as 0; and (2) *Minutes of physical activity*. Number of minutes of physical activity ≥ 3 METS for the past week.

Two additional physical activity measures were used to allow consideration of consistency of associations across measures. The *Godin Leisure-Time Exercise Questionnaire* (Godin & Sheppard, 1985) measures weekly usual frequencies of strenuous, moderate, and mild activities of ≥ 15 minutes in duration during leisure time. Respondents are asked to complete a brief 3-item query of usual leisure-time exercise habits. The *Godin Total Leisure Activity Score* was calculated by summing

the products of weekly usual frequencies of strenuous, moderate, and light activities of ≥ 15 minutes in duration during leisure activities, multiplied by nine, five, and three METs, respectively. Test-retest reliability data ($r =$ from 0.62 to 0.74) and results from validation studies ($r =$ from 0.32 to 0.61) have been satisfactory for the Total Leisure Activity Score (Jacobs, Ainsworth, Hartman, & Leon, 1993; Godin & Sheppard, 1985; Miller, Freedson, & Kline, 1994; Sallis, Buono, Roby, Micale, & Nelson, 1993).

The *Stanford Usual Activity Questionnaire* (Sallis et al., 1985) estimates the level of participation in “habitual” or “lifestyle” physical activity behaviors (e.g., climbing some stairs instead of taking the elevator). A 5-point score was derived from the estimation of five habitual moderate intensity behaviors. A validation and reliability study by Jacobs et al. (1993) has found this questionnaire to be valid ($r = 0.23$) and reliable ($r = 0.77$).

Demographics. Demographics measured were gender, age, marital status, smoking status, and education level (which was dichotomized as high school/technical degree or college degree).

Intervention Evaluation. Participants’ evaluation of the intervention was obtained at follow-up. Participants were asked whether they had read the manual and to rate the extent to which the manual was useful to them. The last question was scored on a 5-point scale ranging from 1 being “*not at all useful*” to 5 being “*very useful*”.

A copy of the measures used in this study can be found in Appendix 2.

Statistical Analyses

Prior to the analyses, the five proposed theoretical mediators and the three physical activity outcome measures across the six cells of the factorial design were examined for missing values and fit between their distribution and the assumptions of univariate and multivariate analyses using procedures suggested by Tabachnick and Fidell (1996) and by Stevens (1990). The variables were examined separately at each stage and by study conditions.

Statistical assumptions. With regard to missing data, group means (e.g., by stage) were calculated from available data and used to replace missing values prior to analysis (baseline: 16 missing values; follow-up: 22 missing values). Eight cases in the preparation stage were identified as univariate outliers because of their high Z scores ($> \pm 3.29$) (NHIS minutes of physical activity at baseline = four cases and NHIS minutes of physical activity at follow-up = four cases). The raw score for these cases was replaced with a value that was three standard deviations deviant from the group mean. Changing the scores on the variables for the outlying cases so that they are deviant, but not as deviant as they were, has been described as a satisfactory procedure to reduce the impact of univariate outliers (Tabachnik & Fidell, 1996). Using Mahalanobis distance with $p < .001$, one case was identified as a multivariate outlier (preparator in the stage-mismatched condition) and was deleted.

Normality was assessed by examining skewness and kurtosis values of each variable across the six cells of the factorial design. Although these analyses determined that, on average, the data were univariately normal, some of the values on the NHIS variable were positively skewed (e.g., +1.397 for contemplators in the stage-matched condition). This non-normal distribution was also confirmed by visual examination of the histogram. In the case of a small deviation from normality, a variable will usually not deviate enough from normality to make a realistic differences in the analyses (Tabachnik & Fidell, 1996). Further, repeated-

measures ANOVA are robust against non-normality even for very skewed distributions, and a lack of normality due to skewness has only a slight effect on power (a few hundredths) (Stevens, 1990). Thus, data transformations were not performed³ because of the low likelihood of variance underestimation and because of the difficulty in interpreting results from data transformation. Further, the use of residual change scores appeared to normalize the distribution.

Sphericity was met ($E = 1$) in all analyses of repeated-measures ANOVA. The assumption of independence of observations also was met because the intervention was individually administered. Homogeneity of variance was not met for one mediator variable (residual change score for the pros among individuals in the contemplation stage). Thus, the hypothesis for this analysis was tested using a more stringent alpha level ($p < .01$). Pairwise linearity was checked using within-group scatterplots and found to be satisfactory. Examination of several of these plots revealed no evidence of curvilinearity.

The bivariate correlation matrix and the determinants of the correlation matrix were examined across all variables, for each cell, to check for the presence of multicollinearity and singularity. The largest correlations across proposed mediators was $r = .44$ among the contemplation group and $r = .51$ for the preparation group (between cognitive and behavioral processes of change). Problems with a correlation matrix usually occur as a result of variables that are correlated $> .90$ (Tabachnik & Fidell, 1996). Thus, examination of these indicators revealed no evidence of multicollinearity or singularity.

For the logistic regression, ratio of cases relative to the number of predictor variables was adequate for the analyses with the individuals in the preparation stage

³ A logarithmic transformation was initially attempted and resulted in a normal distribution. However, results from planned statistical analyses for this variable were almost indistinguishable from the results obtained using non-transformed data.

but was small for those in the contemplation stage. Too few contemplators reached the action stage or met the CDC/ACSM guidelines for regular physical activity by post-intervention follow-up resulting in two-way tables with more than 20% of the cells having frequencies less than five and inordinately large parameter estimates. Odds ratio were not reported for these two outcome variables. There was no reason to suspect a problem with too many empty cells or with outcome groups perfectly predicted by variables on the other outcome variables. No multicollinearity was evident given that the analyses showed no problem with convergence nor were the standard errors for parameters exceedingly large. Examination of residuals for outlying cases in the solution showed no score in excess of ± 3.29 .

For linear regressions, the issue of the ratio of cases to IVs among the contemplation group was similar to that of logistic regressions. Assumptions for normality, linearity, homoscedasticity, and independence of residuals were met. There was no evidence of multicollinearity or singularity or outliers in the solution.

Change in outcomes and hypothesized mediators over time. Repeated-measures ANOVA were performed to examine changes over time in physical activity behavior and differences between individuals classified in the contemplation and preparation stage at baseline. The between-subject factor was stage at baseline (contemplation/ preparation). The within-subject factor was time of assessment (baseline/ post-intervention follow-up). For physical activity behavior, the reported total number of minutes of physical activity (>3METS) per week, the Godin Total Leisure Activity score, and the Stanford Lifestyle Activity score at each time point were the criteria for comparison over time. For the analyses examining change in mediators over time, self-efficacy, pros, cons, experiential processes of change, and behavioral processes of change at each time point were used. To quantify the

magnitude of the observed effects, proportion of variance accounted for was reported, based on partial eta-squared.

Chi-square analyses were used to examine relations between discrete variables such as stage transition and achievement of CDC/ACSM criteria for regular physical activity.

Intervention effects on outcomes and hypothesized mediators. Standardized residual change scores were calculated for all mediators (e.g., self-efficacy, pros of change, cons of change, behavioral processes of change, and experiential processes of change) and physical activity measures (e.g., NHIS, Godin, Stanford). Each change score was calculated by subtracting predicted scores from observed scores, where the predicted score was computed by regressing baseline values on post-intervention scores. Thus, the residual change score is the post-intervention score with the pre-intervention score partialled out. It is a measure of the degree to which an individual increased more than would be expected given his or her initial status. Standardized residual change scores have a mean of 0 and a standard deviation of 1. The residualization of the change scores was performed separately for the contemplation and the preparation stage.

A series of ANOVA was employed to test differences between study conditions in residual change in physical activity behavior (e.g., NHIS, Godin, Stanford) and in residual change in proposed mediators (e.g., self-efficacy, pros, cons, experiential processes of change, and behavioral processes of change). The fixed factor was the intervention (stage-matched/ stage-mismatched/ standard care). All analyses were stratified by baseline stage. To quantify the magnitude of the difference between conditions, effect sizes were also reported. Results of statistical analyses using linear regression procedures were indistinguishable from

the results presented here. As such, results derived from analyses of variance procedures are presented because of their greater familiarity.

Logistic regression was used to analyze intervention effects on categorical outcome measures. Stage transition and meeting CDC/ACSM requirements were entered as the dependent variables in separate regressions. Intervention was dummy-coded and entered as predictors. Separate analyses were computed for each baseline stage.

Mediator effects on outcomes. Pearson correlations between demographics variables, interventions, mediator scores at baseline, mediator residual change scores, and physical activity residual change scores and stage transition were calculated and used in selection of variables for subsequent analyses. Then, regressions were conducted to determine the independent contributions of mediators. For the binary outcome measures (stage transition, meeting CDC/ACSM guidelines) logistic regression was used, and for the quantitative outcome measures (minutes of physical activity per week (NHIS), Godin Total Leisure Activity score, Stanford Lifestyle Activity score) linear regression was used. The number of mediators was reduced by only entering variables that correlated $p < .10$ with physical activity residual change scores and stage transition. Results of all logistic analyses are reported as odds ratios (OR). For example, an OR of 2.0 indicates that, on average, an individual who increases 1 unit on a particular mediator (e.g., self-efficacy) would double his or her odds of stage transition.

Assessment of mediation. To establish whether an intervention effect found at follow-up is mediated by changes in the theoretical constructs targeted by the stage-matched intervention, the following criteria suggested by Baron and Kenny (1986) were examined: (1) Was the independent variable (intervention) associated with change in the hypothesized mediator? (2) Was the independent variable

(intervention) associated with change in the dependent variable (physical activity behavior)? (3) Did change in the hypothesized mediator explain change in the dependent variable (physical activity behavior)? Mediation is indicated by a decrease in the magnitude and significance of the intervention effect, that is, when a previously significant relationship between the independent and dependent variables is *attenuated* when statistically controlling for change in the hypothesized mediator (in addition to meeting the three criteria described above).

One of the conceptual model tested whether self-efficacy and behavioral processes of change assumed the role of mediators in explaining the impact of the stage-matched intervention (to preparation) on physical activity behavior and adjacent stage progression. Another model tested whether the pros and cons of regular physical activity assumed the role of mediators in explaining the impact of the stage-matched intervention (to contemplation) on adjacent stage progression. Separate models were estimated for each dependent variable. Residual change scores⁴ for the hypothesized mediators and the dependent variables were used in each model, given that researchers hypothesize that stage-matched interventions are effective in increasing physical activity behavior due to *changes* in specific mediators (e.g., self-efficacy) (Lewis et al., 2002).

⁴ The use of residual change scores as part of the mediation analysis was based on the analytic procedure employed by Miller and colleagues (2002) to examine mediators of physical activity behavior change. This article was part of a special issue of the American Journal of Preventive Medicine devoted to innovative approaches to understanding and influencing physical activity. In the foreword, Powell, Bricker, and Blair (2002) highlighted that the manuscripts published in this special issue are “refreshing evidence of creative thinking in the area of public health and physical activity.... [and] are more important for the research standards they set and the direction they point than for any specific new finding” (p. 1). Further, residual change scores are preferable to simple change scores because they eliminate autocorrelated error and regression to the mean effects (Shutz, 1989), and were reported in accordance with previous studies investigating potential theoretical mediators of change in physical activity behavior (e.g., Calfas et al., 1996; Calfas et al., 1997; Miller et al., 2002; Sallis et al., 1999).

All analyses were conducted using SPSS (Version 10.0). Statistical significance was set at an alpha level of 0.05, unless otherwise noted.

RESULTS

Participant Characteristics

Of the 190⁵ respondents, 57.4% were women; 62.6% had a college degree; 14.7% were smokers; 75.3% were married; and the mean age was 39.1 years. On average, respondents had engaged in 49.4 minutes and in 0.82 $\geq$ 30-minutes bouts of physical activity of at least moderate intensity in the past week. At baseline, 50.6% of the respondents reported being completely sedentary; the remaining of the sample indicating being insufficiently active. In the previous week, 2.6% met the CDC/ACSM guidelines for minimum physical activity participation (i.e., participating in physical activity of moderate intensity at least four days a week for a total of at least 30 minutes each day). There was no statistical differences in self-reported minutes of physical activity at baseline across the four participating worksites ($F(3, 186) = 0.17, p = .91$). At baseline measurements, 74.2% of participants were classified in the preparation stage and 25.8% were classified in the contemplation stage for regular physical activity.

Data at post-intervention follow-up is available from 157 individuals. Thirty-three participants dropped out of the study; a deactivated email address at the time of post-intervention follow-up was the primary reason for abandon ($n = 21$). The average period of time elapsed between baseline and follow-up measurement was 60.5 ± 16.1 days. The final sample consisted of 157 participants stratified according to their baseline stage for regular physical activity (participants in the preparation stage: stage-matched condition ($n = 43$), stage-mismatched condition

⁵ Several attempts were made to increase the sample size following the untimely dismissal of several hundreds employees at the worksite initially selected for the completion of this study (including the health promotion officer responsible for the implementation of the recruitment protocol) approximately two weeks into data collection. Three additional worksites with similar intranet communication infrastructures were sought and recruitment procedures identical to the first worksite were implemented resulting in the above-mentioned sample size.

($n = 35$), standard care condition ($n = 37$); participants in the contemplation stage: stage-matched condition ($n = 15$), stage-mismatched condition ($n = 16$), or standard care condition ($n = 11$)). Demographic data on the original and follow-up samples as well as on non-completers are provided in Table 8.

Randomization Check and Attrition

To verify the effectiveness of the randomization process, participants in the six conditions were compared on the variables mentioned in the participant characteristics section. As an additional check, the study conditions (stratified by baseline stage of change for regular physical activity) were compared on scores of the five TTM theoretical constructs (e.g., self-efficacy, pros, cons, experiential processes of change, and behavioral processes of change) and physical activity level (in minutes) at baseline. Chi-square tests for the discrete variables and F tests for the continuous variables revealed no differences between the conditions on any of these variables.

Baseline measures were reported on physical activity level primarily for the month of March through July, whereas the final data point was for activity in May to September. Because seasonal variations have been shown to influence physical activity behavior (Stephens & Caspersen, 1994), the months during which baseline and follow-up measurements occurred were examined for differences in physical activity level. Using self-reported minutes of physical activity as the dependent variable, one-way ANOVAs revealed no significant differences between months at which baseline or follow-up assessment occurred. Change in self-reported minutes of physical activity between baseline and follow-up also did not differ significantly based on the month at which either baseline or follow-up assessment was conducted. Season at follow-up, categorized as Summer (defined as June, July, and August (46.5% of the sample)) or not Summer, revealed no significant association with any of the outcome measures.

Table 8. Demographic characteristics at baseline of the original and follow-up sample as well as on non-completers

Variables	Baseline sample (<i>n</i> =190)	Follow-up sample at baseline (<i>n</i> =157)	Non-completers at baseline (<i>n</i> =33)
% female	57.9	60.5	45.5
Mean age (SD)	39.09 (±8.87)	39.24 (±8.89)	38.39 (±8.90)
% married	75.3	75.2	75.8
% responsible for the care of children under the age of 16	42.1	42.7	39.4
% college degree	62.6	64.3	54.5
% smokers	14.7	12.1	27.3
% classified in the contemplation stage	25.8	26.8	21.2
% classified in the preparation stage	74.2	73.2	78.8
Mean number of minutes of physical activity in the last week (SD)	49.38 (±79.30)	48.85 (±78.64)	51.91 (±83.58)
Mean number of bouts of physical activity in the last week (SD)	0.81 (±1.16)	0.80 (±1.17)	0.87 (±1.11)

Attrition from baseline measurement to post-intervention follow-up was 17.4% ($n = 33$) (Individuals in the contemplation stage who received a stage-matched intervention = 16.7%, a stage-mismatched intervention = 11.1%, and standard care = 16.7%. Individuals in the preparation stage who received a stage-matched intervention = 12.2%, a stage-mismatched intervention = 26.5%, and standard care = 15.9%). Logistic regression analysis, with attrition as the dependent variable and the same variables as in the randomization check and study conditions as independent variables, revealed that dropouts were more likely to be males ($p < .05$) and to be smokers ($p < .05$).

Change in Outcome Measures over Time

Stage transition. Figure 4 depicts stage transition from baseline to post-intervention follow-up by stage at baseline. Across study conditions, 26.2% of individuals in the contemplation stage progressed one stage (to preparation), 40.5% progressed two stages (to action), and 35.7% remained in the contemplation stage. Among individuals in the preparation stage, 60.9% progressed one stage (to action), 29.6% remained in the preparation stage, and 9.6% regressed one stage (to contemplation). Chi-square analyses showed no significant group differences in the percentage of individuals who progressed at least one stage by follow-up (preparation stage = 60.9% vs. contemplation stage = 64.3%, ($\chi^2[1, N = 157] = 0.15, p = .69$)). However, significantly more individuals progressed to the adjacent stage in the preparation stage (60.9%) compared to individuals in the contemplation stage (26.2%) ($\chi^2[1, N = 157] = 14.81, p < .0001$). More individuals in the preparation stage (60.9%) also reached the action stage compared to individuals in the contemplation stage (40.5%) by post-intervention follow-up ($\chi^2[1, N = 157] = 5.17, p < .02$).

Physical activity participation. Repeated-measures ANOVAs revealed a significant increase in physical activity behavior across time (NHIS ($F[1, 149] =$

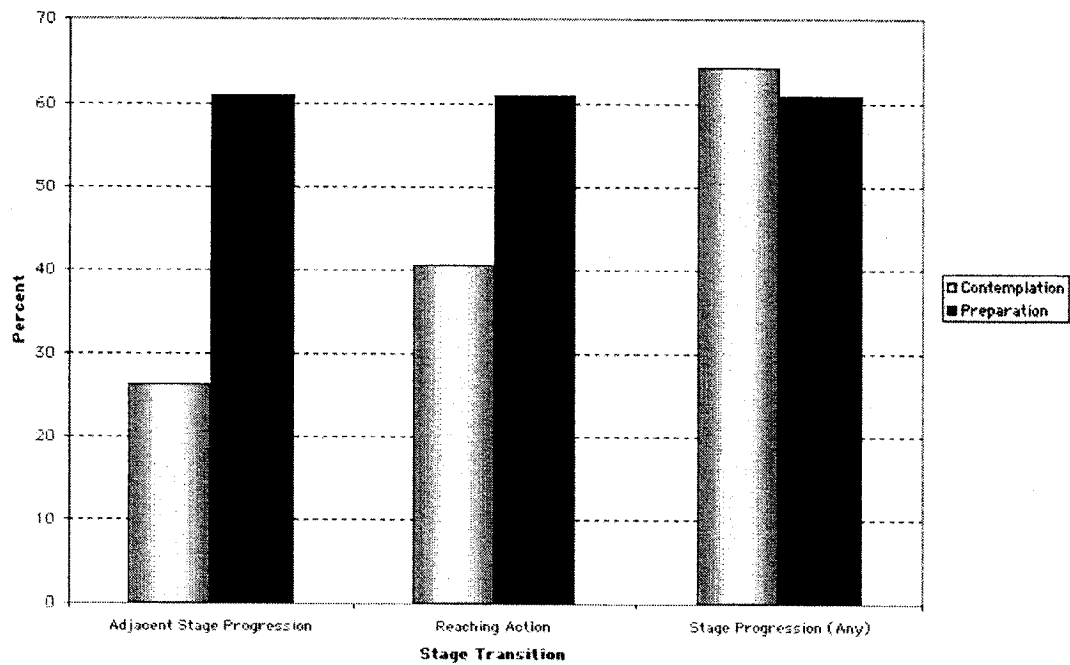


Figure 4. Stage transition for regular physical activity from baseline to post-intervention follow-up by stage at baseline

42.58, $p < .0001$), Godin- ($F[1, 151] = 126.77, p < .0001$), and Stanford ($F[1, 150] = 57.15, p < .0001$)). From baseline to follow-up, participants reported an increase of 77.7 minutes of physical activity per week (effect size = .23), an increase of 15.2 in Godin Total Leisure Activity score (effect size = .47), and an increase of 0.737 in Stanford Lifestyle Activity score (effect size = .28) (see Figure 5, 6, and 7). There was also a time by stage interaction for minutes of physical activity per week (NHIS) ($F[1, 149] = 11.16, p < .001$). At follow-up, participants classified in the contemplation stage at baseline reported an increase of 37.9 minutes per week in physical activity, whereas those in the preparation stage reported an increase of 117.4 minutes of physical activity per week. There was no significant time by stage effects on the Godin and Stanford measures.

Participants were also classified as either meeting or not meeting CDC/ACSM criteria for regular physical activity. Chi-square analyses indicated that a significantly greater proportion of individuals classified in the preparation stage (35.2%) reached the CDC/ACSM guidelines for regular physical activity participation at post-intervention follow-up compared to those classified in the contemplation stage (7.5%) at baseline ($\chi^2[1, N=145] = 11.15, p < .001$).

Intervention Effects on Outcome Measures

Stage transition. Among contemplators, 33.3% of the individuals in the stage-matched condition advanced to the next stage (adjacent) compared to 25.0% in the stage-mismatched and 18.2% in the standard care condition. However, as can be seen in Figure 8, 50.0% of the individuals in the stage-mismatched condition reached the action stage compared to 26.7% in the stage-matched and 45.5% in the standard care condition. A chi-square analysis revealed that these differences were not statistically significant ($\chi^2[2, N = 42] = 0.77, p = .68$) and ($\chi^2[2, N = 42] = 1.90, p = .38$), respectively. Among preparors, 67.4% of the individuals in the stage-matched condition progressed to the next adjacent

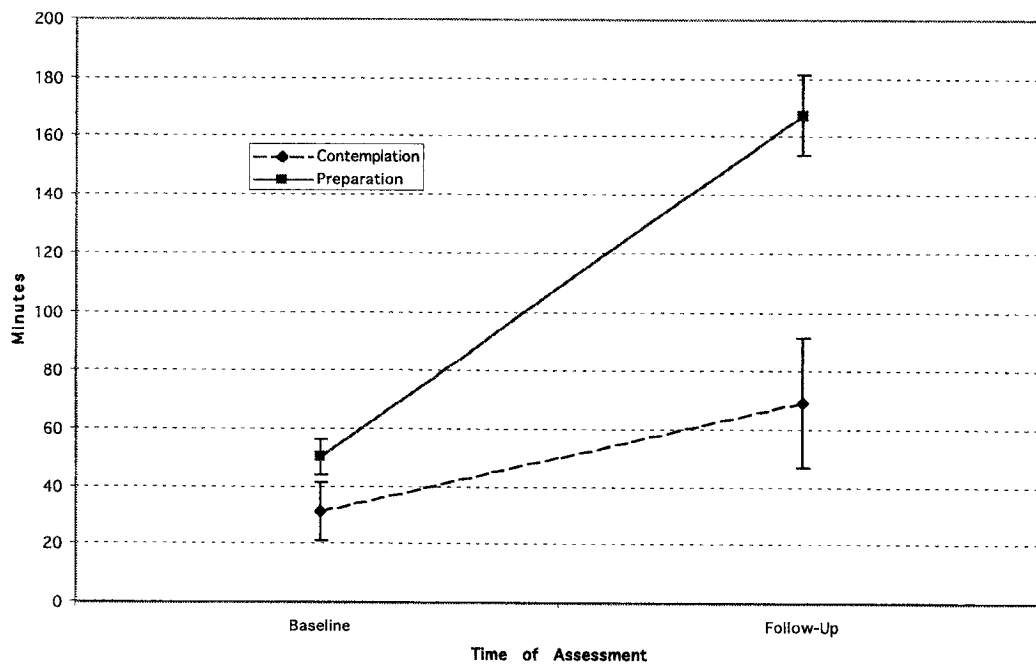


Figure 5. Number of minutes of physical activity (≥ 3 METS) per week at baseline and post-intervention follow-up (NHIS)

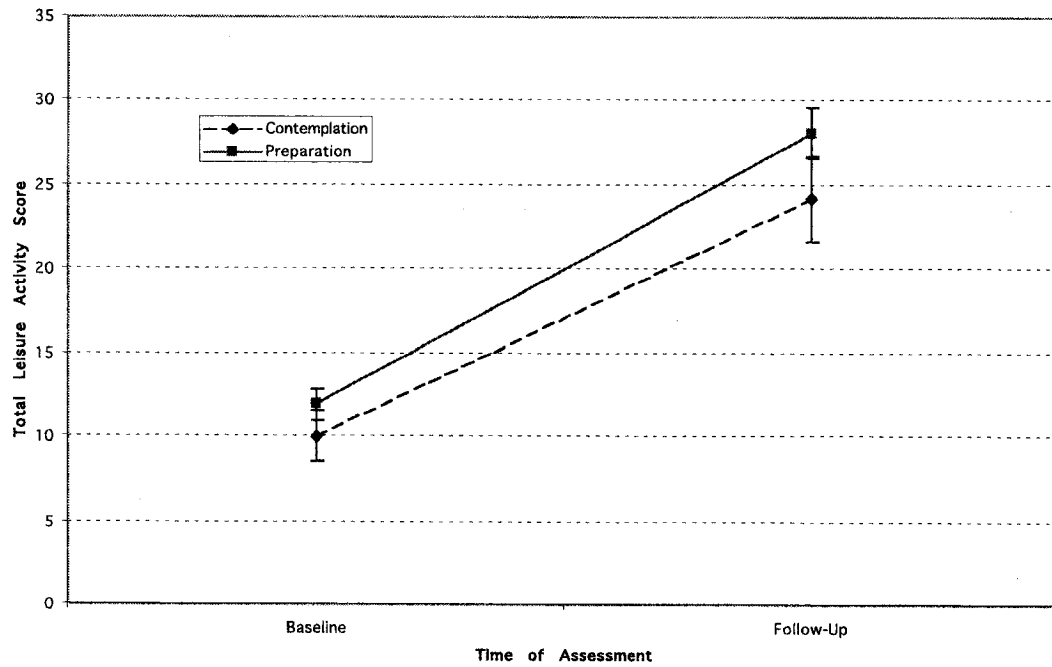


Figure 6. Godin Total Leisure Activity scores at baseline and post-intervention follow-up

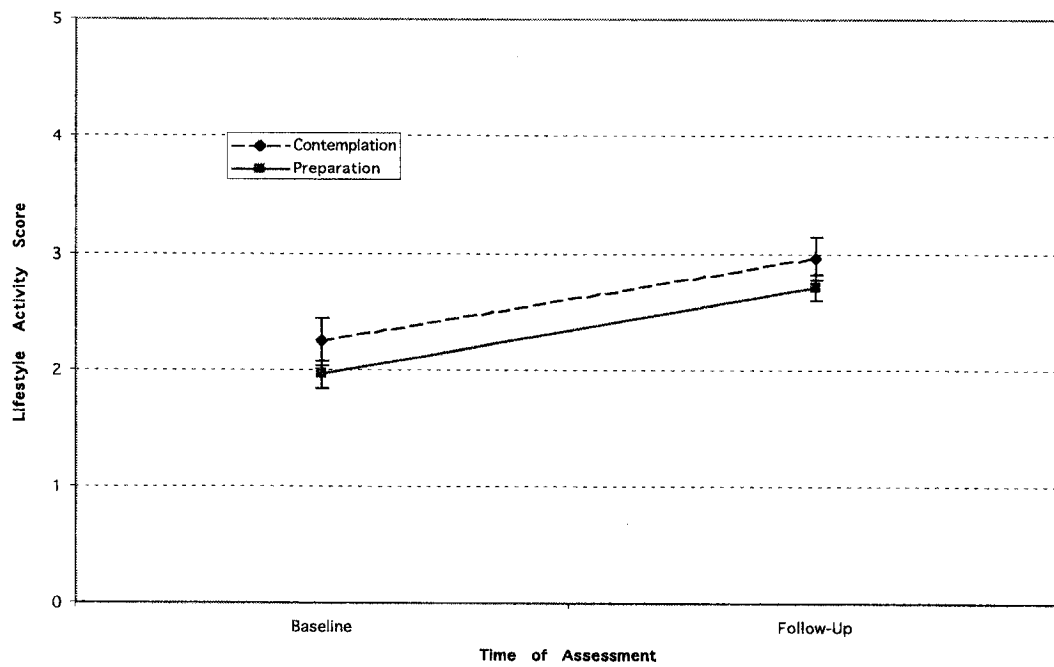


Figure 7. Stanford Lifestyle Activity scores at baseline and post-intervention follow-up

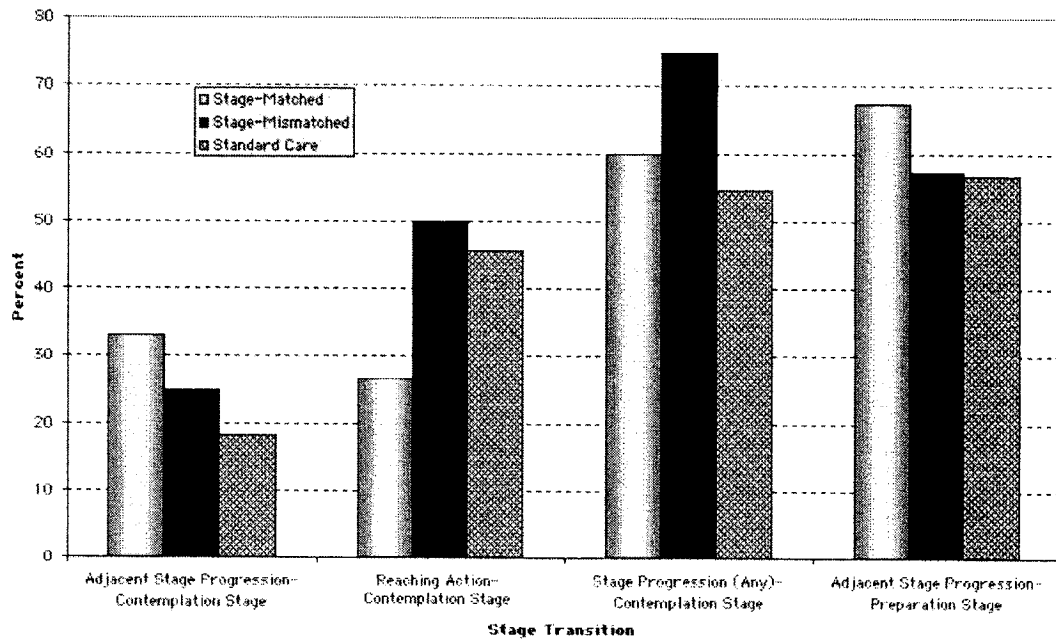


Figure 8. Stage transition from baseline to post-intervention follow-up by study condition

stage compared to 57.1% in the stage-mismatched and 56.8% in the standard care condition. A chi-square analysis revealed that proportion of stage transition did not differ significantly across the three conditions, ($\chi^2[2, N = 115] = 1.24, p = .53$).

Physical activity behavior. Mean standardized residual changes in physical activity behavior from baseline to follow-up by study condition are shown in Figure 9 and 10. Mean residual change scores for each study condition with a value greater than 0 indicate greater than average change, and mean residual change scores with a value less than 0 indicate less than average change. For individuals in the preparation stage, the stage-matched and stage-mismatched intervention both resulted in positive residual change in minutes of physical activity per week and Stanford Lifestyle Activity score compared with a negative residual change in the standard care condition. On the Godin Leisure-Time Exercise measure, residual change for the stage-matched condition was positive compared with negative residual change in the stage-mismatched and standard care condition. Group differences did not reach statistical significance ($(F[2, 110] = 0.87, p = .41)$, $(F[2, 111] = 0.46, p = .62)$, and $(F[2, 112] = 0.31, p = .72)$, respectively). Effect sizes across conditions were small (.008 to .016).

Directly opposite to the hypothesis, residual change in minutes of physical activity per week and Godin Total Leisure Activity score were positive in both the stage-mismatched and standard care condition among individuals in the contemplation stage, compared with a negative residual change in the stage-matched condition. On the Stanford Lifestyle Activity measure, both the stage-matched and the stage-mismatched condition resulted in positive residual change compared with negative residual change for the standard care condition. However, physical activity behavior did not differ significantly across the three conditions ($(F[2, 39] = 0.09, p = .91)$, $(F[2, 39] = 0.33, p = .72)$, and $(F[2, 39] = 0.03, p =$

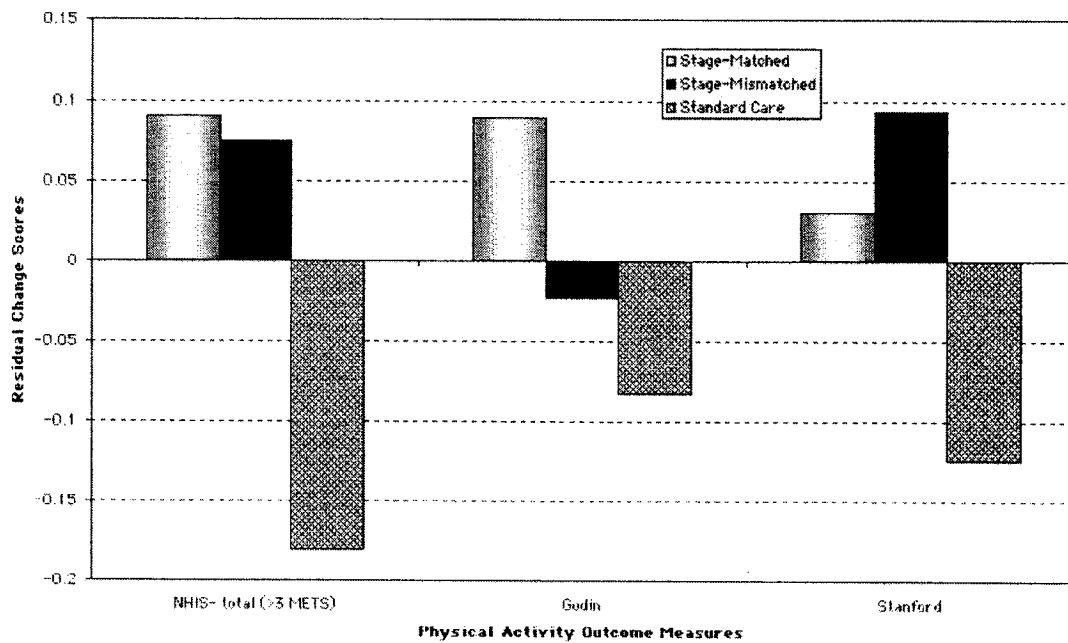


Figure 9. Residual change in physical activity outcome measures from baseline to post-intervention follow-up by study condition for participants in the preparation stage

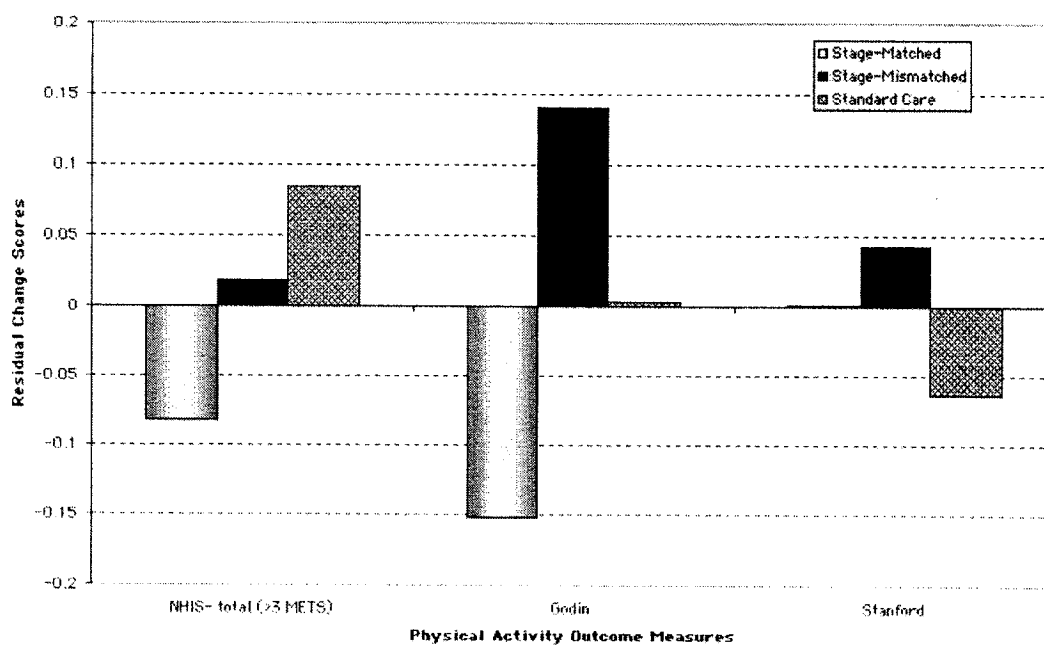


Figure 10. Residual change in physical activity outcome measures from baseline to post-intervention follow-up by study condition for participants in the contemplation stage

.96), respectively). Magnitude of the difference between conditions was small (.002 to .017).

Of the individuals in the preparation stage who received the stage-matched intervention, 42.5% met the CDC/ACSM criteria at post-intervention follow-up compared to 36.7% for those who received the stage-mismatched intervention and 25.7% for those who received the standard care intervention (see Figure 11). Similarly, 15.4% of the individuals in the contemplation stage who received the stage-matched intervention met the CDC/ACSM criteria compared to 6.3% for those who received the stage-mismatched and 0% for those who received the standard care intervention. These differences were not statistically significant ($(\chi^2[2, N = 105] = 2.34, p = .31)$ and $(\chi^2[2, N = 40] = 2.09, p = .35)$, respectively).

Intervention Effects on Hypothesized Mediators

Changes over time in hypothesized mediators of physical activity behavior and stage transition were examined using repeated measures ANOVAs. The group means and standard deviations for these variables as well as the results from the ANOVAs statistics are depicted in Table 9. For the entire sample, the use of behavioral processes of change increased significantly over time. However, the use of experiential processes of change had significantly declined at post-intervention follow-up. Across groups, there were no statistically significant changes in self-efficacy, pros, and cons over time, although changes were generally in the expected direction. No time by stage interactions were noted on any of the hypothesized theoretical mediators.

Mean residual changes in self-efficacy, pros, cons, experiential processes of change, and behavioral processes of change from baseline to post-intervention by study condition are shown in Figure 12 for individuals classified in the preparation

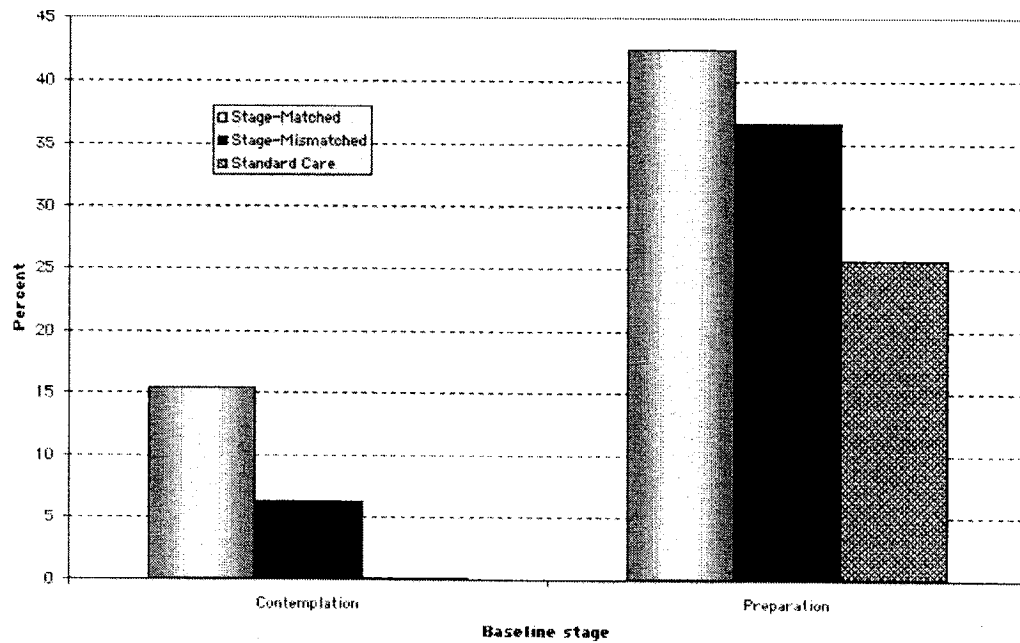


Figure 11. Percentages of participants meeting CDC/ACSM guidelines for regular physical activity by study condition

Table 9. Effects of the interventions on the hypothesized theoretical mediators of physical activity behavior and stage transition

Variables	Stage	Assessment	Stage-Matched Condition		Stage-Mismatched Condition		Standard Care Condition		η^2	F	p
			M	SD	M	SD	M	SD			
Self-Efficacy	Contemplation	Pre	2.72	0.76	2.70	0.61	2.46	0.66	.000	.03	.85
		Post	2.83	0.79	2.55	0.62	2.42	0.70			
Pros	Preparation	Pre	2.81	0.55	2.74	0.58	2.71	0.60	.002	.37	.54
		Post	2.91	0.54	2.76	0.58	2.72	0.51			
	Contemplation	Pre	3.90	0.88	3.61	0.45	3.34	0.47			
		Post	3.76	0.74	3.68	0.50	3.27	0.30			
Cons	Preparation	Pre	3.95	0.69	3.84	0.79	3.83	0.69	.003	.50	.48
		Post	3.89	0.66	3.91	0.64	3.76	0.72			
	Contemplation	Pre	2.73	0.78	2.50	0.52	2.53	0.61			
		Post	2.73	0.64	2.33	0.54	2.50	0.76			
Experiential POC	Preparation	Pre	2.15	0.82	2.55	0.67	2.43	0.59	.045	7.04	.009
		Post	2.07	0.73	2.44	0.73	2.59	0.78			
	Contemplation	Pre	3.16	0.61	2.99	0.70	2.62	0.55			
		Post	2.92	0.63	2.86	0.67	2.53	0.50			
Behavioral POC	Preparation	Pre	3.05	0.62	3.12	0.68	2.98	0.62	.078	12.52	.001
		Post	3.02	0.69	2.99	0.61	2.85	0.56			
	Contemplation	Pre	2.41	0.57	2.24	0.68	2.05	0.39			
		Post	2.47	0.77	2.53	0.90	2.34	0.75			
	Preparation	Pre	2.60	0.62	2.44	0.52	2.50	0.60			
		Post	2.88	0.72	2.69	0.68	2.64	0.69			

Note. F, p, and η^2 values reflect a time effect.

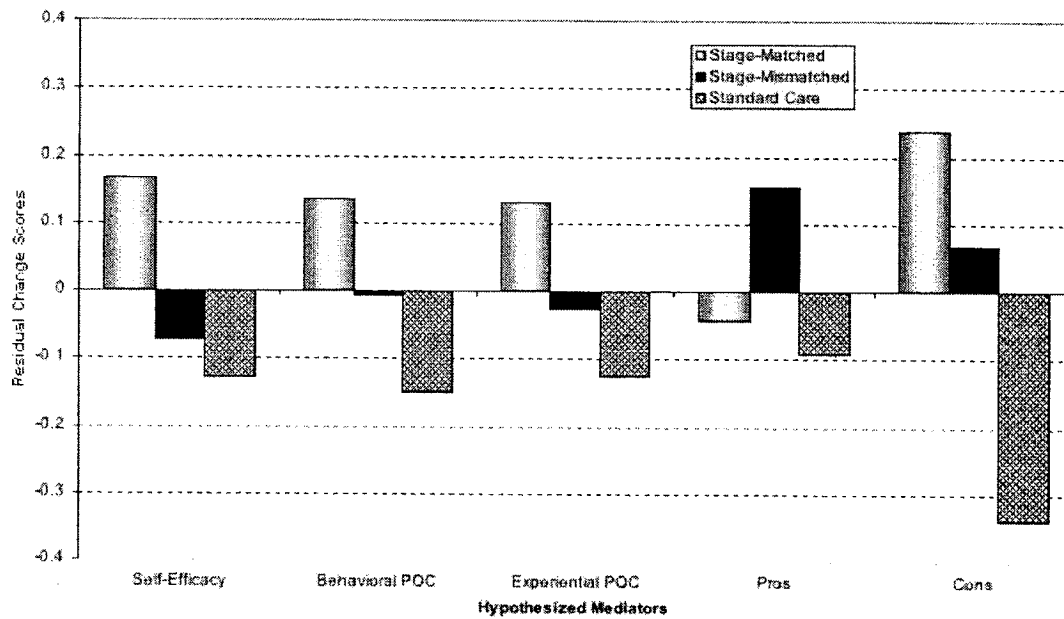


Figure 12. Residual change in hypothesized mediators from baseline to post-intervention follow-up by study condition for participants in the preparation stage at baseline

stage and in Figure 13 for those classified in the contemplation stage. Among individuals classified in the preparation stage, residual changes in hypothesized mediators were positive in the stage-matched condition compared with a negative residual change for those in the standard care condition on all proposed mediators with one exception. Residual change for the pros was negative at post-intervention follow-up for both the stage-matched and standard care condition. The stage-mismatched condition resulted in negative residual change for self-efficacy, experiential processes of change, and behavioral processes of change and in positive residual change for the pros and cons of regular physical activity. The difference between stage-matched and standard care condition in residual change score for the cons of regular physical activity was statistically significant ($F[2, 111] = 3.62, p < .03$). Other group differences did not reach statistical significance.

As shown on Figure 13, the stage-matched intervention resulted in positive residual change for self-efficacy and the pros of regular physical activity among individuals classified in the contemplations stage. Residual changes for the experiential and behavioral processes of change as well as for the cons of regular physical activity were negative for the stage-matched condition compared to positive residual changes in the stage-mismatched condition. Group differences were not statistically significant. Effect sizes across conditions for individuals in the contemplation and preparation stage were small, ranging from .006 to .06.

Correlations between Demographics, Interventions, Hypothesized Mediators, and Outcome Measures

Table 10 shows correlations of demographic variables, interventions, scores on the hypothesized theoretical mediators at baseline, and residual change scores for the hypothesized theoretical mediators with the physical activity residual change scores for the NHIS, Godin, and Stanford outcome measures and with stage transition. Interventions were not significantly correlated with any of the physical

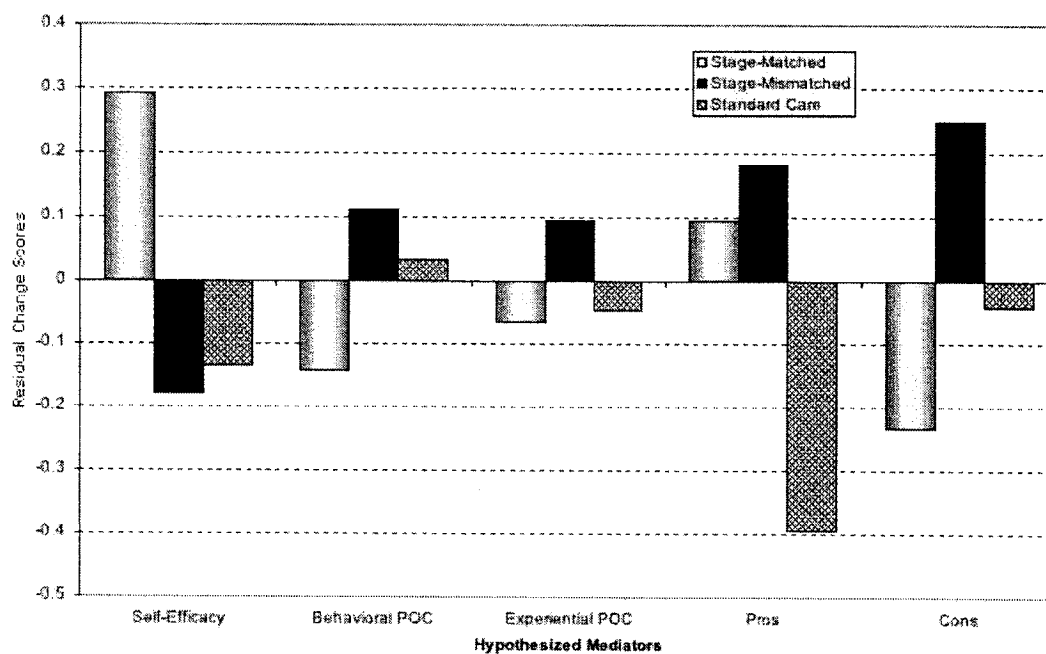


Figure 13. Residual change in hypothesized mediators from baseline to post-intervention follow-up by study condition for participants in the contemplation stage at baseline

Table 10. Bivariate correlations of hypothesized mediators with physical activity (residualized change scores) and stage transition by stage at baseline

Variables	Preparation (<i>n</i> = 115)					Contemplation (<i>n</i> = 42)				
	Stage transition (adjacent)	Meeting CDC guidelines	NHIS	Godin	Stanford	Stage transition (adjacent)	Reaching Action	NHIS	Godin	Stanford
Intervention (1=matched, 0=mismatched)	.016	.059	-.009	.060	.005	.092	-.239	-.048	-.139	-.020
Intervention (1=matched, 0=standard care)	.110	.176	.145	.086	.080	.169	-.195	-.098	-.082	.030
Gender (1=male, 0=female)	-.082	-.224*	-.077	.018	-.091	-.054	.146	-.092	.049	-.109
Age	.179†	.054	.059	-.113	.031	.095	-.038	.114	-.266†	-.166
Education (1=college, 0=no college)	-.219*	-.165†	-.147	.004	-.089	.077	-.137	-.163	.012	.049
Marital status (1=married, 0=other)	.140	.084	.068	.051	.054	.047	-.042	-.052	-.153	-.069
Children (1=yes, 0=no)	-.188*	-.063	-.167†	-.068	.026	-.162	-.049	.121	-.055	.046
Self-efficacy										
baseline	.053	.041	.122	.000	.100	-.052	.088	-.042	.349*	.100
change	.271*	.318**	.189*	.348***	.099	-.013	.126	-.127	.352*	.272†
Behavioral POC										
baseline	.262**	.237*	.209*	.058	.048	-.145	.132	-.039	.151	.191
change	.373***	.392***	.209*	.350***	.320**	.001	.657***	.116	.705***	.217
Experiential POC										
baseline	.119	.198*	.165†	.032	.035	-.046	.126	-.090	.143	.238
change	.077	.187†	.100	.010	.252*	-.055	.266†	.121	.314*	.381*
Pros										
baseline	.005	.137	.120	-.103	.073	.370*	-.012	-.099	.125	.146
change	-.030	-.135	-.128	-.155†	.018	.031	.131	-.081	.343*	.385*
Cons										
baseline	-.259**	-.177†	-.219*	-.202*	-.194*	.280†	-.304†	-.303†	-.269†	.178
change	-.324***	-.230*	-.101	-.168†	.021	-.100	-.406**	-.106	-.157	-.106

Note. All change scores for hypothesized mediators are standardized residual change scores for baseline values.

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < 0.001$.

activity outcome measures (although it is noteworthy that seven out of ten correlation coefficients between intervention (e.g., stage-matched vs. mismatched or standard care) and outcome measures were negative for individuals in the contemplation stage). No demographic variables were significantly correlated with more than one physical activity outcome measure. The cons of regular physical activity at baseline correlated significantly with the measures of stage transition and all but one physical activity outcome measures for both individuals in the contemplation and preparation stage at baseline. Change in self-efficacy, cons, and behavioral processes of change correlated significantly with at least two of the four physical activity outcome measures for individuals in the preparation stage. For individuals in the contemplation stage, pros, experiential processes of change, and behavioral processes of change correlated significantly with at least two of the five outcome measures. No additional variables were identified as candidates for mediation.

Mediators Effects on Outcome Measures

The effect of the hypothesized theoretical mediators on physical activity behavior and stage transition are shown in Table 11 for individuals in the preparation and contemplation stage⁶. Among individuals in the preparation stage, increase use of behavioral processes of change significantly predicted progression to the next adjacent stage (to action), meeting or exceeding CDC/ACSM criteria, increased frequency in physical activity participation (Godin), and increased in Stanford Lifestyle Activity score at post-intervention follow-up. An increase in self-efficacy also significantly predicted increased frequency of physical activity participation (Godin). Opposite to predictions, a decrease in the perceived benefits

⁶ Too few contemplators reached the action stage or met the CDC/ACSM guidelines for regular physical activity by post-intervention follow-up resulting in two-way tables with more than 20% of the cells having frequencies less than 5 and inordinately large parameter estimates. Odds ratio were not reported for these two outcome variables for individuals in the contemplation stage.

Table 11. Mediator effects on physical activity outcome measures

Hypothesized Mediators	Adjacent		Meeting CDC/ ACSM Criteria		NHIS		Godin		Stanford	
	OR	p	OR	p	β	p	β	p	β	p
Preparation stage (n = 115)										
Self-efficacy	1.35	.30	1.38	.25	.138	.21	.242	.02*	-	-
Behavioral POC	2.00	.02*	2.07	.03*	.129	.24	.230	.03*	.259	.01**
Experiential POC	-	-	0.99	.97	-	-	-	-	.117	.27
Pros	-	-	-	-	-	-	-.186	.03*	-	-
Cons	.60	.06†	0.81	.45	-	-	.007	.94	-	-
Contemplation stage (n = 42)										
Self-efficacy	-	-	-	-	-	-	.133	.26	.160	.28
Behavioral POC	-	-	-	-	-	-	.658	.0001***	-	-
Experiential POC	-	-	-	-	-	-	-.086	.48	.288	.056†
Pros	-	-	-	-	-	-	-.195	.10	.258	.096†
Cons	-	-	-	-	-	-	-	-	-	-

Note. Only mediator variables that correlated $p < .10$ with the outcome measure were entered in the regression models.

of regular physical activity was associated with an increase in the frequency of physical activity participation (Godin). The experiential processes of change and the perceived costs of regular physical activity were not significant predictors of change in physical activity behavior or stage transition for individuals in the preparation stage.

None of the hypothesized mediators predicted adjacent stage transition from the contemplation stage. Increased use in behavioral processes of change significantly predicted an increase in the frequency of physical activity participation (Godin) at post-intervention follow-up among individuals in the contemplation stage. There was a trend for increased use of experiential processes of change and perceived benefits of regular physical activity to predict an increase in lifestyle behaviors (Stanford). None of the other hypothesized theoretical mediators predicted significantly change in physical activity behavior.

Assessment of mediation. None of the hypothesized mediators met the necessary conditions for mediation (including the critical prerequisite that there be a significant association between the independent variable and the dependent variable before testing for a mediated effect). Hence, no further assessment of mediators of the intervention effects on physical activity behavior and stage transition was conducted.

Evaluation of the Intervention Manuals by Participants

Table 12 shows the percentages of participants who reported reading the manual⁷, as well as the mean scores on the evaluation questions across study conditions. Of the 128 participants who completed the evaluation items at follow-up, 98% of the participants reported receiving a manual. On average, the majority

⁷ None of the outcome measures correlated significantly with variables measuring whether or not participants reported reading the manual or completing the written activities. As such, no analyses were carried out using these variables as covariates.

Table 12. Means scores on the evaluation items for the intervention manuals per study condition

Items	Study Conditions					
	Contemplation			Preparation		
	Stage-Matched (n = 14)	Stage-Mismatched (n = 15)	Standard Care (n = 9)	Stage-Matched (n = 40)	Stage-Mismatched (n = 24)	Standard Care (n = 26)
Did you read the manual? (%)	85.7	80.0	75.0	87.5	96.0	88.5
Did you complete the written activities? (%)	30.8†	20.0	0.00	40.0†	52.0*	19.2
To what extent (scale of 1 to 5)						
Were the written activities useful to you?	3.33 (1.03)	3.00 (1.61)	2.43 (1.13)	3.31* (1.06)	3.20† (0.96)	2.58 (1.28)
Was the manual useful to you?	3.64 (0.81)	3.62 (1.19)	3.25 (0.71)	3.75† (0.87)	3.43 (1.00)	3.29 (1.12)

Note. The evaluation in this condition differed significantly from the evaluation in the Standard Care condition, stratified by stage at baseline. † $p < .10$. * $p < .05$. ** $p < .01$.

of participants reported reading the manual. The overall usefulness of the manuals was rated as “*moderately useful*”. First, comparing the stage-matched to the standard care condition, stratified by baseline stage, the reported usefulness of written activities was significantly higher among participants in the preparation stage in the stage-matched condition than among those in the standard care condition. No significant differences were found between stage-matched and stage-mismatched conditions regarding the overall usefulness of manuals in either stage. Second, comparing both stages at baseline, participants in the preparation stage were slightly more likely to report that they had completed the written activities than those in the contemplation stage (see Table 13). Third, comparing the evaluation of the manual matched to the contemplation stage, the manual matched to the preparation stage, and the standard care manual, participants who received the manual matched to the preparation stage reported a significantly higher usefulness of the manual than those who received the standard care manual. Further, participants who received the manual matched to the contemplation or to the preparation stage were significantly more likely to complete the written activities and to find those activities useful than those who received the standard care manual.

Table 13. Means scores on the evaluation items for the intervention manuals per stage at baseline and interventions

Items	Stage at Baseline		Interventions		
	Contemplation (<i>n</i> = 38)	Preparation (<i>n</i> = 90)	Contemplation (<i>n</i> = 38)	Preparation (<i>n</i> = 55)	Standard Care (<i>n</i> = 35)
Did you read the handbook? (%)	81.6	90.0	92.1	85.5	85.7
Did you complete the written activities? (%)	21.6†	36.7†	43.2**	36.4*	14.3
To what extent (scale of 1 to 5)					
Were the written activities useful to you?	2.96 (1.34)	3.05 (1.14)	3.20* (0.96)	3.26* (1.21)	2.56 (1.22)
Was the handbook useful to you?	3.58 (0.97)	3.49 (0.99)	3.45 (0.92)	3.76* (0.97)	3.27 (1.02)

Note. The percentage of participants who completed the written activities differed significantly by baseline stage. The evaluation of this manual differed significantly from the evaluation of the Standard Care manual. †*p* < .10. **p* < .05. ***p* < .01.

DISCUSSION

This research was stimulated by recent criticisms that stage models of health behavior place factors that vary on a continuum into discrete categories (stages) whose division is arbitrary. If the path to action is best explained by a continuum model (e.g., stages are not genuinely distinct), there is no reason to expect different mediators to influence different stage transitions and hence, no basis for matching interventions to stage – the appeal of a stage perspective. The present study aimed at testing the validity of the transtheoretical model by contrasting the effectiveness of stage-matched, stage-mismatched, and standard care interventions for promoting regular physical activity behavior and adjacent stage transition among a group of sedentary or insufficiently active adults. Hypothesized theoretical mediators of physical activity behavior and transitions between adjacent stages were also examined. This investigation focused on two stage transitions, from *contemplation* to *preparation* and from *preparation* to *action*.

Stage-Matched versus Stage-Mismatched Interventions

Overall, data from the present study consistently failed to support the hypothesis that matching an intervention to stage of change is more effective than a stage-mismatched intervention. Participants in all conditions significantly increased their physical activity participation with regard to time spent in leisure physical activities of at least moderate intensity, weekly usual frequency of physical activity, and presence of lifestyle physical activity behaviors; although these gains were generally below the CDC/ACSM guidelines for regular physical activity. Despite the significant increase in physical activity behavior and the use of theory-based interventions that specifically targeted mediators hypothesized by the TTM to promote specific stage transitions, the stage-matched and stage mismatched interventions produced equivalent results in terms of stage transition and physical activity adoption at post-intervention follow-up among individuals classified in the contemplation and preparation stage.

Among individuals classified in the preparation stage at baseline, a stage-matched intervention resulted in 67.4% of the individuals progressing to the next adjacent stage (the action stage) compared to 57.1% of those who received a stage-mismatched intervention. The results obtained with stage transition, the primary outcome measure, were supported by a similar pattern of change on physical activity behavior measures. These findings failed to support theoretical predictions that stage-matched interventions would be more effective than stage-mismatched interventions. Given the behavioral intention of individuals in the preparation stage to become physically active on a regular basis within the next 30 days, it may be that stage-matched materials is less crucial than for individuals in earlier stages. Any interventions offering physical activity information may act as a cue to action for individuals who have expressed their intention to change their health behavior. Indeed, in a recent observational study of physical activity behavior, almost 50% of individuals classified in the preparation stage for adoption of regular physical activity progressed to the action stage during a 6-month period in the absence of any physical activity intervention, other than self-monitoring their physical activity behavior (Plotnikoff et al., 2001).

A stage-mismatched intervention (50%) led to twice as many individuals in the contemplation stage progressing to the action stage than a stage-matched intervention (26.7%), although this difference was not statistically significant. Further, no individuals who received the stage-mismatched intervention (e.g., matched to a later stage) regressed to an earlier stage. While stage transition was deemed the primary outcome measure in this study, the ultimate aim of stage models of health behavior change is to promote behavioral change, and the stage-mismatched intervention produced positive residual change scores on all three physical activity outcome measures whereas the stage-matched intervention resulted in negative residual change scores on two of the three outcome measures. The data on stage transition and behavioral change among individuals in the

contemplation stage seem to support the notion that an intervention that promotes stage advancement and behavioral change principles is as effective, if not more so, at increasing physical activity behavior and promoting forward stage transition than an intervention that focuses primarily on resolving ambivalence about initiating behavioral change.

These results conflict not only with the tenets of the TTM but also with speculations that stage-mismatched interventions should be ineffective at promoting stage transition (Glasgow & Orleans, 1997; Mermelstein, 1997). The present study examined two types of mismatched interventions: one in which individuals at an early stage of change (e.g., the contemplation stage) received an intervention more appropriate for people in a later stage (e.g., a "preparation" intervention) and one in which individuals at a later stage (e.g., the preparation stage) received an intervention matched to people in an earlier stage (a "contemplation" intervention). While some (Quinlan & McCaul, 2000) have suggested that mismatching an intervention to an earlier stage is likely to be less effective than mismatching an intervention to a later stage, because the former does not promote stage advancement, the present study found no evidence supporting this hypothesis.

The following explanations for the absence of superiority of stage-matched over stage-mismatched intervention might be considered. First, the lack of differences between stage-matched and stage-mismatched conditions could be related to the existence of subtypes within stages (Dijkstra et al., 1998). For example, some individuals in the preparation stage might benefit more from self-efficacy enhancing information whereas others might benefit more from information aimed at decreasing barriers for the adoption of regular physical activity. Empirical data which appear to support the existence of "stages within stages" (Crittenden, Manfredi, Lacey, Warnecke, & Parsons, 1994; Velicer et al., 1995 in the smoking

cessation literature) may be interpreted as supporting the notion of an underlying continuous behavioral intention measure that is linearly associated with different outcomes and mediators of change (although Velicer et al. (1995) argue that the data should not be interpreted in that way). Second, it may be that the interventions developed for this study did not manipulate matched and mismatched materials that were relevant to individuals who all expressed a behavioral intention to become physically active on a regular basis within the next six months. Several theoretical constructs were strongly correlated among each other (results not reported), and it may be that the stage-matched interventions designed to alter specific constructs inadvertently had a positive influence on other constructs that were not the target of the interventions. Finally, it may be that theoretical constructs generated on the basis of cross-sectional findings are not true mediators of stage transitions, and as such represented an inadequate test of stage-matched and stage-mismatched ideas. Although these explanations may be plausible, the present findings did not support the hypothesized superiority of stage-matched interventions over stage-mismatched interventions for individuals in the contemplation and preparation stage.

Data from this study showed that individuals in the preparation stage were more likely than those in the contemplation stage to meet or exceed the CDC/ACSM guidelines for regular physical activity, reach the action stage, and show a greater increase in physical activity behavior at post-intervention follow-up. These results suggest that some difference does exist between these two groups of individuals. However, there was no evidence based on the data from this study to suggest that the difference involved qualitatively different barriers to the adoption of regular physical activity (i.e., qualitatively distinct stages). It may be that individuals in the preparation stage are further along the path to action (e.g., continuum) that is, in different regions of a dimensional space. Differentiation of

individuals based on a temporal dimension may not provide a useful distinction between those two groups and maximize the predictive validity of the TTM.

Recent cross-sectional work (Kraft, Sutton, & Reynold, 1999) aimed at examining the existence of qualitative differences between stages of change as postulated by the TTM investigated the presence of discontinuity patterns between stages on hypothesized mediators of stage transition and different patterns from one hypothesized mediators to the next. None of the results supported the notion that contemplation and preparation should be distinguished from each other as separate stages in the context of smoking cessation. A similar cross-sectional study in the physical activity domain (Study 1) yielded inconclusive results as to the distinction between the contemplation and preparation stage based on the examination of discontinuity patterns. Studies testing the effectiveness of stage-matched interventions have either not included a preparation stage as part of their staging algorithm (e.g., Calfas, Long, Sallis, Wooten, Pratt, & Patrick, 1996) or have collapsed together data from the contemplation and preparation stage for analysis purposes (Dijkstra et al., 1998) given the absence of differences between individuals in the contemplation and preparation stage. In that respect, it is unclear whether preserving the distinction between the contemplation and preparation stage is worthwhile for individuals with high readiness to change their health behavior who differ solely, based on the classification system of the TTM, on a temporal dimension.

Findings from the present study are similar to recent studies in the smoking cessation literature that contrasted the effectiveness of stage-matched and stage-mismatched interventions, as suggested by Weinstein, Rothman, et al. (1998), and that found that interventions mismatched to a later stage of change are as effective as stage-matched interventions for individuals in the precontemplation stage (Dijkstra et al., 1998; Quinlan & McCaul, 2000). Comparison of results

between the present study and work by Dijkstra et al. is convoluted by differences in the definition and operationalization of stage-matched interventions for individuals in the contemplation and preparation stage. Overall, stage-matched and stage-mismatched interventions produced equivalent results with regard to stage transition, point-prevalence abstinence, and intention to quit for both groups of individuals high in readiness to change. The results from the present study coupled with evidence from prior work using an experimental design challenge the need for stage-matched interventions and the validity of a stage model of health behavior change as postulated by the TTM.

Stage-Matched Interventions versus Standard Care

Findings that the standard care intervention performed as well as stage-matched interventions suggest caution in interpreting results. One cannot rule out that increase in physical activity behavior and stage progression were due to external factors unrelated to the interventions. However, there are several reasons why this interpretation is unlikely. First, data was collected over several months, at different sites, and intervention effects did not vary based on these variables. Second, standard care materials have typically been written for individuals who are getting ready to change their behavior. Thus, for individuals who have expressed their behavioral intention to adopt a new health behavior, standard care materials may have represented stage appropriate materials. Third, several studies have failed to demonstrate the superiority of stage-matched interventions over standard care in the context of physical activity adoption (Blissmer & McAuley, 2002; Cardinal & Sachs, 1996; Naylor et al., 1999). Based on current empirical evidence, the only conclusion that can be derived is that stage-matched interventions promoting physical activity adoption among individuals in the pre-action stages generally outperform assessment-only conditions, although even in some instances these findings have not been replicated (e.g., Castro, Sallis, Hickmann, Lee, & Chen, 1999).

In the present study, the inclusion of a true control condition in addition to a standard care condition to the experimental design would have been preferable, but is sometimes impractical for ethical reasons (Lewis et al., 2002). Further, the value of a stage-matched intervention must be measured against that of the best available standardized intervention (Prochaska, DiClemente, Velicer, & Rossi, 1993). The use of a stage-matched intervention can be justified only if it significantly outperforms an effective standardized intervention, given the additional resources necessary and the added complexity of implementing a stage-matched intervention (Weinstein, Rothman, et al., 1998).

Results from this study demonstrated that standard self-help materials (i.e., Health Canada Physical Activity guide) is effective in promoting the adoption of regular physical activity, with over 25% of individuals in the preparation stage assigned to the standard care condition achieving CDC/ACSM recommendations and with individuals increasing their physical activity participation in activities of at least moderate intensity by approximately 90 minutes weekly by post-intervention follow-up. Further, standard care material was also effective for individuals in the contemplation stage at promoting physical activity behavior and forward stage transition. Thus, as suggested by Marcus et al. (1998), the wide scale use of standard self-help materials can increase physical activity participation in the general population, could have a significant public health impact, and represent a low cost option to health promotion until newer interventions are demonstrated to be significantly superior to standard care at increasing regular physical activity behavior.

Intervention Effects on Hypothesized Mediators

A second objective of this study was to identify the mediators associated with adjacent stage transition and with an increase in physical activity behavior

from the contemplation stage (to preparation) and from the preparation stage (to action) and to determine if these hypothesized mediators were modified by stage-matched interventions specifically designed to alter the theoretical mediators proposed by the TTM. This represent an important contribution to the literature given that data examining the effects of physical activity intervention on the hypothesized mediators are scarce and a large proportion of the variability in physical activity behavior has yet to be explained (Pinto et al., 2001).

The stage-matched interventions were intended to alter theoretical constructs postulated by the TTM to promote forward stage transition and found in the literature to be associated with physical activity adoption. As may be expected based on the lack of differential intervention effects on physical activity behavior and stage transition, there was little evidence of differential intervention effects on the hypothesized theoretical mediators. Across conditions, the use of behavioral processes of change significantly increased whereas the use of experiential processes of change significantly decreased over time. Self-efficacy and the perceived benefits and costs of regular physical activity were not affected. Results indicated that stage-matched interventions were not more successful in achieving the desired effects on the hypothesized mediators than stage-mismatched or standard care interventions. Intervention effects generally were in the expected directions for individuals in the preparation stage, but effect sizes were marginal. The stage-matched intervention was more successful than standard care only at decreasing the perceived costs of regular physical activity among individuals in the preparation stage. For individuals in the contemplation stage, the stage-matched intervention resulted in positive residual change for the perceived benefits and costs of regular physical activity and for self-efficacy, even though this latter effect was not specifically targeted by the stage-matched intervention. The present findings support an interpretation that one reason the stage-matched interventions were not more effective than either stage-mismatched or standard care

interventions in promoting physical activity adoption and stage transition is that the stage-matched interventions were not more successful in changing the hypothesized theoretical mediators.

It is unclear why the stage-matched interventions did not relate to differential changes in hypothesized mediators as expected when compared to the stage-mismatched or standard care interventions. Via behavioral change principles, stage-matched interventions directly targeted self-efficacy and behavioral processes of change for individuals in the preparation stage, and the perceived benefits and costs of regular physical activity for individuals in the contemplation stage. The standard care intervention, which focused primarily on knowledge acquisition, provided only limited (albeit some) coverage of these topics, yet similar changes were found. Perhaps the intervention materials were not intensive enough to produce the desired results on the hypothesized theoretical mediators. Some theoretical constructs may be more resistant to change and may necessitate more intensive interventions (Castro et al., 1999). In this study, the stage-matched interventions consisted of 40-45 page manuals and as such, were much more detailed and comprehensive than other stage-matched physical activity materials. However, the length of the manuals may have deterred some individuals from reading it thoroughly or from absorbing the information contained in it. Further, a large proportion of the participants indicated that they had not completed the written activities, and considering the planned intervention, reading the manual may not have been sufficient to generate changes on the targeted theoretical constructs. Interactive or multimedia (e.g., internet, video, face-to-face contact) formats may have more effectively conveyed stage-matched materials. Translation of theory to practice is challenging and an inadequate operationalization of theoretical constructs arguably may have influenced negatively the power of interventions. Additional research is necessary to clarify the relationship between intervention components and the hypothesized mediators they are designed to

influence as well as on various methods of intervention delivery that will produce significant intervention effects in the desired direction.

The absence of intervention effects of the stage-matched interventions on the hypothesized mediators may help explain the failure of the stage-matched interventions to result in a greater increase in physical activity behavior and stage transition than stage-mismatched interventions or standard care. However, such findings do not appear to relate exclusively to the current work, and have been documented in several other studies examining intervention effects on hypothesized mediators postulated by the TTM. In the context of physical activity adoption, behavioral processes of change (Calfas et al., 1997; Dunn et al., 1997; Marcus et al., 1998; Nichols et al., 2000; Pinto et al., 2001; Sallis et al., 1999) generally have been shown to be amenable to change by stage-matched interventions. A similar unexpected decrease has been found previously for use of experiential processes of change (Marcus et al., 1998) and other TTM constructs (e.g., Castro et al., 1999). Stage-matched interventions have had no differential effect compared to an assessment-only condition on self-efficacy (Calfas et al., 1997; Castro et al., 1999; Dunn et al., 1997; Hallam & Petosa, 1998; McAuley, Courneya, Rudolph, & Lox, 1994; Nichols et al., 2000) and on the perceived benefits and costs of physical activity adoption (Dunn et al., 1997; Marcus et al., 1998; Nichols et al., 2000). These findings raise serious questions about the construct validity of stage-matched physical activity interventions and/or measurement of these hypothesized mediators.

Effects of Hypothesized Mediators on Physical Activity Behavior and Stage Transition

The significant increase in physical activity behavior and the significant proportion of individuals who progressed at least from one stage by post-intervention follow-up made it possible to conduct analyses to identify mediators of

physical activity adoption and stage transition. These analyses particularly intended to further knowledge about the mediators hypothesized by the TTM to promote adjacent stage transition, as prior work generally has examined the mediators of behavioral change (Blissmer & McAuley, 2002; Calfas et al., 1996; Calfas et al., 2000; Dunn et al., 1997; Marcus et al., 1998; Sallis et al., 1999) or reaching the action stage (Calfas et al., 1996; Marcus et al., 1998; Pinto et al., 2001), with relatively little focus on progression to the next stage in the sequence – the key outcome variable according to the TTM.

In initial analyses, bivariate correlations were conducted to assess relationships between demographic variables, interventions, hypothesized theoretical mediators at baseline, change in hypothesized theoretical mediators, and change in physical activity behavior and stage transition. No demographic variables were associated with more than one physical activity outcome measure or with stage transition. The kind of interventions was not correlated with any of the outcome measures. Correlation coefficients indicated that change in hypothesized mediators was related to change in physical activity behavior and stage transition. That is, behavioral processes of change and self-efficacy were significantly correlated with at least four of the five outcome measures for individuals in the preparation stage whereas the behavioral and experiential processes of change and the perceived benefits of regular physical activity were significantly correlated with at least two of the five outcome measures for individuals in the contemplation stage, providing preliminary support for the concept that different factors may be important at different stages. It is also noteworthy that while change in theoretical mediators over time was associated with an increase in physical activity behavior for individuals in the contemplation stage, none of them were associated with adjacent stage transition (to preparation). This finding may be explained by the fact that change in physical activity behavior among individuals in the

contemplation stage generally was associated with advancing two stages (to action) and as such, paralleled change from the preparation stage.

Change scores for the hypothesized mediators had generally higher correlation coefficients than the corresponding baseline variables, a finding consistent with previous research (Calfas et al., 1997), and supporting Bandura's (1997b) concept of reciprocal determinism. Knowing the status of individuals at baseline (e.g., hypothesized theoretical mediators) is of limited use in explaining change, because the mediators themselves are modified over time. It may also explain the failure of findings based on cross-sectional studies to generalize to findings from prospective studies.

Regression analyses revealed that behavioral processes of change were consistent predictors of physical activity adoption and stage transition for individuals in the preparation stage. More specifically, behavioral processes of change were significantly associated with adjacent stage transition from the preparation stage (to action) and with an increase in physical activity behavior in two of the three physical activity outcome measures, a finding consistent with prior research (Lewis et al., 2002). Given the consistency of results between stage transition and increase in physical activity behavior, it suggests that behavioral processes of change are important factors toward the path to action. The behavioral processes of change summarize a variety of strategies to promote physical activity behavior, each of which could be considered as separate mediators. One implication of this finding is that interventions that are effective at enhancing the use of behavioral processes of change should be most successful in promoting physical activity adoption.

Self-efficacy was predictive of increased frequency of physical activity behavior but not time spent engaging in physical activity or adopting lifestyle

physical activity behaviors (e.g., using the stairs instead of the elevator) among individuals in the preparation stage. Interestingly, an increase in self-efficacy was not associated with progression to the action stage. Previous studies have shown that support for self-efficacy as a mediator of physical activity adoption has varied across outcome variables (Lewis et al., 2002). Self-efficacy was associated with increasing the frequency of physical activity (McAuley et al., 1994) and meeting CDC/ACSM guidelines (Dunn et al., 1997; Miller, Trost, & Brown, 2002), but not with reaching the action stage (Pinto et al., 2001) or with time spent engaging in moderate leisure activity (Calfas et al., 1997; Castro et al., 1999; Sallis et al., 1999). Differential determinants for the frequency, intensity, and duration components of physical activity have been documented by Courneya and McAuley (1994) and others (Ruland, Pashkow, Blackburn, Dolansky, & Moore, 2003), although in Courneya and McAuley's study, self-efficacy contributed unique variance to intended frequency, intensity, and duration of physical activity.

The lack of intervention effect on self-efficacy may have implications for the interpretation of mediator effects. Further, the inconsistent findings across the literature on self-efficacy may suggest the presence of moderators at work. For example, change in self-efficacy was associated with change in different physical activity outcome measures for men and women (Sallis et al., 1999). Physical activity adoption likely is a more complex health behavior than smoking cessation, for which the TTM was initially devised, and it is conceivable that different theoretical mediators are necessary to predict the different facets of physical activity behavior.

To our knowledge, no experimental studies had previously examined the mediators of progression from the contemplation to the preparation stage. For individuals in the contemplation stage, no theoretical constructs predicted transition between adjacent stages despite baseline values of the perceived

benefits and costs of regular physical activity being correlated with adjacent stage transition. A possible explanation for the absence of theoretical constructs predicting adjacent stage transition lies in the staging algorithm proposed by the TTM to classify individuals to stage. Based on the TTM staging algorithm, the time frame of intended behavioral change is the only difference that separates individuals in the contemplation and preparation stage. As pointed out by Bandura (1997a), individuals can continue doing the same thing but be propelled from one stage (contemplation) to the next one (preparation) simply with the passage of time. As such, one would not necessarily expect specific mediators to predict stage transition from contemplation to preparation. Only after the stages are correctly defined can interventions truly be matched to those stages (Weinstein, Rothman, et al., 1998).

Most studies to date that have suggested the presence of an association between stage progression from the contemplation stage and the benefits and costs of regular physical activity have used a cross-sectional design. The examination of associations between baseline values of the benefits and costs of regular physical activity and physical activity outcome measures in this prospective study paralleled findings from Study 1 on which TTM predictions were generated. However, the prospective nature of the data generated in this study illustrates the limited utility of baseline scores of hypothesized theoretical mediators as predictive agents of health behavior change and challenges the tenets of the TTM.

Similarly to individuals in the preparation stage, behavioral processes of change were significantly associated with an increase in the frequency of physical activity behavior for individuals in the contemplation stage. A significant increase in physical activity behavior was generally associated with individuals progressing two stages (to action). As such, while there may be different sets of mediators

associated with different stage transitions, change in physical activity behavior across stages may likely be explained by the same mediators.

The experiential processes of change and the costs of regular physical activity were not significant predictors of change of physical activity behavior or stage transition. These findings paralleled cross-sectional results from Study 1 that revealed a linear change across adjacent stages for experiential processes of change and the costs of regular physical activity. These findings are also consistent with prior work (Lewis et al., 2002) that investigated the relation between hypothesized theoretical mediators and physical activity and that showed that experiential processes of change and decisional balance did not influence significantly physical activity behavior. In the present study, change in the benefits of regular physical activity was a significant predictor of the frequency of physical activity participation but not in the expected direction. Though the magnitude of change was marginal, participants in the preparation stage at baseline perceived less benefits of regular physical activity at post-intervention follow-up. A similar pattern of results was found in all conditions, suggesting that the interventions themselves were not responsible for the negative effect on the benefits of regular physical activity. Perhaps sedentary participants at baseline were unrealistically optimistic with regard to the benefits of regular physical activity (e.g., help manage stress, control weight, sleep better). Most of these benefits of regular physical activity, while documented in the literature, may only manifest themselves following an extended period of time spent engaging in regular physical activity. As such, participants may not have had the opportunity to experience these benefits at the time of follow-up.

It is useful to consider why some of the hypothesized mediators were not significant predictors of physical activity behavior and stage transition in regression analyses. Changes in experiential and behavioral processes of change, self-efficacy,

and costs of regular physical activity were significantly correlated among themselves (results not reported). One explanation of this finding is that all four variables measure a similar construct, which challenges the construct validity of the TTM. This finding also has implications for the results from regression analyses given that the theoretical constructs were evaluated based on their independent contribution to explain the overall variance in physical activity behavior change and stage transition. Shared variance among variables significantly reduces the likelihood that correlated theoretical constructs will be found to have an independent predictive value of the outcome variable.

Another possible explanation might be that the theoretical constructs proposed by the TTM are not direct predictors of stage of change, but rather mediate one another. Martin, Velicer, and Fava (1996) postulated that the processes of change influence self-efficacy and the pros and cons, although it is not clear if the authors meant that the processes of change influence stage transitions by way of the pros, cons, and self-efficacy. To date, the relationships among the processes of change, self-efficacy, and the pros, and cons have not been clearly articulated. For the TTM to survive as a stage model of health behavior, it will be necessary to stipulate explicitly the relationships among the theoretical constructs and to test specific causal model for each stage transition involving all relevant theoretical constructs.

Overall, the hypothesized mediators postulated by the TTM explained little of the variance in physical activity change and stage transition, similar to previous studies (e.g., Calfas et al., 1997; Calfas et al., 2000; Castro et al., 1999). The non-significant differential intervention effects on the hypothesized mediators may partially account for these results. Further, less variance is generally explained in moderate intensity activities compared to vigorous exercise (Hovell et al., 1989). Finally, the weak associations in the present study are somewhat consistent with

findings that more variance in physical activity behavior is explained in cross-sectional than in prospective analyses (Sallis, Hovell, Hofstetter, Barrington, 1992).

The present analyses contribute to understanding the underlying processes of physical activity change, but they do not demonstrate mediation of behavior change as defined by Barron and Kenny (1986). Mediation is demonstrated when controlling for a mediator variable significantly reduces the intervention's effect on an outcome. It was not appropriate to evaluate whether hypothesized mediators reduced the effects of interventions in the present study, because the stage-matched interventions had no differential effects on physical activity behavior and stage transition compared to standard care. Without significant paths from the intervention to the hypothesized mediators, and from the hypothesized mediators to outcome, mediation cannot be present.

While the TTM represents an appealing framework to understanding and explaining health behavior change, accumulating evidence suggest that most of the hypothesized theoretical constructs by the TTM have a limited predictive value of health behavior change and adjacent stage transition. Results from the present study could be due to inadequacies in measurement, intervention, or theories. Most likely it is an amalgam of all three, so enhancement in all areas are needed (Sallis et al., 1999). As more studies using an experimental design examine changes in hypothesized mediators and allow theoretical predictions of the TTM to be tested, the stage model should be modified accordingly.

Qualifications

Before considering some implications of this study, it is important to recognize that—as is the case for any single experiment—it has limitations. A number of qualifications should be recognized. First, any generalizations from the present data might be limited to a single stage theory (the TTM), one behavior

(physical activity), two stages of change (contemplation and preparation), and to the attributes of the present sample. Notably, Weinstein, Lyon, Sandman, and Cuite (1998) published data showing positive effects of stage-matched interventions and negative effects of stage-mismatched interventions for home radon testing using the precaution adoption process model.

One limitation pertinent to the present findings is the small number of participants in the contemplation stage across conditions. Several factors resulted in the sample size being smaller than initially planned. First, only about 16% of the adult population is classified in the contemplation stage for regular physical activity (Marshall & Biddle, 2001). Second, recruitment and retention rates have been shown to be much smaller for individuals in the contemplation stage compared to recruitment and retention rates for individuals in later stages (Lichtenstein & Hollis, 1992). Third, given the absence of funding for the implementation of this study, no financial compensations or incentives were offered to study participants. Research has shown that monetary incentives have the most impact on recruitment and retention rates (Helgeson, Voss, & Terpening, 2002) and that recruitment rates in worksites offering some incentives is almost double that of worksites offering no incentives for study participation (Hennrikus et al., 2002). Further, incentives for participation in projects within the workplace are generally the rule of most corporate organizations. Finally, the unexpected cut of several hundreds jobs at the large worksite originally selected for the completion of this study seriously undermined recruitment efforts. A search for additional participating worksites was undertaken, but was complicated by the necessity for worksites to have a similar intranet communication infrastructures so as to minimize experimental confounds. Recruitment procedures were implemented in three additional worksites, and given a retention rate of 83%, resulted in a final sample size of 157 at follow-up.

The resulting statistical power would have allowed the detection of large differences in results between groups, but medium effects could have been missed, and small ones certainly would have been. Observed effects sizes across study conditions were generally marginal (e.g., .002 to .017), which may partially be attributed to subject heterogeneity. Thus, inadequate power is a plausible rival interpretation of the absence of statistically significant differences between conditions, if such differences exist (Kazdin & Bass, 1989). It is open to debate whether the small differences found between stage-matched and mismatched interventions would be clinically significant. It is contended that small changes in physical activity behavior across a large population may produce shifts in risk factors reduction. If the interventions had been intensive and at a high cost per person, such effects might be considered impractical, but print-based interventions are inexpensive and easily portable and as such, warrant further research.

As a result of the smaller than expected sample size, comparisons between study conditions are less reliable than if groups had been larger. In light of these limitations, findings from the present study must be considered preliminary with respect to the comparative efficacy of stage-matched and stage-mismatched interventions for physical activity adoption. Although statistical comparisons were conservative, this work would benefit from replication with larger numbers of participants to strengthen and/or refute the results obtained in this study. Recruitment of those individuals is unfortunately most daunting, therefore, specific strategies need to be developed and used to facilitate the recruitment into intervention studies of individuals who express no intention in changing their health behavior in a near future. Given that this study represented initial work in an understudied domain (e.g., experimental design testing the validity of a stage model), findings from the present study still represent a significant contribution to the literature.

A second limitation is the brief follow-up period. It is conceivable that a longer follow-up would produce different results (see Prochaska et al., 1993). Along the same lines, the long interval of time between assessment periods may have prevented the measurement of meaningful change in the hypothesized mediators of physical activity behavior and resulted in undetected sequential stage transition. Assessments at multiple time points at shorter intervals may be necessary to determine whether any changes in the correlates of physical activity adoption and/ or stage transition can be interpreted as causal factors or as consequences of behavioral change.

A third limitation is the use of self-reported physical activity measures. Self-reported physical activity data are likely to be less accurate than objectively measured and verified data (Matt et al., 1999). However, the focus of this study was on relative levels of physical activity participation, which should show comparable levels of overestimation or underestimation between study conditions (Bock et al., 2001) and over time.

Finally, the sample was selective. Notably, individuals in the contemplation stage who elected to participate into this study expressed a relative interest in receiving information about physical activity adoption. Yet, it seems an appropriate sample to draw conclusions from, since any future implementation of stage-matched interventions for physical activity adoption may well be directed at similar individuals.

Strengths of the Present Study

The present study illustrates the value of experimental designs that compare stage-matched and stage-mismatched intervention, as suggested by Weinstein, Rothman, and Sutton (1998). As recommended by Baranowski, Anderson, and Carmack (1998), this study specified which mediators were targeted by the stage-

matched interventions, determined if stage-matched interventions successfully changed targeted mediators, and evaluated if changes in hypothesized mediators predicted change in physical activity behavior and stage transition. The results from such studies can reveal whether theoretical predictions based on the TTM and ideas about stage transition are accurate. Randomized experimental design, strong theoretical basis for the interventions, and validated outcome measures are strengths of this study. The assessment of hypothesized theoretical mediators of adjacent forward stage transition, linked theoretically to the stage-matched intervention, may be one of the most innovative aspects of this study.

Conclusion – Test of the Validity of a Stage Model

The most important finding from the present study is that stage-matched interventions were not more effective than stage-mismatched interventions in promoting forward stage transition and increased physical activity behavior among individuals in the contemplation and preparation stage— a conclusion consistent with results from recent experimental studies. Further, data from the present study supported the growing body of literature based on experimental designs that show that the strong effects of mediators suggested by the TTM are difficult to document. In this study, stage-matched interventions generally were not more successful in achieving the desired effects on the hypothesized mediators than stage-mismatched or standard care interventions, and the behavioral processes of change were the only construct to consistently explain physical activity adoption and adjacent stage transition for individuals in the preparation stage. None of the hypothesized mediators predicted adjacent forward stage transition for individuals in the contemplation stage. Most hypothesized mediators by the TTM did not predict change in physical activity and stage transition despite a significant increase in physical activity behavior and a significant proportion of individuals progressing to the next adjacent stage in the sequence at post-intervention follow-up.

Thus, empirical evidence to date suggests that the stages of change, or at least a subset of them, appear inconsistent with a stage process. Rather, stages of change as currently defined by the TTM appear more consistent with a set of pseudostages masking a continuous process of intended behavioral change. However, even if health behavior change is eventually explained by a complex prediction equation (e.g., continuous process), stages of change may still be useful as they can facilitate the identification of regions on the continuum where specific theoretical constructs are particularly influential (Weinstein, Lyon, et al., 1998).

As pointed out by Weinstein, Rothman, et al. (1998) in their seminal paper on conceptual and methodological issues relevant to stage theories of health behavior,

“attempts to demonstrate that change in health behavior is a stage process may fail because the stages have not been correctly identified or assessed, because the barriers between stages have not been correctly identified, or because the behavior change does not proceed by stages (p. 298).”

Consequently, results from this study do not prove that health behavior change does not follow a stage process. However, most of the evidence generated to this date examining the validity of stage models are weak and appear more consistent with a continuum model of health behavior change.

The TTM offers a rich heuristic perspective on health behavior change, but given the lack of consistent evidence of a stage process underlying health behavior change, care must be taken in the application of this stage model. It appears that the widespread acceptance of this model was not based on careful consideration of the evidence for it. Based on the current empirical evidence, stage-matched interventions appear premature (Littell & Girvin, 2002).

Recommendations for Future Studies

Future studies should attempt to replicate the findings of the present study in the context of regular physical activity adoption. If experimental studies consistently fail to support a stage perspective for health behavior change, attempts should be made to improve the model. The conceptual and operational definitions of the stages of change would benefit from a revision. The use of arbitrary time frame to describe behavioral intention should be avoided in redefining the stages. Much should be learned from the staging algorithm developed for the precaution adoption process model (Weinstein, 1988) given that it does not reference past behavior or any particular time frame. The measurement of hypothesized mediators may be revisited as attempts to develop shorter and adapted questionnaires may have reduced the questionnaires' ability to measure the constructs they originally intended to measure. Construct validity of the various TTM scales is essential to provide a fair test the validity of the stage model. If future prospective studies fail to provide evidence that the experiential processes of change and the perceived benefits and costs of regular physical activity mediate stage transition, these theoretical constructs should be discarded and other potential mediators should be sought. For example, other correlates of physical activity adoption have been identified in the literature, such as social support (Felton & Parsons, 1994; Sallis, Hovel, & Hofstetter, 1992) and enjoyment of physical activity (Calfas, Sallis, Lovato, & Campbell, 1994; Courneya & McAuley, 1994). Preliminary evidence also suggest that the theory of planned behavior's social cognitive constructs are predictive of stage transition in the context of vigorous physical activity (Courneya, Plotnikoff, Hotz, & Birkett, 2001). Qualitative studies examining the underlying process involved in health behavior change are likely to further our knowledge of how individuals change.

In addition to examining the hypothesized mediators of change in physical activity behavior and stage transition following the recommendations issued by

Baron and Kenny (1986), future studies should examine hypothesized mediators at multiple time points to infer causality. Based on current empirical evidence, it is unclear whether changes in theoretical constructs associated with change in physical activity behavior are best explained as causal factors or as a consequence of behavioral change. Future studies should also investigate how to best translate theory into practice so that health behavior change interventions can meaningfully influence hypothesized mediators they were designed to alter.

To continue the expansion of the field of physical activity promotion, development of a transdisciplinary model of physical activity promotion may be required given the scope of the physical inactivity epidemic (King, Stokols, Talen, Brassington, & Killingsworth, 2002). According to this transdisciplinary paradigm, various theories and perspectives can be placed along a continuum of volitional or personal choice, with those on one end of a continuum focused primarily on the experiential and behavioral factors underlying an individual's personal choice to be active. On the other end of the continuum (i.e., the macro-environmental level), activity-related choice is implicitly shaped by the physical environments and policies. According to the authors, it is becoming increasingly clear that both perspectives need to be taken into account in designing interventions and initiatives that will reverse current population-wide inactivity trends.

Changing health behavior is a daunting, yet, vital endeavor, and further research holds promise for stimulating progress in theories and interventions optimizing the adoption of regular physical activity.

SUMMARY AND CONCLUSIONS

This research was stimulated by recent criticisms that stage models of health behavior, such as the transtheoretical model [TTM], impose artificial categories (termed stages) on a continuous process of intended behavioral change, and that by not being genuinely distinct, these arbitrary stages or “pseudostages” lose their explanatory value. If the stages, or a subset of them, are not qualitatively distinct, there is no reason to expect different mediators to influence different stage transitions and hence, there is no basis for matching interventions to stage. In addition, the TTM has been criticized for not being entirely clear in specifying, or hypothesizing, the specific theoretical mediators that influence transition between each pair of adjacent stages— a prerequisite for developing and testing stage-matched interventions.

Study 1 aimed at providing preliminary evidence about the existence of a *true stage* model (as opposed to a *pseudostage* model) and to generate hypotheses about the theoretical mediators associated with specific stage transitions. This cross-sectional study examined patterns of differences between adjacent stages for regular moderate-intensity physical activity on theoretical constructs hypothesized by the TTM to differ between stages. A sample of 1,172 individuals aged 20-65 recruited through a corporate email newsletter comprised the sample for this internet-based study. Results suggested the presence of “discontinuity patterns” (patterns that do not show consistent increments or decrements across stages) between the contemplation and the action stage and between the preparation and maintenance stage. Experiential processes of change and perceived costs of regular physical activity showed a linear relation across stages. Regression analyses showed that the perceived benefits and costs of regular physical activity differentiated contemplation from the preparation stage whereas self-efficacy and the behavioral processes of change differentiated preparation from the action stage. Self-efficacy and the perceived costs of regular

physical activity differentiated action from the maintenance stage. None of the data supported the distinction between the precontemplation and contemplation stage. These results provide some evidence for the presence of qualitatively distinct stages and warrant further investigations of the validity of a stage model of health behavior using a more rigorous research design.

Studies using an experimental design contrasting stage-matched and stage-mismatched interventions are the only unequivocal way to distinguish between *true stages* and *pseudostages*, and to test the fundamental idea that different factors are important at different stages. Study 2 tested the validity of the TTM using a prospective randomized research design and examined the hypothesized theoretical mediators of regular physical activity and adjacent stage progression. Sedentary or insufficiently active adults ($N = 190$) recruited through corporate email newsletters were randomized to receive either a stage-matched, stage-mismatched, or standard care intervention. Stage-matched interventions were designed to alter hypothesized theoretical mediators of adjacent stage progression for regular moderate-intensity physical activity through print-based materials. This study focused on two stage transitions, from *contemplation* to *preparation* and from *preparation* to *action*. Physical activity behavior, stage transition, and hypothesized theoretical mediators of physical activity participation and forward transition between adjacent stages were assessed at baseline and 8-week follow-up (83% retention rate). Results revealed significant increase in physical activity behavior and stage progression across all conditions. Stage-matched, stage-mismatched, and standard care interventions produced equivalent results in terms of adjacent stage progression, physical activity participation, and proportion of individuals meeting or exceeding CDC/ACSM guidelines at post-intervention follow-up. Behavioral processes of change were the only theoretical constructs to consistently predict progression to the next stage in the sequence for individuals in the preparation stage and increase in physical activity behavior for individuals in the

contemplation and preparation stage. None of the theoretical constructs predicted adjacent stage progression for individuals in the contemplation stage. Preliminary evidence does not support the matching of interventions to stage in the context of regular physical activity and challenge the notion that stages of change, or at least a subset of them, are qualitatively distinct.

Overall, these two studies illustrate the limited utility of cross-sectional comparisons—the approach used most often to study the TTM—in testing the validity of a stage model. While the TTM represents an appealing framework to understand and explain health behavior change, findings from the study using a prospective and experimental design suggest that the stages of change, or at least a subset of them, are inconsistent with a stage process. Rather, the stages as currently defined by the TTM appear more consistent with a set of pseudostages masking a continuous process of intended behavioral change. Further, while results from the cross-sectional study suggest that different theoretical constructs distinguish individuals across adjacent stages, findings from Study 2 demonstrate that most of the hypothesized constructs by the TTM have a limited predicted value of health behavior change and stage progression. Causal inferences drawn from cross-sectional data have to be regarded as weak and conditional on a number of assumptions (e.g., assumption of one-way causation, relevance for populations other than the present sample of participants), and as such, may represent an inadequate test of stage-matched and stage-mismatched ideas. Based on current empirical evidence, stage-matched interventions appear premature. As more studies using an experimental research design allow for the theoretical predictions of the TTM to be tested, the stage model should be modified accordingly.

REFERENCES

- Ainsworth, B. E., Haskell, W. L., Leon, A. S., Jacobs, D. R., Montoye, H. J., Sallis, J. F., et al. (1992). Compendium of physical activities: Classification of energy costs of human physical activities. *Medicine and Science in Sports and Exercise*, 25, 71-80.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.
- Armstrong, C. A., Sallis, J. F., Hovell, M. F., & Hofstetter, C. R. (1993). Stages of change, self-efficacy, and the adoption of vigorous exercise: A prospective analysis. *Journal of Sport & Exercise Psychology*, 15, 390-402.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84, 191-215.
- Bandura, A. (1997a). The anatomy of stages of change. *American Journal of Health Promotion*, 12, 8-10.
- Bandura, A. (1997b). *Self-efficacy: The exercise of control*. New York: W. H. Freeman.
- Baranowski, T., Anderson, C., & Carmack, C. (1998). Mediating variable framework in physical activity interventions: How are we doing? How might we do better? *American Journal of Preventive Medicine*, 15, 266-297.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality & Social Psychology*, 51, 1173-1182.
- Biddle, S. J. H., & Nigg, C. R. (2000). Theories of exercise behavior. *International Journal of Sport Psychology*, 31, 290-304.
- Blair, S. N., Kohl, H. W., Barlow, C. E., Paffenbarger, R. S., Gibbons, L. W., & Macera, C. A. (1995). Changes in physical fitness and all-cause mortality. A prospective study of healthy and unhealthy men. *Journal of the American Medical Association*, 273, 1093-1098.

- Blissmer, B., & McAuley, E. (2002). Testing the requirements of stages of physical activity among adults: The comparative effectiveness of stage- matched, mismatched, standard care, and control interventions. *Annals of Behavioral Medicine*, 24, 181-189.
- Bock, B. C., Marcus, B. H., Pinto, B. M., & Forsyth, L. H. (2001). Maintenance of physical activity following an individualized motivationally tailored intervention. *Annals of Behavioral Medicine*, 23, 79-87.
- Bruce, M. J., & Katzmarzyk, P. T. (2002). Canadian population trends in leisure-time physical activity levels, 1981-1998. *Canadian Journal of Applied Physiology*, 27, 681-690.
- Bunton, R., Baldwin, S., & Flynn, D. (1999). *The stages of change model and its use in health promotion: A critical review*. Retrieved July 31, 2002, from the Health Education Board for Scotland, research and evaluation division website: <http://www.hebs.scot.nhs.uk/research/cr/crscripts/FTReportTocM.cfm?TxtTCode=278&Nav=1&sc=research>
- Buxton, K. E., Wyse, J., & Mercer, T. (1996). How applicable is the stages of change model to exercise behavior? A review. *Health Education Journal*, 55, 239-257.
- Calfas, K. J., Long, B. J., Sallis, J. F., Wooten, W. J., Pratt, M., & Patrick, K. (1996). A controlled trial of physician counseling to promote the adoption of physical activity. *Preventive Medicine*, 25, 225-233.
- Calfas, K. J., Sallis, J. F., Lovato, C. Y., & Campbell, J. (1994). Physical activity and its determinants before and after college graduation. *Medicine, Exercise, Nutrition, and Health*, 3, 323-334.
- Calfas, K. J., Sallis, J. F., Nichols, J. F., Sarkin, J. A., Johnson, M. F., Caparosa, S., et al., (2000). Project GRAD: two year outcomes of a randomized controlled physical activity intervention among young adults. *American Journal of Preventive Medicine*, 18, 28-37.
- Calfas, K. J., Sallis, J. F., Oldenburg, B., & Ffrench, M. (1997). Mediators of change in physical activity following an intervention in primary care: PACE. *Preventive Medicine*, 26, 297-304.
- Camacho, T. C., Roberts, R. E., Lazarus, N. B., Kaplan, G. A., & Cohen, R. D. (1991). Physical activity and depression: Evidence from the Alameda County Study. *American Journal of Epidemiology*, 134, 220-231.

- Cardinal, B. J. (1996). Predicting cardiorespiratory fitness without exercise testing in epidemiologic studies: A concurrent validity study. *Journal of Epidemiology*, 6, 31-35.
- Cardinal, B. J., & Sachs, M. L. (1996). Effects of mail-mediated, stage-matched exercise behavior change strategies on female adults' leisure-time exercise behavior. *Journal of Sports Medicine & Physical Fitness*, 36, 100-107.
- Castro, C. M., Sallis, J. F., Hickmann, S. A., Lee, R. E., & Chen, A. H. (1999). A prospective study of psychosocial correlates of physical activity for ethnic minority women. *Psychology & Health*, 14, 277-293.
- Center for Disease Control and Prevention [CDC]. (2001, March 9). Physical activity trends: United-States, 1990-1998. *Morbidity and Mortality Weekly Report*, 50, 166-169.
- Courneya, K. S. (1995). Understanding readiness for regular physical activity in older individuals: An application of the theory of planned behavior. *Health Psychology*, 14, 80-87.
- Courneya, K. S., & McAuley, E. (1994). Are there different determinants of the frequency, intensity, and duration of physical activity? *Behavioral Medicine*, 20, 84-90.
- Courneya, K. S., Plotnikoff, R. C., Hotz, S. B., & Birkett, N. J. (2001). Predicting exercise stage transitions over two consecutive 6-month periods: A test of the theory of planned behaviour in a population-based sample. *British Journal of Health Psychology*, 6, 135-150.
- Cowan, R., Logue, E., Milo, L., Britton, P. J., & Smucker, W. (1997). Exercise stage of change and self-efficacy in primary care: Implications for intervention. *Journal of Clinical Psychology in Medical Settings*, 4, 295-311.
- Crittenden, K. S., Manfredi, C., Lacey, L., Warnecke, R., & Parsons, J. (1994). Measuring readiness and motivation to quit smoking among women in public health clinic. *Addictive Behaviors*, 5, 497-507.
- Cummings, S. R., Nevitt, M. C., Browner, W. S., Stone, K., Fox, K. M., Ensrud, K. E., et al. (1995). Risk factors for hip fracture in white women. Study of osteoporotic fractures research group. *New England Journal of Medicine*, 332, 767-773.

- Davidson, R. (1992). Prochaska and DiClemente's model of change: A case study? *British Journal of Addiction*, **87**, 821-822.
- Davidson, R. (1998). The transtheoretical model: A critical overview. In W. R. Miller, & N. Heather, (Eds.), *Treating addictive behaviors* (2nd ed., pp. 25-38). New York: Plenum Press.
- De Vries, H., & Backbier, E. (1994). Self-efficacy as an important determinant of quitting among pregnant women who smoke: The o-pattern. *Preventive Medicine*, **23**, 167-174.
- DiClemente, C. C., Prochaska, J. O., Fairhurst, S. K., & Velicer, W. F. (1991). The process of smoking cessation: An analysis of precontemplation, contemplation, and preparation stages of change. *Journal of Consulting & Clinical Psychology*, **59**, 295-304.
- Dijkstra, A., De Vries, H., & Bakker, M. (1996). Pros and cons of quitting, self-efficacy, and the stages of change in smoking cessation. *Journal of Consulting & Clinical Psychology*, **64**, 758-763.
- Dijkstra, A., De Vries, H., Roijackers, J., & van Breukelen, G. (1998). Tailored interventions to communicate stage-matched information to smokers in different motivational stages. *Journal of Consulting & Clinical Psychology*, **66**, 549-557.
- Dishman, R. K., Oldenburg, B., O'Neal, H., & Shepard, R. J. (1998). Worksite physical activity interventions. *American Journal of Preventive Medicine*, **15**, 344-361.
- Duncan, G. E., Sydeman, S. J., Perri, M. G., Limacher, M. C., & Martin, A. D. (2001). Can sedentary adults accurately recall the intensity of their physical activity. *Preventive Medicine*, **33**, 18-26.
- Dunn, A. L., Marcus, B. H., Kampert, J. B., Garcia, M. E., Kohl, H. W. III, & Blair, S. N. (1997). Reduction in cardiovascular disease risk factors: 6-month results from Project Active. *Preventive Medicine*, **26**, 883-892.
- Felton, G. M., & Parsons, M. A. (1994). Factors influencing physical activity in average-weight and overweight young women. *Journal of Community Health Nursing*, **11**, 109-119.

- Giovannucci, E., Ascherio, A., Rimm, E. B., Colditz, G. A., Stampfer, M. J., & Willett, W. C. (1995). Physical activity, obesity, and risk for colon cancer and adenoma in men. *Annals of Internal Medicine*, 122, 327-334.
- Glasgow, R. E., & Orleans, C. T. (1997). Adherence to smoking cessation regimens. In D. S. Gochman, (Ed.), *Handbook of health behavior research II: Provider determinants* (pp. 353-377). New York: Plenum Press.
- Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences*, 10, 141-146.
- Goldstein, M. G., Pinto, B. M., Marcus, B. H., Lynn, H., Jette, A. M., McDermott, S., et al. (1999). Physician-based physical activity counseling for middle-aged and older adults: A randomized trial. *Annals of Behavioral Medicine*, 21, 40-47.
- Gorelick, P. B., Sacco, R. L., Smith, D. B., Alberts, M., Mustone-Alexander, L., Rader, D., et al. (1999). Prevention of a first stroke: a review of guidelines and a multidisciplinary consensus statement from the National Stroke Association. *Journal of the American Medical Association*, 281, 1112-1120.
- Hallam, J., & Petosa, R. (1998). A worksite intervention to enhance social cognitive theory constructs to promote exercise adherence. *American Journal of Health Promotion*, 13, 4-7.
- Hausenblas, H. A., Carson, A. V., & Mark, D. E. (1997). Application of the theories of reasoned action and planned behavior to exercise behavior: A meta-analysis. *Journal of Sport and Exercise Psychology*, 19, 331-346.
- Helgeson, J. G., Voss, K. E., & Terpening, W. D. (2002). Determinants of mail-survey response: Survey design factors and respondent factors. *Psychology & Marketing*, 19, 303-328.
- Helmrich, S. P., Ragland, D. R., Leung, R. W., & Paffenbarger, R. S. Jr. (1991). Physical activity and reduced occurrence of non-insulin-dependent diabetes mellitus. *New England Journal of Medicine*, 325, 147-152.
- Hennrikus, D. J., Jeffrey, R. W., Lando, H. A., Murray, D. M., Brelje, K., Daviddann, B., et al. (2002). The SUCCESS project: The effect of program format and incentives on participation and cessation in worksite smoking cessation programs. *American Journal of Public Health*, 92, 274-279.

- Herrick, A. B., Stone, W. J., & Mettler, M. M. (1997). Stages of change, decisional balance, and self-efficacy across four health behaviors in a worksite environment. *American Journal of Health Promotion*, 12, 49-56.
- Hovell, M. F., Sallis, J. F., Hofstetter, C. R., Spry, V. M., Faucher, P., & Caspersen, C. J. (1989). Identifying correlates of walking for exercise: An epidemiological prerequisite for physical activity promotion. *Preventive Medicine*, 18, 856-866.
- Jacobs, D. R. Jr., Ainsworth, B. E., Hartman, T. J., & Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine and Science in Sports and Exercise*, 25, 81-91.
- Janis, I. L., & Mann, L. (1977). *Decision making: A psychological analysis of conflict, choice, and commitment*. New York: Collier Macmillan.
- Kazdin, A. E., & Bass, D. (1989). Power to detect differences between alternative treatments in comparative psychotherapy outcome research. *Journal of Consulting & Clinical Psychology*, 57, 138-147.
- King, A. C., Stokols, D., Talen, E., Brassington, G. S., & Killingsworth, R. (2002). Theoretical approaches to the promotion of physical activity: Forging a transdisciplinary paradigm. *American Journal of Preventive Medicine*, 23, 15-25.
- Kohrt, W. M., Snead, D. B., Slatopolsky, E., & Birge, S. J. Jr. (1995). Additive effects of weight-bearing exercise and estrogen on bone mineral density in older women. *Journal of Bone and Mineral Research*, 10, 1303-1311.
- Kraft, P., Sutton, S. R., & Reynolds, H. M. (1999). The transtheoretical model of behaviour change: Are the stages qualitatively different? *Psychology & Health*, 14, 433-450.
- Kriska, A. M., & Caspersen, C. J. (Eds.). (1997). A collection of physical activity questionnaires for health-related research. [Special Issue]. *Medicine and Science in Sports and Exercise*, 29(6).
- Lewis, B. A., Marcus, B. H., Pate, R. R., & Dunn, A. L. (2002). Psychosocial mediators of physical activity behavior among adults and children. *American Journal of Preventive Medicine*, 23, 26-35.

- Lichtenstein, E., & Hollis, J. (1992). Patient referral to smoking cessation programs: Who follows through? *Journal of Family Practice*, 34, 739-744.
- Litt, M. D., Kleppinger, A., & Judge, J. O. (2002). Initiation and maintenance of exercise behavior in older women: Predictors from the social learning model. *Journal of Behavioral Medicine*, 25, 83-97.
- Littell, J. H., & Girvin, H. (2002). Stages of change: A critique. *Behavior Modification*, 26, 223-273.
- Marcus, B. H., Bock, B. C., Pinto, B. M., Forsyth, L. H., Roberts, M. B., & Traficante, R. M. (1998). Efficacy of an individualized, motivationally-tailored physical activity intervention. *Annals of Behavioral Medicine*, 20, 174-180.
- Marcus, B. H., Eaton, C. A., Rossi, J. S., & Harlow, L. L. (1994). Self-efficacy, decision-making, and stages of change: An integrative model of physical exercise. *Journal of Applied Social Psychology*, 24, 489-508.
- Marcus, B. H., Forsyth, L. H., Stone, E. J., Dubbert, P. M., McKenzie, T. L., Dunn, A. L., et al. (2000). Physical activity behavior change: Issues in adoption and maintenance. *Health Psychology*, 2000, 19, 32-41.
- Marcus, B. H., & Owen, N. (1992). Motivational readiness, self-efficacy and decision-making for exercise. *Journal of Applied Social Psychology*, 22, 3-16.
- Marcus, B. H., Pinto, B. M., Simkin, L. R., & Audrain, J. E. (1994). Application of theoretical models to exercise behavior among employed women. *American Journal of Health Promotion*, 9, 49-55.
- Marcus, B. H., Rakowski, W., & Rossi, J. S. (1992). Assessing motivational readiness and decision making for exercise. *Health Psychology*, 11, 257-261.
- Marcus, B. H., Rossi, J. S., Selby, V. C., & Niaura, R. S. (1992). The stages and processes of exercise adoption and maintenance in a worksite sample. *Health Psychology*, 11, 386-395.
- Marcus, B. H., Selby, V. C., Niaura, R. S., & Rossi, J. S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly for Exercise and Sport*, 63, 60-66.
- Marcus, B. H., & Simkin, L. R. (1993). The stages of exercise behavior. *Journal of Sports Medicine and Physical Fitness*, 33, 83-88.

- Marcus, B. H., & Simkin, L. R. (1994). The transtheoretical model: Applications to exercise behavior. *Medicine & Science in Sports & Exercise*, **26**, 1400-1404.
- Marcus, B. H., Simkin, L. R., Rossi, J. S., & Pinto, B. M. (1996). Longitudinal shifts in employees' stages and processes of exercise behavior change. *American Journal of Health Promotion*, **10**, 195-200.
- Marshall, S. J., & Biddle, S. J. H. (2001). The transtheoretical model of behavior change: A meta-analysis of applications to physical activity and exercise. *Annals of Behavioral Medicine*, **23**, 229-246.
- Martin, R. A., Velicer, W. E., & Fava, J. L. (1996). Latent transition analysis to the stages of change for smoking cessation. *Addictive Behaviors*, **21**, 67-80.
- Matt, G. E., Garcia, M., Primicias, W. W., Frericks, L., & De Faria, F. (1999). Exploring biases in self-reported exercising behavior heuristics based on recency, frequency, and preference. *Perceptual & Motor Skills*, **88**, 126-128.
- McAuley, E., Courneya, K. S., Rudolph, D. L., & Lox, C. L. (1994). Enhancing exercise adherence in middle-aged males and females. *Preventive Medicine*, **23**, 498-506.
- Mermelstein, R. J. (1997). Individual interventions: Stages of change and other health behavior models – The example of smoking cessation. In S. J. Gallant, G. P. Keita, (Eds.), *Health care for women: Psychological, social, and behavioral influences* (pp. 387-403). Washington, DC: American Psychological Association.
- Miller, D. J., Freedson, P. S., & Kline, G. M. (1994). Comparison of activity levels using the Caltrac accelerometer and five questionnaires. *Medicine and Science in Sports and Exercise*, **26**, 376-382.
- Miller, Y. D., Trost, S. G., & Brown, W. J. (2002). Mediators of physical activity behavior change among women with young children. *American Journal of Preventive Medicine*, **23**, 98-103.
- Montoye, H. J., Kemper, H. C. J., Sarris, W. H. M., & Washburn, R. A. (1996). *Measuring physical activity and energy expenditure*. Human Kinetics: Champaign.

- National Center for Health Statistics. (1999). *Healthy people 2000 review, 1998-1999*. Hyattsville, MD: Author.
- National Institute of Health, National Heart, Lung, and Blood Institute. (1998). *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults*. Author.
- Naylor, P. J., Simmonds, G., Riddoch, C., Velleman, G., & Turton, P. (1999). Comparison of stage-matched and unmatched interventions to promote exercise behaviour in the primary care setting. *Health Education Research*, 14, 653-666.
- Nichols, J. F., Wellman, E., Caparosa, S., Sallis, J. F., Calfas, K. J., & Rowe, R. (2000). Impact of a worksite behavioral skills intervention. *American Journal of Health Promotion*, 14, 218-221.
- Nigg, C. R., & Courneya, K. S. (1998). Transtheoretical model: Examining adolescent exercise behavior. *Journal of Adolescent Health*, 22, 214-224.
- Ontario Ministry of Health [OMH] (1992). *Ontario Health Survey 1990: Users guide vol 1*. Author.
- Paffenbarger, R. S. Jr., Hyde, R. T., Wing, A. L., Lee, I. M., Jung, D. L., & Kampert, J. B. (1993). The association of changes in physical-activity level and other lifestyle characteristics with mortality among men. *New England Journal of Medicine*, 328, 538-545.
- Peterson, T. R., & Aldana, S. G. (1999). Improving exercise behavior: An application of the stages of change model in a worksite setting. *American Journal of Health Promotion*, 13, 229-232.
- Petruzzello, S. J., Landers, D. M., Hatfield, B. D., Kubitz, K. A., & Salazar, W. (1991). A meta-analysis on the anxiety-reducing effects of acute and chronic exercise. Outcomes and mechanisms. *Sports Medicine*, 11, 143-182.
- Pinto, B. M., Lynn, H., Marcus, B. H., DePue, J., & Goldstein, M. G. (2001). Physician-based activity counseling: Intervention effects on mediators of motivational readiness for physical activity. *Annals of Behavioral Medicine*, 23, 2-10.
- Plotnikoff, R. C., Hotz, S. B., Birkett, N. J., & Courneya, K. S. (2001). Exercise and the transtheoretical model: A longitudinal test of a population sample. *Preventive Medicine*, 33, 441-452.

- Potvin, L., Gauvin, L., & Nguyen, N. M. (1997). Prevalence of stages of change for physical activity in rural, suburban and inner-city communities. *Journal of Community Health, 22*, 1-13.
- Powell, K. E., Bricker, S. K., & Blair, S. N. (2002). Treating inactivity. *American Journal of Preventive Medicine, 23*, 1-2.
- Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting & Clinical Psychology, 51*, 390-395.
- Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992). In search of how people change: Applications to addictive behaviors. *American Psychologist, 47*, 1102-1114.
- Prochaska, J. O., DiClemente, C. C., Velicer, W. F., & Rossi, J. S. (1992). Criticisms and concerns of the transtheoretical model in light of recent research. *British Journal of Addiction, 87*, 825-828.
- Prochaska, J. O., DiClemente, C. C., Velicer, W. F., & Rossi, J. S. (1993). Standardized, individualized, interactive, and personalized self-help programs for smoking cessation. *Health Psychology, 12*, 399-405.
- Prochaska, J. O., & Marcus, B. H. (1994). The transtheoretical model: Applications to exercise. In R. K. Dishman (Ed.), *Advances in exercise adherence* (pp. 161-180). Champaign, IL: Human Kinetics.
- Prochaska, J. O., & Velicer, W. F. (1997a). Misinterpretations and misapplications of the transtheoretical model. *American Journal of Health Promotion, 12*, 11-12.
- Prochaska, J. O. & Velicer, W. F. (1997b). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*, 38-48.
- Prochaska, J. O., Velicer, W. F., DiClemente, C. C., & Fava, J. (1988). Measuring processes of change: Applications to the cessation of smoking. *Journal of Consulting & Clinical Psychology, 56*, 520-528.
- Quinlan, K. B., & McCaul, K. D. (2000). Matched and mismatched interventions with young adult smokers: Testing a stage theory. *Health Psychology, 19*, 165-171.

- Reed, G. R. (1999). Adherence to exercise and the transtheoretical model of behavior change. In S. J. Bull (Ed.), *Adherence Issues in Sport and Exercise* (pp. 19-45). Chichester, England: Wiley.
- Reed, G. R., Velicer, W. F., Prochaska, J. O., Rossi, J. S., & Marcus, B. H. (1997). What makes a good staging algorithm: examples from regular exercise. *American Journal of Health Promotion*, 12, 57-66.
- Rosen, C. S. (2000). Is the sequencing of change processes by stage consistent across health problems? A meta-analysis. *Health Psychology*, 19, 593-604.
- Ruland, C. M., Pashkow, F. J., Blackburn, G. G., Dolansky, M. A., & Moore, S. M. (2003). Predictors of women's exercise maintenance after cardiac rehabilitation. *Journal of Cardiopulmonary Rehabilitation*, 23, 40-49.
- Sallis, J. F., Buono, M. J., Roby, J. J., Micale, F. G., & Nelson, J. A. (1993). Seven-day recall and other physical activity self-reports in children and adolescents. *Medicine and Science in Sports and Exercise*, 25, 99-108.
- Sallis, J. F., Calfas, K. J., Alcaraz, J. E., Gehrman, C., & Johnson, M. F. (1999). Potential mediators of change in a physical activity promotion course for university students: Project GRAD. *Annals of Behavioral Medicine*, 21, 149-158.
- Sallis, J. F., Haskell, W. L., Wood, P. D., Fortmann, S. P., Rogers, T., Blair, S. N., et al., (1985). Physical activity assessment methodology in the Five-City Project. *American Journal of Epidemiology*, 121, 91-106.
- Sallis, J. F., Hovell, M. F., & Hofstetter, C. R. (1992). Predictors of adoption and maintenance of vigorous physical activity in men and women. *Preventive Medicine*, 21, 237-251.
- Sallis, J. F., Hovell, M. F., Hofstetter, C. R., & Barrington, E. (1992). Explanation of vigorous physical activity during two years using social learning variables. *Social Science and Medicine*, 34, 25-32.
- Sarkin, J. A., Nichols, J. F., Sallis, J. F., & Calfas, K. J. (2000). Self-report measures and scoring protocols affect prevalence estimates of meeting physical activity guidelines. *Medicine & Science in Sports & Exercise*, 32, 149-156.

- Shutz, R. W. (1989). Analyzing change. In M. J. Safrit, & T. M. Wood (Eds.), ***Measurement concepts in physical education and exercise science*** (pp. 207-228). Champaign, IL: Human Kinetics.
- Stephens, T., & Caspersen, C. J. (1994). The demography of physical activity. In C. Bouchard, R. J., Shephard, & T. Stephens (Eds.), ***Physical Activity, fitness, and health: International proceedings and consensus statement***. (pp. 204-213). Champaign, IL: Human Kinetics.
- Stevens, J. P. (1990). ***Intermediate statistics: A modern approach***. Hillsdale, NJ: Lawrence Erlbaum.
- Sutton, S. R. (2000a). A critical review of the transtheoretical model applied to smoking cessation. In P. Norman, & C. Abraham (Eds.), ***Understanding and changing health behaviour: From health beliefs to self-regulation*** (pp. 207-225). Amsterdam, Netherlands: Harwood Academic.
- Sutton, S. R. (2000b). Interpreting cross-sectional data on stages of change. ***Psychology and Health***, 15, 163-171.
- Sutton, S. R. (2001). Back to the drawing board? A review of applications of the transtheoretical model to substance use. ***Addiction***, 2001, 175-186.
- Tabachnick, B. G. & Fidell, L. S. (1996). ***Using multivariate statistics*** (3rd ed.). New York: Harpers Collins.
- Thomas, S., Reading, J., & Shephard, R. J. (1992). Revision of the Physical Activity Readiness Questionnaire (PAR-Q). ***Canadian Journal of Sport***, 17, 338-345.
- U. S. Department of Health and Human Services [USDHHS]. (1996). ***Physical activity and health: A report of the Surgeon General***. Atlanta, GA: Author.
- Velicer, W. F., Hughes, S. L., Fava, J. L., Prochaska, J. O., & DiClemente, C. C. (1995). An empirical typology of subjects within stage of change. ***Addictive Behaviors***, 20, 299-320.
- Velicer, W. F., Rossi, J. S., Prochaska, J. O., & DiClemente, C. C. (1996). A criterion measurement model for health behavior change. ***Addictive Behaviors***, 21, 555-584.

- Wannamethee, S. G., & Shaper, A. G. (2001). Physical activity in the prevention of cardiovascular disease: an epidemiological perspective. *Sports Medicine*, 31, 101-114.
- Weinstein, N. D., (1988). The precaution adoption process. *Health Psychology*, 7, 355-386.
- Weinstein, N. D., Lyon, J. E., Sandman, P. M., & Cuite, C. L. (1998). Experimental evidence for stages of health behavior change: The precaution adoption process model applied to home radon testing. *Health Psychology*, 17, 445-453.
- Weinstein, N. D., Rothman, A. J., & Sutton, S. R. (1998). Stage theories of health behavior: Conceptual and methodological issues. *Health Psychology*, 17, 290-299.
- Whelton, S. P., Chin, A., Xin, X., & He, J. (2002). Effect of aerobic exercise on blood pressure: a meta-analysis of randomized, controlled trials. *Annals of Internal Medicine*, 136, 493-503.

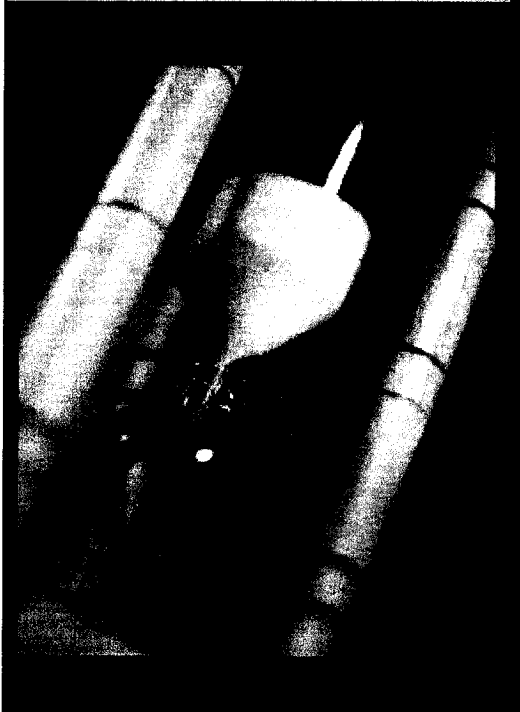
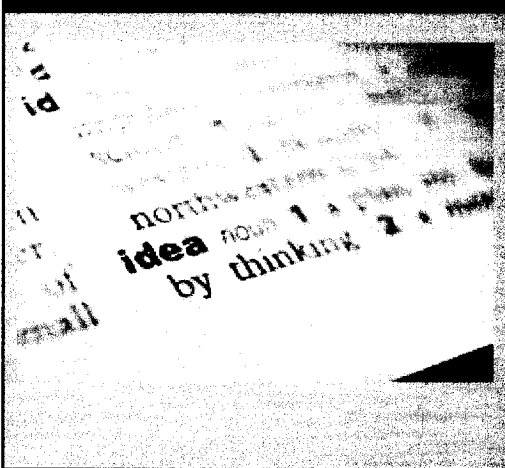
APPENDIX 1

Intervention Manuals

M.-C. LAPLANTE

Stage-Matched Intervention Manual – Contemplation stage

M.-C. LAPLANTE



FITNESS SERIES
Vol. 2

THINKING ABOUT CHANGE?

A Guide for People
who are Thinking about
Incorporating Regular
Physical Activity
into their Lives



AUTHOR: [illegible]

Thinking about change?

A Guide for People who are Thinking about Incorporating Regular Physical Activity into their Lives

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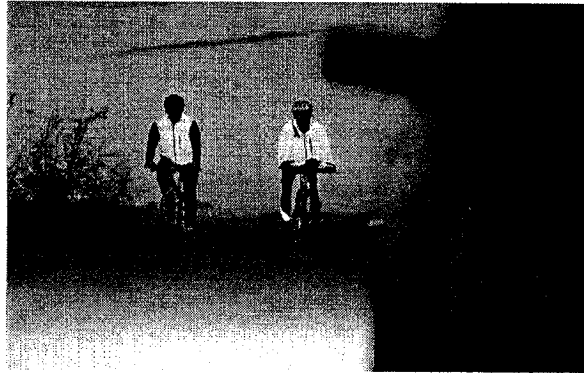
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Foreword

You know about the importance of getting regular physical activity. You have acknowledged that you are not satisfied with your present physical activity lifestyle, and that you need to change it. You have not picked a date when you will start exercising regularly but you know that you will change—someday. Yet, there always seems to be some reasons not to: no time, lack of interest, fatigue... This has resulted in you being more sedentary than you want to be. You are aware that this is a problem and it is often on your mind.

It doesn't matter how long you have been thinking about incorporating regular physical activity into your life, or if you have tried before. What does matter is how you will answer these two important questions-

- ▶ *Do I want to get regular physical activity?*
- ▶ *Is now the right time for me to move ahead on this?*

What makes incorporating regular physical activity into your life challenging is that you feel two ways about this. There is a part of you which knows that you should get more regular physical activity, but at the same time, there is this other part which really does not feel like it. That makes it hard to know what to do when you feel "stuck".

It is understandable that making a decision about getting regular physical activity can be difficult for you. This guide will help you figure out how to get "mentally unstuck" and how to make the best decision for you with regard to incorporating regular physical activity into your life.

What this guide is about...

Most books on physical activity tell you to go ahead and “just do it” and show you how to get started with various exercise programs. Our approach is very different. In this guide, we will help you:

- ▶ Think about pros and cons of getting regular physical activity.
- ▶ Identify and deal with concerns you may have about getting regular physical activity.
- ▶ Make a decision about whether it is the right time for you to incorporate regular physical activity into your life.

How to use this guide?

Throughout this guide, we will suggest that you do some brief written activities to help you make a decision about the importance of physical activity in your life.

We know how much time and effort you devote to making the important decisions in your life. Deciding about the importance of becoming physically active should not be any different. It is important that you learn more about it, talk to others who successfully did it, and think it through for yourself so you can make the best decision for you.

Our experience in helping people who, like you, are considering incorporating regular physical activity into their lives has taught us how important it is that you do ALL written activities in this guide. So,

- ▶ *Take your time!* Go through this guide one step at a time. Changing how you think about regular physical activity takes some time.
- ▶ *Do all the activities that are suggested.* They will help you make the right decision for you.

- *Write down your answers for all activities.* You may tell yourself, “I’ll just read this guide and try to think things through and that will be enough”. This is a real trap. When you need to make a decision about something you feel ambivalent, your thoughts often chase each other around in your mind in endless circles. That makes it hard to think clearly. Once you get your thoughts down on paper, you develop a more objective perspective and making a decision becomes easier. Put a check mark in one of these boxes to indicate whether you are willing to do the written exercises while you read this guide:

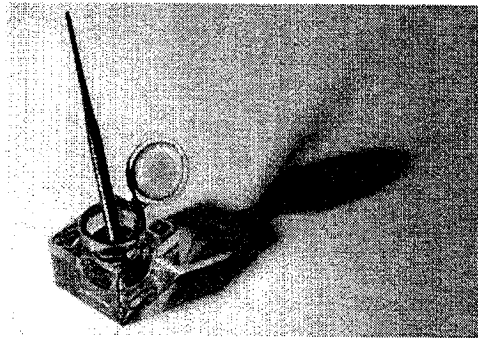
	☐ Yes, I will do the written activities...
	☐ No, I won’t do them...
	☐ I haven’t decided yet...

Did you put a check mark in one of these boxes? Or did you just read it? We ‘ll bet we know the answer! You did, that’s great! If you didn’t, we’ll make a suggestion that could be quite helpful to you. Grab a pen or pencil and put a check mark in one of these 3 boxes now!

- *Discuss what is on your mind with others.* Ask them about positive and negative aspects of getting regular physical activity and how they deal with barriers. You could be surprised about what they have to say and how much you will learn...

If you have tried in the past...

If you have tried getting regular physical activity in the past, and you stopped early on, you are not alone. Incorporating regular physical activity into one's life can be very challenging. People who have tried in the past have told us that they had failed because they had not taken the time to think it through or were unprepared. Although your past attempts may be a source of frustration and disappointment, they can also be a rich source of information from which you can learn and plan for success. Figuring out what led you to stop in the past and exploring strategies that will help you deal with these barriers this time around will increase your chances of success. Keep on trying!



Thinking about change...

*In order to
successfully start
getting regular
physical
activity, I had
to change the
way I thought
about physical
activity.*

Everyone, from children to elderly, men and women, can benefit from regular physical activity. Considerable scientific evidences link regular physical activity with a wide array of physical and mental health benefits. Yet, you may feel as though incorporating physical activity into your life is too hard and demanding. You are not alone! Despite knowing that regular physical activity is good for them, there are lots of people who get less physical activity than they need.

This has led researchers around the world to study how people make up their mind about deciding to get regular physical activity. Using the latest scientific evidence, this guide introduces you to a series of steps that have been found to help people, just like you.

In order to successfully start getting regular physical activity, you will probably need to change the way you think about physical activity. If you are like most people, you may think a lot about it, but never feel like you are moving ahead...

Spending too much time thinking about all the barriers to exercising regularly makes it hard to decide to start getting regular physical activity. Thinking this way is what we call a "mental trap". You see things in absolutes, black-or-white. If you are like most people, you get caught in these traps from time to time and you may not even be aware of it! This results in you procrastinating and postponing any decision on that matter, and this can be discouraging. It is essential that you recognize when you are in a mental trap and get out of it. Mental traps are some of the most powerful barriers that prevent you from incorporating regular physical activity into your life, and they will be discussed in greater detail in a subsequent section of this guide.

For now, it may help if you think of regular physical activity like this:

- ▶ Regular physical activity is good for my body and for my brain, for me and for the significant people in my life.
- ▶ Starting to get regular physical activity is tough but I have successfully done a lot of other things in my life that were tougher.
- ▶ Regular physical activity will help me enjoy my life even more and lead a more productive and meaningful life.

This is a good starting point and these statements apply to most of us. Now, let's find out about what you perceive as the benefits and costs of regular physical activity for YOU.

STEP 1

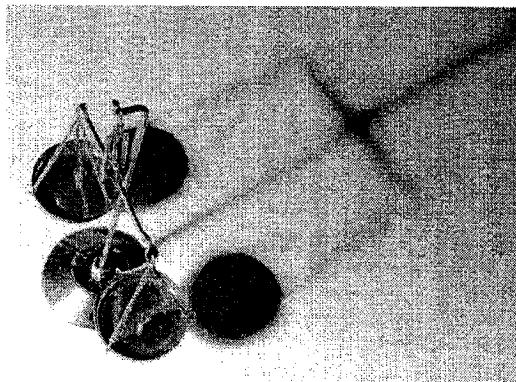
Identifying
the benefits
and costs of
regular
physical
activity for
you.

Considering the downsides of inactivity is important. As human beings, we seem to have a tendency to somehow forget negative consequences resulting from our behaviours or lack of thereof. This seems to be especially true when we are aware that what we do is bad for us, and when we do so anyway.

Consider the absence of regular physical activity in your life.

- Are there any downsides associated with inactivity for you?

Take a few minutes to visualize yourself as the individual that you are: someone who gets less regular physical activity than he or she really needs. Consider all your senses, such as how you look, how you sound when you must do a physical activity, how your body feels, etc... Give yourself time to let your thoughts sink in.



What are the
downsides of
inactivity for
you?

Ask yourself the following questions about the downsides of inactivity for you. Write down your answers in the spaces provided below. Your written answers will be useful to you later on.

• What downsides have you ever experienced from not being regularly physically active? (e.g., easily out of breath, etc...)



• How could being physically inactive negatively impact on the people you care about? (e.g., I won't be a good role model for my children, etc...)

• How does being inactive negatively affect the image you have of yourself? How do you think it affects the image others have of you? What images come to mind? (e.g., lazy, fat, etc...)

• What other bad effects could you experience in the future?

So far, you have identified some downsides associated with inactivity. You have explored how inactivity can negatively impact on your physical health, your self-esteem, and the people you care about. Do you perceive any of these downsides of inactivity to be personally relevant, meaningful, or of importance to you?

You have realized that one of the downsides of inactivity is the way it affects how you think about yourself. Through your own assessment, you probably have come to realize that you perceive some aspects of yourself in negative terms because of your inactivity. Thinking this way may also

*By not getting
regular
physical
activity, I feel
like I am
letting myself
down...*

trigger some negative feelings, such as frustration, anger, fear, guilt, or shame. It is important that you express your feelings about your inactivity. Only then, will you be able to move ahead...

Visualize yourself in the following situation:

You are searching for a new job and you are meeting for the first time with a prospective employer. They are looking for someone that is energetic and seeking new challenges, in others words, someone just like you! You show up on time in the lobby of the building, ready to impress them. They come down to welcome you and to apologize because there is maintenance work done on all elevators and everyone must use the stairs. Their offices are located on the 11th floor...

• Use words to describe what others will see and hear as your climbing the stairs. What will they think about you? How will you feel about yourself?

Take out some old clothes that you would like to fit into again. Put them on and look at yourself in the mirror.

• Write down how you look and feel. What makes you unsatisfied with the way you are now?

Picture yourself in 10-years without having changed your physical activity lifestyle.

• Write down how you will look, feel, how your health and appearance will affect the people around you. What makes you unsatisfied with the way things have turned out?

Imagine that the worst has happened: your current lifestyle choices and your lack of regular physical activity have led you to an early death from a heart attack.

• Write a letter to someone you care about explaining how and why you died, and trying to make amends for all that you have missed doing with them.

Are you missing on something important?

For most people, exploring the downsides of inactivity have left them wondering whether they are missing on something important. You probably feel this way too.

It is important that you figure out for yourself what important part of your life you are missing on by not getting regular physical activity. Try to figure out what personal need or goal is not fulfilled. Looking back at your answers in the previous activities will be helpful.

In the table below, you will find the most common unfulfilled personal *needs* or *goals* from people who, just like you, are thinking about incorporating regular physical activity into their lives. Using a check mark, indicate which of the following statements best apply to you. You may also want to write down one that is personally relevant to you.

WHAT AM I MISSING?

- ☐ I feel that by not getting regular physical activity, I am letting myself down...
- ☐ I would be achieving an important personal goal if I were to get regular physical activity...
- ☐ If I were to start getting regular physical activity, it would be a way of taking back control...
- ☐ Other (please specify):

Once you have identified your most important need or goal that is not fulfilled by your present physical activity lifestyle (e.g., lack of control, letting myself down, etc...), write it down in the box below.

As you will see later, this unfulfilled need or goal will strongly impact on your decision to get regular physical activity.



What are the benefits of regular physical activity for you?

You have explored the downsides of inactivity and what it really means for you. You may feel that these previous activities have awakened you to new possibilities, but you are unsure as to what they are? This section will explore the myriads of benefits that you can get from regular physical activity.

Focus on the present and evaluate how your current physical activity habits (or lack of thereof) make you feel. Take a real look at yourself. Would your life be better if you changed and got more physical activity?

Take a few minutes to answer these questions about the way you see the benefits of regular physical activity.

• What benefits would you get from incorporating regular physical activity into your life (e.g., physical, emotional, & social)? What benefits would your family get?

• How would you feel about yourself if you started getting regular physical activity? How others would feel?



• Why would it be achieving an important personal goal if you were getting regular physical activity?

• How important and meaningful are these benefits to you?

What if you changed?

*I am realizing
how far apart,
who I want to
be and who I
am is...*

Would your life be better if you changed your physical activity habits? Think of how your life would be if you made these changes. Close your eyes and imagine yourself as if you were watching a video of yourself. Imagine yourself as a physically active individual...

✿ Write down what change feels like... your reactions and that of others as a result of you getting regular physical activity... (e.g., proud of myself, people say I look great, good example I set, etc...)

Did you enjoy the feelings you felt as you visualized yourself as a physically active individual? This sense of contentment can be real, and you can decide to make it yours.

Answering all the questions in this guide may have made you realize how far apart is, who you want to be, and who you are. What matters is that you can decide to become who you want to be. Continue, you are on the right track!

**Summarizing
the benefits
of regular
physical
activity...**

We have provided you with a table that will allow you to summarize the benefits you will achieve from exercising regularly. From now on, we will refer to them as the PROS of regular physical activity.

Briefly, list as many PROS as you can think of. Review what you have written in the previous activities. Consider health benefits, your appearance, your productivity, your well-being, how you would feel about yourself, how others would perceive you, etc... Use an extra sheet of paper, if necessary. Make sure to include them all.

PROS of Regular Physical Activity	
	Rating (1-10)
<i>i.e., I would be proud of myself</i>	<i>8</i>
	Total:

How meaningful are those benefits to me?

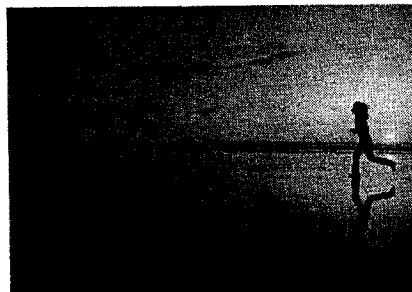
Now that you have developed a comprehensive list of all the benefits from regular exercise, it is important to realize that not all benefits are valued equally by everyone. For example, losing weight through exercise could be perceived by one person as extremely important whereas someone else may perceive this as having little relevance to him or her.

It is important to determine how much YOU value each of the benefits you have identified. Use the following scale to determine the importance of each item to you, and indicate your score (e.g. 1 to 10) in the Rating column of your PROS list.

RATING SCALE

Not very important to me	Moderately important to me	Extremely important to me
.....1.....	2..... 3..... 4..... 5..... 6..... 7..... 8..... 9..... 10.....	

Now that you have indicated all your ratings, add all your scores. This is your PROS score. Report it in the table entitled WEIGHING PROS & CONS, located on page 16. We will come back to it shortly. This score summarizes your perceived benefits if you were to start getting regular physical activity.



What are the costs of regular physical activity for you?

What you have discovered in the previous sections is that, if only the benefits of regularly exercising mattered, you would have started exercising a long time ago. Most people in your situation feel that they are prevented from exercising by what they perceive as costs, barriers, or obstacles associated with regular physical activity. We call them the CONS of regular physical activity.

Both scientific research and common sense agree, as long as you perceive more CONS than PROS of regular physical activity, you will remain “stuck” and will not make a decision about whether to get regular physical activity.

Let’s examine your CONS of regular physical activity. As you did for the PROS, indicate all the costs, disadvantages, or barriers that you see associated with regular physical activity. Be as open as you can. To make a good decision, it is essential that you list all the barriers that you perceive as preventing you from incorporating regular physical activity into your life.

Write down your barriers in the CONS table below. For now, do not write anything in the STRATEGIES column; we will get back to it later.

CONS	Rating #1 (1-10)	STRATEGIES	Rating #2 (1-10)

	Total:		Total:

Now that you have listed all your CONS of regular physical activity, indicate the importance of each item in preventing you from starting to exercise regularly. Use the same rating scale as for the PROS (e.g., 1 to 10) and indicate your score for each CONS in the *Rating #1* column.

RATING SCALE

Not very important to me	Moderately important to me	Extremely important to me
.....1.....	2..... 3..... 4..... 5..... 6..... 7..... 8..... 9..... 10.....	

Sum up all your ratings in your CONS list. The total is your CONS score. Report this score in the table below. It summarizes your perceived barriers to regular physical activity.

Weighing PROS & CONS	
	Score
PROS	
CONS	

To change or not to change?

Examine what you have written about the costs of inactivity and the benefits you would get from exercising regularly. Look at your scores, are your PROS greater than your CONS? At this point, do you feel ready to start getting regular physical activity?

Yes!	Not yet!
Great! A good plan will increase your chances of success at incorporating physical activity into your life. There are several resources (i.e., books, local fitness center, physically active friends, wellness center at work, etc...) that exist to help you get ready to start exercising regularly. We also suggest that you keep on reading this guide. The information that will be presented to you in the next sections will strengthen your decision to exercise regularly and will make you feel even more confident about yourself. Again, congratulations!	If you don't feel ready to start incorporating physical activity into your life, yet, that's okay too. You may perceive some of the benefits of regularly exercising but there may seem to be more disadvantages to do so. In the next sections, we will present you with facts about regular physical activity that you may not be aware of. We will also address some concerns you may have about getting regular physical activity. Keep on reading, you are on the right track!

More for you
to think
about...



The Heart and Stroke Foundation of Canada and numerous other international scientific organizations believe that people can substantially improve their health and quality of life by including moderate amounts of physical activity in their daily lives. Scientific findings also demonstrated that physical activity need not be of vigorous intensity for it to improve health. Health benefits appear to be proportional to the amount of activity; thus, every increase in activity adds some benefits!

The most recent recommendations advise people of all ages to include a **minimum of 30 minutes of physical activity of moderate intensity on most, if not all, days of the week**. Experts agree that for better health, physical activity should be performed regularly.

There are a multitude of reasons as to why you may want to incorporate regular physical activity into your life. You may want to start exercising regularly because of the physical and psychological benefits associated with regular physical activity. You may want to do so because it gives you a better physique, which makes you feel more attractive and more confident about yourself. It may be that nowadays, it is

the “in” thing to do, and you want to join in! Or, you may simply want to do it because physical activity is fun! Read back the PROS you have identified for yourself. What matters is that there are some positive aspects you would like to benefit from.

In the next table (page 20), you will find a list highlighting the benefits of regular physical activity that have been *scientifically* documented. As you read this table, you may be surprised as you realize that these benefits go far beyond what you had expected... You may wonder whether all this can be achieved simply by getting regular physical activity? The experts all agree: yes!

Identify the PROS that you would like to benefit from and that you have not identified in your list of PROS yet. Don't forget to consider both short and long term benefits. Put a check mark beside these items.

RATING SCALE

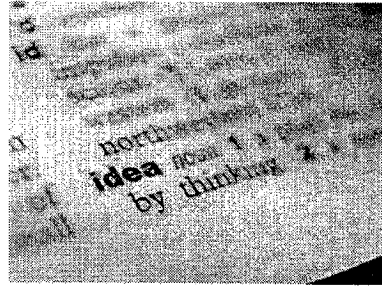
Not very important to me	Moderately important to me	Extremely important to me
.....1.....	2..... 3..... 4..... 5..... 6..... 7..... 8..... 9..... 10.....	

Also indicate how important these benefits are to you, using the same rating scale (i.e., 1 to 10) as you have used earlier and that is shown above. Write down your score in the Rating column.

Scientifically Documented PROS of Regular Physical Activity		Rating (1-10)
	Prevention of cardiovascular diseases (i.e., heart attack)	
	Prevention of hypertension	
	Reduction of elevated blood pressure	
	Prevention of osteoporosis	
	Reduction in elevated cholesterol level	
	Prevention of some forms of cancer (i.e., colon cancer)	
	Prevention of diabetes	
	Lower mortality rates	
	Preservation of the ability to maintain independent living in older age	
	Weight loss	
	Maintenance of healthy weight or of weight loss	
	Reduction in feelings of depression	
	Reduction in feelings of anxiety	
	Increase in general feelings of well-being	
	Increase in health-related quality-of-life	
	Increase in self-esteem	
		Total:

Sum up your ratings. Add this score to your previous PROS score (located on page 16). Indicate your total score in the table entitled WEIGHING PROS & CONS, located on page 34.

What has kept you sedentary all these years is your perception that the CONS of regular physical activity outweigh the PROS. That is why, we have just addressed in details the PROS of regular physical activity. The next logical step is to address your concerns (or CONS) with respect to regular physical activity.



STEP 2

Addressing your concerns about getting regular physical activity.

What if you could find ways to address your concerns about becoming physically active? Would you reconsider incorporating regular physical activity into your life?

In 2000, we surveyed over 1,000 employees from a high-tech company located in Ottawa about their physical activity patterns and their attitude toward regular physical activity. They provided us with invaluable information. In this survey, people who, like you, were thinking about incorporating regular physical activity into their life indicated four main barriers to regular physical activity: (1) lack of time, (2) too much fatigue, (3) lack of willpower, and (4) lack of interest in physical activity. Because of the importance of these barriers in preventing people to exercise regularly, we will address them in detail in this section.

Barriers can be conceptualized in two ways: (1) as practical barriers, or (2) as mental barriers. Practical barriers are foreseeable events or circumstances that hinder your plans, and they require practical solutions. Lack of time because your spouse frequently travels for work, increased responsibilities at home, or bad weather are examples of practical barriers. They make exercising regularly more difficult.

Mental barriers, also called “mental traps”, have to do with the way you *think* about and the *meaning* you attach to both becoming physically active and the practical barriers preventing you from doing so. They are usually negative thoughts or beliefs you have about yourself. An example of a mental trap is to think that you can’t exercise because you don’t have enough willpower or because you are a lazy person. Overcoming mental traps require you to challenge the validity of negative thoughts.

Is a mental trap preventing you from becoming physically active?

When you think about becoming physically active on a regular basis, what kind of things do you tell yourself? Take a look at the 10 mental traps below. Can you relate to any of these traps? Are you getting stuck in any of them? Use a check mark to identify the traps you get stuck in.

10 MENTAL TRAPS	
☐ ALL-OR-NOTHING THINKING. You see things in black or white categories. If the situation is not perfect, you see it as a total failure.	☐ LABELING. This trap is an extreme form of all-or-nothing thinking. Instead of saying, " <i>I didn't plan well enough</i> ", you find yourself saying " <i>I'm a loser</i> ".
☐ JUMPING TO CONCLUSIONS. You interpret things negatively when there are no facts to support your conclusion. Fortune-Telling (you predict things will turn out badly) is a common example.	☐ "SHOULD" STATEMENTS. You have a set of expectations for how you think things need to happen. Many people try to motivate themselves with "should" and "shouldn't". This often results in feelings of guilt when the expectations are not met.
☐ MAGNIFICATION. You exaggerate the importance of your problems and shortcomings and minimize your positives.	☐ OVERGENERALIZATION. You see a single event as a never-ending pattern of defeat. You tend to use words like "always" and "never".
☐ MENTAL FILTER. You pick out a single negative detail and focus on it. If you receive any criticism, then any praise is forgotten.	☐ EMOTIONAL REASONING. You assume that your negative emotions reflect the way things really are. You may say, " <i>I feel lazy, so I must be a lazy person</i> ".
☐ DISCOUNTING THE POSITIVE. You reject positive experience by insisting that they don't count. If you do a good job, you can't accept a compliment (e.g., " <i>anyone could have done it</i> ").	☐ PERSONALIZATION & BLAME. You hold yourself personally responsible for events that aren't entirely under your control. " <i>If I hadn't gone out exercising last night, my son wouldn't have gotten sick</i> ".
Adapted from: Burns, D. 1989. The Feeling Good Handbook.	

Have you recognized any of your mental traps? Think about what you say to yourself on a regular basis with regard to becoming physically active. Listen to your self-talk and identify your mental traps. What do you tell yourself about your chances of successfully incorporating regular physical activity into your life? Write down your mental traps in the space provided below

I Tell Myself...	
☐	<i>I will never have the willpower to exercise regularly</i>
☐	
☐	
☐	

Once you have identified a mental trap, the next step is to **challenge it!** Ask yourself questions such as: *How do I know this for a fact? What evidence do I have for and against this?* The idea behind challenging your negative thoughts is to have a more *realistic* outlook on your thoughts about becoming physically active.

To help you get unstuck from your mental traps, use one or several techniques listed below. In fact, you can use almost any technique to challenge any mental trap. Be flexible and creative. Try a variety of techniques until you find a way to put each of your mental traps to rest, and move on.

9 WAYS TO GET “UNSTUCK” FROM MENTAL TRAPS

☐	Examine the Evidence	Instead of assuming that your negative thought is true, examine the facts and actual evidence for it.
☐	Survey method	Do a survey to find out if your thoughts and attitudes are realistic.
☐	Experimental Method	Do an experiment to test the accuracy of your negative thought.
☐	Double Standard Technique	Talk to yourself in the same way you might talk to a dear friend who was in the same situation.
☐	Pleasure Predicting Method	Predict how satisfying activities will be, from 0% to 100%. Record how satisfying they turn out to be.
☐	Thinking in Shades of Gray	Instead of thinking about your problems in black-and-white categories, evaluate things in shades of gray.
☐	Cost-Benefit Analysis	List the advantages and disadvantages of a negative thought, belief, or behavior.
☐	Straightforward Approach	Substitute a more realistic thought.
☐	Devil's Advocate Technique	Get a partner to play the role of the thoughts that make you not exercise. Your partner will tempt you like the Devil and try to persuade you that you really <i>shouldn't</i> start exercising. You, in turn, will argue and insist that you really can start exercising.

Adapted from: Burns, D. 1989. The Feeling Good Handbook.

Do you see how these techniques will allow you to reevaluate the validity of your negative thoughts, and will help you get unstuck from mental traps? Here's an example of a mental trap and of how you may challenge it.

MENTAL TRAP:

I have no willpower

○ MENTAL TRAPS:

<i>All-or-Nothing thinking</i>	<i>Is it really true that I have no willpower whatsoever?</i>
<i>Overgeneralization</i>	<i>Do I honestly believe that I have never had willpower and that I will never have it?</i>
<i>Magnification</i>	<i>Am I blowing the importance of willpower out of proportion?</i>
<i>Mental Filter</i>	<i>Am I dwelling exclusively on willpower?</i>
<i>Jumping to Conclusions</i>	<i>Am I making a prediction without sufficient evidence?</i>

○ TECHNIQUES:

<i>Examine the Evidence</i>	<i>What is the actual evidence for my lack of willpower? What is the actual evidence that I do have willpower?</i>
<i>Experimental Method</i>	<i>What experiment can I do to find out if this is true? I could develop a good plan of action and then start exercising gradually.</i>
<i>Double Standard Technique</i>	<i>What would I say to a friend with a similar problem (i.e., says he or she has no willpower)?</i>
<i>Cost-benefit Analysis</i>	<i>List the advantages and disadvantages of thinking that I have no willpower?</i>
<i>Straightforward Approach</i>	<i>Tell myself: Willpower is not the key to success. A good plan of action is. Becoming physically active is a matter of choice and commitment.</i>

Use the table below to challenge one of your mental traps. Take the time you need to do this activity. Change is a process that takes some time. Repeat this activity as often as necessary.

MENTAL TRAP: “ _____ ”		
☐	MENTAL TRAPS:	
☐		
☐		
☐		
☐	TECHNIQUES:	
☐		
☐		
☐		

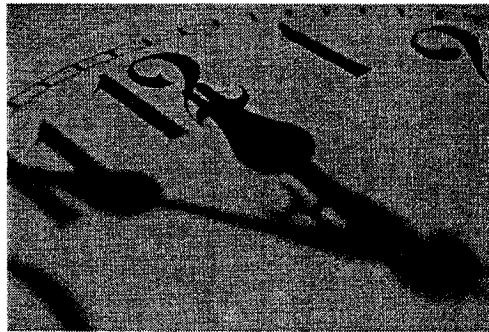
Remember that mental traps can lead to unnecessary procrastination and may result in you remaining more sedentary than you want to be. It is up to you to make your thinking about getting physically active more realistic!

In the next section, we discuss other barriers to regular physical activity, and provide you with practical solutions to overcome them. Keep in mind, however, that they may also be mental traps. For example, there may be some people who really have no time for exercising (e.g., practical barrier), but is this really the case for you (e.g., mental barrier)? Before answering this question, ask yourself whether it is a mental trap. Thinking that you have no time for exercising could be an example of all-or-nothing thinking or overgeneralization. Look closely at the evidence, experiment, or play devil’s

I don't have time!

advocate. Doing so will help you make an informed decision about becoming physically active.

I don't have time! Are there times when you wish that there were 48 hours in a day? Do you feel overwhelmed by work and family commitments? You are not alone! On most days of the week, people must juggle work, family, household chores, social activities and getting a few hours of sleep. This makes it hard to consider incorporating regular physical activity into one's life. Yet, when you look around, there are people who seem to find the time to exercise regularly. How do they do it?



People who have successfully incorporated regular physical activity into their lives have told us that they use three very useful strategies: (1) making regular physical activity a priority in their life, (2) planning ahead, and (3) doing several short bouts of physical activity.

• Make regular physical activity a priority in your life.

Have you noticed that when you tell yourself that you will go exercising *some* time next week, it always seems to be the first thing that is dropped out of a busy day? If you decide to get regular physical activity, it is because you see this as something important for you, and because it is a priority. Thus, you should treat it accordingly. The real issue is to identify what is less important for you and what you can let go. Ask yourself what matters most: your health or household

chores, watching TV, talking over the phone, or surfing the net?

Identify 5 situations in your life that take up significant amount of your time and that you would be willing to let go (i.e., other activities, chores, people, etc...). Write them down in the table below.

For my health, I can let go of...
1.
2.
3.
4.
5.

There are situations that are more difficult to let go than others because they are also very high on your priority list. A good example is your family. In such instances, consider combining together high priorities. Be the best parent or spouse you can be and get your family involved to be physically active with you! Not only will you be spending quality time with them, you will also contribute to their health, and institute in them a mentality of being physically active. This is time well spent...

Another useful strategy is to do as you would do with any important meetings or appointments. Write down in your daily planner the times when you will exercise. Do this at least one week in advance, it will allow you to plan accordingly and planned activities are less likely to be tossed out.

• Plan ahead when you'll exercise and write it down in your agenda.

- Do several short bouts of physical activity.

You can also choose to do several short bouts of physical activity in a day. Research studies have found that three bouts of 10 minutes of physical activity are as effective as one bout of 30 minutes. Thus, you could walk briskly for 10 minutes during your breaks at work. Not only your health would benefit from these short walks, you would also keep your work and family commitments intact!

With some creativity and planning, it is possible to find the time to incorporate regular physical activity into your life!

I am too tired!

- Regular physical activity increases your level of energy and reduces your fatigue.

I am too tired! After a hard day at work, some people do not find the idea of going to exercise very appealing.

What most people don't know is that the lack of regular physical activity contributes to making them tired. When you are not physically fit, your body and your mind are less resistant to demands from the outside world. You get tired more easily and more often.

Scientific investigations have demonstrated that regular physical activity reduces your fatigue. Further, it increases your energy level. After a few weeks of exercising regularly, not only will you feel less tired, but you will also feel more energized!

It's boring!

- Find an activity that you like. Physical activity can be fun!

It's boring! When we ask people who do not get regular physical activity to visualize what exercising regularly looks like, they imagine a non-smiling and absorbed individual, in a "smelly" gym, surrounded by dozens of complex machines, and doing some weight repetitions, and some more, and some more, and some more... in other words, exercising seems like a boring experience...

Some people enjoy doing weights in a fitness center, others don't, and that's okay! What matters is to find an activity that YOU will enjoy. Some activities seem better

suited to certain personalities. Think about who you are and what you like, that will guide in your choice of activities.

There are several things you can do to help you choose an activity that you will enjoy. Consider the following options and use a check mark to identify your favorite ones.

An enjoyable physical activity for me is...	
☐ I prefer doing physical activity alone.	☐ I prefer doing physical activity with other people.
☐ I prefer an activity that is relatively the same every week.	☐ I prefer an activity that is continuously changing.
☐ I prefer doing physical activity indoors.	☐ I prefer doing physical activity outdoors.
☐ I prefer doing physical activity at home.	☐ I prefer doing physical activity in a public place.
☐ I prefer competitive activities.	☐ I prefer non-competitive activities.
☐ I prefer an activity that will help me relax.	☐ I prefer an activity that will push my adrenaline through the roof.

Also, think back at other times in your life when you were more active. There may have been some things you wanted to do or activities that you enjoyed doing? Are there any reasons why you would not enjoy them now? You can also take fun and pride in seeing your fitness level increasing and shaving off those extra pounds. As well, an increase in your mastery of an activity can be quite enjoyable.

There are hundreds of activities that you can choose from. Take the time to consider a wide variety of them and

**Useful
strategies to
overcome
barriers to
regular
physical
activity.**

choose the activity that will meet your interests and needs.

Below is a list of barriers to exercising regularly that people may experience. Beside each barrier, we have listed strategies that will help you overcome them.

BARRIERS	STRATEGIES
Lack of time	Do short bouts of physical activity. Plan ahead. Make it a priority in your life and let go of less important activities.
Too tired/ Lazy	Try regular physical activity, it increases your energy level and reduces your fatigue.
Lack of interest	Find an activity that you'll enjoy. Physical activity can be fun!
Lack of willpower	Develop a good plan of action. That's the key to success!
Lack of exercise facilities	Inquire about existing exercise facilities at work. Use your streets, your house.
Safety concerns	Do physical activity during daylight, with a friend, or where there are a lot of people.
Financial concerns	Buy a good pair of running shoes and your set to go! Most physical activity do not involve costly equipment (i.e., walking).
Family obligations	Get your kids and spouse involved-- Better health for all and quality time spent together.
Work pressure	Try regular physical activity to relieve stress. It will also increase your productivity at work.
Bad weather	Choose an activity that you can do inside during bad weather. Otherwise, dress appropriately.
Peer norms	Join the crowd! Nowadays, exercising is the <i>IN</i> thing to do.

Afraid of looking awkward	Use humor as a strategy! It's normal to feel awkward at first. Also, if you stick to the same activity long enough, you will get better, and this feeling will go away.
Lack of social support	Get a friend or spouse involved. Ask your physician to support you. He or she will be supportive by such a request!
Health problems	Contact your physician for the best plan of action. Most people would benefit from exercise, particularly those experiencing health problems.
Low confidence in oneself to succeed	Set short-term, attainable goals to build self-confidence.
Lack of exercise knowledge	Obtain more information. Your library, wellness center at work, physician, friends, local gym are all a great sources of information about how to get started with exercising.
Lack of physical activity partner	Look around you. You can even find physical activity partners on the web!
Injuries	If this is a chronic condition, meet with a fitness instructor; you can have a fitness plan tailored to your medical condition. Injuries are only temporary.
Unpreparedness	Develop a written plan! Decide on the activity you will do, when, where, and with who.

This list of barriers and strategies is not exhaustive. Several resources exist to help you develop appropriate strategies for you: health professionals, books, or a good friend. You may also want to generate your own strategies. You are the best person to know what is best for you! The only way you will be able to determine whether these strategies are effective for you is to give them a try!

Weighing your PROS and CONS.

You have just explored strategies and techniques to overcome both mental and practical barriers to becoming physically active on a regular basis. Keep these in mind, they will be very useful to you. Now, go back to your list of CONS (see page 15) and briefly indicate the strategies you will use to overcome each barrier you had identified.

Then, reassess the relevance of each barrier you had identified, *keeping in mind the strategies and techniques that you have learned to overcome barriers*. Write down your ratings in the *Rating-2* column. Sum up your score and write it down in the table below (CONS_{new}).

Weighing PROS & CONS	
	Score
PROS _{new}	
CONS _{new}	

Everybody knows that they should exercise regularly. What prevents people from getting regular exercise is what they perceive has being barriers and obstacles. In the previous section, you have learned how to address the most commonly cited barriers to regular physical activity. When faced with roadblocks, it is important to remember that there are always strategies out there for you, it is a matter of figuring them out.

STEP 3

Making a decision

By postponing your decision, you are indeed choosing not to change...

Making a decision about getting regular physical activity is an important one because crucial consequences will result of your decision, either way.

If you make a decision without examining all the evidence, you may change your mind once you are faced with new facts; positive or negative. It is also possible that not having all the facts will result in you postponing change. That is why, to make the best decision, you have just examined all the facts pertaining to getting regular physical activity.

At this point, you have explored your reasons for wanting to change, the barriers preventing you to do so, and strategies that would help you overcome these barriers. It is now time to ask yourself whether you are ready to start incorporating regular physical into your life.

Earlier, we asked you to weigh your PROS and CONS and determine what weighed the most in your decisional balance. This was prior we explored with you that there are strategies out there for you, and that barriers can be overcome with some thinking and creativity.

Now, let's take one final look at your list of PROS and CONS and at your scores (see page 34). Did some of your PROS or CONS scores change after doing the written activities suggested in this guide? Now, which do you perceive as being greater, your PROS or your CONS? In other words, are you ready to move ahead and get ready for regular physical activity?

Taking the next step...

NOT YET! If you have decided not to get regular physical activity at this time, it is probably because you still perceive more costs than benefits to exercising regularly. You have explored some of your reasons for wanting to change and you have come to the conclusion that they are not strong enough, yet. You may be ignoring some of the dangers of inactivity. It seems that it is not the right time for you to incorporate physical activity into your life. You may want to review this guide again at a later time. We hope that you will consider getting regular physical activity again some day.



YES! Great! You are now ready to move ahead. There are several resources that exist to help you *get ready* to start exercising regularly. Your library, a local fitness center, or your wellness center at work all have valuable tools to learn more about getting ready. You can also ask a friend who is physically active to tell you about exercise; physically active people are usually very happy to answer these kinds of questions. This person may even want to accompany you in your first steps toward regular physical activity.

A good preparation will increase your chances that you will succeed at incorporating physical activity into your life. You have already done most of the hard “thinking” work. Keep it up, and again, congratulations!

Good Luck!

Additional resources

Getting ready for change? A handbook for people who are getting ready to incorporate regular physical activity into their lives. Marie-Claude Laplante. (2001). University of Ottawa, School of Psychology. Ottawa, Canada.

Canada's Physical Activity Guide to Healthy Active Living. Health Canada. (1998). Also available at the following Website: www.paguide.com

Physical Activity, Recreation and Active Living in Canada. Available at the following Website: www.activeliving.ca

ParticipAction. Available at the following Website: www.participaction.com

Health Canada Active Living: It's a way of life! Available at the following Website: www.hc-sc.gc.ca/real/fitness

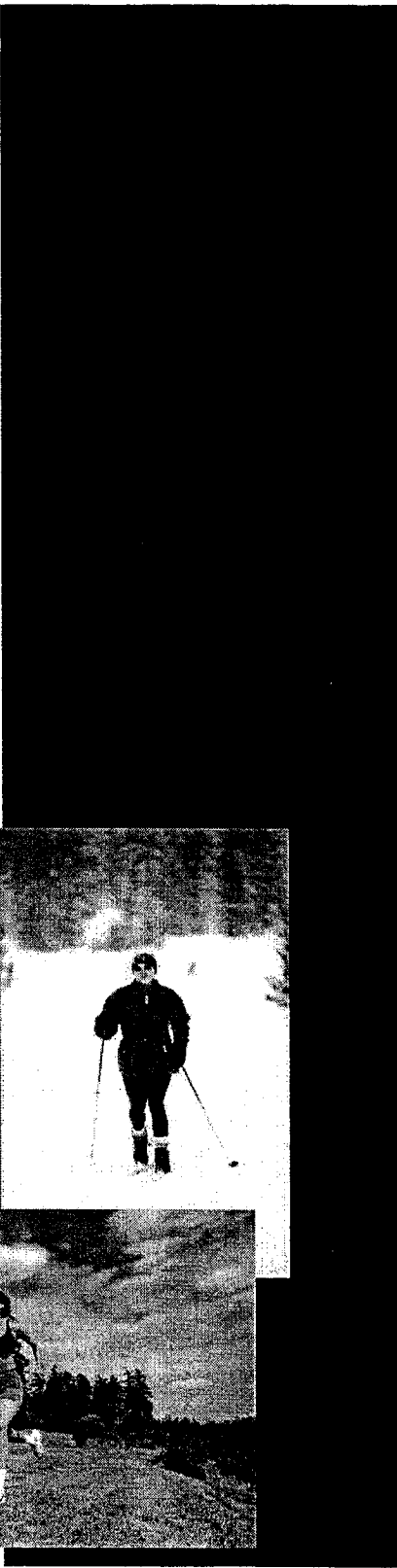
Heart and Stroke Foundation of Canada. Available at the following Website: www.hsf.ca

Your family physician.

Your local bookstore or library.

Your wellness center at work.

A physically active friend...



Stage-Matched Intervention Manual – Preparation stage

M.-C. LAPLANTE



FITNESS SERIES
Vol. 3

GETTING READY FOR CHANGE?

**A Handbook for People
who are Getting Ready to
Incorporate Regular
Physical Activity
into their Lives**



AUTHOR: Marie-Claude Laplante

Getting ready for change?

A Handbook for People who are Getting Ready to Incorporate Regular Physical Activity into their Lives

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FOREWORD

You know that you should be getting more regular physical activity. You may have realized that it has been a while since you were regularly active. Or, you may feel a little embarrassed when you feel yourself breathing heavily after walking up a flight of stairs. You are aware that you would benefit from regular physical activity, yet, you may still see some obstacles that make it difficult for you to do it. What matters is that you have made one of the best decisions you could make for yourself. You have decided to incorporate regular physical activity into your life.

Right now, you are trying to answer 3 important questions:

- ▶ *How committed am I to getting regular physical activity into my life?*
- ▶ *How can I best prepare myself to get regular physical activity?*
- ▶ *How can I feel more confident about getting regular physical activity?*

We know it can be challenging to get regular physical activity. It is why you need to be committed to your decision and have a good plan of action that you feel confident about. This handbook will help you get ready to become physically active on a regular basis.

What this handbook is about...

Step by step, you will learn how to:

- ▶ View regular physical activity as a healthy and enjoyable alternative to unhealthy behaviours.
- ▶ Make a commitment to yourself and others about becoming physically active.
- ▶ Make a plan about how you will incorporate regular physical activity into your life.
- ▶ Feel more confident about successfully incorporating regular physical activity into your life.

How to use this handbook...

Throughout this handbook, we will suggest some brief written activities to guide you in your preparation process. It is very important that you do all activities in this handbook. So:

- ▶ Take your time! Don't rush into something you have not prepared yourself for. Getting ready takes some time. You may want to read this handbook over a period of several days, one step per day.
- ▶ Do all the written activities that are suggested, and write down your answers for all activities. You may tell yourself, "I'll just read this handbook and try to think things through and that will be enough". Beware, this can be a real trap. Once you get your thoughts down on paper, you develop a more objective perspective and developing a good action plan becomes easier. Put a check mark in one of these boxes below to indicate whether you are

willing to do the written exercises while you read this guide:

	☐	Yes, I will do the written activities...
	☐	No, I won't do them...
	☐	I haven't decided yet...

Did you put a check mark in one of these boxes? Or did you just read it? You did, that's great! If you didn't, we'll make a suggestion that could be quite helpful to you. Grab a pen or pencil and put a check mark in one of these 3 boxes now!

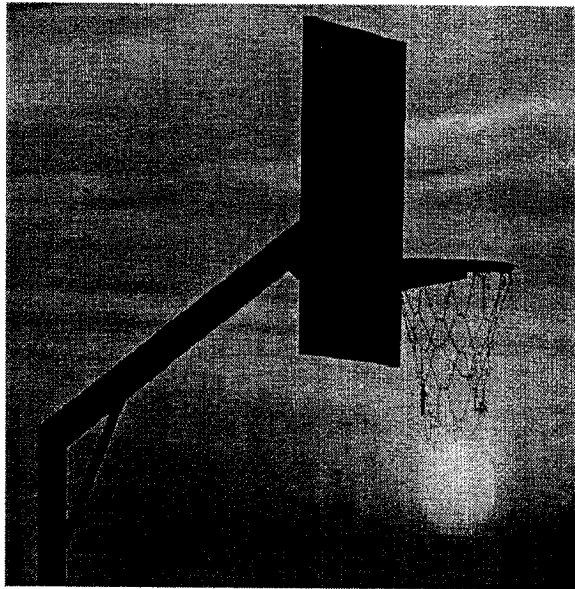
- ▶ Discuss what is on your mind with others. Talk to others about your views on regular physical activity, your plan of action, and your commitment to regular physical activity. Ask people to give you feedback and to talk to you about their own experience. You could be surprised about what they have to say and how much you will learn...
- ▶ Keep this handbook where you will see it everyday for at least the next 30 days.

If you have tried in the past...

If you have tried getting regular physical activity in the past, and you stopped early on, you are not alone.

Incorporating regular physical activity into one's life can be very challenging. People who have tried in the past have told us that they failed because they had not taken the time to think it through for themselves, or were unprepared for the commitment that requires regular physical activity. Although

your past attempts may be a source of frustration and disappointment, they can also be a rich source of information from which you can learn and plan for success.



GETTING READY FOR CHANGE...

Understanding
why you don't
get regular
physical
activity

Experts agree that people of all ages should include a **minimum of 30 minutes of physical activity of at least moderate intensity on most, if not all, days of the week.** This way of life can substantially improve your health and the quality of your life. Yet, there is a significant proportion of the population who, just like you, is not getting regular physical activity. Why?

People who have successfully incorporated physical activity into their lives have told us that understanding why they were not getting regular physical activity was an important first step in getting ready to change.

Read the following statements, then check those that best reflect your reasons for not currently getting regular physical activity.

**What is getting
in the way of regular
physical activity?**

- ☐ I still see some barriers...
- ☐ I am not sure how to get started...
- ☐ I am not sure I can be successful at it...

Let's look in more detail at the reasons you have identified, so you will be in a better position to address them.

Focusing too much on the problem and too little on the solution is often preventing people from moving ahead.



I still see some barriers to getting regular physical activity. You may perceive barriers that are preventing you from getting regular physical activity. Focusing too much on the problem and too little on the solution is often a problem for many people. Incorporating physical activity into your life will require that you put in some effort and use strategies and problem solving skills to overcome your barriers.



I am not sure how to get started. Becoming physically active may seem more complex than most health behaviour changes. Quitting smoking can be challenging, but people know the one thing they need to do: stop smoking cigarettes. Figuring out how to be active requires that you explore what you will do, when, where, with who, etc... in other words, it requires that you do some planning. The next sections of this handbook will help you develop a good plan of action.



I do not feel confident enough. Lack of confidence may prevent you from changing your physical activity habits and overcoming barriers. Believing that you can successfully become active is an important step. The last section of this handbook will address in details this important issue.

There are several reasons why you may not be getting regular physical activity presently. What matters is that you address the issues that are relevant to you.

STEP 1

**Regular
physical
activity as a
healthy
alternative
to...**

By deciding to get regular physical activity, you have acknowledged that this is now a priority for you. To incorporate physical activity in your life, you will need to identify certain things that are of less importance to you and that you are willing to let go. We suggest that you consider replacing negative or unhealthy behaviours in your life by regular physical activity.

Read each of the following statements, then check the ones that are relevant to you.

My views on regular physical activity...

- ☐ 1. Rather than lacking the energy to do all the things I want to do, I could become physically active.
- ☐ 2. Rather than wasting time over stuff I cannot change, I could become physically active.
- ☐ 3. Rather than feeling overweight and unattractive, I could become physically active.
- ☐ 4. Rather than spending several hours each week watching TV, I could become physically active.
- ☐ 5. Rather than continuously feeling tired, I could become physically active.
- ☐ 6. Rather than having difficulty relaxing, I could become physically active.
- ☐ 7. Rather than not enjoying the things I do because of my weight and my lack of fitness, I could become physically active.
- ☐ 8. Rather than relaxing from a busy day at work by watching TV at night, I could become physically active.

Substituting a healthy alternative, such as getting regular physical activity, in place of unhealthy behaviours can have several positive benefits for you. Let's look at these in more detail.

Regular physical activity as a healthy alternative to WORRYING. Statements 2 and 6.

Regular physical activity is a good way to relax and deal with your daily frustrations. Scientific research has demonstrated the positive impact of regular physical activity on stress, depression, anxiety, quality of life, and even self-esteem. In general, physical fitness and regular physical activity are related to lower levels of cardiovascular arousal during and following a stressful period. As such, you will think more clearly and be able to make better decisions. Get physically active when you are in a bad mood or feel depressed. It will allow you to better deal with your stress, and do so in a healthier way.



Useful tip. Research has shown that aerobic activities (e.g., activities involving large muscle groups for extended period of time) are the best type of physical activity to help you deal with stress.

Regular physical activity as a healthy alternative to FATIGUE and LACK OF ENERGY. Statements 1 and 5.

What most people don't know is that it is often the lack of regular physical activity that makes them tired. When you are not physically fit, your body and your mind are less resistant to demands from the outside world. Thus, you get tired more easily.

Scientific investigations have demonstrated that regular

physical activity increases energy level. Further, they have shown that it decreases time needed to fall asleep, and many people report feeling more rested after a night's sleep following exercise the day before. After a few weeks of getting regular physical activity, not only will you feel less tired, but you will also feel more energized in your daily activities.



Useful tip. When people fall asleep, the body's temperature is in a downward phase. Thus, afternoon appears to be the best time for exercise since the body's downward temperature cycle after a workout will coincide with bedtime.

Regular physical activity as a healthy alternative to BEING OVERWEIGHT. Statements 3 and 7.

Many people are preoccupied with weight loss. Indeed, over 1.9 millions Canadians suffer from obesity. Regular physical activity is important to lose and keep weight off. It burns off calories to help you lose extra pounds or helps you stay at your desirable weight. If you are overweight or obese, regular physical activity can improve your appearance and can tone your muscles.

To lose one pound of fat, you need to burn off 3,500 calories more than you take in over a period of a few days. This can be achieved by eating less, being more active, or both. Increasing your energy expenditure, in addition to reducing your energy intake, is the best way to lose weight.



Useful tip. The healthy weight zone is a range of weights corresponding to a Body Mass Index [BMI] between 18.5 and 24.9. The BMI is calculated by dividing your weight (in kg) by your height (in metres) squared. An individual with a BMI between 25.0 and 29.9 is considered overweight, and above 30.0 is considered obese.

If one of your goals in getting regular physical activity is to lose weight, consider the table below in choosing the best activity for you. This table lists the number of calories burned doing certain activities for a period of 30 minutes. The calories spent in a particular activity vary in proportion to one's body weight. As you look at this list, keep in mind that your level of intensity makes a difference in the number of calories burned. Lower intensity activities can be a good idea as well, especially if you are able to do the activities for a longer period of time. Increasing the time spent on your activity is a good way to burn up more calories.

Calories Burned per Activity				
Type of exercise or sport (30-minutes)	Number of calories burned based on a person's weight			
	100 lbs	150 lbs	200 lbs	250 lbs
Weight lifting/ Volleyball	68	102	136	170
Brisk walking/ Yoga	91	136	182	227
Golf	102	153	205	256
Baseball	114	170	227	284
Jogging/ Aerobics/ Tennis/ In-line skating	159	239	318	398
Bicycling/ swimming/ Circuit training/ Basketball/ Ice hockey	182	273	364	455
Karate	227	341	455	568
Squash	273	409	545	697

Regular physical activity as a healthy alternative to WATCHING TV. Statements 4 and 8.

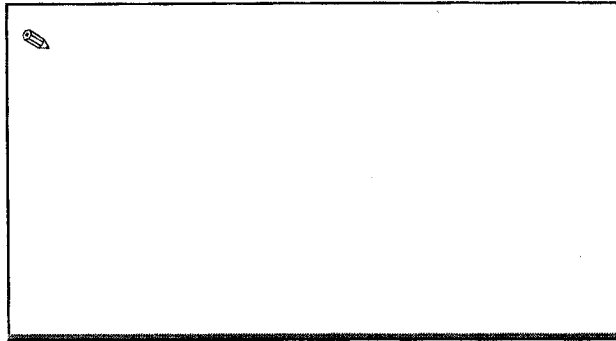
On average, Canadians spend 23 hours every week watching television. During all this time spent in front of the TV, little meaningful interactions take place with family members or friends. Further, high caloric foods are often consumed, which contributes to weight gain and elevated blood cholesterol level. Consider regular physical activity as a healthy alternative to watching TV.



Useful tip. To take advantage of the benefits from regular physical activity, experts suggest to exercise 30 minutes on most days of the week. All things considered, this is the equivalent of one TV show. If you don't feel ready to give up your favorite TV show, keep in mind that several fitness facilities have televisions placed in front of fitness equipment which allows you to exercise and watch your favorite TV show at the same time! Another option is to use a video to record your TV shows and watch them while skipping commercials. If you usually watch 2 hours of television every day, you have just freed up 40 minutes of your time daily. Use this newly found time to become physically active!

Regular physical activity as a healthy alternative to SOMETHING ELSE?

Visualize your life. Try to think about some unimportant, negative, or unhealthy behaviours in your life that could be replaced by regular physical activity (i.e., time spent playing on your computer, in a bar, shopping, overtime at work, or simply being sedentary, etc...). Write them down in the box below and consider replacing them by regular physical activity.

**PROBLEM SOLVING SKILLS.**

Replacing less important or unhealthy things you do with regular physical activity is a good strategy to use in exploring ways to become physically active. Yet, you may encounter situations that may make it hard for you to get physical activity because you are unsure how to deal with them. It is normal to find barriers on the road to becoming physically active. What matters is to be able to find strategies that will help you overcome them.

First, you need to identify your barriers to getting regular physical activity. You may also find that some barriers have a lot to do with how you think about physical activity whereas others seem more practical in nature. Write down your 3 main barriers to becoming physically active on a regular basis in the box below.

BARRIERS	
1.	
2.	
3.	

To assist you in identifying strategies that will help you address these barriers, you may want to use the S.O.L.V.E. method.

State your problem area (e.g., work, relationships, finances, health, weather, family, etc...)

Outline the aspects of the problem- who, what, where, why, and how.

List alternative solutions. Write down as many strategies that you can think of that may be helpful.

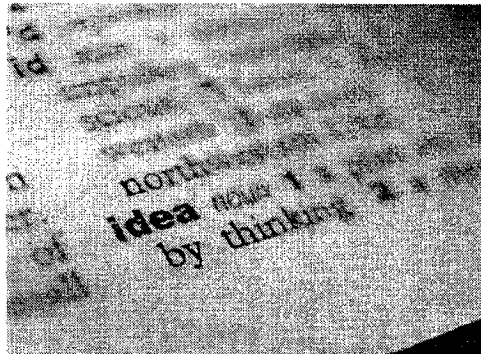
Visualize the possible consequences of the solutions. Choose the best option for you and your current situation and develop a plan.

Evaluate your results. Execute your plan and judge for yourself if it is helpful.

Using problem solving skills is a good method for developing creative solutions to barriers to regular physical activity. It works by focusing on one barrier at a time, and defining it as specifically as possible. Then, deliberately come up with as many unusual solutions as possible. When you first start your brainstorming session, don't criticize any of your ideas. Once you have come up with several possibilities, you can start analyzing the ideas you came up with, and choose the best one. Visualizing the possible consequences and listing the pros and cons for each solution is an excellent way of choosing the best solution for you.

Once you have decided on the best solution, put it to practice. After a little while, evaluate the outcome. Did you

achieve the expected outcome? If yes, that's great! If not, consider why, and whether you need to go back through these steps again.



AN EXAMPLE OF S.O.L.V.E.. In 2000, we surveyed over 1,000 employees from a high-tech company about their attitude toward regular physical activity. The most commonly cited barrier to regular physical activity was lack of time. On the next page, we have used this barrier to illustrate the first 3 steps of this problem solving method. Use the space provided on page 12 to find solutions to the barriers you have identified for yourself.

You will realize that there are several ways to deal with any barriers. It is a matter of being creative and exploring all your options. People around you can also be of great help at generating creative solutions.

S.O.L.V.E.: Lack of Time

State your problem area

Lack of time

Outline the aspects of the problem

The real problem is not that I don't *have* time, rather, it is that I don't *make* time for regular physical activity. I don't act according to the real priorities in my life.

List alternative solutions

- Do several short bouts of physical activity in a day rather than a long one
- Watch less TV or use video to record TV shows
- Spend less time playing on my computer
- Exercise at work during lunch time
- Get up earlier in the morning
- Plan ahead when I will workout and write it in my agenda
- Do a recreational sport with my family
- Be more assertive with coworker or friends who take up too much of my time
- Spend less time procrastinating
- Delegate some responsibilities to family members or coworkers.
- Ask for the collaboration of my family members
- Reassess my life priorities: give more time to regular physical activity and less to unimportant activities (i.e., household chores)

S.O.L.V.E.:

State your problem area

Outline the aspects of the problem

The real problem is not ...

rather, it is ...

List alternative solutions

- ▶
- ▶
- ▶
- ▶
- ▶
- ▶
- ▶
- ▶
- ▶
- ▶

Visualize the possible consequences of the solutions.

Choose the best option for you and your current situation and develop a plan.

Evaluate your results. Execute your plan and judge for yourself if it is helpful.

STEP 2

MAKING A PLAN FOR SUCCESS

Viewing regular physical activity as a healthy alternative to inactivity and other unhealthy behaviours is a good strategy to help you incorporate regular physical activity into your life. The next logical step in getting ready for regular physical activity is to plan how you will go about doing this. A good plan of action is the key to success!

Planning how you will incorporate regular physical activity into your life is not any different to other important projects in your life. You need to choose your goals for getting regular physical activity and then, plan accordingly.

What is your goal?

Some types of physical activities are better suited to meet a specific objective whereas other activities can allow you to meet several of them. To prevent you from being disappointed because you are not getting what you hoped for, it is essential that you identify your *main goal* in getting regular physical activity and choose an activity accordingly.

Read each of the following statements, then check the one statement that best explains your decision to become physically active.

*Developing a
plan of action
based on your
goals is the key
to success!*

I have decided to get regular physical activity because...

- ☐ I want to be healthy.
- ☐ I want to prevent diseases.
- ☐ I want to be physically fit.
- ☐ I want to lose weight.
- ☐ I want to look better.
- ☐ I want to meet new people.
- ☐ I want to take care of my mental health (i.e., stress, anxiety, depression, self-esteem, etc...)
- ☐ I want to be a good role model.
- ☐ everybody else seems to be doing it around me.
- ☐ I want to have fun.
- ☐ Other (specify):

SMART goals. Getting regular physical activity can help you achieve a variety of goals: becoming fit, losing weight, looking better, feeling better, working better, or reducing the risk of future diseases. However, when a goal is vaguely stated, it makes it easier to ignore it.

You need to make your goals as specific as possible. This will not only give a course of action but it will also indicate when you have reached a milestone and it is time for celebration.

A simple technique for developing goals is to be S.M.A.R.T.! It requires that your goal meets the following 5 criteria.

Specific- be precise, clear

Measurable- record your progress

Achievable- realistic

Relevant- to you

Timed- specify a time frame

SPECIFIC. If your stated goal is not specific enough, it will be hard to choose an activity that will allow you to attain it. With goals that lack specificity, you risk of being disappointed with your lack of progress. For example, *“my goal is to lose weight in the abdominal region”* is more wisely stated than *“my goal is to look better”*.

MEASURABLE. If you can’t measure, quantify, rate, or otherwise describe your goal, how can you ever attain it? State your goal in a way that will allow you to track your progress. For example, *“my goal is to decrease my waistline by 2 centimeters”* is more wisely stated than *“my goal is to lose weight”*.

ACHIEVABLE. Setting very high expectations for an exercise program does not increase the likelihood that you will attain your goal. Actually, it is quite the opposite. Many people stop exercising because they are disillusioned when their program fails to accomplish their anticipated results. Thus, choose a realistic goal. *“My goal is to increase my walking distance by one third over the next 6 months”* is more realistic than *“my goal is to run my first marathon in 2 months”*.

RELEVANT. It is important that you choose to incorporate regular physical activity into your life because YOU want to. Choose a goal that is relevant and meaningful to you. For example, *“my goal is to lose 10 pounds in 10 weeks because I want to feel better about myself”* is wiser than *“my goal is to lose weight because my spouse thinks I am too fat”*.

TIMED. Set yourself a time frame to attain you goals. You may have long-term goals and short-term realistic goals. Short-term goals often seem more manageable, and when successfully attain early in your program, enhance your self-confidence and provide you with a sense of accomplishment. For example, *“my goal is to lose 1 pound per week for the next 12 months”* is more wisely stated than *“my goal is to lose 50 pounds in one year”*.

It is now time for you to determine your main goal in starting to get regular physical activity. Here are some examples.

BAD EXAMPLE

GOAL: Lose weight.

ACTIVITY: Get more exercise.

BETTER EXAMPLE

GOAL: To lose 1-lbs a week during 5 months so that I can fit in my size 12 clothes again and feel good about myself.

ACTIVITY: Do 45 minutes aerobic classes at work, 4 times per week.

It is now time for you to write down your main goal in getting regular physical activity. You will also need to specify the activity that will help you achieve this goal (i.e., type of exercise or sports, etc...). After writing down your goal, review it using the SMART guidelines. You may want to wait until you have read the next sections before indicating which activity you will use to attain your goal.

What is YOUR goal?

GOAL: To:

ACTIVITY: Do:

CHOOSE YOUR ACTIVITIES

To help you attain your goal, there are 3 groups of activities that you can choose from: aerobic, strength, and flexibility activities. Regular activities in each of these three

groups will help you achieve the most benefits.

AEROBIC ACTIVITIES. Aerobic activities involve using large muscle groups for extended periods of time. We strongly suggest that the exercise or sport that you choose has an aerobic component. These kind of activities help your heart, lungs, and circulatory system stay healthy and give you more energy. Here are some examples of aerobic activities.

Aerobic Activities	
Walking/ Jogging	Golfing (no cart)
Cycling	Skiing
Swimming	Yard/garden work
Tennis/ Squash	Hockey/ Skating
Aerobic dancing	Basketball



STRENGTH ACTIVITIES. Strength activities are those that make you work your muscles against some kind of resistance (i.e., pushing, pulling). Strength activities help your muscles and bones stay strong, improve your posture, and help to prevent diseases like osteoporosis. The following table highlights examples of strength activities.

Strength Activities

Weight training	Climbing stairs
Exercises like abdominal curls and push-ups	Lifting and carrying objects (i.e., books, groceries, backpack, children...)

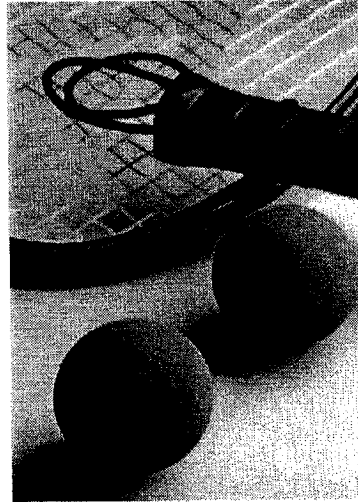
FLEXIBILITY ACTIVITIES. Flexibility activities include reaching, bending, and stretching of all your muscle groups. These kind of activities help you to move easily, keeping your muscles relaxed and your joints mobile. Flexibility activities can also improve your quality of life and independence as you get older. Here are some examples:

Flexibility Activities

Stretching exercises	Tai Chi
Golf	Bowling
Yoga	Dancing
Gardening	Vacuuming/ mopping the floor

While thinking about which activity you will choose, keep in mind that it can include characteristics pertaining from more than one of the groups. For example, most aerobic dancing classes have within a 60 minute session, an aerobic component,

flexibility activities as part of the warm-up and cool-down period, and strength activities (i.e., free weights, abdominal exercises). This is a good example of an integration of all three kinds of activities that will allow you to maximize the health benefits in a short period of time.



*Recommendation:
A minimum of
30 minutes of
physical activity
of moderate
intensity on
most, if not all,
days of the week*

FREQUENCY, INTENSITY, & DURATION?

The most recent recommendations advise people of all ages to include a minimum of 30 minutes of physical activity of moderate intensity (such as brisk walking) on most, if not all, days of the week. Experts agree that for better health, physical activity should be performed regularly.

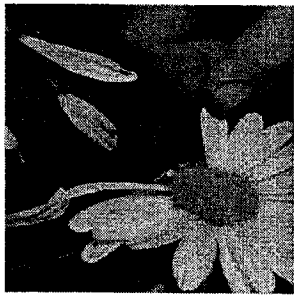
People can substantially improve their health and quality of life by including moderate amounts of physical activity in their daily lives. Scientific findings have also demonstrated that physical activity need not be of vigorous intensity for it to improve health. Health benefits appear to be proportional to the amount of activity; thus, every increase in activity adds some benefits!

Take a look at the table below highlighting the length of time you need to do an activity, based on the intensity of the activity, to achieve health benefits.

HOW LONG DEPENDS ON EFFORT				
Very Light Effort	Light Effort 60-minutes every day	Moderate Effort 30-60 minutes 4-7 days a wk	Vigorous Effort 20-30 minutes 4-7 days a wk	Maximum Effort
▸ Dusting ▸ Seated activities	▸ Light walking ▸ Gardening ▸ Vacuuming ▸ Tai Chi	▸ Brisk walking ▸ Biking ▸ Swimming ▸ Dancing ▸ Water aerobics	▸ Aerobics ▸ Fast cycling ▸ Jogging ▸ Hockey ▸ Basketball	▸ Sprinting ▸ Racing ▸ Training for performance ▸ Competition
	<i>What is my breathing like?</i> <i>What is my heart rate (HR)?</i>			
▸ No change from rest ▸ Normal breathing	▸ Slight increase in breathing rate	▸ Greater increase in breathing rate	▸ More out of breath	▸ Completely out of breath
Resting HR	55-64% MaxHR ¹	65-74% MaxHR	75-90% MaxHR	Greater than 90% MaxHR
RANGE NEEDED TO STAY HEALTHY				
From: <i>Canada's Physical Activity Guide to Healthy Active Living</i>, Health Canada, 1998. Note¹: MaxHR refers to Maximal Heart Rate. This concept is explained on page 27 of this handbook.				

As can be seen in this table, the amount of time you need to spend doing an activity for health benefits depends on the effort or intensity of the activity. You can spend less time doing an activity if you do so more vigorously. You may want to keep this in mind if one of your main barriers to regular physical activity is lack of time.

Now that you have explored the different components of regular physical activity, indicate below the activity that will allow you to attain your goal. Make sure to choose an activity that you will find enjoyable. This is essential. Also, using the table above, indicate the frequency, intensity, and duration at which you will do your chosen activity.

MY ACTIVITY		
ACTIVITY(ies):		
ACTIVITY GROUPS: ☐ aerobic ☐ strength ☐ flexibility		
FREQUENCY:		days a week
INTENSITY:		☐ light ☐ moderate ☐ vigorous
DURATION:		minutes

Where?

Where would be the most convenient location for you to get regular physical activity. Where would you prefer exercising regularly?

OUTSIDE vs INSIDE. Outside activities offer variety in scenery and a breath of fresh air. Indoor activities are less likely to suffer from uncooperative weather and offer a safe environment to exercise. If you prefer outdoor activities, consider choosing an alternate indoor activity that you can switch to on bad weather days, allowing you to still get regular physical activity. Or, you may want to dress appropriately and still go on with your activity. You may also alternate between indoor and outdoor activities depending on the weather and season.

HOME vs FITNESS CLUB. Exercising at home can be convenient for people who prefer exercising alone or need to spend time at home because of family commitments. Consider whether you have or can afford the equipments you will need (i.e., weights, stationary bicycle, aerobic exercise video, etc...). Other people prefer exercising in a fitness club. Fitness clubs allow you to meet new people, take a break from your daily routine, and provide you with a variety of activities, equipment, and fitness experts.

Indicate below your favorite location to exercise when you start getting regular physical activity.

WHERE?

When?

When to exercise? Consider the following periods of the day. When is the best time for you to get regular physical activity?

MORNING. Some people prefer exercising early in the morning. Morning workouts give people a sense of accomplishment for the rest of the day. In the morning, workouts are also less likely to be tossed out by other activities or commitments. Some people also find it more time efficient to roll out of bed early, exercise, and then, get ready for the rest of the day (i.e., take a shower, have breakfast, etc...). By the time most people start their work day, you could have done your workout and feel energized for the rest of the day!

LUNCH TIME. You may feel that you are “slowing down” in the afternoon. Regular physical activity performed at lunch time is a good way to prevent this from happening. Thus, you will be more productive in your work.

AFTERNOON. At this time of the day, your lungs are more open, you have greater muscle strength, and your flexibility level peaks. In other words, it is the time when your workout will probably be easier and when your performances may be the best. Further, exercise in the late afternoon is likely to improve your sleep. On the other hand, you may feel too strained to exercise after work and you may decide to skip it. Studies suggest that workouts scheduled later during the day are more likely to be tossed out, whereas morning workouts are more popular among habitual exercisers.

EVENING. Evening workouts can be a healthy alternative to watching TV. Avoid exercising too long or hard close to bedtime (i.e., less than 3 hours before bedtime). Because you will feel energized, this can make it harder for you to doze

off and may throw off your normal sleep pattern.

Ultimately, the best time of the day to get regular physical activity is when it best fits into your schedule. Write down below when you will do your workouts when you start getting regular physical activity.

WHEN?

How often?

Once you have decided when you will exercise, you will need to decide on which days, how often, and for how long you will exercise during the first few weeks you start getting regular physical activity.

Experts suggest that you increase *gradually* the frequency and duration of your workouts over the first few weeks. For example, you may want to exercise two days during your first week and add one day every other week until you have reached your goal (e.g., 4 days a week). Remember that a long period of time between workouts makes it harder to resume (every time feels like the first time). A gradual but steady increase in the frequency of your workouts will make it easier and you will start enjoying it sooner.

The same thing can be said about the duration of your workout. You may want to start exercising for 20 minutes the first week and increase it by 5 minutes every week until you have reached your goal (e.g., 40 minutes).

In the previous section of this handbook, you decided the best time of the day for you to exercise. Now, consider which days are most convenient for you. Do you prefer weekdays, on the weekend, or a combination of the two? Considering the time and location of your workout may help in your decision. Taking a look at your daily planner will also help you schedule your workouts.

The table below will help you develop your physical activity schedule for the first few weeks. For each week, indicate, using a check mark, the days on which you will exercise. Use the last column to indicate the duration of your workouts for each given week.

EXERCISE SCHEDULE								
	Mon.	Tues.	Wed.	Thurs.	Fri.	Satur.	Sun.	Min.
Wk 1								
Wk 2								
Wk 3								
Wk 4								

Make your workout part of your routine and write it in your agenda once you are done with this activity.

How hard should you exercise?

It is important that you exercise at a comfortable pace. During your activity, you should be able to keep up a conversation. After your activity, if you do not feel back to normal within 10 minutes, you have difficulty breathing, or feel weak, you are exercising too hard. Slow down.



You can find out how hard you exercise by keeping track of your heart rate. This is particularly important if your goal is to improve your cardiovascular fitness.

Your **Maximum Heart Rate** is the fastest your heart can potentially beat in one minute. As a rule of thumb, your maximum heart rate is 220 minus your age. For example, if you are 35 years old, your Maximum Heart Rate is 185 beats per minutes. Regularly exercising above 90% of your Maximum Heart Rate is too strenuous whereas exercising below 55% will do little to improve your fitness level.

If you have chosen to exercise at a moderate intensity level, you should exercise between 65% and 74% of your Maximum Heart Rate. This is called your **Target Heart Rate Zone**. This was illustrated in the table on page 21. As you can see, your Target Heart Rate Zone is directly related to the intensity of your activity, the length of time you need to exercise to achieve health benefits, and your breathing rate.

To find your Target Heart Rate Zone, select the age group closest to your age in the table below. The second column indicates your Target Heart Rate Zone based on your age group.

YOUR TARGET HEART RATE ZONE

Age	Target Heart Rate Zone 65-74% (beats per min.)	Maximum Heart Rate 100% (beats per min.)
20	130-148	200
25	127-144	195
30	124-141	190
35	120-137	185
40	117-133	180
45	114-130	175
50	111-126	170
55	107-122	165
60	104-118	160
65	101-115	155

For example, if you are 35 years old, your Target Heart Rate Zone is between 120 and 137 beats per minute. When you begin exercising, aim for the lower part of your target zone (120 beats per minute). Gradually, you can increase to the higher part of your target zone (137 beats per minute).

To determine if you are within your Target Heart Rate Zone, take your pulse immediately after you stop exercising. The following guidelines will be useful to you.

TAKING YOUR PULSE

1.	Place the tips of your first two fingers over the artery (e.g., radial) on your wrist. This artery can be found on the thumb side of either wrist.
2.	Count the number of heart beats during 10 seconds. Then, multiply this number by 6. The resulting number is your pulse (i.e., number of heart beats per minute).

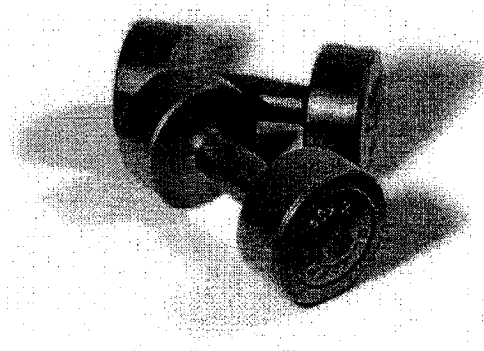
If your pulse falls within your target zone, you are doing fine. If it is below your Target Zone, exercise a little harder next time. If you are above your Target Zone, exercise a little less strenuously.

Becoming more active is very safe for most people, but if you are in doubt, please complete the questionnaire in Appendix 2. This brief questionnaire will tell you whether you should check with your doctor before starting becoming much more physically active.

What you need?

For most kinds of physical activity, a good pair of running shoes and comfortable exercise clothes are all you will need. Other activities may necessitate specific equipment (i.e., swimsuit, racquet, skis, etc...). Ask yourself if you need anything

else that is specific to your activity? Keep these things around your home or workplace. This will remind you to get regular physical activity.



Getting support from whom?

SUPPORT FROM A PHYSICAL ACTIVITY

PARTNER. You may find it easier to get regular physical activity when you have a partner. This may be a good source of motivation and support.

SUPPORT FROM SIGNIFICANT OTHERS. Take a few seconds to consider what you are really looking for in a physical activity partner. For several people, what they need is support and motivation in their first steps. As you start to incorporate regular physical activity into your life, get support from people around you. These people may be your spouse, your children, colleagues at work, or friends. To support you, first and foremost, they must know that you have started exercising. So, say it to people and tell them what you expect from them. What do you want them to tell you? What do you want them to do? The best way to get what you want is to nicely but assertively ask for it!

SUPPORT FROM A VIRTUAL BUDDY. Nowadays, you can find everything on the Internet. It is why you will not be surprised to learn that some websites will match you to someone who, just like you, is becoming physically active. You can then email one another about questions you have, share your successes, helpful strategies to overcome barriers, or simply get some support. If having a virtual buddy in another part of the world seems like an interesting idea to you, you may find what you are looking for while surfing the Internet.

SUPPORT FROM YOURSELF. If you choose to exercise by yourself, you open up the door to new experiences and to meeting new people. If you are interested in activities that require a partner (i.e., squash, etc...), most fitness clubs have lists of people seeking a partner.

Write down in the box below, names of people you will seek support from.

SUPPORT FROM WHO?

What is important to remember at this point is that seeking and accepting support and encouragement from family members, co-workers, and friends is an important step in successfully incorporating regular physical activity into your life.

How to get started?

There are many ways to begin an activity program. We are suggesting a walking program- because it is an easy way for most people to get regular physical activity, and it does not require special facilities or equipment other than good, comfortable shoes. You will find an example of a walking program in Appendix 3 of this handbook.

Another good idea is to participate in a fitness program that has been tailored to your needs. This is usually available free of charge when you join a fitness club. Joining a fitness center at work or in your community is also a good idea because it offers a variety of activities, equipment, social opportunities, and fitness professionals.

Remember that regardless of the activity you have chosen, it is very important that you warm-up before and cool down after each workout. The main function of a warm-up is to prevent injury. This is achieved by using the same muscle groups that will be used during the activity but starting at a lower intensity and increasing gradually. For example, before jogging for 30 minutes, you would walk for 5 minutes and you would do some stretching exercises of your leg muscles (stretch slowly without bouncing). A cool down period is necessary to prevent muscle cramps and dizziness. It is very similar to the warm up period and often consists of walking or gradually decreasing the intensity of movements, and a brief stretching period.

If either of these programs does not meet your needs, look for other recreational sports and exercise programs in brochures, books, or talk to a knowledgeable friend, fitness instructor, or certified personal trainer (see Appendix 1 for additional resources).

Reward yourself!

As a child, you probably received a reward for good behavior, such as a trip to the zoo or a pat on the back. Now that you are an adult, a trip to the zoo may not do the trick to get you to exercise regularly, but rewarding yourself for achieving such a goal is very important. It is essential that you acknowledge that becoming physically active is a challenge and that you are succeeding at it.

Be creative! Take a glass jar and put a coin every time you do a workout. It can be a quarter or a loonie, it is up to you. When the jar is full, buy yourself a special treat. Consider fitness oriented gifts (i.e., fitness outfit, sport sunglasses, etc...). This can be one way of acknowledging and celebrating your accomplishment.

Ask significant others to participate in your celebration. Rewards need not be material. Congratulate yourself and smile!

One of the best rewards of all is to realize the progress you are making. Do you feel that your pants or skirts are looser around your waist line? Do you feel less out of breath when you use the stairs? Have you increased the distance you can walk in 30 minutes? Be proud and savor these personal accomplishments. Write down a reward that is meaningful to you in the box below.

MY REWARD?

STEP 3

Making a commitment

Making a commitment to start exercising is an important step toward incorporating regular physical activity into your life. Think back at things you thought you should do but never committed yourself to do. Did they get done? Probably not... This is why making a commitment to get regular physical activity is so important.

The role of willpower in getting regular physical activity.

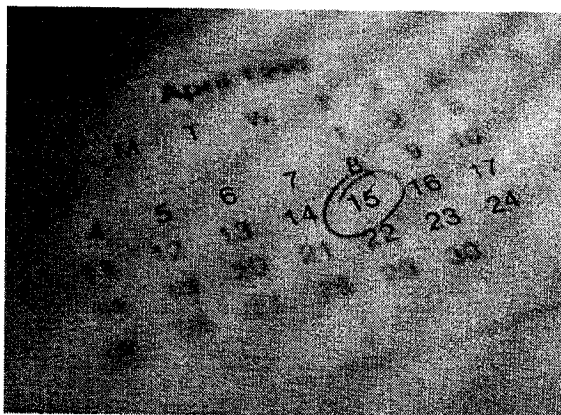
Numerous people believe that they cannot incorporate regular physical activity into their lives because they lack the willpower to do so. They believe that regular physical activity is out of their control and there is nothing they can do about it.

Willpower is another way of referring to “control of one’s actions”. As such, it can be said that we all have control over whether or not we exercise regularly. It is a matter of *choice*, *priorities*, and *commitment*. Will you make incorporating regular physical activity into your life a priority? Regular physical activity is not a matter of willpower. Making a commitment to regular physical activity, finding an enjoyable activities, and developing a good plan of action are your keys to success!

Making a fitness contract with yourself

A fitness contract will help you commit to your choices. We have prepared one for you (see page 36). It highlights your reasons for wanting to change, your goals, a starting date for getting regular physical activity, a summary of your plan of action, barriers to keep in mind, and the names of people who

will support you during this transition period.



With regard to the starting date, we suggest that you pick a day that is “relatively” free of stress, that is typical of your usual routine, and that will allow you to have enough time to squeeze in a workout. A starting date sometime in the next week is a good idea as this will give you enough time to do any preparation you still need to do (i.e., buying a pair of running shoes). Do not put it off too long, there is no such thing as “the perfect day”. Once you have made up your mind, write “GET PHYSICALLY ACTIVE TODAY” in big letters in your daily planner. When you are ready, fill in the blanks in the fitness contract below.

Once you have completed your fitness contract and made your commitment to getting regular physical activity, make it public. Discuss it with people around you and put your contract where others and you can see it. A fitness contract will act as a gentle reminder of one of the best decisions you have made for yourself.

Fitness Contract

I, _____, have decided to incorporate regular
your name
physical activity into my life.

My main reason for starting to get regular physical activity is because _____
your reason

Starting on _____ , I will start doing or playing
date
_____, ____ days a week, for a duration of ____ minutes.
exercise or sport # #

When I have achieved this goal for a period of ____ month(s), I will reward myself by _____.
your reward

The main barrier for me to get regular physical activity is _____
 your barrier
 around it and I have found that _____ and
 your strategies
 _____ are good strategies to overcome it.

I have chosen two people for support and encouragement, _____
_____ and _____. They can best support me by
their names _____ and _____
ways they can help you

Your signature

today's date

Witness signature

today's date

STEP 4

Feeling more confident!

Feel confident in your abilities to get regular physical activity when you feel a little tired or your muscles feel sore; these effects are temporary and short-lived.

We believe that there are several things that you can do to feel more confident about staying active once you get started. These following section will show you how to feel more confident in your ability to get regular physical activity.

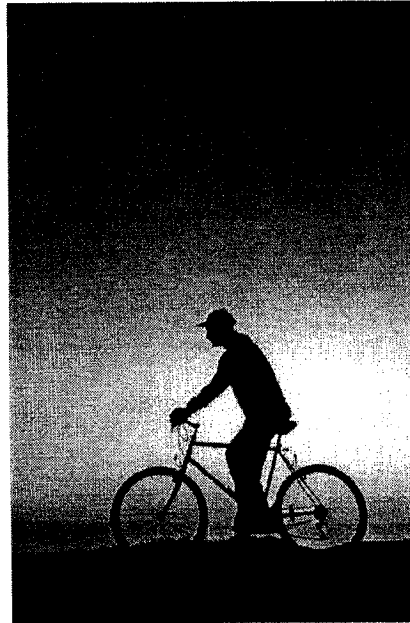
Know what to expect once you get started.

Once you start getting regular physical activity, your body and your mind will start feeling the effects shortly thereafter. Some of these effects are positive and they will motivate you to keep going. Others are normal side effects to starting to get physical activity when your body is not used to it. Knowing about these effects, and expecting them will reduce the likelihood of you feeling discouraged as you will know that any side effects are normal and short lived.

Shortly after your first few workouts, your muscles may feel sore. A certain amount of stiffness is normal at first. You may also feel tired after your first few workouts. Again, this is quite normal. Increasing gradually the frequency and duration of your workouts will help you minimize these side effects. As precautionary means, drink a lot of fluids and avoid eating 2 to 4 hours before a workout. To avoid muscle or joint injuries, make sure to warm up before and then cool down after your workout. Feel confident in your abilities to get regular physical activity when you feel a little tired or your muscles feel sore; these effects are temporary and short-lived.

The good news is that within a few weeks of regular physical activity, you will notice positive improvements. You will feel more energized, you will fall asleep faster and awaken feeling more rested. You may lose one pound in the first week. Your ability to do your activity will also improve, resulting in a sense

of mastery and enjoyment!



Learn from others' experiences.

You probably know of people around you who have been able to successfully incorporate regular physical activity into their lives. Would you be interested in knowing how they got started and about their experiences?

We believe that you can learn a lot from other people around you who exercise regularly. The best way to learn about others is to talk to them. If you are unsure as to how people will react to this, imagine how you would feel if someone was approaching you to learn more about something that you like doing and that you do successfully...

To maximize your experience, try to find a person that is, in some ways, similar to you. For example, if you are a single working mother, learning how a male triathlon Olympic

champion gets regular exercise may be of little help to you because you are too dissimilar. However, learning how another single working mother is able to get regular physical activity will be more relevant and meaningful to you. This type of experience is one of the best ways to go!

KEY PEOPLE TO TALK TO

- 1.
- 2.

QUESTIONS TO ASK THEM

- 1.
- 2.

Write down in the boxes above the names of two people who you will approach in the upcoming week to discuss how they have successfully incorporated regular physical activity into their lives and at least 2 questions you want to ask them. You will learn a lot from these experiences.

Learn from your past experiences.

Other people can teach you a great deal about successful changes. But no one can do a better job at helping you change than yourself. Think about times when you have tried to make changes in your life. There are probably times when you were able to successfully make those changes whereas at other times, it did not work. All these successful and not so successful changes represent an invaluable source of information about yourself. You can use this information to better plan how you will incorporate regular physical activity into your life.

Think about occasions when you made changes in your life. The key is to think about what helped you make these changes and what caused problems for you. Write your answers in the boxes below.

SUCCESSFUL CHANGE
• Situation:
• What helped you?

Choose an occasion when you have wanted to make a change, but were not successful in doing so. If you have tried

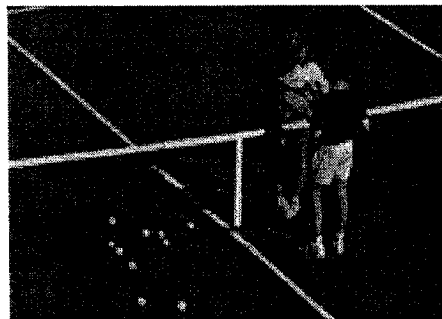
incorporating regular physical activity into your life before, what did it teach you about yourself?

UNSUCCESSFUL CHANGE

• Situation:

• What caused you problems?

What have you learned from trying to change other things in your life? This time, what will you do differently when it comes time to incorporate regular physical activity into your life?



GETTING REGULAR PHYSICAL ACTIVITY

- Situation: *Starting to get regular physical activity*
- What have you learn from past changes in your life that you will be able to apply when you start getting regular physical activity?

What matters is to see how successful and unsuccessful changes in your life can be helpful to better plan how you will get regular physical activity.

Learn to identify and deal with temptations to slip.

As you start incorporating regular physical activity into your life, there may be occasions when you feel tempted to skip a planned workout. There may be other occasions when you will feel like giving up. The best remedy to temptations is to know about them and plan in advance how you will cope with them.

Keep track of when you were unable to do a planned workout. People, moods, and activities are examples of factors that can trigger you to be inactive.

When you skipped a workout, indicate the day, time of day, what you were doing when you made the decision not to exercise, who was with you, the type of exercise you were planning to do, and your reason for not exercising. Also, indicate using a scale from 1 to 10, how much you felt like going to exercise. Write your answers in the table below.

RATING SCALE

Did not feel like
exercising at all

Moderately felt like
exercising

Really felt like
exercising

.....1..... 2..... 3..... 4..... 5..... 6..... 7..... 8..... 9..... 10.....

Day	Time of day	I was doing...	I was with...	Type of exercise	Feel like it... (1-10)	Reason for not exercising
Fri day	5:00	Leaving work	Coworker Dana	Brisk walking	4	Dana invited me to have a beer

Examine your table and look for patterns. What days were least successful? Why? Was the same person always present with you when you decided to skip a workout? Did you indicate each time that you did not feel like doing this activity? What would make things easier for you? You may want to ask others for suggestions.

Using your problem solving skills (i.e., the S.O.L.V.E. method, as was suggested previously), plan how you will cope with these triggers. Example of useful ways to cope with triggers are avoiding places, activities, or people that make you feel like skipping a workout, changing your routine so you have more time for exercising, finding a support person to help you resist the urge of skipping a workout, notice how much you feel better, etc... Again, be creative and feel confident about your abilities to overcome barriers and temptations and about getting regular physical activity.

STEP 5

Ready for
change! GO!

You have examined how regular physical activity can be a healthy substitute to unhealthy behaviours. You have made a plan about how you were going to incorporate regular physical activity into your life, by answering basic questions such as why, what, where, when, and with who. You have made a commitment to both yourself and significant others to incorporate regular physical activity into your life. You have also looked at different ways to feel more confident about exercising regularly. What's the next step? DO IT!

You have done a great job at getting ready to incorporate regular physical activity into your life. Now is the right time to do it. The first few weeks may be challenging but you will soon start benefitting from the physical, emotional, and social aspects of regular physical activity, and you will enjoy being physically active.

Keep this handbook in a handy place, you may want to browse through it again from time to time.

Best wishes in your new active lifestyle!



APPENDIX 1

Additional resources

Thinking about change? A guide for people who are thinking about incorporating regular physical activity into their lives. Marie-Claude Laplante. (2001). University of Ottawa, School of Psychology. Ottawa, Canada.

Canada's Physical Activity Guide to Healthy Active Living. Health Canada. (1998). Also available at the following Website: www.paguide.com

Physical activity and health: A report of the Surgeon General. U.S. Department of Health and Human Services. Atlanta, GA: U.S. Department of Health and Human Services, Center for Disease Control and Prevention, National Center for Chronic Disease Prevention and health Promotion. (1996).

Physical Activity, Recreation and Active Living in Canada. Available at the following Website: www.activeliving.ca

ParticipAction. Available at the following Website: www.participaction.com

Health Canada Active Living: It's a way of life! Available at the following Website: www.hc-sc.gc.ca/real/fitness

Heart and Stroke Foundation of Canada. Available at the following Website: www.hsf.ca

Your family physician.

Your local bookstore or library.

Your wellness center at work.

A physically active or supportive friend...

APPENDIX 2

A note before getting started...

Becoming more active is very safe for most people, but if you're in doubt, please complete the questionnaire below. Some people should check with their doctor before they start becoming much more physically active. Start by answering the seven questions below. If you are between the ages of 15 and 69, this will tell you if you should check with your doctor before you start. If you are over 69 years of age, and are not used to being very active, definitely check with your doctor first.

Yes	No	
☐	☐	1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
☐	☐	2. Do you feel pain in your chest when you do physical activity?
☐	☐	3. In the past month, have you had chest pain when you were not doing physical activity?
☐	☐	4. Do you lose your balance because of dizziness or do you ever lose consciousness?
☐	☐	5. Do you have a bone or joint problem that could be made worse by a change in your physical activity?
☐	☐	6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
☐	☐	7. Do you know of any other reason why you should not do physical activity?

If you answered YES to one or more questions, talk with your doctor before you start becoming much more physically active.

If you answered NO to all questions, you can be reasonably sure that you can start becoming more physically active right now. Be sure to start slowly and progress gradually - this is the safest and easiest way to go.

Delay becoming much more active if:

- ▶ You are not feeling well because of a temporary illness such as a cold or a fever - wait until you feel better; or
- ▶ You are or may be pregnant - talk to your doctor before you start becoming much more active.

Note: If your health changes so that you then answer YES to any of the above questions, ask for advice from your fitness or health professional.

APPENDIX 3

A sample walking program

WALKING PROGRAM

	Warm up	Exercising	Cool down	Total time
Week 1	Walk 5 min.	Then walk briskly 5 min.	Then walk more slowly 5 min.	15 min.
Week 2	Walk 5 min.	Then walk briskly 8 min.	Then walk more slowly 5 min.	18 min.
Week 3	Walk 5 min.	Then walk briskly 11 min.	Then walk more slowly 5 min.	21 min.
Week 4	Walk 5 min.	Then walk briskly 15 min.	Then walk more slowly 5 min.	25 min.
Week 5	Walk 5 min.	Then walk briskly 18 min.	Then walk more slowly 5 min.	28 min.
Week 6	Walk 5 min.	Then walk briskly 20 min.	Then walk more slowly 5 min.	30 min.
Week 7	Walk 5 min.	Then walk briskly 25 min.	Then walk more slowly 5 min.	35 min.
Week 8	Walk 5 min.	Then walk briskly 30 min.	Then walk more slowly 5 min.	40 min.

Note. Exercise at least 4 days every week at the suggested intensity level. After week 8, continue at the same intensity level. The program presented consists of suggested guidelines. Listen to your body and build up more or less quickly as needed. Remember that your goal is to get the benefits you are seeking and enjoy your activity.



Standard Care Manual

M.-C. LAPLANTE

Handbook for ^{CANADA'S} **Physical Activity Guide**
to Healthy Active Living



Includes pull-out copy of the Guide

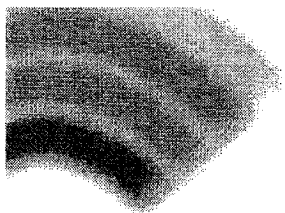


Health
Canada

Santé
Canada



Canadian Society for
Exercise Physiology



Physical activity improves health.

Every little bit counts,

but more is even better -

everyone can do it!

What is *Canada's Physical Activity Guide to Healthy Active Living*?

It is a *Guide* to help you make wise choices about physical activity. Choices that will improve your health, help prevent disease, and allow you to get the most out of life.

The *Guide* is the pull-out section in the two centre pages of this *Handbook*. It provides a rainbow of physical activities that can help you have more energy, move more easily, and get stronger. It tells you how much activity you should strive for and how to get started. It also lists the many benefits of physical activity and the health risks of inactivity. This *Handbook* provides additional information to help you make the best use of the *Guide*.

Using this *Handbook*

Improving your health through physical activity is easier than you think. You will gain significant health benefits just by adding physical activity to your daily routine. Your benefits will increase as you add more activities to your day. The best news of all is that physical activity doesn't have to be very hard to improve your health!

This *Handbook* has been designed to help you get started. It tells you why physical activity is important for your health, and the problems you could experience if you are inactive. It gives you lots of examples to help you choose physical activity that's right for you. It will help you to build physical activity into your routines at home, at school, at work, at play and on the way. It shows you how you can start slowly and build up so that active living becomes as natural as brushing your teeth or putting on your seat belt.

No matter what you are doing now, there are tips to help you become more active, enjoy better health and get the most out of life. There are examples of people just like you, who are working to get moving and improve their health through regular physical activity.

Just by reading this *Handbook*, you are taking the first step to a more active and healthier lifestyle.

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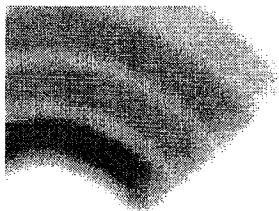
Guide Endorsers listed on back cover

Physical Activity Guide centerfold pull-out

Get active your way –
build physical activity
into your daily life...

- at home
- at school
- at work
- at play
- on the way

...that's
active living!



Benefits of regular activity:

- better health
- improved fitness
- better posture and balance
- better self-esteem
- weight control
- stronger muscles and bones
- feeling more energetic
- relaxation and reduced stress
- continued independent living in later life

Health risks of inactivity:

- premature death
- heart disease
- obesity
- high blood pressure
- adult-onset diabetes
- osteoporosis
- stroke
- depression
- colon cancer

Consider adding activity - more time, more effort, more often. If you are already regularly active, you can still benefit by adding activity. Generally, the more active you are, the more benefits you will get.

Why Physical Activity is Important for You

People need to be active to be healthy. Our modern lifestyle and all the conveniences we've become used to have made us sedentary - and that's dangerous for our health. Sitting around in front of the TV or the computer, riding in the car for even a short trip to the store and using elevators instead of stairs or ramps all contribute to our inactivity. Physical inactivity is as dangerous to our health as smoking!

Add up your activities during the day in periods of at least 10 minutes each. Start slowly...and build up! If you're already doing some light activities, move up to more moderate ones. A little is good, but more is better, if you want to achieve health benefits.

What's the goal?

Scientists say accumulate 60 minutes of physical activity every day to stay healthy or improve your health. Time needed depends on effort - as you progress to moderate activities, you can cut down to 30 minutes, 4 days a week.

Physical activity doesn't have to be very hard to improve your health. This goal can be reached by building physical activities into your daily routine. Just add it up in periods of at least 10 minutes each throughout the day. After three months of regular physical activity, you will notice a difference - people often say getting started is the hardest part. This *Handbook* will show you how easy it can be!

Time needed depends on effort

Very Light Effort	Light Effort 60 minutes	Moderate Effort 30-60 minutes	Vigorous Effort 20-30 minutes	Maximum Effort
• Strolling • Dusting	• Light walking • Volleyball • Easy gardening • Stretching	• Brisk walking • Biking • Raking leaves • Swimming • Dancing • Water aerobics	• Aerobics • Jogging • Hockey • Basketball • Fast swimming • Fast dancing	• Sprinting • Racing
How does it feel? How warm am I? What is my breathing like?				
• No change from rest state • Normal breathing	• Starting to feel warm • Slight increase in breathing rate	• Warmer • Greater increase in breathing rate	• Quite warm • More out of breath	• Very hot/perspiring heavily • Completely out of breath
Range needed to stay healthy				

What do the experts say I have to do?

There are three types of activities you need to do to keep your body healthy: endurance activities, flexibility activities, and strength activities. Do a variety from each group to get the most health benefits. The *Guide* offers you a rainbow of activities to choose from, so tear out the *Guide* from the centre of this *Handbook* now so you can follow along as you read further.

Take a look and see what activities appeal to you. Choosing things you like to do is one of the best ways to build regular physical activity into your life. Check out more examples later in this *Handbook*.

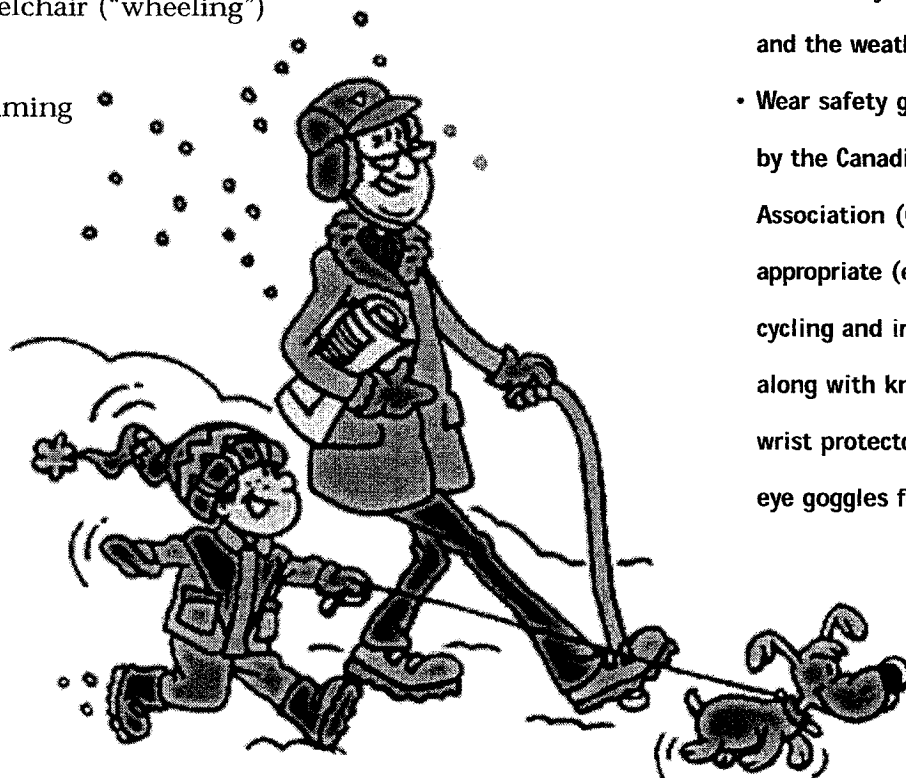
The Three Activity Groups

1. Endurance Activities: (4-7 days a week)

Endurance activities help your heart, lungs and circulatory system stay healthy and give you more energy. They range from walking and household chores to organized exercise programs and recreational sports.

Here are some examples to get you thinking about how to increase your endurance activities:

- walking
- golfing (without a ride-on cart)
- yard and garden work
- propelling a wheelchair ("wheeling")
- cycling
- skating
- continuous swimming
- tennis
- dancing

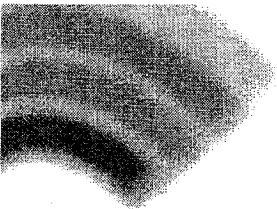


Playing It Safe

For endurance

activities, begin with light activities and progress to moderate and vigorous activities later, if you like. (This will prevent or minimize any muscle soreness you might experience when you are starting out.)

- Use comfortable footwear that provides good cushioning and support.
- Wear comfortable clothing that suits your activity – and the weather!
- Wear safety gear approved by the Canadian Standards Association (CSA) whenever appropriate (e.g., a helmet for cycling and in-line skating, along with knee, elbow and wrist protectors; protective eye goggles for squash).



Safe Stretching

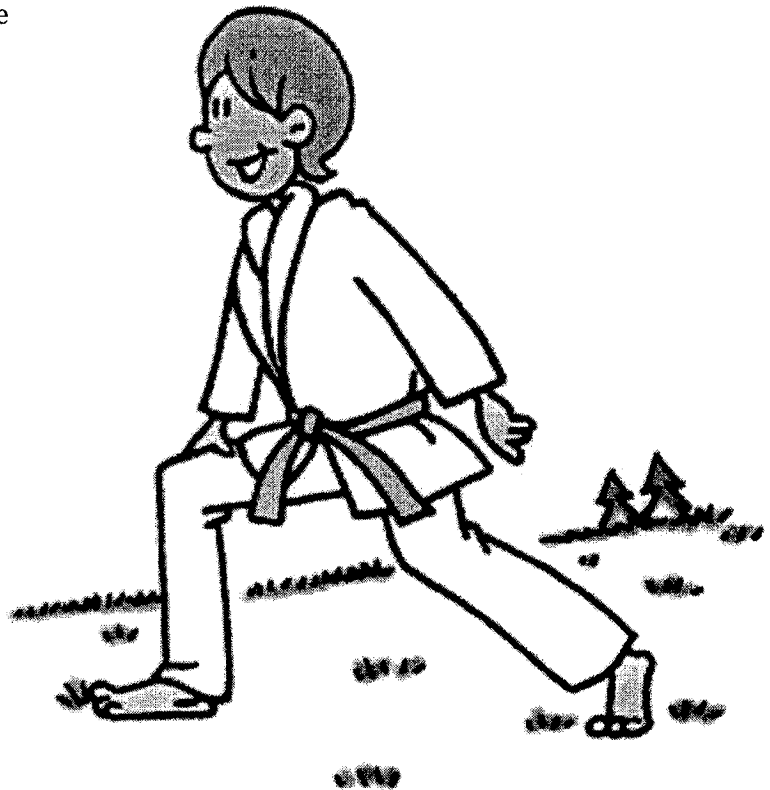
- Start with five minutes of light activity (easy walking, etc.) beforehand, or do your stretching after your endurance or strength activity.
- Stretch slowly and smoothly without bouncing or jerking. Use gentle, continuous movement or stretch-and-hold (for 10-30 seconds) whichever is right for the exercise.
 - Aim for a stretched, relaxed feeling – avoid pain, don't hold your breath, and breathe in a natural rhythm.
 - Seek help from a fitness professional or get a good book on stretching if you're not sure what to do.

2. Flexibility Activities: (4-7 days a week)

Flexibility activities help you to move easily, keeping your muscles relaxed and your joints mobile. Regular flexibility activities can help you to live better, longer, so that your quality of life and independence are maintained as you get older. Flexibility activities include gentle reaching, bending, and stretching of all your muscle groups.

Here are some ideas to help you increase your flexibility activities:

- gardening
- mopping the floor
- yard work
- vacuuming
- stretching exercises
- T'ai Chi
- golf
- bowling
- yoga
- curling
- dance



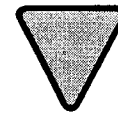
3. Strength Activities: (2-4 days a week)

Strength activities help your muscles and bones stay strong, improve your posture and help to prevent diseases like osteoporosis. Strength activities are those that make you work your muscles against some kind of resistance, like when you push or pull hard to open a heavy door.

To ensure good overall strength, try to do a combination of activities that exercise the muscles in your arms, mid-section, and legs. Strive for a good balance – upper body and lower body, right and left sides, and opposing muscle groups (e.g., both the front and back of the upper arm).

Here are some ideas to increase your strength activities:

- heavy yard work, such as cutting and piling wood
- raking and carrying leaves
- lifting and carrying groceries (not to mention infants and toddlers!)
- climbing stairs
- exercises like abdominal curls and push-ups
- wearing a backpack carrying school books
- weight/strength-training routines



Safe Strength Training

Start with five minutes of light endurance activity and stretching at the beginning of each session.

- Learn proper technique to protect your back and joints from undue stress.
- Use light weights and high repetitions (2-4 sets of 10-15 repetitions of each exercise).
- Breathe regularly when doing an exercise – don't hold your breath!
- Rest for at least one day between strength-training sessions.
- Get help from an experienced leader or consult a reputable book for more information.



How Do I Know if I'm Doing Enough Physical Activity to Stay Healthy?

If you are not sure, you're probably doing activities in the light to moderate range on the chart below. You need to work towards adding up 60 minutes of activities a day in periods of at least 10 minutes each. It's really pretty easy. Remember, every little bit counts!



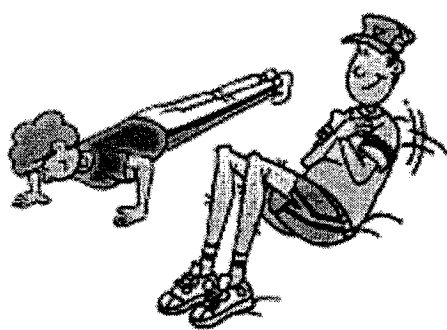
20 minutes +



10 minutes +



20 minutes +



10 minutes

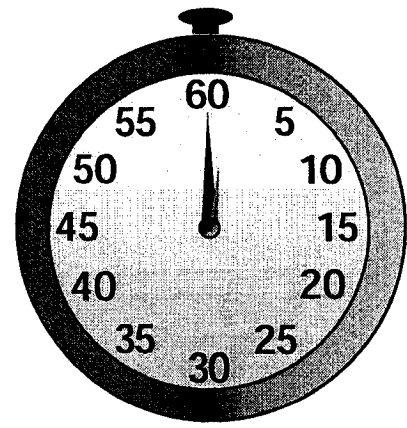
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60 minutes

Time needed depends on effort

Very Light Effort	Light Effort 60 minutes	Moderate Effort 30-60 minutes	Vigorous Effort 20-30 minutes	Maximum Effort
• Strolling • Dusting	• Light walking • Volleyball • Easy gardening • Stretching	• Brisk walking • Biking • Raking leaves • Swimming • Dancing • Water aerobics	• Aerobics • Jogging • Hockey • Basketball • Fast swimming • Fast dancing	• Sprinting • Racing

Range needed to stay healthy



A year ago, none of the following people were doing enough physical activity to stay healthy. Later in this *Handbook* you'll see how they got started. This may give you some ideas about how you could start to build physical activity into your daily routine.

Here's What People Like You Are Doing Now

Meet Pierre (age 55)

He gets up at seven, eats a healthy breakfast and walks to the bus (10 minutes).

At noon, he meets his friend Sue and most days they walk before lunch ... (10 minutes). Before heading back to the office – another 10 minute walk – they do a few stretches to help them stay relaxed through the afternoon.

After work he walks back home from the bus (10 minutes). His walk home is at a brisk pace so that he feels a noticeable increase in his breathing. He enjoys the feeling that this increase in effort gives him.

After dinner he usually does some type of physical activity like walking, skating or swimming at the community recreation centre with his wife, which gets her moving as well (20 minutes). There's 60 minutes and he hardly even noticed!



Introducing Rashida (age 30)

She stays home with her daughter who's four and her son who's two. Running after them keeps her busy, but she also builds activity time into her day. She got started by changing the TV channel to exercise programs and participating in those exercises she felt comfortable doing.

Most mornings now, she follows half an exercise program on TV (10 minutes), and then she puts on music and dances with her children for at least another 10 minutes. Sometimes she does the exercises or dancing with the children's shows on TV.

After lunch she walks to the park with the children, and pushes them on the swings (20 minutes).

After dinner she and her husband romp with the kids before story-time and bed (20 minutes). It was easy for her to get her 60 minutes in while entertaining the kids too!



Here's Jacqueline (age 40)

She's a single mum and does shift work on a full-time basis, which makes for an irregular and hectic schedule. She had to plan to get physical activity into her life and she had very little money. Here's what she does:

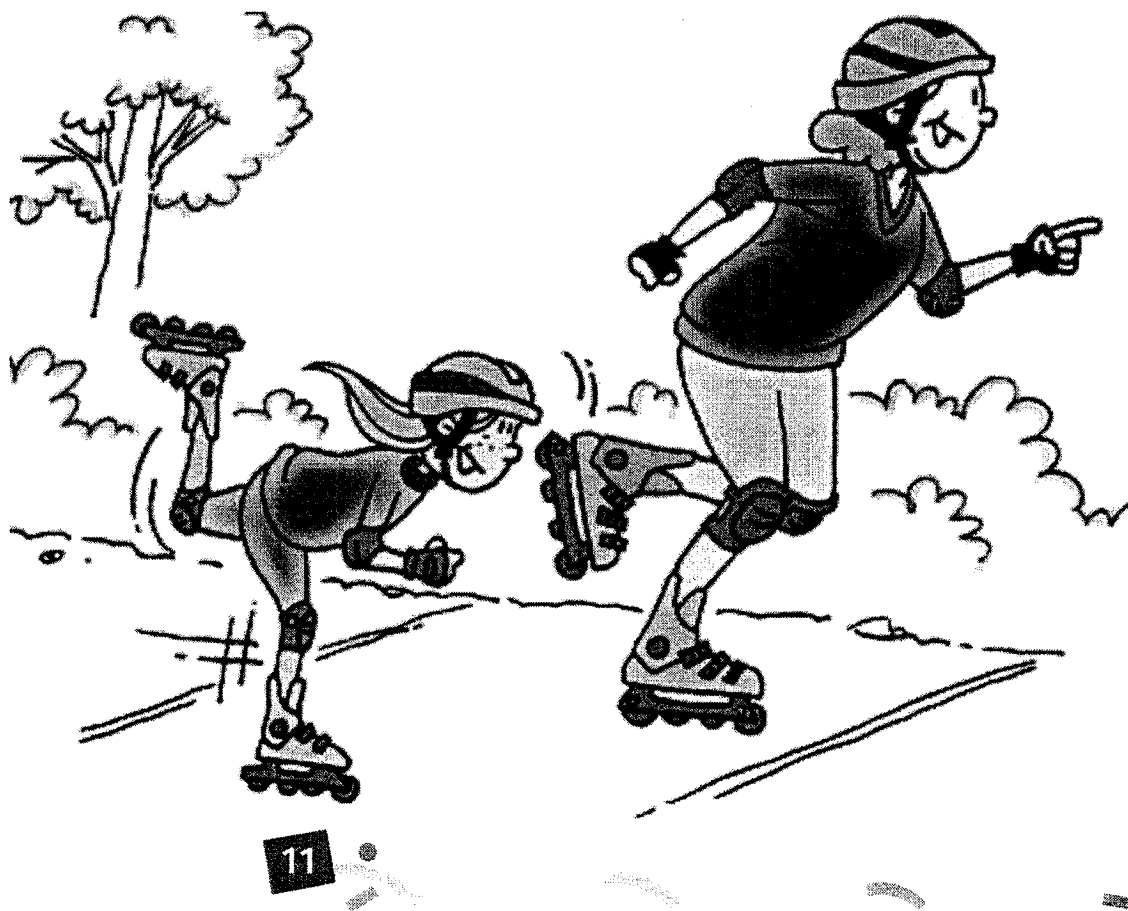
She gets off the bus two stops before her workplace and walks the rest of the way (20 minutes). At work she takes the stairs instead of the elevator most of the time.

She also does easy stretching exercises like rolling her shoulders and stretching her neck during her coffee breaks. She also works her stomach muscles on the bus by tightening them, and working her back muscles by pushing the small of her back into the seat back, doing each for 30 seconds at a time. After only a short time, she felt it working and is now beginning to see an improvement in her posture.

Depending on her shift, she usually walks to the park or in-line skates with her children for 20 minutes or so, at some point in the day. When she misses a day during the week, she spends a little extra time being physically active on the weekends.

Housework like vacuuming or washing the floor makes up the rest of her 60 minutes. Sometimes she only gets in 30 minutes, but she knows that's OK too.

Physical activity doesn't have to
be hard to improve your health.



Say hello to Joshua and his friend Maria (ages 55+)

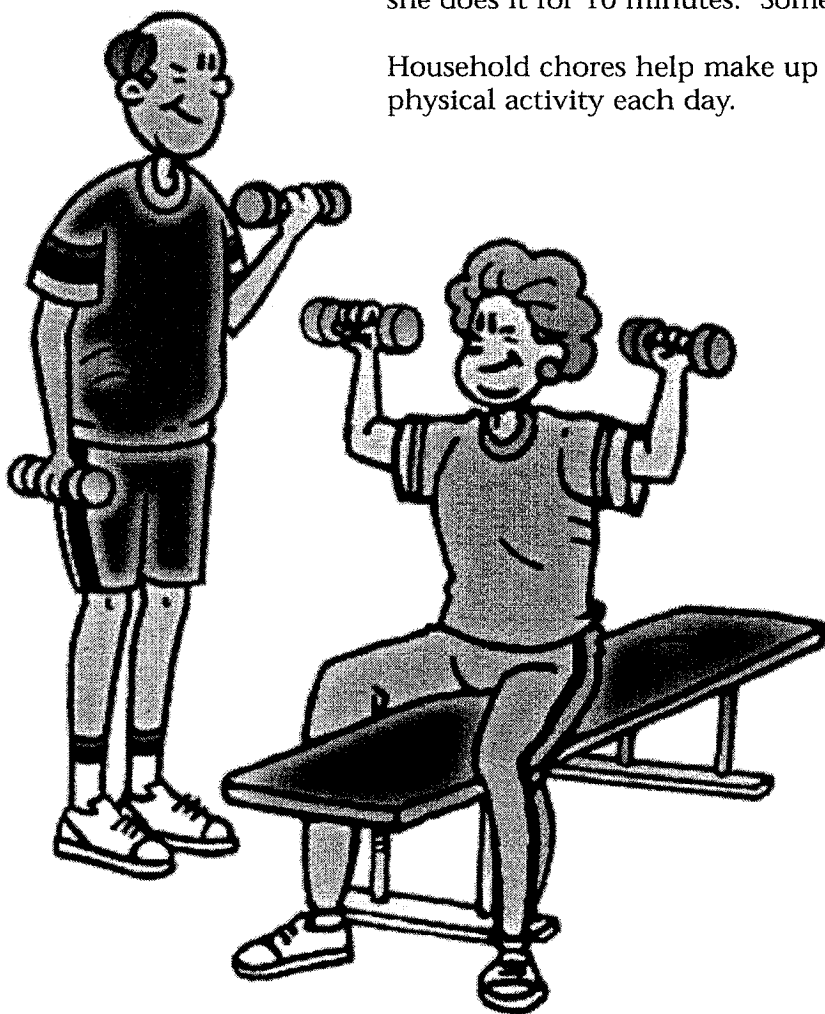
Physical activity can help you live better, longer, so that your quality of life and independence are maintained as you get older.

They are both retired. Joshua had a heart attack and Maria has arthritis, but they needed to put physical activity back in their lives. Their doctors suggested walking would be good for both of them, so they thought about giving it a try together. Here's what they do now.

In the morning they usually walk in the park for 20 minutes. In the winter, they go to the mall and walk there, making sure to walk up the stairs to the second level whenever possible. They use elevators a lot less now than they used to.

In the afternoon, they go to their local Y and join in physical activity periods with other seniors for about 30 minutes. Maria really likes the line dancing even though her arthritis prevents her from doing all the steps. Joshua likes to lift light weights and encourages Maria to do it with him for a bit -- sometimes she does it for 10 minutes. Sometimes they do T'ai Chi together.

Household chores help make up the rest of their 60 minutes of physical activity each day.



Meet Michel (age 25)

Michel is into computers in a big way. It seems that if he's not working on his computer, he is playing computer games, but now he makes sure to build physical activity into his day. And he doesn't let the fact that he is using a wheelchair get in his way.

He's lucky – his company has a fitness facility, so he goes there once a day to lift weights or 'wheel' on the indoor running track. This usually takes about 30 minutes of his work day. A few days a week he plays pick up basketball after work with his friends.

He is achieving the physical activity goals he set for himself and now knows that being in a wheelchair and being a "computer geek" doesn't have to mean being physically inactive. What's more, he still has plenty of time for his computer and he has rediscovered some of life's other enjoyments!



CANADA'S *Physical Activity Guide*

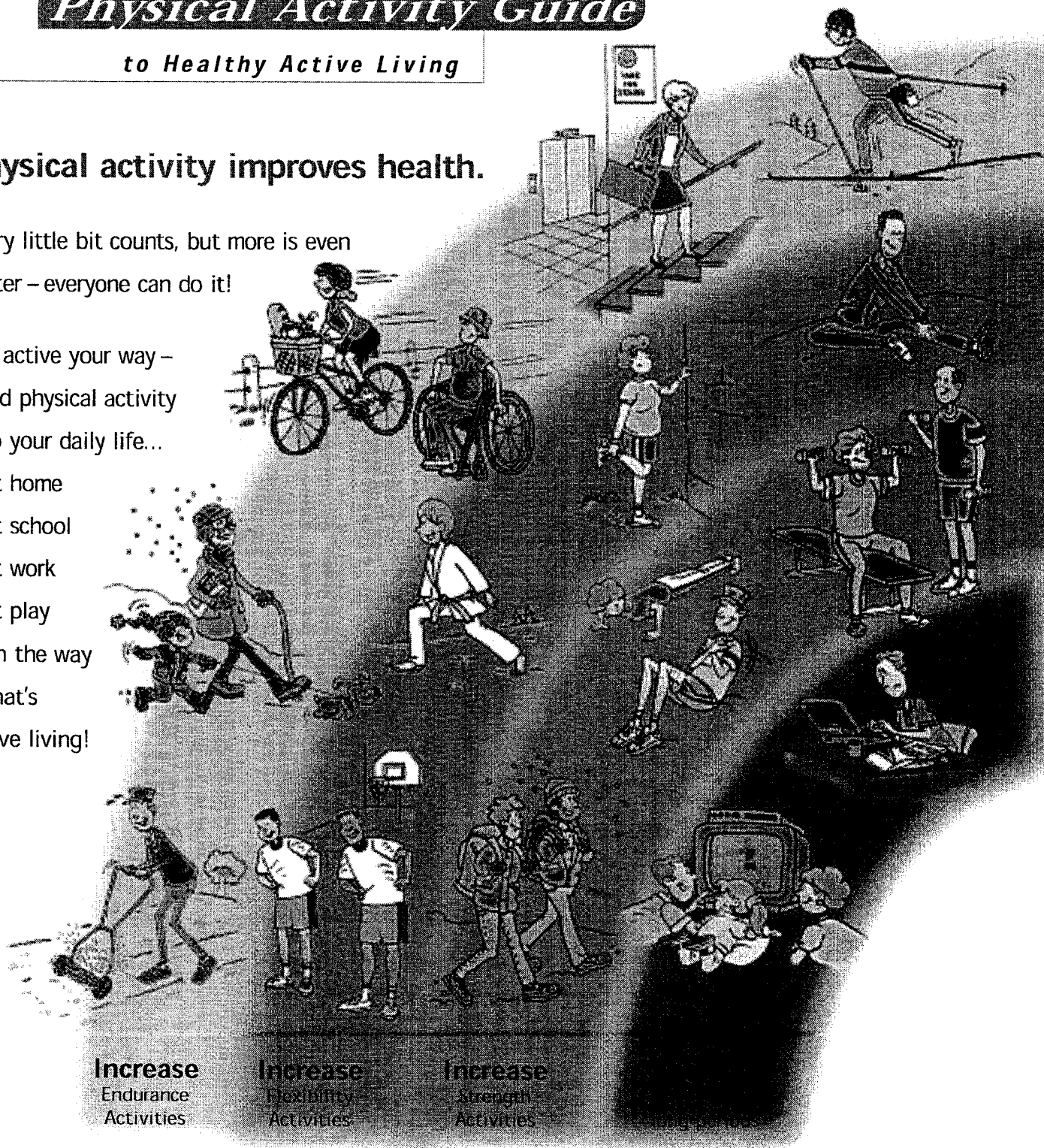
to Healthy Active Living

Physical activity improves health.

Every little bit counts, but more is even better – everyone can do it!

Get active your way –
build physical activity
into your daily life...

- at home
 - at school
 - at work
 - at play
 - on the way
- ...that's
active living!



Increase
Endurance
Activities

Increase
Flexibility
Activities

Increase
Strength
Activities



Health
Canada

Santé
Canada



Canadian Society for
Exercise Physiology

Choose a variety of activities from these three groups:

Endurance

4-7 days a week
Continuous activities for your heart, lungs and circulatory system.

Flexibility

4-7 days a week
Gentle reaching, bending and stretching activities to keep your muscles relaxed and joints mobile.

Strength

2-4 days a week
Activities against resistance to strengthen muscles and bones and improve posture.

Starting slowly is very safe for most people. Not sure? Consult your health professional.

For a copy of the *Guide Handbook* and more information:
1-888-334-9769, or
www.paguide.com

Eating well is also important. Follow *Canada's Food Guide to Healthy Eating* to make wise food choices.

Get Active Your Way, Every Day—For Life!

Scientists say accumulate 60 minutes of physical activity every day to stay healthy or improve your health. As you progress to moderate activities you can cut down to 30 minutes, 4 days a week. Add-up your activities in periods of at least 10 minutes each. Start slowly... and build up.

Time needed depends on effort

Very Light Effort	Light Effort 60 minutes	Moderate Effort 30-60 minutes	Vigorous Effort 20-30 minutes	Maximum Effort
• Strolling • Dusting	• Light walking • Volleyball • Easy gardening • Stretching	• Brisk walking • Biking • Raking leaves • Swimming • Dancing • Water aerobics	• Aerobics • Jogging • Hockey • Basketball • Fast swimming • Fast dancing	• Sprinting • Racing

Range needed to stay healthy

You Can Do It – Getting started is easier than you think

Physical activity doesn't have to be very hard. Build physical activities into your daily routine.

- Walk whenever you can – get off the bus early, use the stairs instead of the elevator.
- Reduce inactivity for long periods, like watching TV.
- Get up from the couch and stretch and bend for a few minutes every hour.
- Play actively with your kids.
- Choose to walk, wheel or cycle for short trips.
- Start with a 10 minute walk – gradually increase the time.
- Find out about walking and cycling paths nearby and use them.
- Observe a physical activity class to see if you want to try it.
- Try one class to start – you don't have to make a long-term commitment.
- Do the activities you are doing now, more often.

Benefits of regular activity:

- better health
- improved fitness
- better posture and balance
- better self-esteem
- weight control
- stronger muscles and bones
- feeling more energetic
- relaxation and reduced stress
- continued independent living in later life

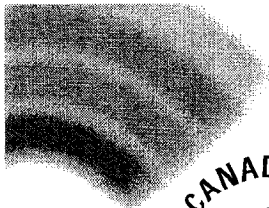
Health risks of inactivity:

- premature death
- heart disease
- obesity
- high blood pressure
- adult-onset diabetes
- osteoporosis
- stroke
- depression
- colon cancer



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CANADA'S

Physical Activity Guide

to Healthy Active Living



Get Active Your Way, Every Day

You Can Do It – Getting started is easy

Sunday

Monday

Tuesday

Wednesday

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Every Day—For Life!

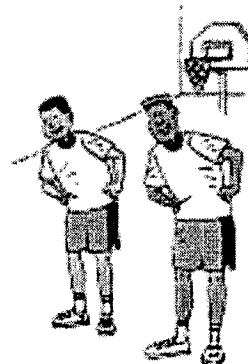
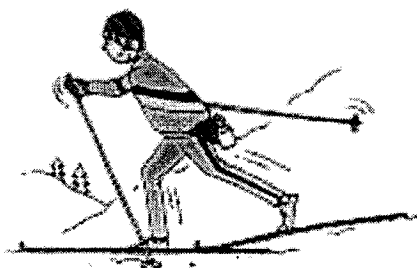
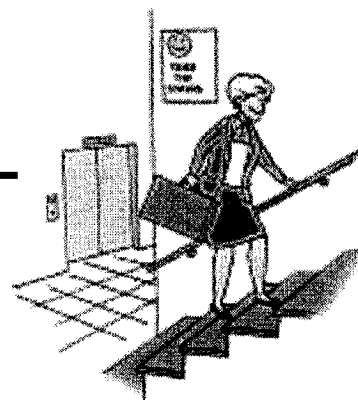


Easier than you think. Keep track of your activities. Record your progress.

Thursday

Friday

Saturday



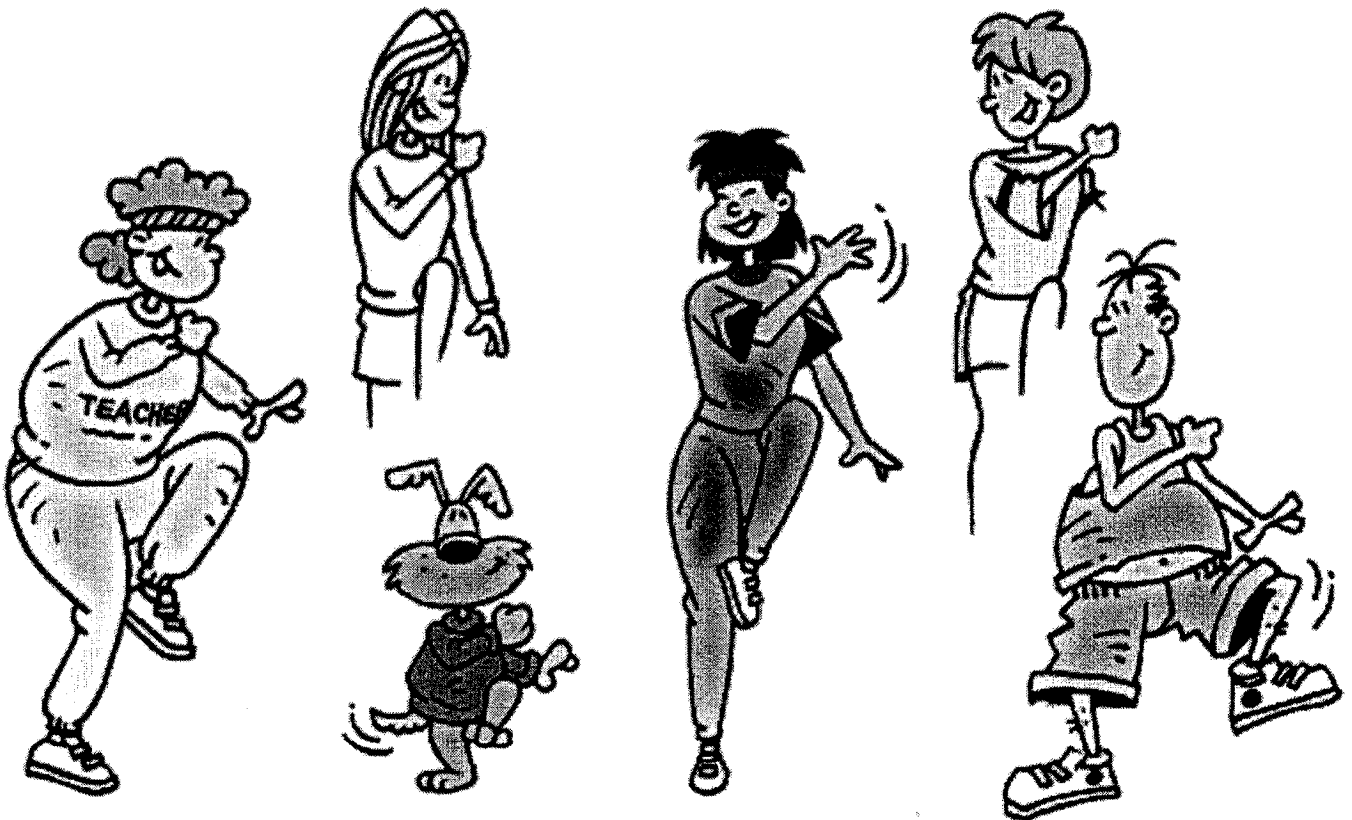
This is Madeleine (age 17)

She's been inactive all her life until now. Here's how she turned things around and became active:

She always liked dancing so she started going three times a week to a dance aerobics class her Phys. Ed. teacher started at school (30 minutes). In fact, now she goes dancing with her friends on the weekends, which she never did before. As well, she started to feel better and even her grades went up.

Once a week she goes to yoga at the community centre for an hour and each day she does yoga exercises for about 20 minutes while watching TV – still her favourite pastime!

She never takes the family car anymore when she runs to the drug store or the market – she walks, and most days she walks to school too, about 10 minutes each way. Madeleine is well on her way to active living – and you can do it too!



Get Active Your Way Every Day – For Life! It's Easier Than You Think!

You can do it – here's why

Did you know that 63% of Canadians – just like you – are not active enough to achieve the health benefits they need from physical activity?

Your body is designed to move and it's surprising how little time it takes to stay healthy and reduce the risk of disease if you are physically active, regularly.

Consider this: you're awake about 15-19 hours a day, but you only have to be active for ONE HOUR and that 60 minutes of activity doesn't have to be done all at once. You can add up your activities, 10 minutes at a time, to get that daily total.

It's easy to take a first step and that counts as progress when you're getting started!

Add up your activities during the day in periods of at least 10 minutes each. Start slowly...and build up! If you are already doing some light activities, move up to more moderate ones. A little is good, but more is even better, if you want to achieve health benefits.

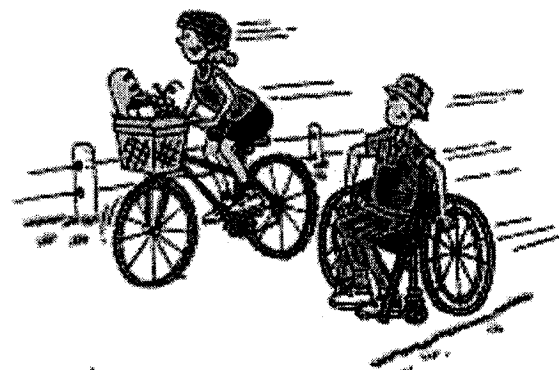
Here's How The People You Met Earlier Took Their First Steps

Check out how Pierre, Rashida, Jacqueline, Joshua, Maria, Michel and Madeleine did it and then think about your own plan, starting with that important first step. Remember, the first step is easier than you think and it really is progress. Jot down some ideas of your own in the space provided or tick off the things in their plans that might apply to you.

How did Pierre get started?

Pierre was 55 years old when he decided to put physical activity back in his life.

Just like all of us, he was very busy, had too little time for himself, had no energy and little motivation. He had been into sports when he was young, but his life had become too complicated for organized activities...and anyway there was no time. He didn't have enough money to invest in a health club either. He knew that he needed to exercise – his doctor had told him so on many occasions – but he just didn't get around to doing it.



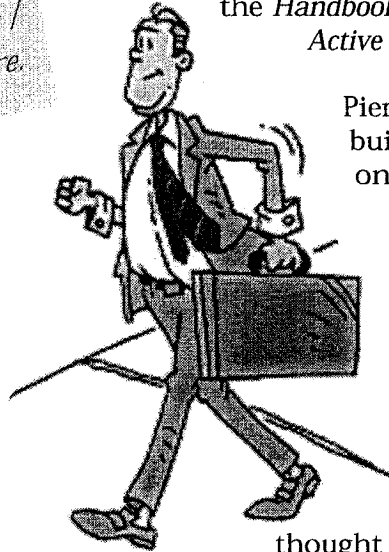
Jot down some ideas on how
you can take your first steps:

One day, he was talking to a friend who told him that a mutual acquaintance had just died of a heart attack at 56. That's me, thought Pierre, I'll be next. That day, he decided he had better do something. But what? Here's what he did.

He went to his doctor for a check-up and asked him if he could help him get started. *This was Pierre's first step.* The doctor asked him what he wanted to do. Pierre laughed and said, "Nothing Doc, but I think I'd better do something!" The doctor gave him a brochure from the Heart and Stroke Foundation and the *Handbook for Canada's Physical Activity Guide to Healthy Active Living* to get him on the right track.

Pierre went home and discovered that he could build activity into his daily life at work, at home, on the way, and he didn't have to join something. He put a simple plan together that he could fit into his day and posted it on the fridge. It simply read:

Today is the first day of the rest of my life. I'm going to walk to the bus every day – that's 10 minutes. Next week I might decide to do more.



Every step that Pierre took was progress. He thought about it, asked for advice, read information and reminded himself to try. After one month he walked 10 minutes most days of the week.

Now Pierre does 60 minutes of physical activity most days and, not only that, his family is more active too, because they keep reading his fridge notes!

How did Rashida get started?

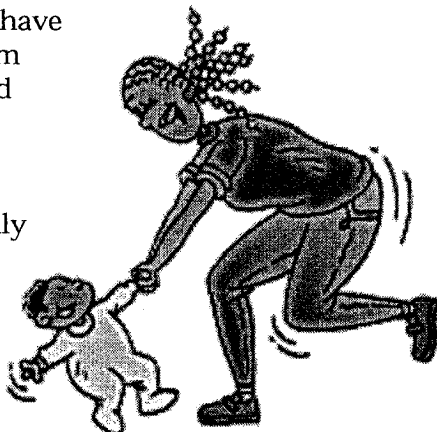
You remember, she's a stay-at-home mum with kids aged two and four. You probably think that she already had enough exercise chasing them around, but actually, she spent a lot of time on the couch watching them play or watching TV. She felt sluggish and she had no energy and she certainly had no plans to get active.

One day her Mom phoned and told her she'd been diagnosed with osteoporosis and that her doctor said it runs in families. Her Mom had just read some brochures from the Osteoporosis Society and found out that exercise helps to prevent the disease. She wanted her daughter to do something now. Sure Mom, said Rashida, but she had no intentions of doing anything – after all, she was too tired from looking after the children. But her mother's words kept playing on her mind...

One day at the community centre she picked up a brochure about helping your children to grow up physically active and healthy.

Reading it was her first step. She discovered all kinds of fun things she could do with her children that would also get her active. Who would have guessed that dancing in the living room counted, she thought. Rashida realized just how much time she spent sitting around.

Rashida discovered that being physically active with her children was fun and after a few months she added more activities to her list of things to do. She spent less time sitting and more time moving. Now she's got it all worked out and her kids love dancing with her. She's even got her husband into the game and the whole family is making active living a way of life. Soon her friends began doing it too! Now, instead of having coffee and cookies while they watch their children play, the moms on her block meet at the local community centre for an exercise class, while their kids go to play group.



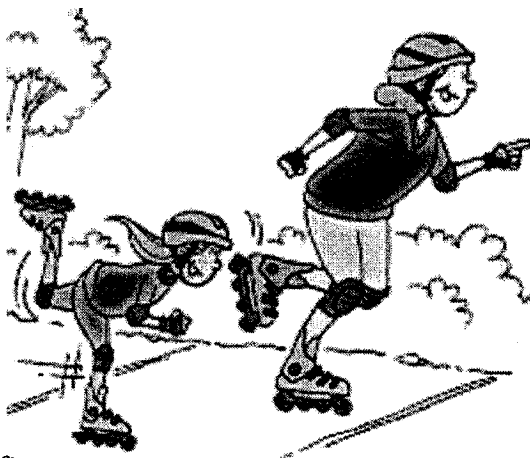
You can do it...

Getting started is easier
than you think.

How did Jacqueline get started?

At 40, Jacqueline could barely keep up with work and the kids. Being a single parent was tough – no money, no time, no energy. She had seen the ParticipACTION ads on TV, but who had the time or money for that stuff – certainly not her! She watched TV to relax from the stress of work, but always woke up feeling tired the next day. What was she to do?

One day her daughter looked at her and said, "You know Mum, in school today, we learned that you have to be physically active to stay healthy. You don't do anything. I think you should start because what will happen to us if you get sick?" Jacqueline's heart skipped a beat. She hadn't thought about it that way. But there was still the problem of no time and no money... even so, the kids didn't let up on her. Some weeks later, Jacqueline found herself in the counselling office at work. *Her first step* was to pick up a few brochures and begin looking into physical activity and health. She chose one activity to start – she started walking with her children, after all, they were the ones who were concerned about her in the first place.



Remember, getting health
benefits through physical
activity only takes ONE HOUR
out of the 24 hours in your
day. And it can be added-up
in periods of at least
10 minutes each.

After several months, she also started walking to work. She still feels tired from the stress of balancing work and home, but she handles it better and now wakes up refreshed. She's into active living and her children are as happy as she is with her new lifestyle. Why all the fuss about 60 minutes, she wonders today, but when she started out, she really thought it would be impossible.

How did Joshua and Maria get started?

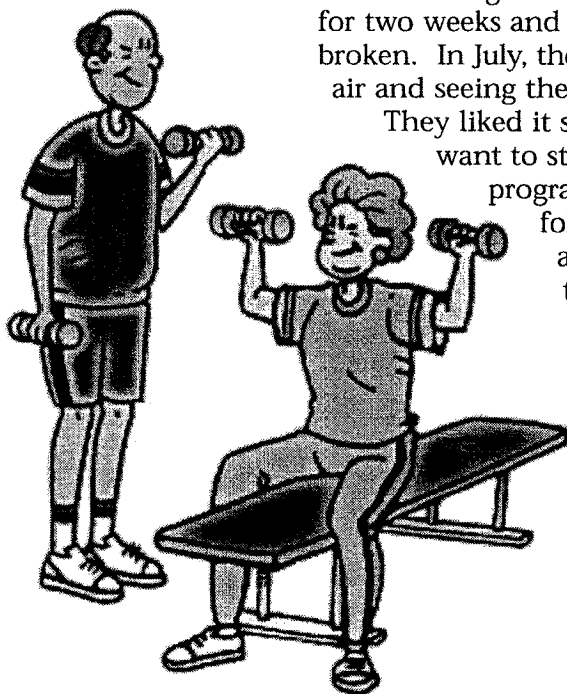
Well, Joshua had a mild heart attack at 60. His doctor told him he must start walking or he would have another one. He had a big scare, but the idea of walking every day appalled him. What should he do?

His friend Maria hardly got out of the house. Maybe they could do it together, he thought. At least he would have company. Maria thought he had gone crazy – I have enough trouble just walking around the house, she laughed. But her chiropractor had told her to walk as well. After joking about it for several weeks, the two of them decided they would do something. *Deciding to try was their first step.*

So they made a plan. They would start to walk when the weather got nice. By May 15, they had no more excuses, so they started their morning walks. In early June, Maria went to visit her daughter for two weeks and they both stopped walking – the habit was broken. In July, they tried again. It got them outside into the fresh air and seeing the neighbours and they really began to enjoy it.

They liked it so much that when winter came, they didn't want to stop. Then they heard about a mall-walking program and joined that too. They met some more folks their age and found out about the seniors' activity program at the local Y and checked that out next.

Today, they are both doing at least 45 minutes of activity a day – and some days it's more than 60. They say they never thought it was possible for them to be physically active, but now it's one of the most important and enjoyable things in their lives.



How did Michel get started?

At 25, Michel has used a wheelchair for most of his life. Because of his passion for computers, he tended to spend hours-on-end in front of his computer. He was beginning to feel aches and pains in his upper body as a result of these prolonged periods of inactivity. It never occurred to him that being physically active was within his reach, or that the time he spent in front of the computer was adding to his already sedentary lifestyle. He knew his company had a gym, but was unaware that it could meet his additional needs.

One day he was 'surfing' the Internet and he landed on a site about the inactivity problems typical of computer users. He found that sedentary living is as dangerous to your health as smoking – a habit he had never started because he wanted to be healthy. Oops, he thought. That's me! So he looked into it further, roaming the Net looking for information on how to improve his health through physical activity. But even though he became quite knowledgeable on the subject, he still couldn't seem to get out from behind that computer!

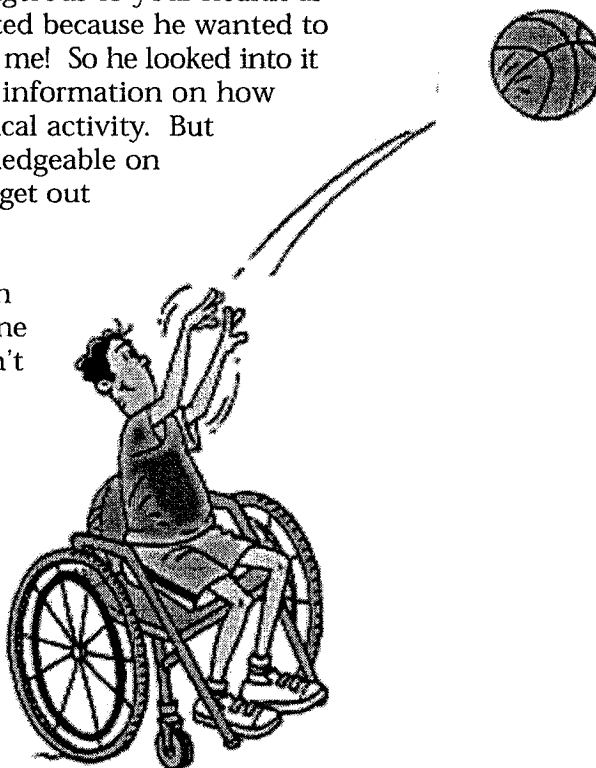
Then one day, he found an article on the Internet that advised, "Just do one small thing to get you moving – don't try to make a grand plan right off the bat." It also said, "Whatever your situation or ability, you can try a variety of activities to improve your health and get a feel for what's right for you."

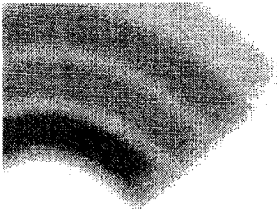
That day, he made his first move. He wheeled himself into his company's gym, met with the fitness coordinator and he's on his way to healthy active living. He found out that many facilities are accessible and that he can be active alongside his co-workers. He now feels more energetic and alert and still has plenty of time for his computer! He also bookmarked the website about *Canada's Physical Activity Guide to Healthy Active Living* to keep learning about being physically active.

Activate *Canada's Physical*

Activity Guide Website!

www.paguide.com





Add up your activities during the day in periods of at least 10 minutes each. Start slowly... and build up! If you are already doing some light activities, move up to more moderate ones. A little is good, but more is even better, if you want to achieve health benefits.



How did Madeleine get started?

Remember, Madeleine is 17 and had spent a lot of time sitting around – a “couch potato”. She skipped Phys. Ed. in school, always felt clumsy and uncoordinated when she had to do physical activities with others and preferred reading or watching TV to intramural sports or being active outdoors.

Her friends kept trying to get her to join them in physical activities both during and after school, but she always said no. The more she sat on the couch, the more tired she became. She was overweight as well. How could she possibly put on tights and go to a gym class, she would ask herself.



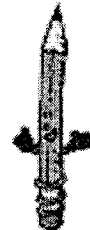
Gradually her friends stopped asking her to do things with them and Madeleine sat on the couch even more. Her mom told her she needed exercise so she would have more energy. She told her to get out with her friends and swim, walk, bike or dance. One day her mom gave her a copy of the *Handbook for Canada's Physical Activity Guide to Healthy Active Living* and asked her to at least read it. Do something, she said. The only idea she liked was dancing...well, maybe I can, she thought.

So she took her first step. She talked to a friend at school. The friend told her that aerobic dance class was now being offered in Phys. Ed. and suggested she come and watch. “It’s fun,” her friend explained. “And you like to dance, so you might decide to join us.” Madeleine thought about it. She was still pretty nervous, but her friend kept encouraging her. One day she finally went and just watched. She knew a few people in the class and they sure seemed to be having fun...

Eventually, she joined in and found to her surprise that she could follow all the steps. The teacher encouraged her and so she tried another class and then another... finally she decided to take the plunge and sign-up. She liked it! Another of her friends in the class also took yoga and encouraged her to come and watch that too – so she went and watched again. This time it did not take her so long to sign-up. In just over a year, Madeleine is now in two classes, goes out Saturday nights with her friends, is no longer a couch potato, feels a lot better about herself, and is even getting better grades at school.

So what did you learn from these first steps and experiences?

- Every time you take a step you make progress.
- Planning to start is the first step for many people.
- Getting information is one step everyone can take.
- You don't need a grand plan to start.
- Congratulate yourself when you take a step.
- Getting started is easier than you think.
- Getting started can be reading about what to do, watching a class or other people to see how they do it, trying something, and getting ready to start.
- Watching a class helps you to decide if the activity is right for you.
- Try a class – many programs have free trials so you can try it without a big commitment.
- There are many ways to add physical activity to your life.
- You can start slowly and build up.
- Every little bit counts – you can add up your activities throughout the day.
- You can build physical activity into your life at home, at school, at work, at play and on the way.
- You do not have to have a lot of money to be physically active.
- You can choose activities that you like to do.
- Everyone can find enough time, if they decide to do it.
- You're never too young or too old to start living actively.
- People feel better when they are physically active.
- Physical activity can be a family thing, or you can do it on your own or with a friend.
- You can join an organized activity, or you can do something on your own, like take a walk in the park.
- The key is to take that first step and everybody's first step is different – remember each step counts as progress.
- It's easy to start. Even a call for information is a beginning and it counts as progress. Congratulate yourself – reading this *Handbook* is already a first step!



Take a minute to jot down one step that you could take now.

Check out the list on this page if you can't think of one and see if there is an idea there that you can use.

My first step:

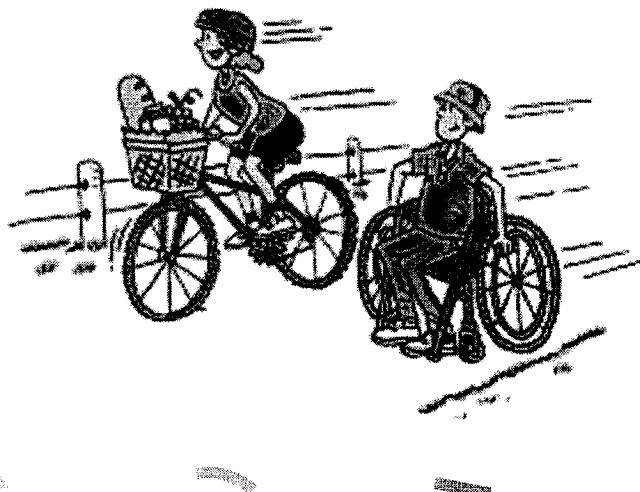
Date:



Here's a list of possible first steps you could take this week

Are you ready to take your first step? Make it easy:

- Get some information from your local YM/YWCA or community centre.
- Call the Parks and Recreation Department in your community.
- Talk to a health professional or a physical activity expert.





Note: If you have
an illness that you
think might prevent

you from becoming more active
than you are now, check out the
Physical Activity Readiness
Questionnaire at the back of
this *Handbook*.

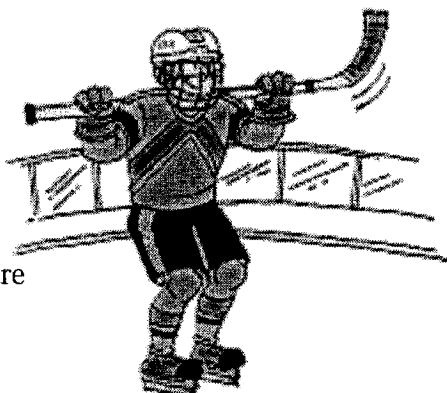
- Talk to the counselling office at school or at work.
- Talk to friends who have built physical activity into their daily routines and ask them how they got started.
- Go to the library and borrow a book on physical activity and your health.
- Buy a pair of walking shoes.
- Check out what physical activity organizations exist in your community.
- Call your provincial/territorial Recreation Department.
- Check out the *Guide* Website at www.paguide.com
- Call 1-888-334-9769 for more information.
- Find out if a nearby mall has a walking route posted or a regular walking program.
- Make yourself a list of the reasons why you might want to introduce physical activity into your life.
- Make a list of the health problems you already have that physical activity might help to improve.
- Check out if there are walking paths in your community.
- Locate the parks in your community.
- Talk to a friend who might want to join you in your changing lifestyle so you can move forward together.
- Watch classes at your community centre that you might want to try.

If you are active sometimes, but not enough to achieve the health benefits described in this *Handbook*:

- Walk whenever you can – get off the bus early, park the car further away or leave it at home, and use the stairs instead of the elevator.
- Reduce inactivity for long periods, like watching TV or using the computer.
- Get up from the couch or your office chair and stretch and bend for a few minutes every hour.
- Start slowly, progress gradually.
- Start with a 10-minute walk – gradually increase the time.
- Take the stairs to go up one or two floors at work or on appointments.
- Choose to walk, wheel or cycle for short trips.
- Find out about walking and cycling paths nearby and use them.



- Observe a physical activity class to see if you want to try it.
- Try one class to start – you don't have to make a long-term commitment.
- Do the activities you are doing now, more often or with more effort.
- Check out the programs and services at the YM/YWCA or community recreation centre and see if anything interests you.
- Join a friend who is already active at the gym, on the tennis court or in the pool.



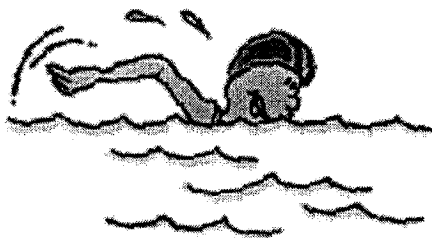
Remember, all these steps count as progress – take one, then congratulate yourself, and take another!

Build Physical Activity Into Your Daily Life:

- at home
 - at school
 - at work
 - at play
 - on the way
- ...that's active living!

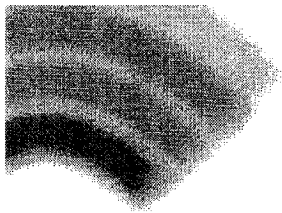


Here are some ideas to help you. Choose activities that interest and appeal to you. The best way to keep going, once you've taken that first step, is to do activities that are easy to fit in your schedule and could be fun at the same time.



Take a first step and put a checkmark beside the activities in the following list that you might like to incorporate into your daily routine. To get the health benefits you want from physical activity, you need to do it regularly, so pick the ones that you think you could realistically build into your daily life.



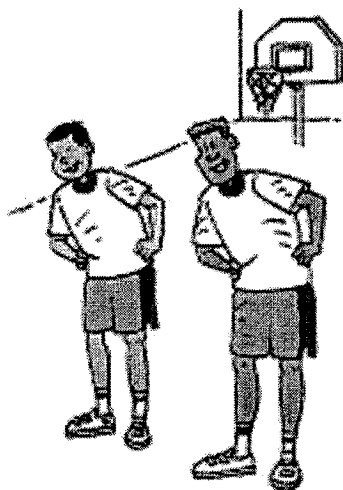


Activities you can do at home

- ☐ Create a new morning routine. Start your day with 10 minutes of movement indoors or outdoors. Some stretching and a short walk first thing in the morning can be better than caffeine.
- ☐ Go for a bike ride.
- ☐ Trade in your power mower for a push mower.
- ☐ Park the car 10 minutes away from the store you are going to. Better yet, leave the car at home.
- ☐ If you live in a seniors' residence, start a hall-walking group. Add to your route each week and pick up friends along the way.
- ☐ Parents – play catch or fly a kite with your kids.
- ☐ Dance to your favourite up-beat music for 10 minutes a day.
- ☐ Do a physical activity routine with leaders on TV.

Activities you can do at school

- ☐ Take an evening fitness class at your neighbourhood school, and encourage your friends to do the same.
- ☐ Support quality daily physical education at your child's school.
- ☐ Encourage teachers to talk about physical activity and active living.
- ☐ Create a walking school bus with other parents in your neighbourhood – instead of car-pooling, take turns walking the kids to school.
- ☐ Choose physical education as one of your courses.
- ☐ Get involved in intramural programs.



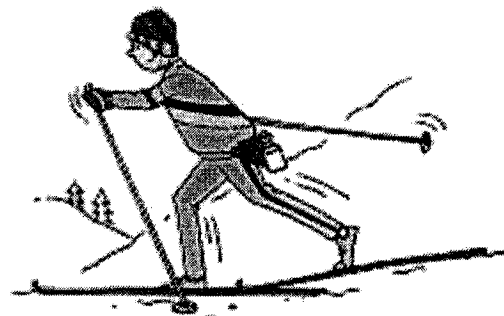
Activities you can do at work

- ☐ Take stretch breaks during meetings.
- ☐ Have a "walking" meeting – grab your colleague and discuss business while taking a walk.
- ☐ Take the stairs. Pretend the elevator is out of service.
- ☐ Post a notice near the entrance to the stairway suggesting people take the stairs and have them sign it when they do to encourage others to follow their lead.
- ☐ Replace your coffee break with a walking/wheeling break.
- ☐ Contract your stomach and back muscles while sitting in your chair or on the bus.
- ☐ Take a brisk walk before lunch for about 10 minutes.
- ☐ Try to make active living one of the goals of your work team.
- ☐ Roll your shoulders and stretch your neck when sitting in front of the computer.



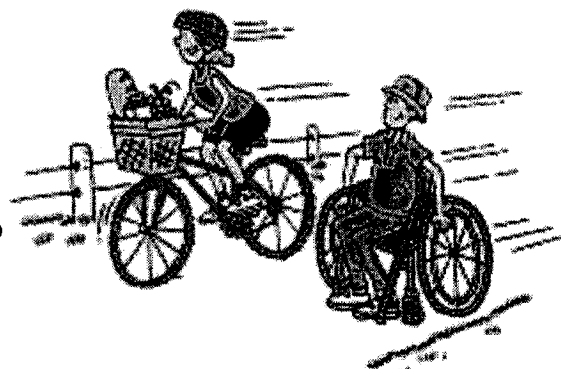
Activities you can do at play

- ☐ Make a personal or family commitment to try a new activity each season: snowshoe, curl, hike, bike, dance, bowl, fish, camp, ice-skate, ski, swim, in-line skate, walk, run, skip rope, play tag with your kids, or play ball in the park.
- ☐ Join a club or organization that coordinates active living events.
- ☐ Participate in community programs like SummerActive and try some new activities.
- ☐ Get in the garden and dig, prune, rake and weed.
- ☐ See how many different 10-minute walking, wheeling or cycling routes you can find in your neighbourhood.
- ☐ Hit a tennis ball with a friend.
- ☐ Arrange to meet a couple of friends for a walk every day at the same time.
- ☐ Join a T'ai Chi or yoga class.
- ☐ Go line dancing, folk dancing, or square dancing.



Activities you can do on the way

- ☐ Walk, cycle, in-line skate, or wheel to work or school.
- ☐ Get off the bus two stops early and walk home.
- ☐ Leave the car in a parking lot 10 minutes from work and walk the rest of the way.
- ☐ Take your bike to work – you'll save on gas as well as help to protect the environment and your health.
- ☐ If your job involves a lot of driving, plan several short stops in your day. Get out of the car and walk for 10 minutes or more whenever you can.



Get Active Your Way, Every Day - For Life!

If you're still in doubt that physical activity is important to your health and you're not able to take the first step toward a healthier lifestyle, please read this *Handbook* again in a couple of months. Maybe then you will be ready to take your *first step*.

Remember what Pierre wrote on his fridge: *Today is the first day of the rest of my life*. It's the first day of the rest of your life too, and physical activity can help ensure you lead an independent, quality life even as you get older.

If you've made a plan, or decided how to get started, you have taken your first step – good for you!

Put *Canada's Physical Activity Guide to Healthy Active Living* on your fridge to remind you of your commitment to your health. You can also turn it over and use the calendar on the back to keep track of your activities and record your progress.



Take a minute to jot down activities you can do:



The Physical Activity Readiness Questionnaire (PAR-Q)

Becoming more active is very safe for most people, but if you're in doubt, please complete the questionnaire below.

Some people should check with their doctor before they start becoming much more physically active. Start by answering the seven questions below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and are not used to being very active, definitely check with your doctor first.

YES NO

☐ ☐

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

☐ ☐

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

☐ ☐

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

☐ ☐

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

☐ ☐

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

☐ ☐

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

☐ ☐

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

If you answered YES to one or more questions, talk with your doctor before you start becoming much more physically active.

If you answered NO to all questions, you can be reasonably sure that you can start becoming more physically active right now. Be sure to start slowly and progress gradually – this is the safest and easiest way to go.

Delay becoming much more active if:

- You are not feeling well because of a temporary illness such as a cold or a fever – wait until you feel better; or
- You are or may be pregnant – talk to your doctor before you start becoming much more active.

Note: If your health changes so that you then answer YES to any of the above questions, ask for advice from your fitness or health professional.

Putting It All Together – Support From Your Community

There's more to getting active than just making up your mind to do it. An active living community helps make active choices easy choices by:

- encouraging families to be active together;
- promoting physical education in schools and encouraging use of schools for community activities;
- promoting supportive physical activity policies in workplaces with things like showers, fitness facilities, flex-time and secure bike parking;
- promoting physical activity in community parks, facilities, play structures and special events; and
- sponsoring safe, active transportation through bike paths and lanes, well-lit walking trails, pedestrian-friendly neighbourhoods, and secure bike parking in association with local businesses.

Look for and ask about these things, which can often be found in your community.

For More Information or Help to Take Your First Step...

Check out these contacts to find out more about physical activity for yourself and your family:

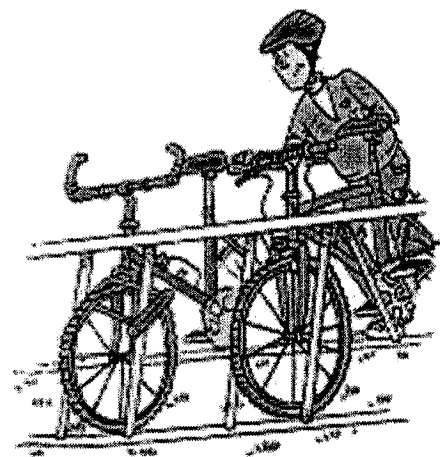
- your local recreation department to learn more about resources and activities in your community
- YMCA, YWCA, private fitness clubs, boy scouts and girl guides
- a certified fitness professional* in your community
- your physician or another health professional
- a physical education teacher
- the coordinator of your workplace fitness/active living program, if you have one
- your community seniors' centre or association
- your local public health unit or department
- provincial health organizations such as the Heart and Stroke Foundation
- a library or bookstore for reputable books and other active living resources (you can ask a fitness professional for suggestions)

** Ask if the fitness professionals are certified through an organization like the Canadian Society for Exercise Physiology, your provincial fitness council or the YM/YWCA.*

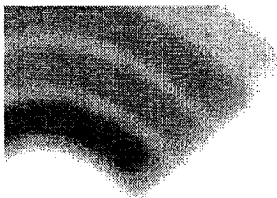
Call toll-free: 1-888-334-9769

Activate Canada's Physical Activity Guide Website:
www.paguide.com

Physical activity is an investment in your health. Make it something you want to do, not something you have to do. Get active your way, every day - for life!



Think of minutes of physical activity as dollars in your health bank and make an investment in your health today.



Guide Endorsers

The following organizations have endorsed *Canada's Physical Activity Guide to Healthy Active Living*:

- Active Living Alliance for Canadians with a Disability
- Active Living Canada
- Active Living Coalition for Older Adults
- The Arthritis Society
- Asthma Society of Canada
- Boys and Girls Clubs of Canada
- Canadian Academy of Sport Medicine
- Canadian Association for the Advancement of Women and Sport and Physical Activity
- The Canadian Association for Health, Physical Education, Recreation and Dance
- Canadian Association for School Health
- Canadian Association of Principals
- Canadian Athletic Therapists Association
- Canadian Cancer Society
- The Canadian Centre for Occupational Health & Safety
- Canadian Centre for Stress and Well-Being
- Canadian Chiropractic Association
- Canadian Diabetes Association
- Canadian Fitness and Lifestyle Research Institute
- Canadian Forces Personnel Support Agency
- Canadian Home and School Federation
- Canadian Institute of Child Health
- Canadian Institute of Planners
- Canadian Intramural Recreation Association
- Canadian Labour Congress
- Canadian Medical Association
- Canadian Mental Health Association
- Canadian Naturopathic Association
- Canadian Nurses Association
- Canadian Parks/Recreation Association
- Canadian Physiotherapy Association
- Canadian Public Health Association
- Canadian Teachers Federation
- The College of Family Physicians of Canada
- Department of National Defense
- Dietitians of Canada
- Federal, Provincial and Territorial Ministers Responsible for Fitness, Recreation and Sport
- Federation of Canadian Municipalities
- Girl Guides of Canada
- Go for Green
- The Heart and Stroke Foundation of Canada
- Industrial Accident Prevention Association
- The Lung Association
- National Institute of Nutrition
- National Fitness Leadership Advisory Council
- Osteoporosis Society of Canada
- ParticipACTION
- Royal Canadian Mounted Police
- Scouts Canada
- YMCA Canada
- YWCA of Canada

Call toll-free **1-888-334-9769**

Activate *Canada's Physical Activity Guide* Website:
www.paguide.com

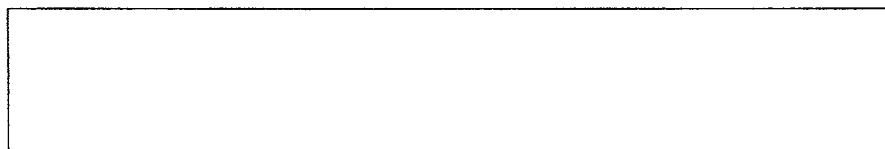
Canada's Physical Activity Guide
Ottawa, Ontario
K1A 0S9

Also available in alternate formats upon request.

Également disponible en français sous le titre *Cahier d'accompagnement du Guide d'activité physique canadien pour une vie active saine*.

Cat. No. H39-429/1998-2E
ISBN 0-662-26628-5

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APPENDIX 2

Measures

M.-C. LAPLANTE

MEASURE OF STAGE OF CHANGE FOR REGULAR PHYSICAL ACTIVITY

Adapted from: Marcus, B. H., Selby, V. C., Niaura, R. S., & Rossi, J. S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly for Exercise and Sport*, 63, 60-66.

Do you currently engage in regular moderate physical activity according to this definition.

People can be physically active by doing many different types of exercise (walking, cycling, swimming, etc...) and each of these activities can be done using different levels of exertion. A moderate level of exertion means that you would not feel strain during the activity, and for an activity to be considered regular, you would participate it at least four days a week, for at least 30 minutes a day.

- ☐ Yes, I have been for MORE than 6 months.
- ☐ Yes, I have been for LESS than 6 months.
- ☐ No, but I am planning to start in the next 30 days.
- ☐ No, but I am planning to start in the next 6 months.
- ☐ No, and I do NOT plan to start in the next 6 months.

DECISIONAL BALANCE MEASURE

ADAPTED FROM: Marcus, B. H., Rakowski, W., & Rossi, J. S. (1992). Assessing motivational readiness and decision making for exercise. *Health Psychology*, 11, 257-261.

Lots of things influence what people do about physical activity. How much has each of the following ideas influenced your decision about whether or not to get regular moderate physical activity?

Not at all	A little	Somewhat	Quite a lot	Very much
... 1 ...	... 2 ...	... 3 ...	... 4 ...	... 5 ...

Remember, we are NOT asking you how much you agree or disagree, but rather how much each has influenced your decision about whether or not to get regular moderate physical activity.

1. Physical activity would help me reduce tension or manage stress.
2. I would feel more confident about my health by getting physical activity.
3. I would sleep better.
4. Physical activity would take too much of my time.
5. I would have less time for my family and friends if I participated in physical activity.
6. I am too tired to get physical activity because of my other daily responsibilities.
7. Physical activity would help me have a more positive outlook.
8. Physical activity would help me control my weight.
9. I'd worry about looking awkward if others saw me being physically active.
10. Getting physical activity would cost too much money.

SELF-EFFICACY MEASURE

Adapted from: Marcus, B. H., Selby, V. C., Niaura, R. S., & Rossi, J. S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly for Exercise and Sport*, 63, 60-66.

The next questions ask how confident you are about doing regular physical activity in different circumstances.

Not at all confident	Not very confident	Moderately confident	Very confident	Extremely confident
... 1 ...	... 2 ...	... 3 ...	... 4 ...	... 5 ...

I am confident that I can participate in regular moderate physical activity...

1. when I am a little tired.
2. when I am in a bad mood or feeling depressed.
3. when I have to do it by myself.
4. when it becomes boring.
5. when I can't notice any improvements in my fitness.
6. when I have many other demands on my time.
7. when I feel a little stiff or sore.
8. when the weather is bad.

PROCESSES OF CHANGE MEASURE

Adapted from: Marcus, B. H., Rossi, J. S., Selby, V. C., & Niaura, R. S. (1992). The stages and processes of exercise adoption and maintenance in a worksite sample. *Health Psychology*, 11, 386-395.

We want to know how often during the last month you had any of the thoughts, experiences, activities, or feelings described by each statement. Please remember, when it says "physical activity", it means "regular moderate physical activity".

Never	Seldom	Occasionally	Often	Very Often
... 1 ...	... 2 ...	... 3 ...	... 4 ...	... 5 ...

How often in the last month...

1. did warnings about the health problems caused by inactivity concern you?
2. did you feel you would be a good role model for others if you were getting physical activity?
3. did you notice society changing in ways that make it easier to get physical activity?
4. did you think that you would be achieving an important personal goal if you were getting physical activity?
5. did you use physical activity to help relieve your stress instead of just worrying about your stress?
6. did you ask someone to help you improve your physical activity skills?
7. did you read anything about physical activity to learn more about it?
8. did warnings about physical inactivity being bad for your health worry you?
9. did you feel you were letting yourself down if you didn't get physical activity?
10. did you set physical activity goals for yourself that you could reach?
11. did you make sure that you have the things you needed in order to get physical activity?
12. did you talk to anyone about the importance of physical activity?
13. did you think that you could influence others to be healthier if you were getting physical activity?
14. did you notice that more workplaces were encouraging their employees to get physical activity?
15. did you get your physical activity instead of doing something else?
16. did you ask someone to give you feedback about your physical activity?
17. did you tell yourself that taking care of your body through physical activity was a personal accomplishment?

18. did you intentionally keep things around your home or workplace to remind you to get physical activity?
19. did you plan how you would get physical activity?
20. did you remind yourself about a commitment to get physical activity?
21. did you ask someone to do physical activity with you?

NATIONAL HEALTH INTERVIEW SURVEY [NHIS]

From: Kriska, A. M., & Caspersen, C. J. (Eds.). (1997). A collection of physical activity questionnaires for health-related research. [Special Issue]. *Medicine and Science in Sports and Exercise*, 29(6).

	In the past 2 weeks, have you done any of the following exercise, sports, or physically active hobbies?	Yes	No	How many times in the past 2 weeks did you do that activity?	On the average, about how many minutes did you actually spend doing that activity each time?	Did you have a small, moderate, or large increase, or no increase at all in your heart rate or breathing?
1	Walking for exercise	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
2	Gardening or yard work	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
3	Stretching exercise	☐	☐	___ times	___ minutes	
4	Weightlifting or other exercises to increase muscle strength	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
5	Jogging or running	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
6	Aerobics or aerobic dancing	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
7	Riding a bicycle or exercise bike	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
8	Stair climbing for exercise	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
9	Swimming for exercise	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
10	Playing tennis	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
11	Playing golf	☐	☐	___ times	___ minutes	
12	Bowling	☐	☐	___ times	___ minutes	
13	Playing baseball or softball	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
14	Playing handball, racquetball, or squash	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
15	a) downhill skiing	☐	☐	___ times	___ minutes	
	b) cross-country skiing	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
	c) water skiing	☐	☐	___ times	___ minutes	
16	Playing basketball	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
17	Playing volleyball	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
18	Playing soccer	☐	☐	___ times	___ minutes	☐ Small ☐ Large

						☐ Moderate ☐ None
19	Playing football	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
20	Playing ice hockey	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
21	Ice skating	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None
22	Doing martial arts	☐	☐	___ times	___ minutes	☐ Small ☐ Large ☐ Moderate ☐ None

GODIN LEISURE-TIME EXERCISE QUESTIONNAIRE

From: Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences*, 10, 141-146.

Considering a 7-day period (a week), how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time.

	Times per Week
STRENUOUS EXERCISE (heart beats rapidly) (i.e., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)	
MODERATE EXERCISE (not exhausting) (i.e., fast walking, baseball, tennis, easy bicycling, volley ball, badminton, easy swimming, alpine skiing, popular and folk dancing)	
MILD EXERCISE (minimal effort) (i.e., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking)	

STANFORD USUAL ACTIVITY QUESTIONNAIRE

From: Sallis, J. F., Haskell, W. L., Wood, P. D., Fortmann, S. P., Rogers, T., Blair, S. N., et al., (1985). Physical activity assessment methodology in the Five-City Project. *American Journal of Epidemiology*, 121, 91-106.

Do you usually participate in any of the following activities? (yes or no)

1. Climbing some stairs for exercise instead of taking the elevator.
2. Walking instead of driving a short distance.
3. Parking away from your destination so you have to walk more.
4. Walking on your lunch hour or after dinner.
5. Getting off at a bus stop which is not the one nearest your destination and walking.