



# Relationships between gross- and fine motor functions, cognitive abilities, and self-regulatory aspects of students with physical disabilities



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## ARTICLE INFO

### Article history:

Received 29 September 2014

Received in revised form 28 September 2015

Accepted 15 October 2015

Available online 27 October 2015

### Keywords:

Congenital physical disabilities

Cerebral palsy

Motor disability severity

Self-regulation

Motivation

## ABSTRACT

This article reports research on self-regulatory aspects (i.e., goal-setting, self-efficacy and self-evaluation) of secondary and post-secondary students with congenital motor disabilities, who performed a ball-throwing-at-a-target task. Participants were divided into four subgroups presenting distinct combinations of motor and cognitive abilities (i.e., normal cognitive development and mild physical disabilities, normal cognitive development and severe physical disabilities, mild-to-moderate intellectual disability and mild physical disabilities, and mild-to-moderate intellectual disability and severe physical disabilities). Results showed that students presenting mild motor disabilities exhibited a positive self-concept and self-regulation profile, irrespective of their cognitive functioning. Students with considerable motor disabilities, but without cognitive challenges, presented a negative, though realistic self-concept and self-regulation profile. Finally, students with considerable motor disabilities and mild-to-moderate cognitive disabilities showed a positive, though unrealistic, self-regulation profile. The nature of the diverse relationship of motor and cognitive (dis)abilities to specific self-regulatory aspects are discussed, and important instructional implications are mentioned.

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## 1. Introduction

Self-regulation is an umbrella term addressing an array of cognitive, motivational and affective processes, designated to facilitate goal attainment (Cleary, Callan, & Zimmerman, 2012). Self-regulation qualities, however, do not operate independently in the process of goal pursuits, but they rather interact with other factors such as the person's physical and cognitive abilities, and the task demands (Heckhausen, 1991). Moreover, self-regulation does not always operate as a unified entity; specific aspects of this complex construct, such as task-specific self-concept or self-evaluation, are mobilized each time a person sets out to achieve a specific goal (Zimmerman & Cleary, 2006). Self-concept itself, although hierarchical and multidimensional, comprises generalized self-appraisals across situations (Marsh, Tracey, & Craven, 2006). There is evidence that the effective promotion of selected aspects of self-regulation may substantially improve knowledge and skills acquirement both in typical students and students with disabilities (Nader-Grosbois & Lefèvre, 2011; Zimmerman, 2008; Zimmerman & Kitsantas, 2005).

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Research has confirmed that students with physical disabilities can profit from a well-developed self-regulation, like all other students; however, it has also established that several structural parts of this construct, like goal-setting, self-efficacy and self-evaluation, are inadequately developed in this population (e.g., Siegert, McPherson, & Taylor, 2004; Wang, Badley, & Gignac, 2006; Wehmeyer, Yeager, Bolding, Agran, & Hughes, 2003). Specifically, Kunnen (1990, 1992) has found that a considerable number of students with congenital physical disabilities present diminished interest in achieving goals, insufficient persistence in task completion, reduced self-attribution of success, unrealistic self-evaluation, inadequate adaptation of their expectations following a success or a failure, and ineffective use of acquired information on task demands and characteristics (see also Jennings, Connors, & Stegman, 1988; Smidt & Cress, 2004). These shortcomings obstruct students with physical disabilities in their effort to adequately perceive the relation between their actions and the produced results (perceived contingency), thus preventing them from acquiring a realistic view of the causes producing success or failure (Kunnen & Steenbeek, 1999).

In searching for specific factors that may hinder students with congenital physical disabilities from developing and effectively using their self-regulatory strategies, researchers have examined the difficulties in movement coordination and executive functions encountered by various sub-groups of this diverse population. In the case of students with cerebral palsy, for example, it was found that the expected positive effect of goal setting on the quantity and quality of their kinematic patterns was substantially compromised by the difficulties encountered by them in programming and controlling successive movements and by their high failure rates in performing motor tasks (Chen & Yang, 2007; Smidt & Cress, 2004). Similarly, in the case of students with spina bifida it was found that the positive effect of self-regulation was to a considerable degree reduced, due to their difficulties in focusing attention and planning activities (Rose & Holmbeck, 2007). Finally, in reference to students with a history of epileptic seizures it was established that the low achievement level, the compromised persistence in task completion, and the unskillful/purposeless object manipulation may interfere with the growth of self-regulation (Hauser-Cram, 1996).

The functionality (in the sense of ICF-CY, cf. WHO, 2007) and the effectiveness of self-regulation seem to be decisively affected not only by the mere existence of a physical disability, but also by its severity (Camfield, Breau, & Camfield, 2001; Lee et al., 2010). Severe physical disabilities cause physical exhaustion or inadequate physical condition, which deprive the individual of the possibility to gain appropriate experience and develop adequate expertise through physical activity (e.g., Santiago & Coyle, 2004). Thus, the development of self-regulation is hindered to a considerable degree (e.g., Kitsantas & Zimmerman, 2002). A similar effect to that of physical exhaustion is also caused by ageing (Kunnen, 1992; Nosek, Hughes, Robinson-Whelen, Taylor, & Howland, 2006).

Evidently, the co-existence of intellectual and physical disability debilitates the developmental perspectives of self-regulation. Smidt and Cress (2004) reported positive correlations between the mental age of students with physical disabilities and their exploratory behavior, their persistence in task completion, and the degree of their task involvement. Eisenhower, Baker, and Blacher (2005) found that children presenting both cerebral palsy and intellectual disability develop lower self-regulation than children presenting merely Down syndrome. Varsamis and Agaliotis (2011) showed that students presenting both physical and intellectual disability face considerably more problems in their self-regulatory behaviour, than students with comparable cognitive functions, who present only intellectual disability. In children with epilepsy, the existence of intellectual disability is considered as a cause of behavioural problems, weakened mental health, and low self-esteem (Buelow et al., 2003). In the same vein, the co-existence of epilepsy and cognitive restrictions affects adversely several aspects of a child's school and home functionality (Camfield et al., 2001).

It should be noted, however, that, according to some indications, cognitive restrictions may exert a diverse influence on self-assessment/self-evaluation. Specifically, research involving individuals with spina bifida, cerebral palsy, and other physical or developmental disabilities, who presented also intellectual disability, failed to establish the expected negative influences on self-concept, especially in the areas of physical abilities and body appearance (Buelow et al., 2003; Minchom et al., 1995; Weiss, Diamond, Demark, & Lovald, 2003). A similar result was obtained by Varsamis and Agaliotis (2011) in their self-concept, goal orientation, and self-regulation profiling of students with physical, intellectual and multiple disabilities. Thus, it could be hypothesized that self-evaluative components of self-regulation may not always be negatively affected by intellectual disability.

In the face of the findings on the influence of cognitive abilities on self-assessment/self-evaluation the view can be supported that the severity of the physical disability and the level of the cognitive ability may have multiple and diverse relationships with self-regulation. However, it seems that inadequate and/or insufficient self-regulation tends to substantially compromise a person's ability to select courses of actions, to evaluate outcomes, and to revise, if needed, his/her decisions (Nader-Grosbois & Lefèvre, 2011; Wehmeyer & Schalock, 2001). Especially in the case of persons with physical disabilities, any motor and/or strength shortage, combined with inadequate self-regulation, may escalate ordinary motor tasks to real challenges, thus undermining both domain specific and global self-concept of these persons (Martin & Whalen, 2012). Instructors and program designers, then, interested in supporting students with physical disabilities achieving high levels of functionality (in school domain and further major life areas) should include self-regulation in the educational programs meant for these students.

The present research investigated the differences among students with physical disabilities possessing different sets of physical and cognitive characteristics, regarding self-evaluation, self-regulation and performance in a motor task. Furthermore, the present research sought to discover possible correlations between the severity of motor and cognitive functions, on the one hand, and difficulties in the development of the three aforementioned facets (self-evaluation, self-regulation and motor

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