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INTRODUCTION

Early childhood education and cognitive neuroscience

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Early childhood (0-6 years) is a crucial period in a child's development during which his experiences can have a significant influence on subsequent learning (Duval & Bouchard, 2013; McCain, Mustard, & McCuaig, 2011). It is currently a major concern for government authorities in several countries around the world about how to best support children as they enter early childhood education (e.g., child care centers, 4- and/or 5-year-old kindergarten). In terms of research, early childhood and early childhood education receive considerable attention from researchers of different fields (e.g., education, psychology). In recent years, several studies have focused on the two-way relationship between the brain and early childhood development and learning.

In recent years, several studies (e.g., Gazzaniga, & Mangun, 2014; Kolb, Whishaw, & Teskey, 2019) have focused on the two-way relationship between the brain and early childhood development and learning. By examining how brain processes are involved in the early years development and learning for children, some studies contribute to deepen our current understanding of this developmental period, using a level of analysis specific to brain functioning and structure. Other studies (e.g., Choi *et al.*, 2016; Goble, Sandilos, & Pianta, 2019) focus more specifically on the effects of early childhood educational contexts, for example in terms of quality of educational practices, on children's cognitive and brain development. A better knowledge of these effects can thus contribute to pedagogical advancements in the field of early childhood education.

For this special issue, the *Neuroeducation* journal has invited researchers to present research results and theoretical or methodological arguments based directly or indirectly on brain functioning or structure in early childhood education. This issue is composed of two experimental studies, a methodological article, and a literature review.

First, the article by Noémie Montminy-Sanschagrin, Stéphanie Duval, and Caroline Bouchard reports the initial results of a study aimed at exploring "The link between self-regulation skills observed in 5-year-olds and the quality of interactions in preschool education classes" (free translation). This article discusses the significant relationships that were observed between certain dimensions of the quality of interactions and self-regulation processes and highlights the implications of these results for both the practice and research communities.

Then, the methodological article by Jérémie Blanchette Sarrasin, Lorie-Marlène Brault Foisy, Alexandra Auclair, Martin Riopel, and Steve Masson entitled "Guidelines for conducting a pre-post intervention study with preschool children using fMRI: The rationale behind the methodological choices of a research project on reading acquisition" discusses the challenges involved in conducting neuroimaging research projects with young children. More specifically, it presents the rationale behind the methodological choices of a quasi-experimental study using functional magnetic resonance imaging (fMRI) with preschool children. A discussion proposes guidelines that may facilitate the conduct of such research projects.

Next, Isabelle Deshaies, Jean-Marie Miron, Colette Picard, and Steve Masson present a review of the literature entitled "Better preparing preschool students to learn arithmetic: A review of studies proposing intervention programs based on the neurosciences" (free translation). One of the main conclusions of this review is that there are few intervention programs based on neuroscience research, and none specifically targeting the brain mechanism of inhibitory control, which is one of the three prerequisites considered essential for learning arithmetic in preschool.

Finally, Isabelle Deshaies, Jean-Marie Miron, and Steve Masson report the results of a research project they conducted to fill the gap identified in the previous literature review in "Effect of a pedagogical intervention aimed at learning inhibitory control on the development of prerequisites related to arithmetic in 5-year-old preschool students" (free translation). This article presents the main results of an intervention specifically targeting inhibitory control on the numeracy skills of 126 preschool students and highlights the role of inhibitory control in arithmetic learning.

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