

Journal of Education and Recreation Patterns (JERP)

www.jerpatterns.com


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To cite this article:

Pennington, C.G. (2021). Applying the Transtheoretical Model of Behavioral Change to Establish Physical Activity Habits. *Journal of Education and Recreation Patterns (JERP)*, 2(1), 11-20.

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Applying the Transtheoretical Model of Behavioral Change to Establish Physical Activity Habits

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ARTICLE INFORMATION

Original Research Paper

Received: 05.02. 2021

Accepted: 02.03. 2021

<https://jerpatterns.com>

June, 2021

Volume: 2, No: 1

Pages: 11-20

ABSTRACT

The Transtheoretical Model is an integrative model of behavior change developed in response to increasing theoretical diversity within psychotherapy. Since its conception, the model has been applied to a variety of behavior change contexts such as substance abuse, diet, and exercise. **PURPOSE:** to review and summarize the literature relative to applications of the Transtheoretical Model in exercise interventions, and to provide considerations for health professionals while using the Transtheoretical Model in their practice. **METHODS:** The components of the Transtheoretical Model of behavior change are parsed and analyzed to review their function and role in the model. In addition, the model is reviewed to determine the effectiveness of applying the Transtheoretical Model in conjunction to interventions aimed at increasing physical activity behavior. **RESULTS:** In general, results support the application of Transtheoretical Model for physical activity behavioral change, but not unconditionally. Beyond highlighting results of studies applying the Transtheoretical Model, implications and considerations for interventions using the models are also detailed. **CONCLUSION:** When acknowledging the multidimensional nature of the model, it is important to demonstrate a good understanding of how the various dimensions relate to one another and recognize how these relationships will influence intervention development.

Keywords: Physical Activity, Behavioral Change, Health Professionals

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INTRODUCTION

It has been well documented that exercise routine habits developed early in life persist across the lifespan. Resulting from alarming studies and surveys suggesting rapidly increased occurrences of obesity in youth and adults, there remains a presence of scholars dedicated to analyze this world-wide concern (Nelson et al., 2011; Pennington & Nelson, 2020). While a wealth of research has proven that nutritional habits are a direct cause to obesity, a similarly robust body of literature also suggests that lifestyle factors – such as physical inactivity - is also a major factor in obesity-related illnesses and related health conditions. Regular physical activity, among its numerous physiological and psychological benefits, also is proved to limit the probability of developing obesity, reduce occurrences of cardiovascular disease, and enhance individuals' quality of life (Nutbeam & Harris, 2004; Pennington, 2020a,b). The Physical Activity Guidelines for Americans suggest that persons participate in 150-300 of moderate-intensity, or 75 minutes to 150 of vigorous-intensity activity per week (U.S. Department of Health and Human Services, 2018). Chronic diseases, such as obesity, manifest themselves over the course of a lifetime, oftentimes with medical ramifications expressing several years after the underlying origination of the health condition has developed. Obesity is a condition that occurs as a result of an imbalance of energy in and out. Obesity is multi-dimensional, but it is well established that obesity is directly related to an over intake of energy substrates compared to what the body uses during total daily energy expenditure (i.e. the thermic effect of food, the resting metabolic rate, non-exercise activity thermogenesis, and exercise activity thermogenesis). Hence, increasing physical activity will have positive effects on reducing the likelihood of developing obesity due to providing a greater negative energy balance (Pennington, 2019).

Other chronic diseases are linked to lacking physical activity: Type 2 diabetes, Cardiovascular diseases (such as stroke, hypertension, and heart failure), cancer, and metabolic syndrome are the most common causes of mortality (World Health Organization, 2003). Hence, exercise remains a crucially important opponent to the many wide-varieties of chronic diseases (Roberts & Barnard, 2005; Nutbeam & Harris, 2004). To that end, clients, patients, and civilians should receive support and encouragement form leadership in health agencies at challenging task easier said than done (Graham-Clarke & Oldenburg, 1994). Research suggests that the deliberate use of behavioral theory will greatly increase the likelihood of behavior modification success (Hutchison, Breckon, & Johnston, 2009). One of the more commonly applied behavioral theory structures for physical activity-based interventions is the Transtheoretical Model (Prochaska & DiClemente, 1983; Prochaska, DiClemente & Norcross, 1992).

The purpose of this article is to review the literature relative to applications of the Transtheoretical Model (TTM) to exercise interventions, and to provide considerations for health professionals while using the model in their practice. Boundaries of this review include the exclusion of articles published in non-peer-reviewed journals outside the United States. Reasons for this restriction include access to articles and barriers related to the cost accuracy of translation. Additionally, with the exception of one article (Cardinal, Engels & Zhu, 1998), this review was bound to interventions concerning adult participants with one or more risk factor characteristics (i.e. obesity, tobacco use, etc.). Further inclusion criteria required articles published after the year 1979- the year the original language of the TTM was developed.

An Overview of the Transtheoretical Model

The TTM is a combinable scheme for initiating behavior modification created by Prochaska (1979) with roots in psychotherapy. Since the development of TMM as an instrument, it has been applied to a variety of behavior change applications such as diet, and exercise (Velicer, Prochaska, Fava, Norman & Redding, 1998; Hutchison, Breckon & Johnston, 2009).

The Transtheoretical Model Constructs: A defining feature of the TTM is the multiple components of its design - *stages of change*, the *processes of change*, *self-efficacy*, and *decisional balance* (Hutchison, Breckon, & Johnston, 2009). When applying the model as an intervention instrument towards modifying behavior, it is important to consider how each facet of the model behaves with one another.

The States of Change: The TTM construct, *states of change*, represents the movement of the individual from lower levels [or stages] of success [or progress] to higher levels of success (Adams & White, 2005; Velicer et al., 1998). The *stages of change* construct is further broken down into smaller phases, such as:

1. *Precontemplation* (e.g. individuals have no intention to take action regarding their behavioral modification, and they may not recognize that their behavior is undesirable),
2. *Contemplation* (e.g. individuals start to notice and accept that their behavior is undesirable, and they now begin to consider at the positive and negative effects of persistent undesirable behavior),
3. *Preparation* (e.g. individuals now have intent towards behavioral change in the short-term future, and they may start making small progress in-line with the desired behavioral change),
4. *Action* (e.g. individuals have now developed made intentional observable alterations in adjusting their undesirable behavior or possible have developed new healthy lifestyle patterns),
5. *Maintenance* (e.g. individuals have experienced at least six months of successful behavioral modification and are deliberate about avoiding *relapse*),
6. *Termination* (e.g. individuals now do not possess a desire to return to the undesirable behavior in any physical or emotional context, and are confident about their ability to maintain the desirable behavior, and lastly,
7. *Relapse* which, technically, is not considered a “stage” per se, yet it is a return from the *action* or *maintenance* stages to an earlier stage in the cycle.

Processes of Change: The processes of change construct is comprised of activities individuals utilized to advance through the stages. Most commonly, for individuals to advance they require: *decisional balance* (e.g. possessing awareness that the advantages of changing are greater than the disadvantages), *self-efficacy* (e.g. the confidence they can make and maintain changes in environments that make the old behavior appear attractive and/or desirable again), and the *processes of change* (e.g. the planned design that can assist the individual in making and maintaining their change) (Dallow & Anderson, 2003; Graham-Clarke & Oldenburgh, 1994; Marshall et al., 2003).

The Ten Processes of Change: The ten processes of change construct includes (Graham-Clarke & Oldenburgh, 1994; Dallow & Anderson, 2003; Marshall et al., 2003):

1. *Consciousness-raising* – increasing personal understanding through personal education and additional information -as well as relevant personal feedback - about the healthy behavior;
2. *Dramatic relief* – being afraid, anxious, or concerned due to the undesirable behavior, or experiencing encouragement and/or enthusiasm when hearing about how others have successfully modified unhealthy behavior;
3. *Self-reevaluation* – when individuals acknowledge that they want and identity and to live a lifestyle that includes the desirable, healthy behavior;
4. *Environmental reevaluation* – the recognition of how the undesirable behavior impacts other people;
5. *Social liberation* – the recognition of society being more supportive of the desirable behavior;
6. *Self-liberation* – the belief in their capacity to progress and the enforcement and re-enforcement of pledges to progress and change;
7. *Helping relationships* – locating others who support the behavioral change;
8. *Counter-conditioning* – replacing unhealthy ways of behaving/acting and thinking with desirable ways;
9. *Reinforcement management* – adding and enhancing accolades and compensations resulting from desirable behavior and eliminating or reducing rewards that come from undesirable behavior; and
10. *Stimulus control* – the use of cues and reminders that promote the desirable behavior as replacements for cues and reminders that promote undesirable behaviors.

Self-Efficacy: The construct of self-efficacy refers to the situation-specific confidence individuals have that they can cope with high-risk situations without relapsing to their unhealthy or high risk-habit. Greater levels of self-efficacy lead to greater changes in behavior. A change in the level of self-efficacy can predict a lasting change in behavior if there are adequate incentives and skills (Bock, Marcus, Pinto & Forsyth, 2001; Fahrenwald & Walker, 2003; Kim et al., 2004). Self-efficacy also deals with how well one can execute a course of action to overcome a high-risk situation or deal with prospective situations. Banduras(1977) provided four sources of efficacy beliefs:

1. Performance outcomes,
2. Vicarious experiences,
3. Verbal persuasion, and
4. Physiological feedback.

Considerations of these four sources enable physical activity facilitators to better ensure adherence to physical activity patterns and behavioral modification.

Decisional Balance: The decisional balance construct reflects the individual's relative weighing of the pros and cons [or advantages and disadvantages] of changing. The pros and cons combine to form a decisional "balance sheet" of comparative potential gains and losses. The balance between the pros and cons varies depending on which stage of change the individual is in (Marcus et al., 1998). The evaluation of pros and cons is part of the formation of attitudes. During the change process individuals gradually shift from cons to pros, forming a more positive attitude towards the target behavior.

Findings: Applying the Model to Increase Physical Activity

The purpose of many studies in psychotherapy and health education has been to examine the constructs of the TTM of behavior change in relationship to exercise behavior (Fahrenwald & Walker, 2003). There is no doubt that the dynamic approach of the TTM to understanding physical activity including different stages of 'readiness' is an appropriate framework to understand behavior and behavior change (Biddle & Mutrie, 2008). One may view the success of the TTM in other health-related applications (i.e. smoking cessation), to perhaps lend confidence towards its application to the adoption of positive exercise patterns. Indeed, many researchers have shown the value of implementing the TTM as their theoretical framework in physical activity contexts in adults of differing ages (Cox Burke, Gorely, Beilin & Puddey, 2003; Dunn Marcus & Kampert, 1999). Be that as it may, the TTM application is only partially validated for predicting exercise behavior in adults (Plotnikoff, Hotz, Birkett & Courneya, 2001; Bock et al., 2001).

Following the results of research and directives of health professionals, some generalizable statements can be made regarding the state of research investigating the effectiveness of utilizing the TTM towards the end of increasing adherence to exercise adoption and maintenance. In general, results support the application of TTM for physical activity behavioral change (Adams & White, 2003; Marshall & Biddle, 2001; Plotnikoff et al., 2001; Dallow, & Anderson, 2003). While it has been successfully applied to health behaviors among adult samples (Fahrenwald & Walker, 2003), it may not be appropriate for preadolescents' exercise and exercise behavior due to issues related to children's level of independence regarding physical activity. In youth, level of exercise commitment is significantly related to gender, age, and grade level (Cardinal, Engels & Zhu, 1998).

Additionally, in research investigating the impact the theory has on exercise adoption, the stages of change construct is the dominantly reported upon dimension of the model (Hutchison, Breckon & Johnston, 2009; Bridle et al., 2005). Few studies have reported to have applied all facets of the model and subsequently have not acknowledged its multidimensional nature (Hutchison, Breckon & Johnston, 2009). However, researchers observing participants longitudinally (i.e. Plotnikoff et al., 2001; Hilton, Doherty, Kendrick, Kerry, Rink & Steptoe, 1999; Steptoe et al., 1999; Steptoe, Kerry, Rink & Hilton, 2001), rather than cross-sectionally (i.e. Cardinal, Engels, & Zhu, 1998), have observed changes across multiple constructs and may be richer in findings (Bridle et al., 2005).

The role of processes of change for physical activity behavior is unclear, and the presence of higher-order constructs is not always apparent in exercise applications of the model, although negative cases can be observed (e.g. Marshall & Biddle, 2001). Because the processes emerged from psychotherapy to treat addictions, their relevance specific to the exercise domain is uncertain, although, negative cases against this claim are also observable (e.g. Dallow, & Anderson, 2003; Marcus, Rakowski & Rossi, 1992).

Although research does not often investigate all the constructs of the model, it is understood that significant relationships exist between all the constructs of the model (Fahrenwald & Walker, 2003; Dallow & Anderson, 2003; Bock et al., 2001). Developing a deeper understanding of how these relationships play a role in motivating an individual to practice positive exercise patterns is crucial to properly implementing the model in physical activity contexts. Despite a lack of research exploring the implementation the TTM to its fullest fidelity, research suggests that even a "watered-down" TTM-based intervention will produce

more powerful and longer-lasting adherence to physical activity than a program lacking a theory (Dallow & Anderson, 2003; Kim, Hwang & Yoo, 2004).

Health-specific results enjoyed by participants engaged in exercise interventions applied through the TTM include: enhanced cardio-respiratory conditioning (Hilton et al., 1999; Dunn et al., 1999; Steptoe et al., 2001; Dallow & Anderson, 2003); deeper adherence to suggested lifestyle changes and exercise adherence (Steptoe et al., 2001; Bock et al., 2001; Cox et al., 2003); a measured progression through stages of change (Plotnikoff et al., 2001; Fahrenwald & Walker, 2003); a firmer commitment to decreasing blood pressure (Cox et al., 2003); improved body composition (Dunn et al., 1999; Steptoe et al., 2001; Kim, Hwang & Yoo, 2004; Dallow & Anderson, 2003); and a fuller developed self-efficacy towards physical activity fostered through positive progression through an exercise intervention utilizing the TTM (Bock et al., 2001; Marcus et al., 1998; Dallow & Anderson, 2003). In all of the aforementioned studies, participants engaged in exercise interventions were adults ages 18-69 years (the majority falling in the range of 35-65 years) who possessed one or more physical activity risk factors associated with their lifestyle or health condition. These risk factors include: smoking, diabetic, obesity (BMI 30 + kg/m²), a high total cholesterol (6.5 + mmol/L), elderly, self-reported sedentary lifestyle, time constrained (e.g. new motherhood), and possessing a self-reported low level of exercise self-efficacy.

In conclusion, results of studies describing attempts to use the TTM aimed at increasing participants' likelihood of adopting and maintaining physical activity indicate to future researchers and health professionals that the TTM is reasonably effective, although some scholars indicate that TTM-based activity promotion interventions may be less effective than originally proposed (Hutchison, Breckon & Johnston, 2009). Adams and White (2003) argue that physical activity behavior is more complex than single behaviors (e.g. smoking). Therefore, interventions that treat physical activity as a single behavior may fail to recognize the complexity and specificity required for exercise interventions. Additionally, as noted, many studies reported on the TTM-based interventions as the related solely to the stages of change. Because these studies neglected other constructs and dimensions of the model (processes of change, self-efficacy, and decisional balance), results may lack in the sophistication of analysis required to "complete" the findings of the exercise intervention in relationship to the full model.

Discussion: Implications for Using the Transtheoretical Model

How can we analyze this information to help with program development? The following are considerations for applying the TTM to increase physical activity to short- and long-term success (inspired by Hilton et al., 1999; Steptoe et al., 1999; Steptoe et al., 2001; Bock et al., 2001): (a) because baseline and post-intervention evaluations may be misleading, trained health professionals, like nurses, may be ideal for the evaluation of measurable physical health variables of participants rather than relying, solely, on self-determined health status; (b) interventions may provide individually tailored feedback reports matched to participant's stage of motivational readiness for physical activity adoption. Ideally, these reports will target deficiencies and reinforce successes and assets to improve participants' construct of self-efficacy; (c) interventions can supply self-help manuals matched to participant's stage of motivational readiness for physical activity adoption. Ideally, these manuals will be focused on processes of change in different stages of behavior change; (d) repeated exposure to intervention materials is likely to increase an interventions long-term success. Follow-ups, for example, phone calls, text messages, and regularly-scheduled counseling sessions, may be considered to maintain exercise adherence and further foster more desirable decisional balances among participants; and (e) interventions employing health counselors and health coaches may

suggest embarking in modest goal setting with their clients. Specific, measurable, attainable, realistic, time-oriented goals are more likely to foster self-efficacy than alternative goals, leading to improved decisional balance, appropriate considerations within the process of change construct and ultimately a continuation of exercise within the maintenance stage of change construct.

Limitations and Recommendation

The stages of change construct is a variable, not a theory. Many TTM-based interventions may be flawed because they are variable rather than theory driven (Bridle et al., 2005). The stages of change is an organizational construct, which on its own provides no explanation of behavior change. It is only when it is combined with the other dimensions of the model that any explanatory power can be assumed. When acknowledging the multidimensional nature of the model, it is important to demonstrate a good understanding of how the various dimensions relate to one another and recognize how these relationships will influence intervention development.

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