

Citius, Fortius, Altius, Cognitus—Understanding Which Psychological and Cognitive Components Drive Physical Activity and Exercise Benefits in Parkinson Disease

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With regard to a recent editorial,¹ we fully appreciate the “Olympic story” illustrated by the recently revised motto “*Citius, Fortius, Altius—Communitus*” (“Faster, Higher, Stronger—Together”), urging the scientific community to collaboratively address some issues of exercise benefits in patients with Parkinson disease (PD) and, more broadly, in patients with multiple chronic conditions. No doubt, more holistic and multidisciplinary approaches will advance the breakthroughs in diagnosis, treatment, and research.

By highlighting the quality of the large prospective observational study by Yoon et al,² de Vries and co-authors¹ elegantly refine the crucial issue of volume in the physical activity programs targeting the improvement of motor functioning and general health in PD. Therefore, the increased opportunities for people with PD to benefit from physical activity interventions, particularly the volume over quite a long period, prompt us to mention the pivotal psychological and cognitive components involved in specially adapted exercises. The benefits of intensity and volume of physical activities, or any other recent physiotherapy interventions in PD, are questionable if and only if the patients are engaged in regular physical practice. We all know that it is not always, if ever, sufficient to simply tell patients that they need to be active in noticing any change in exercise behaviors. We offer here a wider discussion of this very relevant and important issue.

“How to mitigate the difficulty of engaging participants in exercise regimens for prolonged periods”¹ needs to be recontextualized to address psychological facilitators and barriers to physical activity. People with chronic conditions practice less than the general population; too few achieve the minimum health-enhancing physical activity recommendations.³ Too few even participate in the proposed physical activity interventions, with a high drop-off rate and a low maintenance of programs.

A recent, exhaustive overview of the main theoretical frameworks has been proposed to challenge the psychological determinants of physical activity behavior in the general population⁴ and identified several facilitators and barriers intended to help individuals to initiate physical activity. Under the sociocognitive framework, physical activity facilitators include intention and self-efficacy, whereas some examples of barriers are perceived difficulty and stigmatization. According to the humanistic framework, facilitators include intrinsic motivation, psychological needs satisfaction, and perceived vitality, whereas some barriers are extrinsic motivation, psychological needs threat, and perceived

fatigue. Considering the dual-process framework, facilitators are positive automatic-affective valuation, automatic approach tendencies, and habits, whereas examples of barriers are negative automatic-affective valuation and automatic avoidance tendencies. Finally, the new conflict resolution models put forward that physical activity facilitators confront physical activity barriers in daily life.⁵ Such opposition produces motivational conflicts that must be resolved to favor a health behavior goal (eg, physical activity) instead of a competing goal (eg, sedentary activity). Among others, self-control has been acknowledged as a strategy to adaptively resolve motivational conflicts, thereby facilitating physical activity participation. However, conclusions on the relationships between these determinants and physical activity participation were mostly based on correlational studies, mainly conducted among the general population. Evidence from interventional studies addressing the plurality of determinants and/or the conflict resolution strategies in PD is lacking and should be expressly implemented to promote physical activity in patients with multiple chronic conditions. We argue that psychological facilitators and barriers to physical activity, its physiological components (with different intensity and volume training),² and practices that optimize the long-term participation in physical activity must be seen as a unified clinical research entity rather than separate issues. This also includes the compelling necessity of improving the environmental and financial access to physical activity opportunities.

Furthermore, how can the cognitive processes of executive function foster the participants’ engagement in physical practice in the long term? In addition to the effects of physical activity programs on cognitive performance in PD,⁶ the theoretical and empirical question of a virtuous circle linking the maintenance of physical activity over time and exercise-related executive improvement is increasingly being examined.⁷ Through the positive self-regulation of healthy behaviors, a bidirectional relationship between physical activity and executive functioning arises. In a 10-year follow-up of people aged between 50 and 70 years, with executive assessments occurring every 2 years, it was shown that the magnitude of executive performance was a determinant of sustained engagement in meaningful physical activity; any change in executive performance was associated with a change in physical activity behavior and vice versa. In addition, low executive performance was strongly predictive of physical inactivity and sedentary lifestyle habits with their respective and independent deleterious effects on health.⁸ In the same vein, recent studies found that executive function improvements during physical activity programs predict health behavior adherence. The participants with the greatest executive progress as a result of the program were those who maintained the highest levels of physical activity during the following year.⁹

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All other things being equal, the challenging question of the patients' engagement in a long-term physical activity can be answered to a certain extent by the ingredients involved in physical activity itself. Recent findings suggest that an important determinant for a beneficial outcome of physical activity is not just aerobic exercise with minimal cognitive demands but, first and foremost, cognitively enriched aerobic exercise (ie, with cognitive and motor skill component). In this regard, a randomized controlled trial¹⁰ showed that a 32-week intervention requiring both complex locomotor and cognitive exercise can maintain executive features and delay the cognitive decline in PD. These findings are crucial considering that executive dysfunction is frequently present from the early stages of PD.

Therefore, we propose “*Citius, Fortius, Altius, Cognitus—Communiter*” (“Faster, Higher, Stronger, More cognitive—Together”). Let us move to a new frontier and strive for cognitively enriched aerobic exercise, preferably involving long-term, intrinsically motivated, intentional, and pleasurable physical activity.

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