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REVIEW ARTICLE

Is the answer for health always "more"?

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The regular participation in physical activity through resistance and endurance type exercise is associated with improvements in multiple physiological systems and is associated with improvement in markers of health. There are well established fitness principles for increasing aerobic capacity, muscular strength, muscular size, endurance, etc. The effectiveness of exercise protocols is sometimes judged based on whether the protocols are capable of improving those aforementioned outcomes. What is less discussed is whether it is necessary to emphasize "improvement" when the goal is maximizing the health span.

Objectives: To discuss whether there is a reason to progress beyond the minimum guidelines when the goal is health.

Design and Methods: Narrative Review.

Results: A review of recent papers on physical activity provide a compelling case for the importance of physical activity for reducing morbidity and premature mortality. It is clear that doing even a little bit of physical activity is likely to be beneficial for health. Some work has also found additional improvement beyond the minimum recommended guidelines.

Conclusions: Meeting the guidelines for physical activity is associated with numerous beneficial health outcomes. The ultimate goal is for individuals to maintain sufficient amounts of physical activity across their entire life span. For some, pushing themselves in exercise could be the motivation they need to maintain an exercise protocol for decades. For others, always having to push the boundaries is a deterrent and the goal could be to focus on achieving participation in the behavior rather than a focus on some change in outcome (e.g. strength).

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Key words: ■ exercise ■ health span ■ minimum guidelines ■ physical activity

INTRODUCTION

The mission of the American College of Sports Medicine is to educate and empower professionals to advance the science and practice of health and human performance.[1] The regular participation in physical activity through resistance and endurance type exercise is associated with improvements in multiple physiological systems and is often associated with improvement in numerous biomarkers of health.[2–5] There are well established fitness principles for increasing aerobic capacity, muscular strength, muscular size, endurance, etc.[6] The effectiveness of exercise protocols is sometimes judged based on whether the protocols are capable of improving those aforementioned outcomes. What is less discussed is whether it is necessary to emphasize "improvement" when the goal is maximizing the health span. Health span being defined as how many years one is spent with their physical function intact and free of chronic disease.[7] The goal of this article is not to suggest that someone who is inactive, maintain that level of inactivity. The purpose is to discuss whether there is a reason to progress beyond the minimum guidelines when the goal is improving health.

The Physical Activity Guidelines

Guidelines are given for preschool aged children, children and adolescents (6 through 17 years), adults, and older adults (65 years and older).[8] The same argument may be made for each but this article will specifically focus on adults. The key points from the guidelines for adults are noted as four separate points

"Adults should move more and sit less throughout the day. Some physical activity is better than none. Adults who sit less and do any amount of moderate-to-vigorous physical activity gain some health benefits."

"For substantial health benefits, adults should do at least 150 minutes (2 hours and 30 minutes) to 300 minutes (5 hours) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) to 150 minutes (2 hours and 30 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Preferably, aerobic activity should be spread throughout the week."

"Additional health benefits are gained by engaging in physical activity beyond the equivalent of 300 minutes (5 hours) of moderate-intensity physical activity a week."

"Adults should also do muscle-strengthening activities of

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moderate or greater intensity and that involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits."

Setting the stage

Consider this thought experiment. Person A, B, and C are identical outside of their physical activity levels. Since guidelines change over time, it is assumed that the aforementioned guidelines were the guidelines which were followed or not followed over time.

Person A is 50 years old, has been meeting, but not exceeding, the minimum physical activity recommendations since they were 20 years of age.

Person B is 50 years old, has been exceeding the physical activity recommendations and has progressed the stimulus as needed since they were 20 years of age.

Person C is 50 years old, has been inconsistent with physical activity and has not met the guidelines since they were 20 years old.

Who has improved their odds of having a longer health span? Who maximized their physiological response to physical activity? Is the answer to the former the same as the latter? Or, is having more overall adaptation not necessary for better "health"?

Being physically active is better than being inactive (Person A and B > Person C)

A review of recent papers on physical activity provide a compelling case for the importance of physical activity for reducing morbidity and premature mortality.[4] Further, in the second edition of the Physical Activity Guidelines for Americans[8] the benefits are summarized as follows

"…physical activity fosters normal growth and development and can make people feel better, function better, sleep better, and reduce the risk of a large number of chronic diseases. Health benefits start immediately after exercising, and even short episodes of physical activity are beneficial. Even better, research shows that just about everyone gains benefits: men and women of all races and ethnicities, young children to older adults, women who are pregnant or postpartum, people living with a chronic condition or a disability, and people who want to reduce their risk of chronic disease." Importantly, the document emphasized that there are clear differences between guidelines for health and athletic performance. The guidelines, noted above, state that even doing a little bit is likely to be beneficial. This is supported by a recent dose-response systematic review and meta-analysis published in The Lancet.[9] For all-cause mortality, cardiovascular disease incidence, dementia, and falls, an inverse non-linear dose response association was found, with inflection points around 5000-7000 steps per day (compared to 2,000 steps per day). Inverse linear associations were found for cancer incidence, type 2 diabetes incidence, and depressive symptoms. For the outcomes investigated, they observed that even very low step counts were associated with risk reductions (e.g. 3000 steps per day).[9] Interestingly, the coveted "10,000 steps per day" appears to still be a useful target for individuals interested in maximizing their health span. For example, although benefits were observed at lower volumes of activity, lower risks for all-cause mortality, cardiovascular disease incidence, cancer mortality, dementia, and depressive symptoms were observed in those exceeding 7,000 steps per day. However, the risks for other variables such as cardiovascular disease mortality, cancer incidence, type 2 diabetes, and falls were not appreciably reduced beyond 7,000 steps per day.

Other work highlights that combining aerobic exercise with resistance exercise may be even more effective at reducing all-cause and cardiovascular disease mortality.[4,10] There is also evidence that completing multiple types of exercise reduces rate of falls.[11] Interestingly, the supplemental data from that study indicates that this reduction in falls did not appear to depend upon whether or not the exercise program was progressed. This reduction in falls can be linked with other concepts such as the catabolic crisis model.[12] The catabolic crisis model states that there are periods of time in one's life where muscle loss is accelerated due to acute periods of inactivity. This may occur as a result of injury (e.g. fall). Once the individual is able to return to normal ambulatory activity, much of the muscle loss is likely regained (though may become more difficult with age). This loss of muscle tissue as a result of disuse (different from detraining) could negatively impact the individual's health span if for no other reason than the loss of physical function.[13,14] Taken together, performing minimum levels of activity is associated with beneficial effects with some outcomes being improved further in those who were doing more activity or combined activities.

Does doing even more physical activity, result in even more benefit (Person B > Person A > Person C)?

A summary of the Physical Activity Guidelines[15] stated that *"Over time, physical activity will get easier as the body adapts to performing physical activity that is greater in amount or intensity than usual. People should be encouraged to progress to higher levels of physical activity as they become more fit."* For developing and maintaining cardiorespiratory, musculoskeletal, and neuromuscular fitness the ACSM[6] recommends for cardiorespiratory fitness that *"progression is reasonable until the desired exercise goal is attained"*. For resistance exercise, however, it is recommended that *"A gradual progression of greater resistance, and/or more repetitions per set, and/or increasing frequency is recommended."* This is echoed in an article from Phillips, Ma, and Rawson [16] where it is stated that *"Although progressive overload is important to target long term, there are benefits to doing the bare minimum in frequency, load, time, type, and volume."*

Reviewing the Physical Activity Guidelines[8] and that recommended by ACSM[6], it appears that "more" is usually recommended if the individual can do more. Although there was some concern that too much physical activity might be deleterious,[17] this does not appear to be well supported in the literature. Although there is little risk to doing more[18,19], how much more of a benefit is there to be gained for health beyond the minimum recommended guidelines? For mortality, some work suggests that there is nothing to be gained beyond that

already recommended[19,20] whereas other work suggests some benefit to exceeding the minimum recommended guidelines[18]. Phillips et al.[16] argue that progression is important for resistance training. Notably, the importance they place on progressive overload is due to the belief that *"improving strength is essential to lowering mortality and disease risk."* However, the references provided support that while participation in relatively small amounts of resistance type exercise training is associated with reduced risk of all-cause mortality,[2,10,21] there does not appear to be any evidence provided in those studies that the effect was driven by increasing strength. Rather, it may be that incrementally progressing activity up to the minimum guidelines is all that is needed to largely saturate the purported beneficial effects of resistance training. It should be noted that this particular research question is difficult to address because relatively few people are completing physical activity at those upper limits of the physical activity spectrum. Absence of evidence is not evidence of absence but it is certainly reasonable to assume that the health benefits do not infinitely improve.

Is there merit to "more" even without health benefit?

The question of whether to progress after meeting the minimum guidelines for health span appears to be an open one. As noted earlier, some but not all work supports that more might be beneficial for mortality.[18] The different methodologies used make interpreting the literature a challenge (e.g. mortality vs health span). However, are there still reasons why the focus on "more" could be useful for some individuals even if the health benefits are not augmented? The ultimate goal is for individuals to maintain sufficient amounts of physical activity across their entire life span. For some, chasing after a goal and pushing themselves in exercise could be the motivation they need to maintain an exercise protocol for decades. For others, it may be that always having to push the boundaries is a deterrent and the goal could be to focus on achieving participation in the behavior (e.g. steps per day) rather than a focus on some change in outcome (e.g. change in strength). The importance placed on whether to progress to levels beyond the minimum recommended guidelines may depend upon the timepoint in an individual's life. As life goes on and responsibilities accumulate, doing the minimum to maintain may take on more importance for some.

CONCLUSIONS

Meeting the guidelines for physical activity is associated with numerous beneficial health outcomes. Progressing beyond the minimum may result in further improvement but there are almost certainly limits. For example, if a certain outcome is within a "healthy range" then what further improvement could one hope for? Of course, becoming stronger by progressing the exercise load makes completing activities of daily living even more submaximal. However, at a certain point those activities seem unlikely to benefit from further improvements in strength. The guidelines are clear that doing some activity is better than doing no activity. Slowly

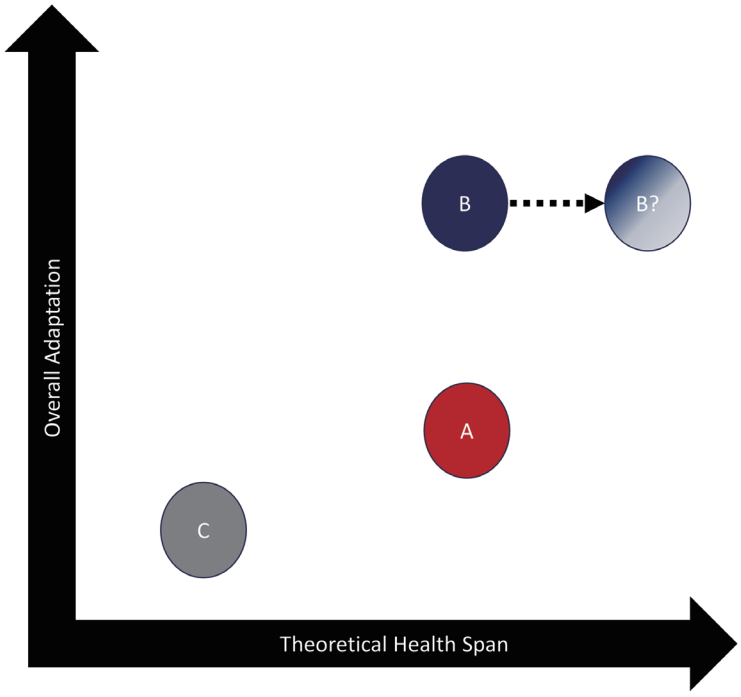

Figure 1. A hypothetical example comparing the relationship between overall adaptation and health span. "A", "B", and "C" refer to the three different scenarios described within the text. "A" meets the minimum physical activity guidelines only, "B" exceeds the physical activity guidelines and progresses the stimulus as needed, and "C" does not meet the physical activity guidelines. For overall adaptation, it is clear that "B" would almost certainly be superior to "A" and "C". The lesser known point is whether "B" would be better than "A" for health span.

progressing individuals up to the minimum guidelines for physical activity is likely to largely maximize their health span. Although there could be some benefit to progressing beyond the minimum guidelines, the ability to do more does not necessarily mean a further improvement in the health outcome of interest.

Although we traditionally judge the effectiveness of interventions on whether or not some physiological outcome "improves", there is merit in championing a message that maintenance of sufficient physical activity is beneficial even if it is unlikely to result in further measurable adaptation which would be expected of someone consistently progressing the intensity of their exercise bouts. Returning to the earlier example, it is almost certain that Person A and B would have a longer health span than Person C. Person B would almost certainly have greater overall adaptation than Person A but would that lead to an appreciable change in health span (Figure 1)? Time will tell.

DISCLOSURE STATEMENT

The author reports no conflicts of interest.

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