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Why are they late? Timing abilities and executive control among students with learning disabilities

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ABSTRACT

While a deficient ability to perform daily tasks on time has been reported among students with learning disabilities (LD), the underlying mechanism behind their 'being late' is still unclear. This study aimed to evaluate the organization in time, time estimation abilities, actual performance time pertaining to specific daily activities, as well as the executive functions of students with LD in comparison to those of controls, and to assess the relationships between these domains among each group. The participants were 27 students with LD, aged 20–30, and 32 gender and age-matched controls who completed the Time Organization and Participation Scale (TOPS) and the Behavioral Rating Inventory of Executive Function-Adult version (BRIEF-A). In addition, their ability to estimate the time needed to complete the task of preparing a cup of coffee as well as their actual performance time were evaluated. The results indicated that in comparison to controls, students with LD showed significantly inferior organization in time (TOPS) and executive function abilities (BRIEF-A). Furthermore, their time estimation abilities were significantly inferior and they required significantly more time to prepare a cup of coffee. Regression analysis identified the variables that predicted organization in time and task performance time among each group. The significance of the results for both theoretical and clinical implications are discussed.

What this paper adds?

This study examines the underlying mechanism of the phenomena of being late among students with LD. Following a recent call for using ecologically valid assessments, the functional daily ability of students with LD to prepare a cup of coffee and to organize time were investigated. Furthermore, their time estimation and executive control abilities were examined as a possible underlying mechanism for their lateness. Although previous studies have indicated executive control deficits among students with LD, to our knowledge, this is the first analysis of the relationships between their executive control and time estimation deficits and their influence upon their daily function and organization in time abilities. Our findings demonstrate that students with LD

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need more time in order to execute simple daily activities, such as preparing a cup of coffee. Deficient working memory, retrospective time estimation ability and inhibition predicted their performance time and organization in time abilities. Therefore, this paper sheds light on the mechanism behind daily performance in time among students with LD and emphasizes the need for future development of focused intervention programs to meet their unique needs.

1. Introduction

The term learning disabilities (LD) refers to a wide group of neurological disorders caused by deficits in the central nervous system, which influence the individual's ability to maintain, process or convey information to others in an efficient way (Kavale & Forness, 2000). While the definition of LD varies around the world, most definitions focus on the academic domain (Scanlon, 2013), despite lack of knowledge about the implications of LD and comorbid phenomena (ADHD, DCD) for daily function and behavior in home, work and social environments (e.g., Johnson, Mellard, & Byrd, 2005; Sharfi & Rosenblum, 2014). The literature about students with LD is scarce, despite their increasing number in higher education settings (Heiman & Precel, 2003; Sparks & Lovett, 2009), which has reached approximately 5.7% of students in the United States (National Center for Education Statistics, 2009). In 2008, a law outlining the rights of post-secondary students with learning disabilities was approved in Israel. According to this law, learning disabilities in higher education institutions should be diagnosed by an authority, such as the Council of Higher Education (Law on rights of students with learning disabilities at post-secondary school institutions, 2008). It is approximated that 10–15% of the student population in Israel has been diagnosed with a learning disability (Law proposal on rights of students with learning disabilities at post-secondary school institutions, 2007). According to the Israeli Central Bureau of Statistics, in 2015 there were 264,552 post-secondary students in Israel (Central Bureau of Statistics, 2015). Yet, despite their high number, little is known about students with LD (Gropper, Gotlieb, Kronitz, & Tannock, 2014; Sparks & Lovett, 2009) and their participation in daily activities (Sharfi & Rosenblum, 2014a). Cognitive deficits experienced by those students are also inadequately understood (Gropper et al., 2014) and research about the relationships between their cognitive deficits and actual daily behavior is limited. The available literature on this population indicates that adults with LD deal with difficulties in the performance of daily activities such as baking, driving, using public transportation and participating in leisure activities (Sharfi & Rosenblum, 2014b). In addition, the research shows that students with ADHD require more time to complete everyday activities (Prevatt, Proctor, Baker, Garrett, & Yelland, 2011), and that those with LD also experience difficulties managing and organizing their daily schedule (Guare, Dawson, & guare, 2013; Dahan, Hadas-Lidor, Meltzar, & Roitman, 2008).

Managing a daily schedule requires organization of the tasks that need to be done within a time frame for efficient daily tasks performance (Lavoie, 2006; Rosenblum, 2012). Students with LD and ADHD have emphasized their difficulties in organization and time efficiency (Dahan et al., 2008), as well as their willingness to improve their organization and time management skills (Gropper et al., 2014). Poor time organization among students with LD or ADHD may affect their daily function, and manifest as late arrival to classes, difficulty adhering to time limits and deadlines, and postponing of tasks (Dahan et al., 2008; Guare et al., 2013). However, the literature on the ability of students with LD to organize and manage their daily tasks in time is limited, thus, more research is required to understand the underlying mechanisms (Rosenblum, 2012).

Time estimation, defined as the individual's ability to accurately perceive the duration of a temporal interval (Zakay, 1990), is required for the efficient organization of time (Rosenblum, 2012). Time estimation ability is generally evaluated by timing tasks that require retrospective or prospective responses (Bauermeister, Barkley, Martínez, Cumba, Ramírez, & Reina, 2005), while the participant estimates the duration of an interval, either knowing it in advance (prospective) or not (retrospective) (Hurkes & Hendriksen, 2011; Prevatt et al., 2011). Time estimation is an important ability for students' optimal daily performance, enabling them to estimate the time it will take to arrive to class on time, manage their schedule to allow sufficient time for studying, and start a project or homework assignment on time (Hurkes & Hendriksen, 2011; Prevatt et al., 2011). Despite its importance, there is a lack of research on time estimation abilities among people with LD (e.g., Willburger, & Landerl, 2010). In addition, though time estimation deficiency has been identified among individuals with ADHD (e.g., Pollak, Kroyzer, Yakir, & Friedler, 2009; Prevatt et al., 2011), most studies in this area have been performed in a laboratory setting and do not relate to real life daily tasks (Prevatt et al., 2011).

Time estimation is an executive ability (Barkley, 1997; Brown, 2009; Ustun, 2007), which enables the individual to execute certain activities while taking into account the given amount of time. Executive functions (EF) are higher-level cognitive functions which include complex goal-directed behaviors (WHO, 2007). They are composed of two close but separate executive abilities: meta-cognitive ability and motivational-emotional ability (Ardila, 2008; Dawson & Guare, 2004; Roth et al., 2005). According to the literature, individuals with LD have impaired executive abilities (e.g., Compton, Fuchs, Fuchs, Lambert, & Hamlett, 2012; Horowitz-Kraus, 2014; Varvara, Varuzza, Sorrentino, Vicari, & Menghini, 2014). In particular, college students with LD, ADHD and DCD struggle with executive difficulties in planning, inhibition, working memory, time organization and management (Brosnan, Demetre, Hamill, Robson, Shepherd, & Cody, 2002; Dahan et al., 2008; Fleming &