

Maintenance of Physical Activity Interventions: premises of efficacy individual

Manutenção de Intervenções de Atividade Física: premissas para eficácia individual

Mantenimiento de Intervenciones de Actividad Física: premisas para la eficacia individual

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This is a review aim to present of a physical activity research program examining the *Maintenance* aspect of the RE-AIM model. The studs considered with middle-aged and older adults. It is consider maintenance at the individual level typically represented by the degree to which initial changes in participant behavior are sustained over time. In most cases, this reflects six months or more post intervention. In particular it review the extent to which self-efficacy is implicated in the maintenance of physical activity. This work suggests that perceptions of personal efficacy are important for initial adoption of this health behavior but also for maintenance for periods as much as five years. Importantly, these effects are sustained when past behavior is controlled. As self-efficacy is modifiable, it should be possible for interventionists to design strategies to enhance efficacy thereby maximizing maintenance.

Descriptors: Exercise; Motor activity; Self efficacy; Intervention studies; Health behavior.

Esta é uma revisão que tem como objetivo apresentar investigações sobre atividade física examinando o aspecto *Manutenção* do modelo RE-AIM. Os estudos citados realizaram-se com adultos de meia-idade e idosos. Considerou-se manutenção ao nível individual, tipicamente representada, pelo grau em que as alterações iniciais no comportamento do participante são mantidas ao longo do tempo. Na maioria dos casos, isso reflete seis meses ou mais pós-intervenção. Em particular, foi analisada em que medida a auto-eficácia está relacionada com a manutenção da atividade física. Este trabalho sugere que as percepções de eficácia pessoal são importantes não só para adoção inicial deste comportamento de saúde, mas também para a manutenção por períodos maiores que cinco anos. É importante ressaltar que esses efeitos são sustentados quando o comportamento passado é controlado. Como a auto-eficácia é modificável, é possível aos intervencionistas traçarem estratégias para melhorar a eficácia maximizando assim a manutenção.

Descritores: Exercício; Atividade motora; Autoeficácia; Estudos de intervenção; Comportamentos saudáveis.

Esta es una revisión que tiene como objetivo presentar investigaciones sobre actividad física examinando el ítem *Mantenimiento* del modelo RE-AIM. Los estudios citados se realizaron con adultos de media edad y ancianos. Se consideró mantenimiento al nivel individual, típicamente representado, por el grado en que las alteraciones iníciales en el comportamiento del participante son mantenidas a lo largo del tiempo. En la mayoría de los casos, eso refleja seis meses o mas pos-intervención. En particular, fue analizada en qué medida la auto-eficacia está relacionada con el mantenimiento de la actividad física. Este trabajo sugiere que las percepciones de eficacia personal son importantes no solo para la adopción inicial de este comportamiento de salud, sino también para el mantenimiento por períodos mayores a cinco años. Es importante resaltar que esos efectos son sustentados cuando el comportamiento pasado ha sido controlado. Como la auto-eficacia es modificable, es posible para los intervencionistas trazar estrategias para mejorar la eficacia maximizando así el mantenimiento.

Descriptores: Ejercicio; Actividad motora; Auto-efectividad; Estudios de intervención; Comportamientos saludables.

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INTRODUCTION

Recent data suggest that individuals who adhere to physical activity guidelines have significantly reduced all-cause mortality compared with those who do not¹. However, adhering to health regimens such as regular exercise, weight management, and medication use are notoriously difficult for people to maintain on a long-term basis.

Maintenance, in the context of the *RE-AIM* model, is manifest at both the individual and the setting level. At the latter level, maintenance is determined by assessing the extent to which a program or policy has been institutionalized or become part of organizational practices and policies. Maintenance at the individual level is represented by the degree to which initial changes in participant behavior are sustained over time; typically, this reflects six months or more post intervention.

The article aim to present of physical activity interventions for middle-aged and older adults conducted by the Exercise Psychology Laboratory at the University of Illinois over the past two decades.

This work is grounded in social cognitive theory² and, in particular, the role played by self-efficacy in effecting the maintenance of physical activity behavior. Self-efficacy has long been considered the “active agent” in social cognitive theory and reflects beliefs regarding an individual’s capabilities to successfully carry out a course of action³.

In lay terms, self-efficacy may be considered a situation-specific form of self-confidence. As self-efficacy expectations can be subject to both external (vicarious experiences) and internal (enactive attainment) influences, they are ideal targets for manipulation⁴ and intervention⁵.

The primary sources of efficacy information include past performance accomplishments (mastery experiences), social persuasion, social modeling, and the interpretation of physiological and emotional states².

Efficacy expectations are theorized to influence the activities individuals choose to pursue, the degree of effort they expend in pursuit of their goals, and the levels of persistence they demonstrate in the face of setbacks, failures, and difficulties. Clearly, choice, effort, and persistence are important elements of successful adoption and maintenance of physical activity behavior.

The self-efficacy would appear to be a very natural correlate of this complex health behavior and, indeed, it has been one of the most consistently reported correlates of exercise behavior and its outcomes⁶. Subsequently, we believe that a focus on this correlate of physical activity behavior has importance for the consideration of maintenance at the individual level as an integral part of the *RE-AIM* model. The objective of this study is to present of a physical activity research program examining the *Maintenance* aspect of the *RE-AIM* model in middle-aged and older adults.

METHOD

This is a brief review of studies conducted in a United States research center with a focus on the maintenance of physical activity behavior.

It is summarize data from several prospective studies and exercise trials conducted by our laboratory located at the University of Illinois, Urbana-Champaign. As such, it report on the association of self-efficacy with maintenance of physical activity for periods that range from four months to five years.

RESULTS

It is present eleven publications describing the work conducted at laboratory focusing on the association between self-efficacy and physical activity behavior among middle-aged and older adults with a special emphasis on the Maintenance dimension of the *RE-AIM* framework.

One publications are from the 1980s, six of 1990s, three from the 2000s, and 1 from

the 2010s. All eleven publications ten are articles, and were published in 6 different journals, including three journals focusing on behavioral health, one on older adults' health, one on preventive medicine, and one on epidemiology. one publication is referred of book.

DISCUSSION

As previously noted, it have systematically examined the role played by self-efficacy in the maintenance of physical activity in middle-aged and older adults over the past two decades. In an early study⁷, it reported that self-efficacy at baseline of a 5-month activity program for low-active, middle-aged adults ($N = 103$) was predictive of adoption during the first three months of the program, with more efficacious individuals having greater frequency of attendance.

In an effort consider how self-efficacy influenced maintenance, a follow-up assessment was conducted nine months beyond baseline⁸. Of the original 103 participants, 82 individuals (79.61%) completed assessments at this time. Self-efficacy to continue exercising was assessed at the end of the 5-month program to predict exercise participation at follow-up (assessed via telephone interviews).

Aerobic capacity, previous exercise behavior, and exercise intensity during the program were also included as predictors of future activity. All of the predictor variables were correlated with exercise behavior at the bivariate level, but only self-efficacy emerged as a significant predictor of exercise participation over the 4-month follow-up period.

Given the malleability of self-efficacy as a construct, such findings might suggest that focusing on self-efficacy as a key component of physical activity interventions may be profitable for further enhancing maintenance at the individual level.

Building on these encouraging results, McAuley et al⁵ conducted an efficacy-based randomized controlled trial to examine exercise behavior at several stages of the

exercise process (i.e., adoption and adaptation, maintenance). Sedentary, middle-aged adults ($N=114$) were recruited to participate in the program and were randomly assigned to either an adherence intervention condition or an attention control condition. Both groups participated in a progressive 3-day per week, 5-month exercise program in which each hour-long session consisted of a warm-up, an aerobic activity period (walking), and a cool-down.

Based on the tenants of self-efficacy theory⁹, the adherence intervention incorporated the four primary sources of efficacy-based information (mastery experiences, social modeling, social persuasion, and interpretation of physiological states) from baseline to program termination at month five.

The attention control condition received non-exercise, health-related information throughout the program. Results revealed significant treatment effects for the efficacy-based adherence condition in comparison to the attention control group. Each month, the intervention condition exercised more frequently ($ds = .40 - .59$), spent more time engaged in exercise ($ds = .31 - .55$), and walked greater distances than the control group ($ds = .23 - .52$). Self-efficacy was a significant predictor of exercise behavior in the early and middle stages of the exercise trial but not at the program's end.

This finding is in line with the literature which states that efficacy plays a greater role in the early stages of exercise behavior (adoption and adaptation), but as the behavior becomes more routine and possibly less demanding over time, the role of self-efficacy as a predictor may begin to diminish^{7,10}.

The studies presented above provide evidence which suggests that efficacy judgments are more salient during the earlier stages of the exercise process⁵, and that self-efficacy at the end of a structured exercise program is a significant determinant of exercise at follow-up⁸.

However, these findings were specific to a walking-based exercise program which limits generalizability, at least to some extent, as other modes of exercise might produce conflicting results and alternate conclusions. To address this, McAuley et al¹¹ recruited 174 sedentary older adults to participate in a 6-month randomized controlled trial examining the effects of two exercise modalities (i.e., walking vs. stretching/toning) on changes in exercise self-efficacy, as well as self-efficacy to overcome barriers.

Exercise classes for both conditions last for one hour, three times per week. The walking intervention was specifically designed to influence aerobic fitness, while the stretching and toning intervention focused on flexibility and strength. Following program completion, follow-up assessments to determine predictors and patterns on long-term maintenance were conducted at 6 and 18 months¹².

Adherence to the six-month program was 88% and this did not differ by exercise condition. At follow-up 80% of the original sample was willing to participate and preliminary analyses indicated that men were significantly more active at both the 6- and 18-month follow-up periods.

Importantly, participants had maintained their level of physical activity, as measured by the Physical Activity Scale for the Elderly (PASE¹³). Structural equation modeling tested several competing models of exercise prediction. The final, best fitting model revealed that greater exercise frequency during the 6-month program, more positive affect relative to being active, and greater social support were associated with greater self-efficacy at program end.

In turn, self-efficacy had a significant direct effect on exercise maintenance at 6- and 18-month follow-up. Thus, individuals who are more efficacious about exercise at the end of the six-month program are also more likely to maintain the behavior in the near future. Of particular importance is the fact that self-efficacy is a predictor of

physical activity maintenance *independent* of past exercise behavior.

Our research team continued to follow this sample to further determine the contributions of self-efficacy in predicting long-term maintenance by collecting physical activity at five years after program termination¹⁴. At this assessment period, 72.4% ($n=126$) of the original sample participated. There had been a 21% decline in physical activity, as assessed by the PASE, since the 18-month follow-up period, with mean levels of physical activity dropping below baseline. However, the greatest declines were in the stretching/toning condition, while the walking condition reported 5-year activity levels that were above baseline.

Subsequent analyses using covariance modeling revealed that PASE scores at 18-month follow-up were the strongest predictors of 5-year PASE scores; however, greater efficacy at program end and more positive affect continued to have a significant effect on 5-year activity independent of past behavior.

A recent study¹⁵, it is reported data from a 12-month physical activity intervention for older adults in which participants ($N=179$) were randomized to either a walking group or a flexibility, toning, and balance condition. Measures of executive function and self-regulatory strategy use were assessed at baseline, while self-efficacy was assessed three weeks into the program.

Maintenance of physical activity was measured by attendance for the subsequent 11 months in the program. Percentage attendance was 68.2% overall and did not differ by group. Path analyses indicated that use of self-regulatory strategies and cognitive (executive) function significantly predicted maintenance but did so indirectly through self-efficacy. Such findings stress the importance of executive function (i.e., being able to plan, multi-task, inhibit responses) and self-efficacy in one's ability to self-regulate challenging health behaviors. The

authors suggest that assessments of cognitive function prior to interventions might be useful in identifying those who may have difficulty maintaining behavior over time. Such knowledge might be used to develop strategies to promote the adoption and maintenance of exercise while trying to prevent attrition.

Long-term maintenance at the individual level is an important public health issue, yet the maintenance of physical activity behavior in efficacy trials is seldom assessed¹⁶. This is unfortunate because the successful maintenance of targeted health behaviors can provide aid in determining the value and effectiveness of various behavioral interventions.

CONCLUSION

The studies highlighted in this mini-review are of one research program's approach to understanding the maintenance dimension of the *RE-AIM* framework from a social cognitive perspective. Our findings underscore the importance and influence of self-efficacy on behavioral management and long-term maintenance. The progressive nature of self-efficacy in relation to adherence and maintenance is promising, as this construct can be easily targeted and modified throughout the course of an exercise intervention.

Moreover, the studies reviewed consistently showed that self-efficacy can have significant short-and long-term effects on the independent maintenance of physical activity (post-intervention).

The extent to which these findings are generalizable, however, have yet to be determined as the study samples reported here were self-selected, relatively homogenous in terms of demographic factors, participated in highly organized and supervised exercise environments, and were associated with a single research center.

Finally, it findings indicate that individuals with higher levels of exercise-related self-efficacy at program's end are more likely to engage in and maintain the

behavior in the long-run. As such, researchers should be encouraged to create exercise environments that target the sources of efficacy, not only to maximize adherence to the program itself, but to influence the eventual maintenance of the behavior in the future. Additionally, researchers should consider providing strategies to reinforce self-efficacy in the later stages of interventions, and also conduct at least one six-month follow-up assessment to examine changes in the behavior of interest, as well as overall program effectiveness.

Ultimately, if the effects of a behavioral intervention are not sustainable at the individual level, then it is not likely to have much of an impact on primary health attention.

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CONTRIBUTIONS

Thomas Richard Wójcicki contributed to study design and data analysis, participated in the interpretation of results; and contributed to the manuscript drafts;

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