

Prognosis

Prognosis is a medical term to describe the likely outcome of an illness.

Programmed Cell Death

► [Apoptosis](#)

Progressive Overload

A fundamental principle in resistance training that states in order to see adaptations in body structures, physiological function, or performance, an increasing demand must be placed on the neuromuscular system, e.g., increasing the resistance over time.

Pro-inflammatory Activation

Pro-inflammatory activation (or classical activation) is a macrophage inflammatory state characterized by the secretion of pro-inflammatory chemokines (CCL2, CCL8), and cytokines (IL-12, TNF α), ROS, a high microbicidal activity. It can be triggered in vitro by IFN γ and/or LPS treatment. Proinflammatory macrophages are associated with acute inflammation.

Pro-inflammatory Cytokines

Cytokines produced predominantly by activated immune cells and are involved in the amplification of inflammatory reactions. These include IL-1, IL-6, TNF- α , and TGF- β .

Promotion of and Adherence to Physical Activity

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Synonyms

[Compliance](#); [Develop](#); [Encourage](#); [Engagement](#); [Involve-](#)
[ment](#); [Participation](#); [Prompt](#); [Raise](#); [Retention](#)

Definition

Promotion refers to the encouragement of something (e.g., physical activity) to happen or develop. However, getting started and continuing an activity, such as an exercise program, can be two different processes, requiring different strategies. Generally, adoption refers to the beginning stage of an exercise regimen, while adherence refers to maintaining it for a prolonged period of time, following the initial adoption phase, that is, the level of participation achieved in a behavioral regimen once the individual has agreed to undertake it. Central to adherence is the assumption that the individual voluntarily and independently chooses to engage in the activity. Adherence is generally regarded as a largely psychological issue and knowledge about it becomes paramount in health promotion efforts [1]. Unfortunately, inconsistencies in the literature on definitions and measurement of adherence make valid comparisons among studies difficult. Also, long-term follow-up of behavioral intervention methods and their effect on exercise adherence is generally lacking [2, 3]. Current studies suggest that there are different processes associated with short-term versus long-term behavior change. Consequently, some behavioral strategies may be more important for the ► [maintenance](#) phase compared with initiation of ► [physical activity](#). In this regard, it is critical that future studies provide information on the greatest influences to the initiation and long-term adherence to physical activity [4].

Increasing the prevalence of people who are physically active (i.e., foster promotion and adherence) demands several contributions including understanding/investigating the determinants (correlates, ► [mediators](#)) of active and inactive lifestyles, both in the short- and the long-term, developing assessment tools for the behavior and outcomes from both acute and chronic involvement in activity, testing appropriate theoretical frameworks and related adherence strategies for interventions, and conducting robust evaluations of interventions and training other professionals in behavior change strategies [5]. Furthermore, research on exercise adherence has typically focused on planned bouts of high-intensity exercise scheduled for specific times and days. A focus on other types of physical activity (e.g., occupational, transportation, routine activities) that strongly influence total daily energy expenditure demands a reconceptualization of both definitions and measures of adherence. It has become clear that in order to continue to advance the field of exercise behavior, researchers must develop broader definitions of physical activity participation that extend beyond the traditional definitions of program adherence.

Characteristics

Given the complexity of the processes involved, exercise adherence is not the domain of a single field. Theoretical and practical contributions on its promotion come from several fields such as exercise science, sports medicine, preventive medicine, health psychology, behavioral medicine, epidemiology, nutrition, health promotion, rehabilitative medicine, communication, marketing sciences, and public policy. Regardless, the high prevalence of physical inactivity raises the central question of how to optimally facilitate the adoption of a physically active lifestyle over the long term. The continued development and expansion of conceptual approaches that can broaden our understanding of factors that potentially influence physical activity participation is critical. In order for interventions to be effective a sound understanding of physical activity determinants or correlates, preferably rooted in sound theoretical frameworks, is needed [6].

Research in the physical activity promotion arena has focused on the application of theoretical perspectives aimed primarily at personal levels of understanding and analysis. The investigation of such theories has provided important insights related to potentially useful correlates of physical activity behavior and have been cogently reviewed elsewhere [6]. In brief, the main theories used have been the health belief model, theory of planned behavior, social cognitive theory, the transtheoretical model and, more recently, self-determination theory. Background on these theories is available elsewhere [7, 8].

Taking research beyond the personal level, there has been a greater recognition of the “bigger picture” of the influences in physical activity, whereby factors associated with, or directly influencing physical activity, are placed within a wider framework that go beyond the psychological level to Social (societal values and preferences, public policies, economic/market factors) and Built Environments (land use patterns, the transportation system, and design features). Factors associated with physical activity can fall in several arenas: (1) demographic and biological; (2) psychological, cognitive, and emotional; (3) behavioral attributes and skills; (4) social and cultural; (5) physical environmental; or (6) physical activity characteristics. The fact that there are multiple correlates within each category of variables strongly suggests a very complex causal web. The documentation of intrapersonal, interpersonal, social/cultural, and physical environmental correlates seems to demand a multilevel ecologic approach to understanding physical activity [6]. However, identifying social and environmental determinants of physical activity is complex and it is far from complete. For example it is difficult to sort out which characteristics of the built environment have the

strongest association. Nor does the literature illuminate the strength of the associations or the populations affected. More important, the evidence falls short of establishing causal connections. Weaknesses of the current literature include the lack of a sound theoretical framework, inadequate research designs, and incomplete data. Nevertheless, it provides preliminary evidence that some characteristics of the built environment may affect physical activity levels, or at least certain types of physical activity (e.g., destination-oriented travel or recreational physical activity). These characteristics include certain land use measures (e.g., density, diversity of uses), accessibility, certain design features, and certain aspects of the transportation infrastructure (sidewalks in particular) [11].

Table 1, adapted from a previous review [6], shows the pattern of findings pertaining to the influences on overall physical activity in adults, depicting variables evaluated in multiple studies (combined by levels of evidence), and, when applicable, the theory or theories involved. Even if an initial scan of the field (documented in the table) suggests that variables involved are too numerous to provide definitive guidelines for behavior change, a closer inspection shows that approaches that articulate the important role of support, perceptions of competence and beliefs concerning autonomy and control have degrees of overlap and provide important guides for behavior change. In addition, stage-based, hybrid models, and Motivational Interviewing-based protocols, provide pragmatic frameworks to apply theoretical principles [5].

Regarding the most common strategies used to promote physical activity behavior, they can typically be grouped into: (1) behavior modification approaches (e.g., prompts, contracts); (2) reinforcement approaches (e.g., charting attendance and participation, rewarding attendance and participation, feedback and testing); (3) cognitive-behavioral approaches (e.g., goals, self-talk, thought focus strategies, association, dissociation); and (4) social support approaches (e.g., social support from partner, group, or class). A recent comprehensive meta-analysis found that behavioral interventions appeared to be more effective than cognitive interventions and that interventions to increase physical activity should emphasize components such as self-monitoring, stimuli to increase physical activity, rewards, behavioral goal setting, and modeling of actual physical activity behavior [9]. However, when long-term sustained adherence is considered, additional strategies need to be taken into account, namely, the use of “intrinsic” approaches, which focus on the experience or the process of engaging in (meaningful) physical activity and require addressing motivation in a more detailed way. Because of their clinical relevance

Promotion of and Adherence to Physical Activity. Table 1 Variables associated with overall physical activity in adults. (Adapted from [6])

Correlate	Scope	Theory or model
<i>Repeatedly documented positive association with physical activity</i>		
Enjoyment of exercise	Psychological, cognitive, and emotional factors	SDT
Self-motivation		SDT
Self-efficacy		SCT, TPB, TTM
Expected benefits/outcome expectations		SCT, TTM
Intention to exercise		TPB
Stage of change		TTM
Perceived health or fitness		–
Self-schemata for exercise		–
Activity history during adulthood	Behavioral attributes and skills	SCT
Processes of change		TTM
Dietary habits (quality)		–
Physician influence	Social and cultural factors	SCT
Social support from friends/peers		SCT
Social support from spouse/family		SCT
Education	Demographic and biological factors	–
Income/socioeconomic status		–
Gender (male)		–
Genetic factors		–
<i>Repeatedly documented negative association with physical activity</i>		
Barriers to exercise/cons	Psychological, cognitive, and emotional factors	HBM, TPB, TTM
Mood disturbance		–
Climate/season	Physical environment factors	Eco
Perceived effort	Physical activity characteristics	SDT
Race/ethnicity	Demographic and biological factors	–
Age		–
<i>Repeatedly documented lack of association with physical activity</i>		
Knowledge of health and exercise	Psychological, cognitive, and emotional factors	HBM
Susceptibility to illness		HBM
Activity history during childhood	Behavioral attributes and skills	–
School sports		–
Smoking		–
Access to facilities (perceived)	Physical environment factors	Eco
Overweight/obesity	Demographic and biological factors	–
<i>Weak or mixed evidence of positive association with physical activity</i>		
Control over exercise	Psychological, cognitive, and emotional factors	TPB
Personality variables		–
Psychological health		–
Skills for coping with barriers	Behavioral attributes and skills	SCT, TTM
Decisional balance		TTM, SDT
Past exercise program		–
Type A behavior pattern		–

Promotion of and Adherence to Physical Activity. Table 1 (continued)

Correlate	Scope	Theory or model
Access to facilities (actual)	Physical environment factors	Eco
Childlessness	Demographic and biological factors	–
Injury history		–
<i>Weak or mixed evidence of negative association with physical activity</i>		
Lack of time	Psychological, cognitive, and emotional factors	–
Poor body image		–
Social isolation	Social and cultural factors	–
Intensity	Physical activity characteristics	–
High risk for heart disease	Demographic and biological factors	–
Marital Status		–
<i>Weak or mixed evidence of no association with physical activity</i>		
Attitudes	Psychological, cognitive, and emotional factors	HBN, TPB
Health locus of control		TPB
Value of exercise outcomes		TPB
Alcohol	Behavioral attributes and skills	–
Sports media use		–
Exercise models	Social and cultural factors	SCT
Past family influences		SCT
Cost of programs	Physical environment factors	SCT, Eco
Home equipment		Eco

HBM health belief model, TPB theory of planned behavior, TTM transtheoretical model, SCT social cognitive theory, SDT self-determination theory, Eco ecological models

these approaches are better explained below. Indeed, while some interventions proved to be effective and successfully increased physical activity in the short term, subjects often fall back into their original routines once the intervention period is completed. Maintenance and long-term adherence to physical activity are essential to achieve sustainable health effects. However, knowledge of effective intervention strategies for long-term maintenance of physical activity is at an early stage and is not often reported/achieved [3, 4].

Clinical Relevance

Understanding the mechanisms behind sustained physical activity is an important topic for conceptual and practical reasons, namely to develop more effective exercise promotion interventions and practices. Research on theory-based treatment-induced mediators of physical activity participation (i.e., intervention mechanisms contributing to physical activity change) is critical to identify potential causal mechanisms through which interventions operate, which can streamline and improve the program by focusing on effective components; active therapeutic

components could be intensified and refined whereas inactive or redundant elements could be discarded. Thus, progress in identifying the most effective treatments and understanding why treatments work or do not work depends on efforts to identify mediators of treatment outcome, a research endeavor that led to the recommendation that randomized controlled trials routinely include and report such analyses [6].

Motivation and Long-Term Promotion of Physical Activity

As pointed out, experimental research and increased theoretical and methodological clarity could accelerate the identification of effective behavior change techniques and the development of evidence-based practices. In the general population, research has now shown that maintenance of exercise is especially related to the process and the quality of the exercise participation experience, which emphasizes intrinsic or well-integrated motives, stressing the need to shift from outcome-focused treatments to process-oriented approaches. Results from a recent large randomized controlled trial [10] highlighted that exercise

autonomous motivation, a particular type of motivation, predicts long-term adherence to physical activity and weight loss maintenance in women. Contrary to the popular perception that all motivation is good motivation, this study showed that intrinsic reasons and well-internalized sources of (psychological) energy to be active, pertaining to autonomous motivation (as in feeling a sense of “ownership” and personal endorsement about one’s exercise routine), are potentially very useful for lasting behavior change, while more external/extrinsic types of motivation are not. The results of this trial highlighted the importance of interventions targeting the internalization of exercise behavioral regulation and making exercise and physical activity positive and meaningful experiences rather than simply focusing on immediate behavior change. In opposition, exerting pressure, establishing deadlines, having external contingencies such as using financial or similar incentives, and offering little choice about how to lose weight are all strategies with reduced likelihood of success. They can produce results but essentially they are a short-term solution for a long-term problem. Presently, researchers are finding that the qualitative aspects of motivation need to be more emphasized in interventions, as disappointing long-term results of interventions may be due to the fact that existing programs largely ignore the potentially crucial element of motivation for sustained behavioral change. Understanding better how to motivate physical activity and lifestyle changes is a critical issue.

These are significant issues also from a mental health perspective. Indeed, in the view of self-determination theory, physical activity can be an inherently rewarding activity that contributes to both happiness and subjective vitality. Intrinsic aspirations for exercise can contribute to the satisfaction of basic needs and an overall sense of wellness [8]. Thus, health professionals should be encouraged to help participants make the transition from “should” to “want to” motivation. Partially, this means going beyond teaching/training particular behavior change skills (e.g., goal setting, self-monitoring) to encompass strategies like participants’ verbalization of their own behavioral goals and exploration of how these goals can be accomplished in the context of their lifestyle, identifying factors that encourage more identified and intrinsic reasons for change (while downplaying external reasons to exercise), and promoting competence and confidence (e.g., through modeling). Also, and most importantly, the support of autonomy and self-initiation are recommended by assuring choice (e.g., promoting active experimentation, supporting subjects’ initiatives, minimizing external sources of control/pressure),

exploring individual values, meanings, and goals and how they can be linked to the targeted behavioral changes, and interpreting and deconstructing social pressures/expectations. In sum, it is important to help participants focus on their own valued goals (e.g., health and fitness, improved well-being) as well as behavioral targets (i.e., adopting certain exercises or attending a certain number of sessions per week), and also encourage the creation of enjoyable exercise environments. Fortunately, a wide variety of sports and physical activities are available, and these provide multiple opportunities for optimal challenges and different experiences that can help all people develop the sense of ownership and mastery that underpins autonomous regulation. Recommending lifestyle and informal physical activity over formal and programmed exercise may be another key to adherence. Adherence may be increased because of the relative ease of incorporating lifestyle exercise into daily life, enhancing confidence in the ability to perform physical activity (self-efficacy).

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