

Université de Montréal

**Elements of a theory of social competence:
Socio-cognitive and behavioral contributions in typical
development**

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Résumé

L'être humain évolue quotidiennement au cœur d'un monde social hautement complexe auquel il est singulièrement adapté d'un point de vue évolutif. L'individu qui navigue de façon adéquate, parmi les situations et les interactions sociales, y parvient grâce à une machinerie cognitive sophistiquée et spécialisée connue sous le terme de « cognition sociale », composée d'un ensemble de fonctions acquises durant le développement et permettant la perception, le traitement, l'interprétation et la réaction à des stimuli sociaux dynamiques et nuancés. Le développement social serait sous-tendu par le fonctionnement cognitif global (p. ex. le fonctionnement intellectuel, le langage, la mémoire, l'attention, les habiletés visuoperceptuelles), ainsi que par des habiletés sociocognitives spécifiques (p. ex. la théorie de l'esprit, l'empathie, la reconnaissance des émotions faciales, la prise de perspective, l'attribution d'intentions, le raisonnement moral), le tout assuré par un ensemble de structures et réseaux neuronaux connu sous le terme « cerveau social ». Malgré les connaissances empiriques suggérant une association entre les facteurs neuronaux, cognitifs et environnementaux du développement social, notre compréhension des interactions dynamiques et complexes entre les habiletés sociocognitives, l'influence externe de facteurs environnementaux, ainsi que leurs impacts individuels et combinés sur le développement social typique demeure préliminaire. L'objectif général de cette thèse était d'étudier deux corrélats principaux qui sous-tendent la compétence sociale durant le développement, soient la cognition sociale et le comportement social. Le modèle SOCIAL (Beauchamp & Anderson, 2010) est utilisé comme cadre théorique et empirique pour explorer de multiples facettes du développement de la compétence sociale et des liens entre les habiletés sociocognitives (p.ex. le raisonnement moral et la prise de perspective) et le comportement social global.

La première étude explore la contribution des aspects cognitifs (théorie de l'esprit) et affectifs (empathie) de la prise de perspective au raisonnement moral et au comportement social des enfants et des adolescents neurotypiques. Un outil novateur d'évaluation du raisonnement moral, le Socio-Moral Reasoning Aptitude Level (So-Moral), fut utilisé pour rehausser la valeur écologique du construit. Ainsi, des dilemmes sociomoraux quotidiens ont été présentés aux

participants, qui ont également complété des mesures de théorie de l'esprit, d'empathie, et de comportement social. Les résultats suggèrent que les aspects cognitifs (théorie de l'esprit) et affectifs (empathie) de la prise de perspective contribuent conjointement à prédire la maturité morale chez les enfants, mais pas chez les adolescents. Par ailleurs, certaines lacunes au plan du raisonnement moral seraient associées à des instances plus fréquentes de comportements externalisés, mais aucun lien entre la maturité morale et les comportements prosociaux n'a été détecté. La théorie de l'esprit contribuerait de manière significative à la maturité du raisonnement moral chez les enfants, suggérant l'importance d'une évaluation cognitive d'une situation sociomorale. Comme les facteurs prédictifs du raisonnement moral différeraient chez les enfants et les adolescents, il est possible que des mécanismes sous-jacents distincts soient impliqués.

La deuxième étude documente l'association entre les facteurs externes, tels qu'opérationnalisés par le temps hebdomadaire passé à jouer à des jeux vidéo, et le comportement social. Cette étude vise également à comprendre les liens entre l'usage des jeux vidéo, la cognition sociale et l'adaptation sociale chez des enfants du primaire. L'étude révèle que les enfants qui passent moins de temps à jouer à des jeux vidéo par semaine tendent à exhiber plus de comportements prosociaux. Toutefois, aucun lien n'a été identifié entre la fréquence d'usage de jeux vidéo et les comportements mésadaptés. Il est donc possible que les interactions sociales complexes, réelles et face-à-face soient particulièrement importantes au développement des compétences sociales chez les enfants.

De façon globale, les données de la thèse contribuent à établir un portrait plus complet des relations complexes et dynamiques entre la cognition sociale, les expériences sociales et le comportement social lors du développement typique. Les résultats offrent des pistes novatrices quant à l'approfondissement des connaissances théoriques, empiriques et cliniques au sujet du développement social, et fournissent des fondements empiriques pour soutenir l'élaboration de programmes d'intervention et d'outils d'évaluation de la cognition et de la compétence sociale.

Mots-clés : cognition sociale, raisonnement moral, prise de perspective, empathie, théorie de l'esprit, jeux vidéo, fonctionnement social, enfance, adolescence.

Abstract

Humans are characterized by species-specific social skills and interactions, which direct much of their behaviors, dictate thought processes and form the foundations of human consciousness and reality. These social abilities are highly complex and intricate, involving a large range of developmentally acquired skills allowing the perception, processing, interpretation and response to dynamic social stimuli. The fine-tuning of these diverse abilities across the lifespan contributes to an individual's social competence, allowing the navigation of the social world. Smooth and adaptive social development is supported by core cognitive functions (e.g. intellectual ability, language, memory, attention, visual-perceptive skills), as well as by specific skills (e.g. theory of mind, empathy, emotion recognition, perspective taking, intent attribution, moral reasoning) referred to under the umbrella of "social cognition" and subsumed by neural structures and networks of the "social brain". Despite strong evidence supporting the associations between neural, cognitive and social functioning, much remains to be learned about the interplay between socio-cognitive abilities during development, the external influence of environmental factors, as well as their individual and additive impact on social behavior. The main objective of this dissertation was to study two manifestations of social competence in typical development, namely, social cognition and social behavior. The SOCIAL model (Beauchamp & Anderson, 2010) is used as the theoretical and empirical framework providing fertile ground for the investigation of multiple facets of the development of social competence and a better understanding of the global interplay of socio-cognitive skills (e.g., moral reasoning and perspective taking) and social behavior more broadly.

The first study explores the contribution of cognitive (theory of mind) and affective (empathy) aspects of perspective taking to moral reasoning and social behavior in typically developing children and adolescents. An innovative neuropsychological tool for assessing moral reasoning, the Socio-Moral Reasoning Aptitude Level (So-Moral), was used to enhance the ecological value of the construct. Everyday socio-moral reasoning dilemmas were presented to children and adolescents to evaluate their moral maturity, and assessments of theory of mind, empathy and social behavior were also completed. Jointly, both aspects of perspective taking (theory of mind and empathy) predicted moral reasoning maturity in children, but not in

adolescents. Poorer moral reasoning skills were associated with more externalizing behavior problems across the age span, but no associations were found with respect to prosocial behavior. Theory of mind skills were independent predictors of moral reasoning, suggesting that a cognitive understanding of the situation may be especially useful when children are asked to reason about a moral conflict. Contributing factors to moral reasoning differed in children and adolescents, suggesting differential underlying mechanisms.

The second study investigates the contribution of external influences, as operationalized by time spent playing video games, to social behavior. A secondary objective was to add to the growing body of literature exploring associations between video game playing, social cognition and social behavior, in an age group less frequently focused on (elementary school-aged children). The main results of the study indicate that children who spend less time per week playing video games have greater prosocial tendencies, but no association was found with behavior problems. Findings highlight the possibility that real-life, complex, and nuanced social interactions outside screen-based play may be central to fostering social competence skills in children.

Overall, the results of the studies presented in this dissertation contribute to building a more comprehensive picture of the complex interplay between social cognition, social experience and social competence during typical development. Findings offer new avenues for improving theoretical, empirical and clinical knowledge of social development and provide an empirical basis for the development of social skills intervention programs as well as social cognition assessment tools.

Keywords : social cognition, moral reasoning, perspective taking, empathy, theory of mind, video games, social functioning, childhood, adolescence.

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List of abbreviations

EF:	Executive functioning
MR:	Moral reasoning
SES:	Socioeconomic status
SIP:	Social Information Processing
SOCIAL:	Socio-Cognitive Integration of Abilities
So-Moral:	Socio-Moral Reasoning Aptitude Test
ToM:	Theory of Mind

Cette thèse est dédiée aux deux hommes de ma vie : un, qui n'est plus de ce monde, et l'autre, qui est, et sera toujours, mon monde.

In 1994 my father dedicated his doctoral dissertation at the University of Pennsylvania to his father, who had passed away by then, and to me (I was only nine years old at the time). The dissertation was entitled "The Elements of a Theory of Plans". His dedication was the following: "To Anne. May you make and realize many great plans".

How's this, Daddy?

Acknowledgments

Si cette thèse est dédiée aux hommes de ma vie, elle ne fut possible que grâce aux femmes monumentales et prodigieuses dont j'ai la chance inouïe d'être entourée. En premier lieu, maman, Hélène Gaudry Seni, archétype de courage, de grâce et de résilience, sans qui rien n'est possible. En second lieu, mes deux maîtres, Miriam Beauchamp et Nadia Lessard, femmes plus qu'inspirantes qui allient brillance et humilité, ambition et intégrité. Croître dans leur ombre, à leurs côtés, est encore un honneur infini.

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Rationale

“Man is by nature a social animal; an individual who is unsocial naturally and not accidentally is either beneath our notice or more than human. Society is something that precedes the individual. Anyone who either cannot lead the common life or is so self-sufficient as not to need to, and therefore does not partake of society, is either a beast or a god.”

Aristotle, *Politics*.

“It is not the consciousness of men that determines their being, but, on the contrary, their social being that determines their consciousness.” Karl Marx, Preface of *A Contribution to the Critique of Political Economy*, 1859.

Although many sentient beings exist and thrive in some form of group system, it can be argued that humans possess the distinct feature of regarding social interaction as a goal in itself. Aristotle, as cited above, may thus be right, for socialization is part of the essence of human life and value, and the fostering of adequate and fulfilling social interactions may be an Aristotelian virtue in itself. Indeed, not only are social interactions an inherent part of the fabric of everyday functioning, but positive social interactions are sought and valued in most cultures. Philosophers, sociologists, economists and psychologists of all kinds (evolutionary, social, neuroscientific) have long investigated this distinct characteristic of our social nature, exploring its innate roots as well as the varying differences in its expression, both typical and pathological. We have come to understand that adequate social functioning has its roots in the first social interactions we encounter as infants and continues to develop and mature throughout the lifespan. These skills emerge through delicate yet resilient interactions between what lies inside and outside the “black box”, i.e. the brain, and they involve a highly complex understanding of others’ subjectivity as well as regulation of our own behavior. While phenomenological manifestations of social competence occur in everyday observable interactions with others, psychology has appropriately been concerned with the social experience of individuals; this *qualia*, the social life as it is experienced by the individual, is at the basis of the understanding,

interpretation, and generation of those observable social behaviors which, in turn, become relational processes when we interact with other sentient beings.

This dissertation is concerned with the study of two of the main correlates that support healthy and adequate social competence in typical development, namely, social cognition and social behavior. The first study explores the interplay between specific socio-cognitive skills and their associations with social behavior, while the second study investigates the contribution of external influences, as operationalized by time spent playing video games, to social behavior. A third study, completed in collaboration with another PhD student, Evelyn Vera-Estay, as part of her PhD dissertation, was conducted in parallel to the first study and investigated the links between other socio-cognitive skills and social behavior. It is presented as an appended manuscript to be submitted for publication. In the following introduction, an overview of the definitions and models of social competence is first presented, in which the SOCIAL model (Beauchamp & Anderson, 2010) is put forward as a theoretical and empirical framework well-suited for an integrative approach to the study of social competence and its development in healthy children and adolescents. As such, the model presents a bio-psycho-social approach to addressing the contributions of socio-cognitive and external factors to social competence. Next, relevant components of social cognition are briefly discussed, with a focus on perspective taking, the overarching ability to cognitively and affectively be aware of, and respond to, the perspective of others in social interactions, effectively modulating adequate and morally mature social behaviors and experiences. General and specific external factors related to social behaviors are then discussed, in particular video gaming as a form of social experience and exposure. Finally, dissertation objectives and hypotheses are presented.

Introduction

Social Competence

Within psychology, social competence refers to the complex skills “required to engage socio-cognitive processes and display social behaviors” (Beauchamp & Anderson, 2010). Social cognitive neuroscience is a relatively recent discipline that addresses the neural underpinnings of social behaviors and social competence. A number of conceptual and empirical models from both psychology and neuroscience have been put forward to represent how individuals come to develop and maintain social competence and social skills.

Social Information Processing (SIP) models of social competence

Many theoretical conceptualizations of social competence have focused on the cognitive aspects of social interaction, namely the purported differences in the treatment of social (*versus* non-social) information and their impact on general social functioning. While Piaget paved the way for social cognitive development models (Piaget, 1932), Crick and Dodge (1994) were among the first theorists to develop a model of social information processing in adults, suggesting that social behavior is generally a consequence of what we know or think; that is, how we react to a social situation in relation to what we believe, understand and interpret to be true about others. This model accounts for situations in which misinterpretation of visual cues or incorrect outcome expectancies may result in inadequate social behavior (e.g., aggression, immoral conduct, inappropriate behavior), highlighting that effective processing at each of five stages is necessary for adequate social functioning. According to Crick and Dodge (1994), processing of social information thus involves a complex system of problem-solving steps ranging from perceptual skills (e.g. the encoding of social cues), to complex cognitive and interpretative skills (e.g. attributions of intent, clarification of goals, memory storage of social schemas, rules and social knowledge), resulting in socio-behavioral responses (e.g. behavior enactment).

Lemerise and Arsenio (2000) later revised and broadened Crick and Dodge’s original model (1994) in order to include socio-emotional and moral processes, arguing effectively that social knowledge and schemas are impacted on bi-directionally by emotional and affective processes (e.g. temperament, arousal, emotion regulation) as well as cognitive ones (see Figure 1).

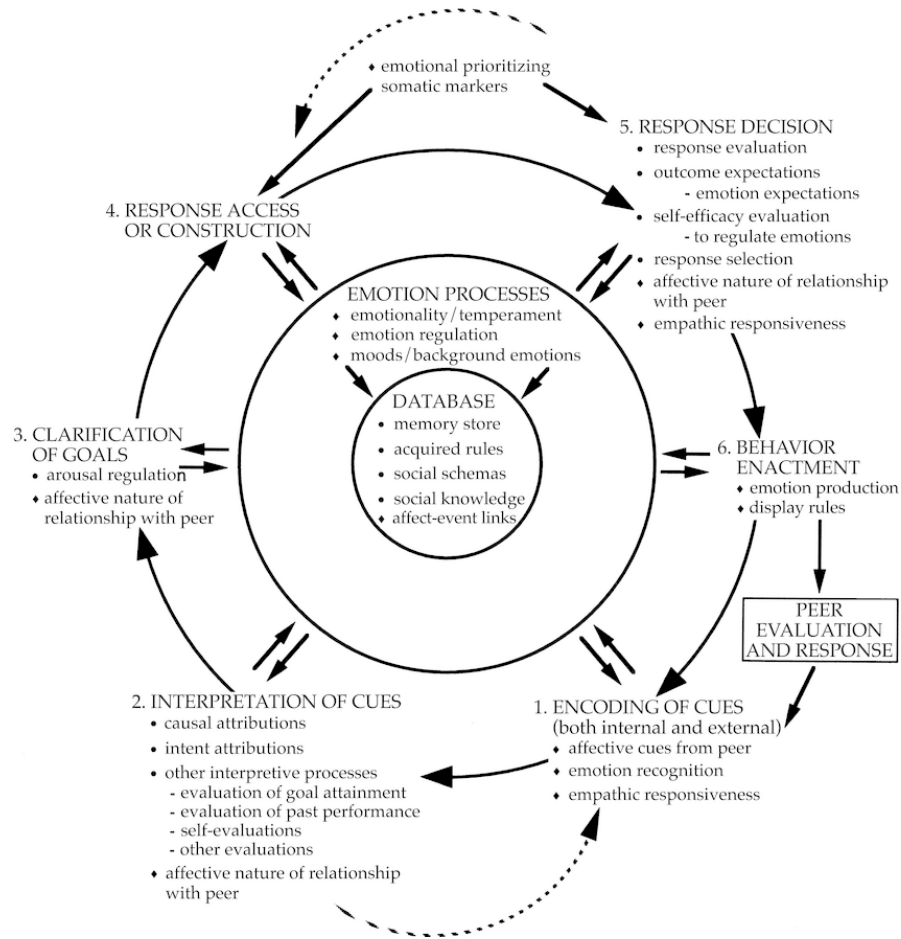


Figure 1. Lemerise and Arsenio’s integrated model of emotion processes and cognition in social information processing (2000).

Developmental and constructivist models of social competence

While SIP models have the advantage of putting forth the importance of cognitive and executive skills in relation to social behaviors, they cannot fully address the varying ways in

which these functions relate in development, nor can they comprehensively take into account the additive influences of the environment, or of brain maturation, on social competence. Moreover, there is evidence that socio-cognitive skills differ from individual to individual, as well as within normal and clinical populations, with varied impacts on social competence skills, and these effects are difficult to explain using SIP models alone (Dunn, Brown, Slomkowski, Tesla & Youngblade, 1991; Greenwald & Banaji, 1995; Frischen, Bayliss & Tipper, 2007; Hong & Chiu, 2001). As such, other perspectives on social competence have emerged to account for these discrepancies. Social constructivist and social learning theorists (Vygotsky, 1934), for example, have highlighted the crucial role of social relationships and interactions in the scaffolding of experiences and the development of social skills (Iarocci, Yager & Elfers, 2007). Additionally, developmental theorists have put forward the importance of shared experiences with parental figures during childhood, such as joint attention, for example, in the development of social cognition (e.g. understanding of intentionality and agency in others) and the appropriate regulation of social behavior (Tomasello, 1995). In an alternative theoretical perspective, Bronfenbrenner's social ecological model (1994) suggests that human and social development greatly relies on gradually more complex reciprocal interactions between the individual and the objects, people and symbols in its environment (which he referred to as 'nested ecological systems'). While these different theoretical perspectives have individually contributed to the vast theoretical and empirical knowledge of social development, most models have lacked the ability to fully and comprehensively address the question of how children come to develop social competence from a multidimensional and systemic viewpoint, including the neuroscientific, psychological, and social dimensions of such a fundamental yet highly complex question.

The Socio-Cognitive Integration of Abilities Model (SOCIAL)

The need for an integrative bio-psycho-social framework for the development of social competence, based on empirical data as well as clinical principles, is addressed by the SOCIAL model (Beauchamp & Anderson, 2010), according to which the emergence and development of social competence skills are reliant on the subtle interplay between neurobiological, cognitive,

socio-emotional, communicative and environmental dimensions of the social experience (see Figure 2). The SOCIAL model posits that social skills and behaviors depend on the adequate and normal maturation of the brain and cognition, and that this maturation occurs broadly within a supportive environment, from early infancy through adulthood.

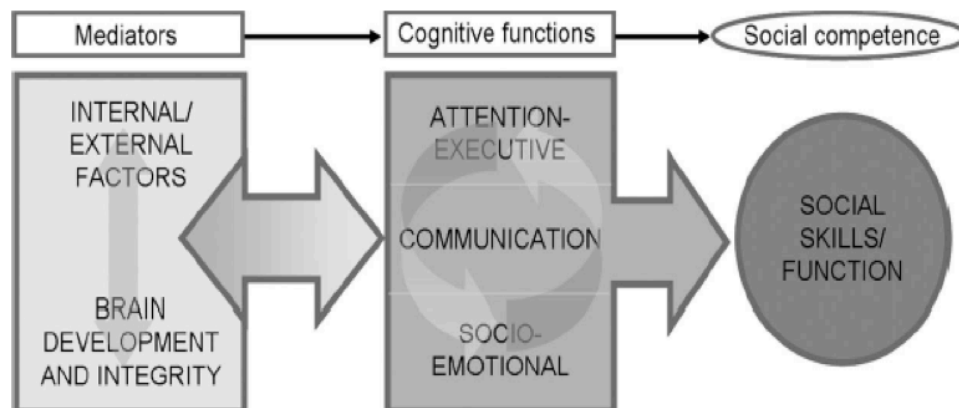


Figure 2. Beauchamp and Anderson’s (2010) Socio-Cognitive Integration of Abilities Model (SOCIAL)

SOCIAL: Mediators of social cognition and competence

The first component of the SOCIAL model represents two dimensions of mediators that affect the emergence of social competence in development, interacting dynamically with cognitive functioning to determine a person’s social competence. As such, the SOCIAL model suggests that changes or disruptions at any level are liable to result in alterations to social cognition and social functioning (e.g., brain disorders, lower SES, poor cognitive skills, etc.), highlighting its value for determining social competence within clinical neuropsychology.

Brain development and integrity: Social neuroscience in the last two decades has known leaps and bounds in terms of empirical evidence for the neural substrates related to social skills and social cognition. There is now consensus that social skills are supported by functional brain

networks that are relatively specialized to social information. Strong evidence from lesion studies of acquired brain injury, neuroimaging and animal studies support the notion of a “Social Brain”, an identifiable network of brain regions that has protracted development across childhood, adolescence, and into early adulthood (Adolphs, 2001; 2009; Eslinger, Flaherty-Craig & Benton, 2004; Blakemore, 2008; Kennedy & Adolphs, 2012, see Figure 3). This network can be divided into more specific subsystems supporting distinct socio-cognitive skills (Beauchamp, 2017).

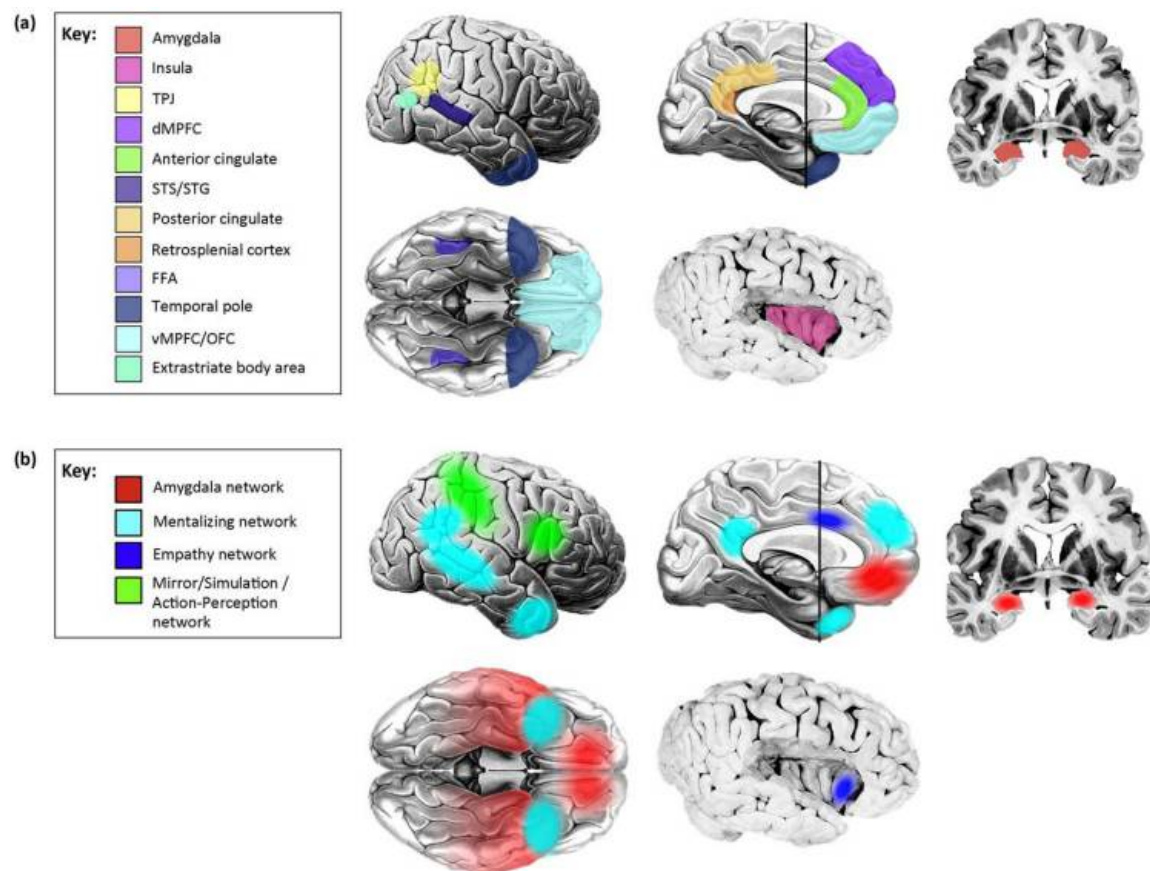


Figure 3. Representation of the social brain structures (a) and networks (b), as proposed by Kennedy and Adolphs (2012).

Internal/external factors: Internal factors refer to the components of an individual’s self that affect their relationship with others. These intrinsic factors include, among others, personality

(e.g. openness or introversion), temperament (e.g. shyness) and physical attributes (e.g. obesity, facial anomalies, or attractiveness), and are highly related to an individual's social skills and the quality of their social interactions, strengthening the argument for a biological basis for social interaction (Beauchamp & Anderson, 2010). On the other hand, external factors in SOCIAL refer to the characteristics of an individual's environment that can interact with the individual's social behavior and the nature and quality of their social interactions. These include, among others, familial functioning, structure, dynamics and environment (e.g. parent-child interactions, attachment styles), socioeconomic status, culture and social/family values (e.g. customs, social norms), as well as the child's broad social experience, such as degree and quality of social participation, access to social resources and activities, types and quality of play, and, simply put, how individuals generally spend their time.

SOCIAL: Cognitive and affective functions

The second component of the SOCIAL model details the cognitive and affective constructs that support the integrity of social skills: attention-executive functioning, communication and socio-emotional skills. These three domains are critical for social functioning and encompass not only social information processing as it relates to language (communication), but also both cognitive or "cold" processes (attention-executive) and "hot" or affective processes (socio-emotional). Of note, this distinction is supported by the posited dissociation between cognitive and socio-cognitive processes, at least in clinical populations presenting specific socio-cognitive deficits (Allen, Strauss, Donohue & van Kammen, 2007), while evidence also suggests that core cognitive processes such as attention and memory may also contribute to the perception and production of social behavior (Beauchamp, 2017).

Attention/executive component: These high-order cognitive skills include, among others, attentional control, cognitive flexibility, working memory, planning, problem-solving, and processing speed. While being critical for adequate and efficient functioning in everyday life, disruption or deficits in these skills may also result in disruptions to social interactions and competence, as demonstrated in typical development as well as clinical and neurodevelopmental

conditions. For example, there is evidence of social consequences of acquired brain injuries (Gomes, Rinehart, Greenham, & Anderson, 2014; McDonald, 2013), and in the context of neurodevelopmental conditions (Bora & Pantelis, 2016; Eddy & Cavanna, 2013).

Communication component: Communication, from basic perceptual skills to highly complex language development and *social* communication (e.g. joint attention, expressive and receptive communication, integration of affect in gestures and facial expressions), forms the basis through which people perceive and respond to their social environment. Expressive and receptive skills have clear implications for communication and impact on the content and the form of the message being communicated between individuals. Verbal skills (e.g. pragmatics, inferences) and nonverbal signals (e.g. intonation, prosody, rhythm) are important factors of communication that impact the interpretation of social situations and modulate appropriate social responses.

Socio-emotional component: The socio-emotional dimension of the SOCIAL model refers to socio-cognitive processes directly. These multiple levels of hierarchical functioning, beginning with the basic processing of social cues (e.g. face/emotion recognition, attribution), extend to the most complex and integrative socio-cognitive skills that require the ability to take the perspective of others, including the understanding of others' internal states, beliefs, and thoughts (theory of mind, Young & Saxe, 2009), the emotional reaction elicited by another's internal state (empathy, Eisenberg, Zhou & Koller, 2001), as well as moral reasoning and decision-making, a key component of social cognition that is particularly useful in the perception, understanding and production of appropriate social behaviors and interactions (Moll, Zahn, de Oliveira-Souza, Krueger & Grafman, 2005).

As illustrated in the SOCIAL model, socio-cognitive processes are central to social competence, and can be defined as “*the ability to construct representations of the relations between oneself and others, and to use those representations flexibly to guide social behavior*” (Adolphs, 2001, p.231). In other words, social cognition refers to those distinct, yet interrelated, mental processes that permit the perception and treatment of social cues and stimuli in order to

interact in the social world (Beauchamp & Anderson, 2010; Happé & Conway, 2016). These processes modulate appropriate social behavior within social contexts, and key constructs related to this dissertation will be discussed in further detail in the following sections.

Social Cognition

Despite different approaches, there is general consensus across social models that the development of social skills and maintenance of adequate social competence across the lifespan is a bio-psycho-social process. Empirical evidence concerning the development of social cognition supports that socio-cognitive skills emerge as the results of a developmental cascade: the acquisition of basic skills in infancy (e.g. facial expression processing) become building blocks for the refinement of more complex socio-cognitive skills in childhood, adolescence and even adulthood (e.g. theory of mind, empathy, moral reasoning) (Beaudoin & Beauchamp, in press). Socio-cognitive development and global development are also mutually dependent systems, driven by biological processes that continue to develop across the lifespan in a dynamic way (Blakemore, 2008; Garrigan, Adlam & Langdon, 2018; Beaudoin & Beauchamp, in press). The following section presents a brief description of the specific socio-cognitive skills and their development that are the focus of this dissertation, as well as broader links with social behavior.

Perspective Taking

Perspective taking in a social context can be defined as the overarching human developmental ability to broadly “*put one’s self in the place of another person and to make inferences concerning the other’s capabilities, attributes, expectations, feelings, and potential reactions*” (Light, 1979 in Diazgranados, Selman & Dionne, 2016, p.1). Perspective taking skills develop with age as the brain matures and as a function of the social opportunities that children encounter through which they interact with others, hone their understanding of the social world, and graduate from egocentric and undifferentiated perspectives to more differentiated

acknowledgement of multiple points of view. Close links between perspective taking skills and appropriate social behavior have been established. Research has shown that individuals with better perspective taking skills tend to exhibit more prosocial behaviors that tend to favor the welfare of others (Batson et al., 1997), and are generally better able to develop and maintain positive, supportive and successful relationships (Franzoi, Davis & Young, R. D., 1985; Verhofstadt, Buysse, Ickes, Davis & Devoldre, 2008). In sum, perspective taking is a broad umbrella construct for a variety of complex skills that require individuals to ‘put themselves in someone else’s shoes’. Within social cognition, this includes both cognitive and affective processes, such as theory of mind and empathy.

Cognitive aspects of perspective taking: Theory of mind

Theory of mind is a high-level socio-cognitive skill that enables the interpretation of others’ mental states and beliefs about reality (Moll et al., 2005). Theory of mind skills allow young children to understand that others’ beliefs and desires are different from their own, and are related to others’ emotional states as well (Rieffe, Terwogt, & Cowan, 2005; Rieffe, Terwogt, Koops, Stegge, & Oomen, 2001). Theory of mind is a complex ability involving step-wise skills of inference at different, explicit and implicit levels of thinking and beliefs (e.g., *first-order belief*: Peter thinks X; *second-order belief*: Peter thinks Mary thinks X; *third-order belief*: Peter thinks Mary thinks he thinks X). A fundamental aspect of theory of mind development is the ability to understand that our own beliefs about reality (as well as others’) can be inaccurate, because of missing information, wrongful interpretation or misunderstanding, for example. This is called a *false belief* and is typically measured using verbal theory of mind tasks that assess children’s ability to infer an agent’s actions from their perceived belief state, when this belief state differs either from reality or from the child’s own knowledge (Killen, Mulvey, Richardson, Jampol & Woodward, 2011). While it has been extensively documented that basic levels of theory of mind are acquired during the preschool years (Saracho, 2014), there is evidence that higher-level understanding of false beliefs and complex theory of mind abilities continue to develop well into adolescence and early adulthood (Dumontheil, Apperly &

Blakemore, 2010), in relation to the sophistication of other socio-cognitive abilities, as well as through the complexification of social interactions.

Affective aspects of perspective taking: Empathy

Empathy can be broadly defined as the “*capacity to understand and appreciate the emotional states and needs of others in reference to oneself*” (Decety, Michalska, Akitsuki & Lahey, 2009, p.2), while involving a minimal degree of differentiation between the self and the other (Eisenberg & Fabes, 1990). Decety and Lam’s neuroscience-based model (2006) suggests that empathy skills are supported by both bottom-up and top-down processes between high and low-level cognitive and emotional skills, as well as being modulated by executive functioning (Decety & Jackson, 2004; Shamay-Tsoory, 2011). Evidence from developmental and social neuroscience reveals that the development of empathy is an ontogenetic process rooted in early infancy (through processes such as affective sharing), one that begins well before the emergence of verbal and complex social understanding abilities (Tousignant, Eugène & Jackson, 2017). Differentiation between egocentric empathetic responses (sometimes referred to as ‘sympathy’) and true empathetic distress (Hoffman, 2000) occur in development through a process that can justly be understood as perspective taking. This is facilitated by children’s understanding of others’ emotional states as independent from their own and mirrors the gradual shift from an egocentric to a pluralistic, sociocentric perspective. Strong evidence points to the existence of a link between empathy and moral processes in the production of prosocial behavior stemming from empathetic distress for others, such as altruism, for example (Hoffman, 2000; Batson, 2011; Beauchamp & Anderson, 2013; Eisenberg et al., 2002; Hoffman, 2000; Malti, Gasser & Gutzwiller-Helfenfinger, 2010).

Moral Reasoning

“Humans are not born with a moral sense. We are, however, given an innate capacity to develop one, much in the way we have now come to view the acquisition of language.” Abigail

A. Baird, *Adolescent Moral Reasoning: The Integration of Emotion and Cognition*. In: Sinnott-Armstrong, W. Ed. (2008). *Moral Psychology*, Volume 3.

Moral reasoning is a developmental skill that is crucial for engaging, developing, and maintaining adaptive social behaviors and positive interpersonal interactions (Moll et al., 2005). Defined as the capacity to understand and think about moral emotions and conventions that govern social interactions in everyday life (Haidt, 2001), this skill also encompasses higher cognitive functions such as understanding and processing interpersonal cues and planning appropriate responses (Scourfield, Martin, Lewis, & McGuffin, 1999), ultimately allowing for smooth social interactions. Moral reasoning is supported by cognitive, affective and motivational processes that are grounded in social experience and culture (Decety & Howard, 2013), appropriately fitting into a comprehensive, systemic bio-psycho-social perspective of social competence. Evidence exists of a further subset within the ‘Social Brain’ regions, supporting higher order social cognition such as moral reasoning and decision making, designated as the ‘Moral Brain’ (Casebeer, 2003; Garrigan, Adlam, & Langdon, 2016; Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Moll, Zahn, de Oliveira-Souza, Krueger, & Grafman, 2005).

Moral development and the cognitive/affective debate

There is a long-standing debate concerning the roots of moral reasoning. Do we come to moral decisions with our minds or with our hearts? From the head or from the gut? David Hume’s intuitionist view of morality claimed that our altruistic behavior is guided by our feelings of empathy and sympathy for others (Malti, Gummerum, & Buchmann, 2007). Later, philosopher Immanuel Kant’s defense of deontic rationality elevated morality to pure formal logical reason. Kohlberg’s (1981) pioneering cognitive theories followed from the Kantian tradition and more directly from the constructive, developmental theories of Jean Piaget. Cognitive developmental theorists have long placed cognition and rationality as central to moral reasoning. Kohlberg and those who advocate a cognitive approach to moral development (Colby & Kohlberg, 1987; Nucci, 2002) consider moral behavior as resulting from moral judgments,

identified by formal criteria (such as universalizability and impartiality). The cognitivist tradition has thus focused on the independent contributions of cognitive factors to the moral process, considering moral judgments in terms of developmental stages reliant on cognitive development and processes such as intelligence, theory of mind and executive functions (flexibility and inhibition). According to Kohlberg, the maturation of these cognitive abilities are modulated by social interactions, resulting in the need for a gradually more flexible thinking and reasoning when individuals are faced with social conflicts and dilemmas (Greene & Haidt, 2002). Kohlberg identified six stages of moral reasoning, divided into three levels containing two stages each, moving gradually from an egocentric to a socio-centric set of values and reasoning processes. The *pre-conventional level* is developmentally the most primary: its concern and main motivation is obeying to rules and avoiding punishment. This basic egocentric perspective then develops into the *conventional level* of reasoning, one focused on interpersonal relationships and the individual profits one can gain through them. At this stage, loyalty, cooperation and in-group satisfaction are values most prized in evaluating moral situations and forming judgments. The most sophisticated stage (stage 4) in this level, typically reached in late adolescence, is concerned with observance to the law and the preservation of the social order as a value in itself. Finally, the most mature of levels, the *post-conventional level*, is reached when an individual can reason with flexibility about values that surpass the individual and society. Universal values such as freedom, rights, equality and the preservation of life are viewed as superior to the social contract maintaining the social order. Moreover, at this stage, one can allow for compromise and nuance: the complex level of reasoning necessary at this stage permits the individual to be flexible about situations, consider abstract moral values in different contexts and weight them against each other. It has been found that only a minority of individuals ever reach this most complex level of reasoning (Colby & Kohlberg, 1987). Kohlberg's tradition has therefore been a fertile ground for the investigation of individual, primarily cognitive, factors contributing to moral reasoning that continue to develop through childhood, adolescence and adulthood.

One of the many reformulations and revisions of Kohlberg's theory, incorporating links with SIP models and the development of socio-cognitive skills such as empathy, is proposed by Gibbs' theory of sociomoral reasoning and maturity (Gibbs, 2010; Gibbs, Basinger, & Fuller,

1992). Gibbs, while maintaining a stage-like approach to the complexification (and maturation) of moral judgments in development, argued that affective predispositions such as empathy, shame and guilt are as fundamental to moral processes as are cognitive stage structures as conceived by Kohlberg, especially as they relate to prosocial and antisocial behavior (Van Vugt et al., 2011). Developmental research in moral psychology has raised questions about the purely cognitive approach to moral development by stressing the critical contributions of emotional processes to morality and integrating emotions into cognitive models of moral functioning to mirror revisions in social information processing models (Lemerise & Arsenio, 2004). Moreover, it has been suggested that the process of formulating an appropriate moral decision is greatly dependent on the ability to feel, interpret, respond to, and generate an appropriate emotion in the context of a moral dilemma, thus should involve abilities such as empathy and emotional regulation (Eisenberg, 2000). When Kohlberg's ideas about morality as justice were first challenged by Gilligan's (1982) view of morality as care, differing views on morality as cognitive judgments appeared. Haidt's intuitionist view of moral reasoning, for example, suggests that the evaluation of moral situations, rather than a slow, effortful, conscious and verbal process, is instead dependent on an instinctive, quick, and highly automated system (Haidt, 2001). Building on the notion of a more socio-emotional approach to moral reasoning, Eisenberg (2000) and her colleagues emphasize the predominant role of moral emotions, such as empathy and guilt, in morality and particularly, in relation to behavior (Malti, Gummerum, & Buchmann, 2007).

Moral development and social behavior

The case for the involvement of moral emotions in moral development is supported by links between moral reasoning and social behavior. The broad scope of socially disruptive behaviors linked to difficulties in moral reasoning highlights the importance of research into the mechanisms and the development of appropriate, socially adapted, mature moral reasoning. Indeed, poor social functioning, antisocial and maladaptive behaviors such as criminality and aggression, have been linked to deficits in moral reasoning (Arsenio & Lemerise, 2004; Eslinger, Flaherty-Craig, & Benton, 2004). The study of moral reasoning has been driven in part

by psychological and behavioral research on delinquency and acts of victimization, which very often consist of moral transgressions, such as aggression, violence, sexual offenses, substance abuse and bullying (Boxer, Goldstein, Musher-Eizenman, Dubow, & Heretick, 2005; Righthand & Welch, 2005; Henry & Slater, 2007; Camodeca & Goosens, 2005). Since much of the earlier literature on moral reasoning was dominated by Kohlberg's (1981) work on principles of justice, according to which moral conflicts are conflicts of law, rules and obligations, a portion of research on social behavior has focused on aggressive and maladaptive behaviors in relation to poor moral reasoning and impaired social skills (Arsenio & Lemerise, 2004, Beauchamp & Anderson, 2010). On the other hand, moral psychology research also focuses on positive moral reasoning and prosocial behavior, in contexts in which authority is minimal, and moral dilemmas and conflicts are more concerned about another person's needs, desires and feelings than about obligations and lawful dictates (Eisenberg, Cumberland, Guthrie, Murphy, & Shepard, 2005). Interestingly, what seems to be necessary for mature moral reasoning and the non-transgression of laws and social dictates, may not be entirely sufficient for social behavior that is concerned with the welfare of others. Moreover, moral reasoning research in prosocial contexts, as opposed to contexts of rule-breaking and violations, has the quality of more accurately reflecting the complexity of the actual social interactions and dilemmas most individuals encounter and engage in daily. In reality, *everyday* moral reasoning is not only about negative obligations (ex: the obligation not to harm others), but more often about the moral conduct enhancing interpersonal interactions, including positive inclinations to help others in need and to promote others' goals as well as one's own (Krettenauer & Johnston, 2011). Likewise, whereas research has been largely focused on aggression and deviant behavior, prosocial behavior cannot be reduced to the absence of aggressive behavior or of moral transgressions; rather, acting in a prosocial manner is genuinely qualitatively *moral*, inasmuch as it is focused on the consideration of another person's welfare (Malti, Gummerum, Keller, & Buchmann, 2009). Therefore, to arrive at an extensive understanding of the development of prosocial behavior, i.e. behavior motivated by the desire to benefit another person rather than one's own goals (Eisenberg *et al*, 2005), an in-depth look at the mechanisms underlying moral reasoning and action is necessary. Examining how individuals come to choose and enact prosocial behaviors has the potential to yield insight into potential loci of intervention for youth at-risk for engaging in socially maladaptive behaviors and into the promotion of socially

adaptive behaviors benefitting society as a whole. These findings are particularly of interest for the developing population, namely children and adolescents, who are particularly vulnerable to social pressures (Brennan & Dauvergne, 2011).

Social experience

Classic research on animal models indicates that brain integrity and cognition are supported by enriched environments and frequent social contact, highlighting important links between the development of social skills, internal factors (such as socio-cognitive skills) and the quality of external factors, as suggested by the SOCIAL model (Harlow, Dodsworth, & Harlow, 1965; Innocenti, 2007). The broad social experience can be understood as one such ‘external factor’ in relation to the development of adequate social competence in children, as it encompasses, amongst others, interpersonal relationships (in terms of quantity and quality), family functioning, parent-child interactions and cultural and socioeconomic contexts. Dynamic developmental links have been established between social cognition, social behavior and the exposure to social interactions. Bandura’s Social Learning Theory (1991), for example, emphasizes the role of imitation, modeling and reinforcement through social opportunities as one of the stepping-stones to the development of mature socio-cognitive thought and adequate social skills. Moreover, evidence supports links between impoverished or depleted psychosocial environments, in school and family contexts (i.e. peer relations, parent-child interactions, family environment, conflict levels in families, parental support) and maladaptive, aggressive or antisocial behavior in children and adolescents (Barrera & Li, 1996; Cummings, Goeke-Morey, & Papp, 2003; Jessor, 1991; Olweus, 1994; Stevens, De Bourdeaudhuij & Van Oost, 2002; Werner & Crick, 2004), along with added impacts on perspective taking skills (Eisenberg-Berg & Mussen, 1978; Henry, Sager & Plunkett, 1996). Conversely, positive family environments have been demonstrated to be a protective factor in the development of behavioral problems (Lopez, Pérez, Ochoa, & Ruiz, 2008). There are established links between the quantity and quality of social interaction experiences in children, their social cognition and their prosocial behavior tendencies (Paulus & Leitherer, 2017; Thompson et al., 2018), as conceptualized in a

social interactionist approach (Carpendale & Lewis, 2004), according to which prosocial development is constructed through interactions facilitating the increasing coordination of children's needs with those of others.

Video gaming

Another way of considering social exposure and interactions is to investigate how children spend their time and what type of play they engage in. Vygotsky's (1978) work on the role of peers highlights the crucial role of traditional forms of play in providing positive contexts for children's psychosocial developments. As such, one of the most popular types of play that children and adolescents engage in today is video gaming. Video games and online gaming have become a leading part of the entertainment industry over the last few decades, with up to 97% of teenagers in the US reportedly playing some form of video game (Lenhart et al., 2008). Therefore, it is conceivable to posit that video gaming may now be considered a form of (digital) play slowly replacing physical playgrounds (Granic, Lobel, & Engels, 2014; Lobel, Engels, Stone, Burk, & Granic, 2017). There is some consensus that the effect of video game exposure on social behavior and related cognitive and affective skills is tangible, with studies reporting both positive and negative effects (see Greitemeyer & Mügge, 2014, for a review). Much research to date has focused on the negative social outcomes related to gaming, specifically with regards to violent video games and their associations with aggression, including aggressive behavior, cognition, and affect (Anderson, 2004; Sherry, 2001). However, findings regarding the effect of video games on social outcomes are far from unanimous (Ferguson & Colwell, 2017; Sakamoto, 1994), and some video games including prosocial content have demonstrated positive effects on social competence skills and prosocial behavior (Greitemeyer, Traut-Mattausch, & Osswald, 2012; Gentile et al., 2009; Prot et al., 2014; Harrington & O'Connell, 2016; Kral et al., 2018). Therefore, in this work, video game playing will be considered as representing a form of external social influence, part of the broad social experience, as follows, and its links with social cognition and social behavior will be investigated.

Objectives and hypotheses

On-going debate concerning the roots of adequate social behavior, as demonstrated by the variety of models of social competence, as well as the historic cognitive/affective debate central to research on morality, highlights a need for a better understanding of the global interplay of cognitive and emotional factors contributing to moral reasoning and social behavior more broadly. The SOCIAL model provides a fertile ground for the investigation of multiple facets of the development of social competence in typically developing children and adolescents, as is proposed in this dissertation. First, a possible way of reconciling both the cognitive and affective perspectives is to unify cognition and emotion in a more fundamental way than by plainly describing two functions developing in parallel. In this dissertation, we propose that both emotional and cognitive factors pertaining to social competence are components of the overarching, unifying construct that is perspective taking. This integrative construct could be an explanatory paradigm joining contributing factors to social competence, moral processes, and underlying adequate social behavior in development. Second, while a bulk of research in psychology to date has focused on environmental factors and their impact on the development of social competence and adequate social skills, less attention has been given to the broader social experience of children, namely, on how they spend their time, interacting socially or not. Video gaming, and playing frequency, with its increasing popularity and prevalence, is likely to be a factor at the heart of the social experience of youth, and with effects on socio-cognitive skills and social competence.

Study 1: Put yourself in my shoes: Perspective taking, moral reasoning and social behavior in childhood and adolescence

The first study aimed to explore the contributions of two aspects of perspective taking (theory of mind and empathy) to moral reasoning across the broad span of childhood and adolescence, as well as to investigate the posited association between moral reasoning and

behavior using a developmentally appropriate task presenting everyday moral conflicts (So-Moral; Beauchamp & Dooley, 2012; Dooley, Beauchamp, & Anderson 2010). Perspective taking is posited as a unifying construct reflecting cognitive and affective contributions to moral reasoning and behavior. As such, theory of mind and empathy were expected to jointly contribute to moral reasoning. Furthermore, associations between moral reasoning social behavior tendencies were expected to be found. This study has been submitted to *the Journal of Moral Education*.

Study 2: *Video game playing frequency, social cognition and social behavior in childhood*

The goal of the second study was to explore the associations between frequency of video game playing in children and two main components of social competence, namely social cognition and social behavior (including both positive and negative aspects of behavior). The aims were to explore the relations between children's video game playing frequency, their socio-cognitive skills, and social behavior. Negative associations between video game playing frequency and socio-cognitive/adaptive skills were expected, and it was hypothesized that more frequent video gaming would be related to poorer prosocial skills as well as with more social problems. This study has been submitted to the *Journal of Youth and Adolescence*.

Article 1

Put yourself in my shoes: Perspective taking, moral reasoning and social behavior in childhood and adolescence

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Abstract

Background: Moral reasoning (MR), a key component of social cognition, is acquired in developmental stages. MR skills have been associated with positive and negative social outcomes, in relation to cognitive and affective processes. Among these, the overarching ability to take another person's perspective may be important in determining MR. Both the capacity to understand another's internal beliefs and thoughts (theory of mind) and the emotional reaction elicited by another's internal state (empathy) fall under the construct of perspective taking and are thus likely to contribute to MR and social behavior. **Methods:** The current study aimed to determine the contributions of perspective taking (theory of mind, ToM, and empathy) to MR in typically developing children and adolescents aged 6 to 20 ($n = 156$), and investigate the posited link between MR, prosocial, and externalized behaviors using an innovative visual MR tool (So-Moral task). **Results:** ToM subcomponents explained 46% of MR scores across children and adolescents, reciprocity being a significant, independent predictor of MR. Jointly, aspects of perspective taking (ToM and empathy) predicted MR in children, explaining 42% of the variability, but not in adolescents. Less mature MR was associated with more externalizing behavior problems, but no associations were found with respect to prosocial behavior or social problems. **Conclusions:** Findings align with integrative approaches to MR and emphasize the roles of both affective and cognitive factors. Cognitive precursors were independent predictors of MR, suggesting that a cognitive understanding of the situation may be especially useful when children are asked to reason about a moral conflict. Children and adolescents differ in terms of what factors contribute to MR, suggesting the possibility of differential underlying mechanisms.

Keywords: moral reasoning, theory of mind, empathy, perspective taking, childhood, adolescence.

Introduction

Humans are characterized by species-specific social skills and interactions, which direct much of their actions, dictate thought processes and form the foundations of human consciousness (Beauchamp & Anderson, 2010). Not only are social interactions inherent to everyday functioning, positive social interactions are sought and valued across cultures, and are markers of social acceptance and maturity. Moreover, high quality social functioning is critical to the development of positive, long-term relationships and impacts physical and psychological wellbeing (Cacioppo, 2002; Cacioppo, Berntson, Sheridan & McClintock, 2000).

Adequate social functioning is driven in part by the development and integrity of underlying socio-cognitive skills, such as emotion processing, theory of mind, empathy, and moral reasoning (Happé & Frith, 2014; Beauchamp & Anderson, 2010). These abilities are largely subsumed by the “social brain”, an identifiable network of brain regions that has protracted development across childhood, adolescence, and into early adulthood (Adolphs, 2001; 2009; Kennedy & Adolphs, 2012; Blakemore, 2008; Malti & Latzko, 2010; Decety, Michalska & Kinzler, 2012). Moral reasoning (MR) is a key component of social cognition and is particularly useful in the perception, understanding and production of appropriate social behaviors and interactions (Moll et al., 2005). Moral processes are variously defined across philosophical, psychological and neuroscientific disciplines, but there is general agreement that they include moral reasoning (MR), moral decision-making, and moral judgment. Defined as the capacity to understand and think about moral emotions and conventions that govern social interactions in everyday life (Haidt, 2001), MR also involves higher cognitive and social functions, such as understanding and processing interpersonal cues and planning appropriate responses (Scourfield, Martin, Lewis & McGuffin, 1999), ultimately allowing for appropriate decision-making in social situations.

Impaired MR is associated with poor social functioning, sometimes characterized by externalized behaviors (e.g., acting out, rule-breaking, lying), but also, in more extreme cases,

antisocial and maladaptive behaviors such as criminality, aggression, violent offending, and bullying (Arsenio & Lemerise, 2004; Eslinger, Flaherty-Craig & Benton, 2004, Boxer et al., 2005; Righthand & Welch, 2005; Henry & Slater, 2007; Camodeca & Goosens, 2005). Conversely, mature MR has been linked to prosocial behavior, i.e., behavior motivated by the desire to benefit another person rather than one's self (Eisenberg et al, 2005; Laible et al., 2008; Laible et al., 2014), social competence, and altruistic and cooperative traits (Eisenberg et al., 2002; Malti, Gummerum, Keller, & Buchmann, 2009; Malti & Latzko, 2010). In reality, morality cannot be focused solely on negative obligations or restrictions on behavior (e.g., the obligation not to harm others); rather, mature MR should include positive inclinations to help others in need and to promote others' goals as well as one's own (Krettenauer & Johnston, 2011). Thus, to fully understand and promote prosocial behavior as a whole, it is useful to consider what specific socio-cognitive skills contribute to mature and appropriate MR and decision-making in everyday situations.

Perspective taking and Moral reasoning

MR is a high-level skill that is acquired in developmental stages and is determined by biological, social and individual factors (Lane et al., 2010; Hinnant et al., 2013). Cognitive processes such as executive functioning, intent attribution, abstract reasoning, and theory of mind have been shown to contribute to better MR (Vera-Estay et al., 2016; Astington, 2004; Baird & Astington, 2004; Beauchamp & Anderson, 2010; Killen et al., 2011; Young et al, 2007; Loureiro & Souza, 2013), as have affective processes including emotion recognition, moral emotions, emotional attribution, emotional expectancies, scope of personal involvement, empathy, and sympathy (Beauchamp, Dooley & Anderson, 2013; Eisenberg et al., 2002; Hoffman, 2000; Malti et al., 2010; Saelen & Markovits, 2008; Krettenauer, Jia & Mosleh, 2011; Laible et al., 2014). Among these processes, the overarching ability to take another person's perspective may be particularly salient in determining MR because it can tap into both cognitive and affective elements. Perspective taking includes the capacity to cognitively understand other's internal states, beliefs, and thoughts, i.e. theory of mind (ToM) (Young & Saxe, 2009), as well as the emotional reaction elicited by another's internal state, i.e., empathy (Eisenberg, Zhou & Koller, 2001). For instance, we consider a person's thoughts, beliefs and intentions (ToM) when attributing responsibility

for a morally reprehensible act, while also considering the emotional states of different parties (empathy) in attempting to resolve a moral conflict (Lane et al., 2010, Wellman & Miller, 2008). However, despite evidence that ToM and empathy are both linked to MR, they are typically studied in isolation.

Moral reasoning and Theory of mind

ToM is a complex ability involving step-wise skills of inference at different, explicit and implicit levels of thinking and beliefs (e.g., *first-order belief*: Peter thinks X; *second-order belief*: Peter thinks Mary thinks X; *third-order belief*: Peter thinks Mary thinks he thinks X). *False beliefs* are typically measured using verbal ToM tests that assess children's ability to infer an agent's actions from their perceived belief state, when this belief state differs either from reality or from the child's own knowledge (Killen et al., 2011). While it has been extensively documented that basic levels of ToM are acquired during the preschool years (Saracho, 2014), there is also evidence that higher-level understanding of false beliefs and complex ToM abilities continue to develop well into adolescence and early adulthood (Dumontheil et al., 2010). With respect to moral processes, a person's beliefs about another's mind provides information necessary to engage the moral process regarding the other's actions (MR) and/or to decide on a course of action (moral decision-making) (Knobe, 2005). There is substantial empirical support for the association between ToM and MR (Sodian et al., 2016; Sommer et. al., 2014; Smetana et. al., 2012; Young, Cushman, Hauser & Saxe, 2007; Lane et al., 2010; Baird & Astington, 2004), with studies indicating that evaluations of moral transgressions rely first on an awareness of others' intentions and motivations for their actions, and that the influence of ToM on MR is likely to be bidirectional (Smetana, 2010). Children gradually integrate information about others' mental states when faced with the evaluation of morally relevant situations (Cushman et al., 2013). Moreover, a longitudinal study by Smetana and colleagues (2012) showed that young children who exhibit more flexible, mature, and sociocentric MR in situations of moral transgressions are also more efficient at understanding others' mental states.

Moral reasoning and Empathy

Empathy can be broadly defined as the “capacity to understand and appreciate the emotional states and needs of others in reference to oneself” (Decety et al., 2009), while involving a “minimal degree of differentiation between the self and the other” (Eisenberg & Fabes, 1990). Like ToM, empathy has been shown to be associated with MR in both typically developing and clinical populations (Barriga et al., 2009; Eisenberg & Mussen, 1978; Gleichgerrcht et al., 2015; Soderstrom, 2003; Hoffman, 2000). In a study of 9 and 10 year-old children, girls who showed more empathetic awareness also tended to exhibit better moral judgment and more prosocial behaviors (Warden and Mackinnon, 2003). Links between empathy and moral processes are further supported by studies demonstrating that low empathy levels predict utilitarian moral judgments, which often involve personal harm (e.g. pushing a loved one off a footbridge, Gleichgerrcht & Young, 2013). Finally, research shows that empathy is associated with behavior that is socially appropriate, effectively preventing moral transgressions and underlying everyday MR (Beauchamp & Anderson, 2013; Eisenberg et al., 2002; Hoffman, 2000; Malti, Gasser & Gutzwiller-Helfenfinger, 2010).

Prosocial behavior

In addition to the direct, empirical links identified between the cognitive (ToM) and affective (empathy) counterparts of perspective taking and MR, there is also evidence that perspective taking, as a unitary construct, is associated with social behavior. A meta-analysis indicates that social perspective taking is positively related to prosocial behaviors and negatively related to antisocial behaviors (Miller and Eisenberg, 1988). Other reviews reveal a positive association between perspective taking and altruistic tendencies (Underwood & Moore, 1982). Further evidence of the combined contributions of both cognitive and affective factors to prosocial behavior suggests that ToM skills are strengthened by empathic tendencies in fostering prosocial behaviors (Carlo et al., 2010; Lonigro et.al., 2014). However, despite studies reporting associations between both cognitive and affective components of perspective taking to MR and behavior, it remains unclear how both components interact to contribute to optimal MR. Furthermore, associations between perspective taking, MR and prosocial behavior have been

typically investigated in circumscribed age groups, and rarely across the full span of childhood and adolescence. As such, outstanding questions with regards to the association between components of perspective taking and MR may be a function of methodological challenges in the assessment of MR.

Methodological issues in the measurement of MR

Measurement of MR is complex and can be limited by methodological challenges. Some existing MR tasks are confounded by the need for exceptional sustained attention, working memory and visual, verbal and reading skills (Dooley, Beauchamp & Anderson, 2010; Killen & Smetana, 2007). There are also concerns that tasks designed for adults do not transfer well to children (Beauchamp, 2017). Moreover, traditional moral interviews used to assess MR are often based on extreme, hypothetical dilemmas, and use situations that minimize personal and emotional involvement, variables that may influence MR maturity and decision-making (Greene et al., 2001; Moll et al., 2002; Orobio de Castro et al., 2002). In order to circumvent these methodological limitations, the Socio-Moral Reasoning Aptitude-Level task (So-Moral) was developed (Dooley et al., 2010; Beauchamp et al., 2013). This first-person perspective, developmental, visual task was designed to reflect both child and adolescent realities and to investigate developmental stages of MR using an ecological approach. Familiar sociomoral dilemmas are presented via sequences of pictures of children or adolescents playing out different scenarios, each involving a sociomoral conflict. The main outcome variable, moral maturity, is valid across childhood and adolescence (Chiasson et al., 2017), is associated with cognitive and affective abilities such as ToM, executive functions and empathy (Vera-Estay, Beauchamp & Dooley, 2015; Vera-Estay et al., 2016; Garon et al., 2018), and is sensitive to brain insult (Beauchamp et al., 2013; Beauchamp et al., in press; Chiasson et al., 2017). It thus offers an interesting and novel opportunity to investigate how perspective taking contributes to MR and how these skills relate to social behavior in childhood and adolescence.

Objectives and hypotheses

The current study aimed to explore the contributions of two aspects of perspective taking (ToM and empathy) to MR across the broad span of childhood and adolescence, as well as to investigate the posited association between MR and behavior using a developmentally appropriate task presenting everyday moral conflicts (So-Moral). Specifically, we aimed to 1) investigate the associations between moral maturity, moral decision-making, ToM (including first-, second- and third-order false beliefs, reciprocity, deception and cheating detection subcomponents), empathy, prosocial behaviors and externalized behaviors; 2) explore the contribution of the various subcomponents of ToM to MR; and 3) explore the joint contribution of ToM and empathy to MR. We posit that PT is a unifying construct reflecting cognitive and affective contributions to MR and behavior. As such, we expected that ToM and empathy would jointly contribute to MR. Moreover, we expected to find a positive association between mature MR and prosocial behavioral tendencies and a negative association between MR and externalized behaviors.

Methods

Participants

One hundred and fifty-six typically developing children and adolescents aged 6 to 20 years (Mean age =12.0, SD= 3.3 years, 72 males) participated in this study. They were predominantly Caucasian (82.1%), had no history of any psychiatric or neurological condition, had IQ levels in the low to high average range (M=108.3, SD =11.6) and were primarily from middle-class families, according to their income (Statistics Canada, 2015). Participants were recruited in regular curriculum primary schools, high schools and colleges in Quebec, Canada. In the case of primary and high school students, parents received a letter detailing study information as well as asking for their participation. For recruitment of college participants, information about the study was presented in class and interested students were invited to sign a form allowing the research them to be contacted. All parents of children under the age of 18 years provided written informed consent prior to participation. Assessments were conducted in the participants' primary language, either French or English, and took place either on site in schools or in a

laboratory setting. All participants and/or their parents were compensated 20 to 30\$ for their participation in the study. The study was approved by the local research ethics committee.

Measures

To control for order effects in the assessments, two counterbalancing procedures were applied randomly across participants: one to the order of the entire testing session, and one to the order of the dilemmas in the So-Moral task (see below). The following measures were administered.

Demographic and Developmental Questionnaire: Parents' of participants completed a questionnaire pertaining to their child's medical, developmental and social history, as well parents' education level, ethnicity, occupation, income, and family constellation. Socioeconomic status is reported using the Social Risk Index (SRI, Roberts et al., 2008), a composite measure comprised of six aspects of social status: family structure, education of primary caregiver, occupation of primary income earner, employment status of primary income earner, language spoken at home and maternal age at birth. The total score is reported with higher scores indicating higher social risk and lower socio-economic status.

Intellectual functioning: The Wechsler Abbreviated Scale of Intelligence (WASI, Wechsler, 1999) was used to provide an estimate of general intellectual ability based on the Vocabulary and Matrix Reasoning subtests (IQ, M =100, SD = 15).

Theory of Mind: To assess children's ability to infer other people's mental states, the Theory of Mind Picture Stories task (Bechi et al., 2012; Brune, 2005) was administered. Internal consistency for the task is good (Cronbach's $\alpha = .86$; Bechi et al., 2012). Participants are presented with three types of stories, each depicting either (1) a scenario where two characters cooperate; (2) a scenario where one character deceive a second character; and (3) a scenario showing two characters cooperating to deceive a third. Each picture story consists of four cartoon cards, which are presented face-down in mixed order; participants are then asked to turn the cards over and order them in a logical sequence of events. For each cartoon story sequenced correctly a maximum score of 6 can be obtained: 2 points are given each for the first and last correctly sequenced picture and one point each for the third and fourth picture. After the children

correctly arrange the four cards, they are asked to answer questions that pertain to the mental states of the different characters, including questions of first-, second- and third-order false beliefs as well as of reciprocity, deception and cheating detection. Each question answered correctly receives 1 point. Scores on each story are summed into a total ToM score of 59 maximum points. Additional individual variables of interest for this study were first-, second- and third-order false beliefs (score 0 to 3), as well as reciprocity, deception and cheating detection (score 0 to 3).

Empathy: Empathy was measured using the Index of Empathy for Children and Adolescents (IECA) for participants aged 12 and over (Bryant, 1982) and its adapted parent-version, the Griffith Empathy Measure (for participants aged 11 and under) (Dadds et al., 2008). The IECA and the GEM include identical items, have demonstrated adequate validity and reliability and both have been shown to be well correlated (Bryant, 1982; Dadds et al., 2008). The Index of Empathy for Children and Adolescents (IECA) measures the participant's understanding of other people's emotions in the form of a self-report questionnaire for youth. Items are scored on a dichotomous scale (0 = no, 1 = yes), with higher scores corresponding to higher levels of empathy. The IECA has demonstrated adequate consistency ($\alpha = .54-79$) and reliability statistics (Bryant, 1982). The Griffith Empathy Measure (GEM, (Dadds et al., 2008) is a 23-item parent-report questionnaire adapted from Bryant's Index of Empathy for Children and Adolescents (Bryant, 1982) in which parents rate the empathetic abilities of their child on a nine-point Likert scale from -4 (strongly disagree) to 4 (strongly agree). The GEM has adequate reliability and validity across gender and age ($\alpha = .81$, Dadds et al., 2008). The Total Empathy score (-92 to 92) was used.

Moral reasoning: The Socio-Moral Reasoning Aptitude Level Task (So-Moral) (Beauchamp et al., 2013; Dooley et al., 2010; Vera-Estay et al., 2015, 2016; Chiasson et al., 2017) is a self-paced, visual, computer-based task that presents visual moral dilemmas specifically designed for children and adolescents. The task has gender and age specific versions. The child version (6–12 years old) includes 9 dilemmas, while the adolescent version (13–21 years old) has 10 dilemmas. Each dilemma (see example FIGURE 1) consists of: (1) an introductory screen presenting the name of the dilemma (e.g. 'wallet'); (2) three separate screens showing first-

person perspective pictures of child or adolescent actors in various social scenarios representing a conflict centered on a moral domain according to Social Domain Theory (Turiel, 1983); and (3) a final screen presenting a dichotomous decision (e.g. whether or not to engage in a particular action such as stealing from a shop, cheating at a game, etc.). The aggregate number of morally adapted responses is compiled to obtain a moral decision-making score, which ranges from 0 to 9 or 10 points depending on the version. Participants are then asked to provide a justification for the choice they made. Each participant's justification is recorded verbatim and subsequently scored according to a standardized coding system (Beauchamp & Dooley, 2012) based on cognitive developmental framework (Gibbs, 2010; Kohlberg, 1981; Kohlberg, Levine, & Hewer, 1983; Turiel, 1983). Both decision-making and maturity scores are independent. Developmental stages of MR have been adapted to fit the social nature of the dilemmas in the So-Moral task and consist of the following: (1) centrations and authoritarian-based consequences; (2) egocentric/pragmatic exchanges; (3) interpersonal focus; (4) societal regulation; and (5) societal evaluation (see Table 1). Transition stages (1.5, 2.5, etc.) are used to account for answers that provide elements of two consecutive reasoning stages. When elements of non-consecutive stages are provided, the response is coded according to the highest schema detected. The MR maturity score (0–50 points for adolescents, 0–45 for children) is obtained by summing the justification scores (a proportion was used to bring the total MR score of the child version to a common denominator of 50). For the purpose of the study, each moral justification response was scored independently by two trained raters and discrepancies were resolved by discussion and consensus. The So-Moral has adequate inter-rater reliability (Cronbach's $\alpha = .83-.94$) and construct validity (Dooley et al., 2010). The MR maturity score was used as the main dependent variable.

Prosocial behavior: The parent version of the Prosocial Tendencies Measure (Carlo & Randall, 2002), translated into French and adapted by Girard et al. (2014), was used to assess children's prosocial behavior. In this 24-item questionnaire, parents are asked to rate the prosocial tendencies of their child on a five-point Likert scale from 1 (Extremely unlikely) to 5 (Extremely likely), including six types of prosocial behaviors: public, anonymous, in response to dire situations, emotional, compliant and altruistic. The original Prosocial Tendencies Measure and adapted French version are reliable and internally consistent (Carlo & Randall, 2002; Girard et

al., 2014), Girard and colleagues reporting excellent internal consistency ($\alpha = .95$). In this study, the global score (0-96) was used as a measure of children's prosocial behavior.

Social behavior problems: The Child Behavior Checklist for ages 6-18 (CBCL 6- 18, Achenbach & Rescorla, 2001) is a parent-report questionnaire on which children are rated on internalizing and externalizing problems such as anxiety, depression, rule breaking, aggressive behavior, somatic, social, and attention problems. Items are rated from 0 (not true) to 2 (Very true or often true). This questionnaire has good psychometric properties (see Achenbach & Rescorla, 2001, for detailed validation studies). In this study, T-scores from the externalizing subscale (including rule-breaking and aggressive behavior) and the social problems subscales were used as measures of children's behavior problems.

Statistical analyses

Statistical analyses were performed using SPSS 24.0 software. Prior to all statistical analyses, data were examined for any violations of test assumptions (normality, linearity and homoscedasticity). Two subcomponents of ToM (reality and deception) were excluded from analyses, because they did not respect normality assumptions. First, correlations were calculated to explore the associations between the two main MR variables of interest (SoMoral-moral maturity and moral decision making) and perspective taking including ToM (Cartoon Stories total score, first-, second- and third-order false beliefs scores, reciprocity, and cheating detection scores) and empathy (IECA/GEM), and behavior (Prosocial Tendencies Measure, CBCL social problems, CBCL externalizing problems). A hierarchical regression was conducted in order to explore the contributions of ToM sub-components to MR maturity. Age, sex, SRI and IQ were included in the first block as they have been shown to be strongly associated with MR. Then, ToM subcomponents significantly associated with MR and conceptually associated with PT, were added in the second block. A second hierarchical regression analysis was conducted to explore the joint contribution of PT variables (ToM subcomponents and empathy) to MR. The second regression model included age, sex, SRI and IQ in the first block and empathy and significant ToM subcomponents in the second block. The regression model was performed separately in primary-aged children (aged 6 to 12) and adolescents (aged 12 to 20) because of

the difference in parent/self-reporting on the empathy measure. Results corresponding to $p < .05$ were considered statistically significant. The strength of correlations and effect sizes were determined according to Cohen's criteria (Cohen, 1998).

Results

Descriptive results and inter-correlations of the main study variables

Main descriptive results and correlations are presented in Table 1. Participants' moral decision-making scores were significantly and positively associated with some ToM subcomponents (first-order false beliefs and cheating), but no link was found with social behavior measures. Participants' MR maturity scores were significantly and positively associated with all subcomponents of ToM, including first, second and third order false beliefs, as well as reciprocity and cheating. Externalized behaviors were related to poorer MR skills. However, prosocial tendencies and social problems were not associated with MR. Empathy was not correlated with MR in children or in adolescents in this sample. Nevertheless, because of strong previous evidence supporting the link between empathy and MR, it was retained in the main regression analysis to investigate the combined, contribution of both aspects of perspective taking.

Regression analyses

Contributions of ToM subcomponents to MR in children and adolescents

The results of the first hierarchical regression are presented in Table 2. Age, sex, SRI, and IQ significantly contributed to MR ($F(4,133) = 25.72, p < .001$) and explained 44% of the variance of MR, considered a large effect size ($f^2 = 0.8$). Introducing ToM subcomponents (reciprocity and cheating) to the model explained an additional, borderline significant 3% of the variance in MR ($F \text{ change}(2, 131) = 3.11, p = .05$), with a small effect size ($f^2 = .05$). Together, the variables included in the regression model explained 46% of MR scores ($F(6,131) = 18.72, p < .0001$), considered a large effect size ($f^2 = .9$). Reciprocity ($\beta = .15, p = .03$) was a significant, independent predictor of MR.

Contributions of perspective taking (ToM subcomponents and empathy) to MR in children

The results of the second hierarchical regression are presented in Table 3. In children, age, sex, SRI and IQ significantly contributed to MR ($F(4,70) = 8.85, p < .0001$) and explained 34% of the variance of MR with a large effect size ($f^2 = .51$). The inclusion of reciprocity, cheating and empathy in the model explained an additional 8% of the variance of MR (F change (3,67) = 3.08, $p = .03$) with a small size effect ($f^2 = .14$). Together, the variables included in the regression model explained 42% of MR scores ($F(7,67) = 6.83, p = .0001$), considered a large effect size ($f^2 = .72$). Reciprocity ($\beta = .25, p = .02$) and cheating ($\beta = .21, p = .04$) were significant, independent predictors of MR maturity.

Contributions of perspective taking (ToM subcomponents and empathy) to MR in adolescents

The results of the second hierarchical regression are presented in Table 3. In adolescents, age, sex, SRI and IQ significantly contributed to MR ($F(4,56) = 3.15, p = .02$) and explained 18% of the variance of MR with a moderate effect size ($f^2 = .23$). The inclusion of reciprocity, cheating and empathy in the second block did not explain any additional variance of MR (F change (3,53) = .16, $p = .92$). In this group, perspective taking variables, individually or joint, were not predictors of MR maturity.

Discussion

This study provides novel information about the links between perspective taking (ToM and empathy), MR, and social behavior in a large sample of healthy children and adolescents aged 6 to 20 years. The findings indicate that ToM skills are associated with MR overall, but that this cognitive aspect of perspective taking only predicts MR in children, not in adolescence/early adulthood. Empathy, the affective component of perspective taking, was not related to MR in either children or adolescents in this study. Participants who had less mature MR had higher rates of externalizing behavior problems, but no associations were found with respect to prosocial behavior or social problems more specifically.

The finding of a positive association between age and MR maturity is in line with previous work (Decety et al., 2012; Gibbs, 2013; Chiasson et al., 2017), and further suggests that children become less egocentric and more sociocentric in their reasoning on moral issues. This gradual sophistication of MR throughout childhood and adolescence may be attributable, in part, to associations with more general cognitive development (e.g., intellectual ability, executive functioning; Vera-Estay et al., 2015; social information processing, Crick & Dodge, 1994; Decety & Lamm, 2006), neural sophistication (Blakemore, 2008), as well, as with increased exposure to social experiences and opportunities for social perspective taking and learning (Narvaez, 2010; Walker & Taylor, 1991). However, while we did find that age and intellectual ability explained a significant portion of the variation in MR, adding cognitive and affective perspective taking was meaningful, as discussed below.

As expected, various aspects of ToM were significantly associated with moral maturity. The findings are generally in line with the body of literature previously discussed supporting a strong association between ToM and MR in more limited age groups and with different tasks (Smetana et al., 2012; Sommer et al., 2014; Killen et al., 2011). Interestingly, only first-order false beliefs were correlated with moral decision-making, suggesting that the basic ability to recognize that the content of another's mind may be different from one's own may be the first step in predicting the consequences of one's own actions in a social situation. The lack of correlation with higher-order ToM (second- and third-order false beliefs, for example) could further suggest that these more advanced skills may not be necessary for basic moral decision-making. Recent work also using the So-Moral task suggests that moral maturity and decision-making, although sharing common characteristics, may be distinct constructs (Garon et al., 2018). As such, both basic and higher-level subcomponents of ToM (first-, second-, third-order false beliefs, detection of cheating and reciprocity) were associated with MR maturity in the current study. Detection of reciprocity, in particular, emerged as a key contributor to the way in which youth reason about a sociomoral conflict. Associations between reciprocity, perspective taking and sociomoral processes are supported by neuroimaging findings in adolescents (Van Den Bos et al., 2011), and links between better perspective taking abilities and prosocial behavior tendencies, such as trust and reciprocity, have been reported elsewhere (Frett et al., 2014). In the context of the So-

Moral task, a specific contribution of reciprocity to MR may reflect changes in the quality of MR as children begin to justify their moral decisions based on concepts of mutual exchanges of favours (e.g. Stage 2: “I’ll help you now, because I might need you to help me in the future”) (Beauchamp & Dooley, 2012). While Stage 2 remains a relatively egocentric level of MR, it does reflect emerging awareness of the importance of reciprocity. Children 6-12 years of age can usually reason at least at So-Moral Stage 2 (Chiasson et al., 2017). Another possible mechanism for the link between reciprocity and MR may be in underlying executive functions such as cognitive flexibility, which, by definition, are likely to support a child’s ability to consider alternate (or “reciprocal”) options (Vera-Estay et al., 2016).

Together, both aspects of perspective taking (ToM and empathy) jointly predicted MR, but only in children. These results are in line with integrative approaches emphasizing the roles of affective and cognitive factors in the development of moral processes (Malti & Latzko, 2010). However, only cognitive factors, reciprocity and cheating, emerged as independent predictors of MR maturity in children. Presumably, empathy may play some role in underscoring the emotional relevance of a socio-moral conflict, but the current data suggest that a cognitive understanding of the situation may be especially central to interpreting the cues and context necessary when reasoning about a moral situation (Reid et al., 2013). With respect to the absence of a direct association between empathy and MR, it is also possible that young children may apply deontic rules in sociomoral situations, forming expectations and predictions about the behaviors of others and reasoning about what should, must or may be done in a certain situation, without engaging empathetic processes relating to the victims in socio-moral situations (Clément, Bernard & Kaufmann, 2011).

Interestingly, we found no contribution of either affective or cognitive perspective taking to MR in adolescents and young adults. Although speculative, adolescents may employ moral processes differently than children do, as suggested by proponents of Social Domain Theory. Social Domain Theory suggests that there are three distinct domains of reasoning in socio-moral situations: moral (concerns of justice, welfare and rights), socio-conventional (pertaining to

rules, authority and punishment according to cultural norms) and psychological (regarding beliefs about the self, identity, personal choice and autonomy) (Killen et al., 2006; Turiel, 1983). Research suggests that younger children tend to focus on moral concerns, whereas adolescents focus on socio-conventional, psychological and identity-relevant concerns (Palmer, Rutland & Cameron, 2015), drawing on group dynamics, interpretation of complex situations, as well as their own personal autonomy (Killen et al., 2013). Perhaps then, adolescents in the current study may rely more on *psychological* reasoning in moral situations, favouring in-group biases, or justifying their decisions based on their own self, identity and autonomy, instead of relying on previously acquired perspective taking skills. Alternatively, other factors could account for additional variance in MR in adolescents, such as executive functions (Vetter et al., 2013; Vera-Estay et al., 2016; Shamay-Tsoory, 2010) or additional environmental, cultural and individual variables (Hinnant et al., 2013; Beauchamp & Anderson, 2010).

Finally, MR skills were associated with parent reported displays of externalized behaviors in children and adolescents, but not with prosocial behavior tendencies. The former is contrary to previous evidence supporting a link between mature moral processes and prosocial, altruistic behavior (Eisenberg et al., 1995; Malti et al., 2007; Malti et al., 2009). It could be that exhibiting more prosocial behaviors may depend more strongly on other socio-cognitive skills such as empathy, moral emotions, executive functioning and self-regulation (Williams, O'Driscoll & Moore, 2014; Alessandri, Caprara, Eisenberg, & Steca, 2009; De Wall, 2008; Hoffman, 2000; Eisenberg & Miller, 1987; Veenstra et al., 2008; Diener & Kim, 2004), or be better accounted for by socio-environmental and methodological factors such as family characteristics, socioeconomic status, parental stress and reporting biases (Veenstra et al., 2008). Conversely, the finding of an association between poorer MR skills and increased externalized behavior is consistent with theory and evidence suggesting links between immature moral processes (e.g. egocentric biases, hedonistic justifications) and externalized behaviors (Gibbs, 2003; Malti & Keller, 2009). Although speculative, difficulties in social understanding, related to less mature MR skills, may partly explain poorer social outcomes (Veiga, Neto & Rieffe, 2016). This finding in the current data is of importance, given that participants were healthy, typically developing children and adolescents with low levels of disruptive behaviors. Indeed, it makes sense that

abilities to reason about the needs of others should be related to behavior outcomes (Laible et al., 2014).

Strengths and Limitations

Strengths of the study include the use of a novel, ecological approach to the assessment of MR that reflects everyday conflicts and both child and adolescent realities, as well as a large age range (6 to 20 years) allowing for the investigation of perspective taking and MR across broad developmental span. However, a number of limitations need to be taken into account. First, while the content of the empathy measures used in children and adolescents was the same, the younger group relied on parent report, while the older group self-reported, each introducing different biases (e.g., personal parental bias versus socially desirable responding). Direct and/or third party empathy measures could be additionally beneficial in future work; however, few, if any measures are available across such a wide age span (e.g., see, however, Vossen and colleagues (2015)'s Adolescent Measure of Empathy and Sympathy, applicable from 8 years to adulthood). Another limitation is the overrepresentation of Caucasians and relatively high SES, limiting generalizability to broader populations. Finally, the current study was based on a cross-sectional design and precludes any causal associations.

Conclusions

This study provides novel information about the contribution of socio-cognitive building blocks of MR in a large sample of children and adolescents, based on an ecological approach to the measurement of MR. The main results indicate that both aspects of perspective taking (ToM and empathy) jointly predict MR in children, in line with integrative approaches emphasizing the roles of affective and cognitive factors in the development of moral processes. Cognitive perspective taking appears to be especially important for reasoning about a moral situation in children. In adolescents, perspective taking aspects were not predictive contributors of MR, suggesting that other factors contribute to MR in adolescence. Finally, children and adolescents who had less mature MR had more externalizing behavior problems, but no association were found with prosocial tendencies. The findings contribute to a better understanding of loci of intervention for promoting better MR and indirectly reducing externalizing behaviors in youth.

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Table 1. Main descriptive results and correlations¹

¹Pearson correlation coefficients

Variable	<i>M</i>	<i>SD</i>	Correlations	
			MR maturity	Moral decision-making
Theory of Mind				
First order false beliefs ^a	4.8	0.6	.26***	.18*
Second order false beliefs ^b	4.4	0.9	.36***	.11
Third order false beliefs ^c	2.3	0.9	.43***	-.01
Reciprocity ^d	2.6	0.6	.37***	.12
Cheating ^e	1.9	0.3	.20*	.18*
Total ToM ^f	51.7	7.1	.40***	-.01
Empathy				
GEM ^g	32.8	23.1	.19	.16
IECA ^h	15.9	3.1	-.01	.32**
Prosocial behaviors				
Social problems ⁱ	54.3	6.0	.01	.16
Externalized behaviors ^j	51.5	10.9	-.25**	.11
Prosocial tendencies ^k	81.5	12.3	.06	.10
Intellectual functioning	108.3	11.6	.23**	.11
SRI	1.5	1.7	.08	.01
Age	12.1	3.3	.61***	-.80
Sex			.16	.12
Moral Reasoning				
Moral maturity ^l	24.0	6.6	1	.16*
Moral decision-making ^m	8.9	1.4	.16*	1

* $p < .05$ ** $p < .01$ *** $p < .001$

^aTheory of Mind Picture Stories task first order false beliefs score; ^bTheory of Mind Picture Stories task second order false beliefs score; ^cTheory of Mind Picture Stories task third order false beliefs score; ^dTheory of Mind Picture Stories task reciprocity score; ^eTheory of Mind Picture Stories task cheating score; ^fTheory of Mind Picture Stories task total beliefs score
^g Griffith Empathy Measure total score ^h Index of Empathy for Children and Adolescents total score ⁱ CBCL Raw Social Problems score; ^j CBCL Raw Externalized Behaviors score; ^k Prosocial Tendencies Measure total score; ^l So-Moral, total justification score; ^m So-Moral, total decision-making score

Table 2. Sociocognitive predictors of moral reasoning

Predictor	Moral reasoning	
	ΔR^2	β
Step 1	.43***	
Age		.6***
Gender		.13*
SRI		0.01
IQ		.24***
Step 2	.03*	
Age		.53***
Gender		.14*
SRI		0.01
IQ		.20**
Reciprocity ^a		.15*
Cheating ^b		.08

* $p < .05$ ** $p < .01$ *** $p < .001$

^aTheory of Mind Picture Stories task reciprocity score; ^bTheory of Mind Picture Stories task cheating score

Table 3. Perspective taking predictors of moral reasoning

Predictor	Moral reasoning			
	Children		Adolescents	
	ΔR^2	β	ΔR^2	β
Step 1	.34***		.13*	
Age		.50***		.13
Gender		.24*		.09
SRI		-.04		.10
IQ		.07		.43***
Step 2	.08*		.01	
Age		.34**		.13
Gender		.24*		.10
SRI		-.08		.09
IQ		.05		.45***
Reciprocity ^a		.25*		-.05
Cheating ^b		.21*		-.05
Empathy ^{c,d}		-.04		-.06

* $p < .05$ ** $p < .01$ *** $p < .001$

^a Theory of Mind Picture Stories task reciprocity score; ^b Theory of Mind Picture Stories task cheating score; ^c Griffith Empathy Measure total score (children); ^d Index of Empathy for Children and Adolescents (adolescents)



Figure 4. Figure 1 : Example item from the So-Moral-Child task (Socio-Moral Reasoning Aptitude Level).

References

- Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA School-Age Forms & Profiles*. . Burlington, VT: : University of Vermont, Research Center for Children, Youth, & Families.
- Adolphs, R. (2001). The neurobiology of social cognition. *Current opinion in neurobiology*, *11*(2), 231-239. [https://doi.org/10.1016/S0959-4388\(00\)00202-6](https://doi.org/10.1016/S0959-4388(00)00202-6)
- Adolphs, R. (2009). The social brain: neural basis of social knowledge. *Annual review of psychology*, *60*, 693-716. doi:10.1146/annurev.psych.60.110707.163514
- Alessandri, G., Caprara, G. V., Eisenberg, N., & Steca, P. (2009). Reciprocal relations among self-efficacy beliefs and prosociality across time. *Journal of personality*, *77*(4), 1229-1259. doi: 10.1111/j.1467-6494.2009.00580.x
- Arsenio, W. F., & Lemerise, E. A. (2004). Aggression and moral development: Integrating social information processing and moral domain models. *Child development*, *75*(4), 987-1002. <https://doi.org/10.1111/j.1467-8624.2004.00720.x>
- Astington, J. W. (2004). Bridging the gap between theory of mind and moral reasoning. *New Directions for Child and Adolescent Development*, *2004*(103), 63-72. <https://doi.org/10.1002/cd.98>
- Baird, J. A., & Astington, J. W. (2004). The role of mental state understanding in the development of moral cognition and moral action. *New directions for child and adolescent development*, *2004*(103), 37-49. <https://doi.org/10.1002/cd.96>
- Barriga, A. Q., Sullivan-Cosetti, M., & Gibbs, J. C. (2009). Moral cognitive correlates of empathy in juvenile delinquents. *Criminal Behaviour and Mental Health*, *19*(4), 253-264. <https://doi.org/10.1002/cbm.740>
- Beauchamp, M. H. (2017). Neuropsychology's social landscape: Common ground with social neuroscience. *Neuropsychology*, *31*(8), 981. <http://dx.doi.org/10.1037/neu0000395>
- Beauchamp, M. H., & Anderson, V. (2010). SOCIAL: an integrative framework for the development of social skills. *Psychological bulletin*, *136*(1), 39. DOI: 10.1037/a0017768
- Beauchamp, M. H., & Dooley, J. J. (2012). *Administration and coding manual SocioMoral Reasoning Aptitude Level Task (So Moral)*. ABCs Laboratory. University of Montreal. Canada.

- Beauchamp, M. H., Dooley, J. J., & Anderson, V. (2013). A preliminary investigation of moral reasoning and empathy after traumatic brain injury in adolescents. *Brain Injury*, 27(7-8), 896-902. <https://doi.org/10.3109/02699052.2013.775486>
- Bechi, M., Riccaboni, R., Ali, S., Fresi, F., Buonocore, M., Bosia, M., . . . Cavallaro, R. (2012). Theory of mind and emotion processing training for patients with schizophrenia: Preliminary findings. *Psychiatry Research*, 198(3), 371-377. <https://doi.org/10.1016/j.psychres.2012.02.004>
- Blair, R. J. R. (2007). The amygdala and ventromedial prefrontal cortex in morality and psychopathy. *Trends in cognitive sciences*, 11(9), 387-392. <https://doi.org/10.1016/j.tics.2007.07.003>
- Blakemore, S. J. (2008). The social brain in adolescence. *Nature Reviews Neuroscience*, 9(4), 267-277. doi:10.1038/nrn2353
- Boxer, P., Goldstein, S. E., Musher-Eizenman, D., Dubow, E. F., & Heretick, D. (2005). Developmental issues in school-based aggression prevention from a social-cognitive perspective. *Journal of Primary Prevention*, 26(5), 383-400. <https://doi.org/10.1007/s10935-005-0005-9>
- Brune, M. (2005). Emotion recognition, 'theory of mind,' and social behavior in schizophrenia. *Psychiatry Research*, 133(2-3), 135-147. <https://doi.org/10.1016/j.psychres.2004.10.007>
- Bryant, B. K. (1982). An Index of Empathy for Children and Adolescents. *Child Development*, 53(2), 413-425. DOI: 10.2307/1128984
- Cacioppo, J. T. (2002). Social neuroscience: Understanding the pieces fosters understanding the whole and vice versa. *American Psychologist*, 57(11), 819. <http://dx.doi.org/10.1037/0003-066X.57.11.819>
- Cacioppo, J. T., Berntson, G. G., Sheridan, J. F., & McClintock, M. K. (2000). Multilevel integrative analyses of human behavior: Social neuroscience and the complementing nature of social and biological approaches. *Psychological Bulletin*, 126, 829-843. <http://dx.doi.org/10.1037/0033-2909.126.6.829>
- Camodeca, M., & Goossens, F. A. (2005). Aggression, social cognitions, anger and sadness in bullies and victims. *Journal of Child Psychology and Psychiatry*, 46(2), 186-197. <https://doi.org/10.1111/j.1469-7610.2004.00347.x>

- Carlo, G., Mestre, M. V., Samper, P., Tur, A., & Armenta, B. E. (2010). Feelings or cognitions? Moral cognitions and emotions as longitudinal predictors of prosocial and aggressive behaviors. *Personality and Individual Differences, 48*(8), 872-877. <https://doi.org/10.1016/j.paid.2010.02.010>
- Carlo, G., & Randall, B. A. (2002). The Development of a Measure of Prosocial Behaviors for Late Adolescents. *Journal of Youth and Adolescence, 31*(1), 31-44. DOI: 10.1023/A:1014033032440
- Chiasson, V., Elkaim, L., Weil, A. G., Crevier, L., & Beauchamp, M. H. (2017). Moral reasoning in children with focal brain insults to frontotemporal regions. *Brain Impairment, 18*(1), 102-116. <https://doi.org/10.1017/BrImp.2016.33>
- Chiasson, V., Vera-Estay, E., Lalonde, G., Dooley, J. J., & Beauchamp, M. H. (2017). Assessing social cognition: age-related changes in moral reasoning in childhood and adolescence. *The Clinical Neuropsychologist, 31*(3), 515-530. <https://doi.org/10.1080/13854046.2016.1268650>
- Clément, F., Bernard, S., & Kaufmann, L. (2011). Social cognition is not reducible to theory of mind: when children use deontic rules to predict the behaviour of others. *The British journal of developmental psychology, 29*(Pt 4), 910-928. <https://doi.org/10.1111/j.2044-835X.2010.02019.x>
- Dadds, M. R., Hunter, K., Hawes, D. J., Frost, A. D., Vassallo, S., Bunn, P., . . . Masry, Y. E. (2008). A measure of cognitive and affective empathy in children using parent ratings. *Child Psychiatry & Human Development, 39*(2), 111-122. DOI : 10.1007/s10578-007-0075-4
- De Waal, F. B. (2008). Putting the altruism back into altruism: the evolution of empathy. *Annu. Rev. Psychol., 59*, 279-300. doi: 10.1146/annurev.psych.59.103006.093625
- Decety, J., & Lamm, C. (2006). Human empathy through the lens of social neuroscience. *The scientific World journal, 6*, 1146-1163. <http://dx.doi.org/10.1100/tsw.2006.221>
- Decety, J., Michalska, K. J., Akitsuki, Y., & Lahey, B. B. (2009). Atypical empathic responses in adolescents with aggressive conduct disorder: a functional MRI investigation. *Biological psychology, 80*(2), 203-211. <https://doi.org/10.1016/j.biopsycho.2008.09.004>

- Decety, J., Michalska, K. J., & Kinzler, K. D. (2012). The Contribution of Emotion and Cognition to Moral Sensitivity: A Neurodevelopmental Study. *Cerebral Cortex*, *22*, 209-220. <https://doi.org/10.1093/cercor/bhr111>
- Diener, M. L., & Kim, D. Y. (2004). Maternal and child predictors of preschool children's social competence. *Journal of Applied Developmental Psychology*, *25*(1), 3-24. <https://doi.org/10.1016/j.appdev.2003.11.006>
- Dooley, J. J., Beauchamp, M., & Anderson, V. A. (2010). The measurement of sociomoral reasoning in adolescents with traumatic brain injury: A pilot investigation. *Brain Impairment*, *11*(02), 152-161. <https://doi.org/10.1375/brim.11.2.152>
- Dumontheil, I., Apperly, I. A., & Blakemore, S. J. (2010). Online usage of theory of mind continues to develop in late adolescence. *Developmental science*, *13*(2), 331-338. <https://doi.org/10.1111/j.1467-7687.2009.00888.x>
- Eisenberg, N., & Fabes, R. A. (1990). Empathy: Conceptualization, measurement, and relation to prosocial behavior. *Motivation and Emotion*, *14*(2), 131-149. <https://doi.org/10.1007/BF00991640>
- Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological bulletin*, *101*(1), 91. <http://dx.doi.org/10.1037/0033-2909.101.1.91>
- Eisenberg-Berg, N., & Mussen, P. (1978). Empathy and moral development in adolescence. *Developmental Psychology*, *14*(2), 185. <http://dx.doi.org/10.1037/0012-1649.14.2.185>
- Eisenberg, N., Carlo, G., Murphy, B., & Van Court, P. (1995). Prosocial development in late adolescence: a longitudinal study. *Child development*, *66*(4), 1179-1197. <https://doi.org/10.1111/j.1467-8624.1995.tb00930.x>
- Eisenberg, N., Zhou, Q., & Koller, S. (2001). Brazilian Adolescents' Prosocial Moral Judgment and Behavior: Relations to Sympathy, Perspective Taking, Gender-Role Orientation, and Demographic Characteristics. *Child development*, *72*(2), 518-534. <https://doi.org/10.1111/1467-8624.00294>
- Eisenberg, N., Cumberland, A., Guthrie, I. K., Murphy, B. C., & Shepard, S. A. (2005). Age changes in prosocial responding and moral reasoning in adolescence and early

- adulthood. *Journal of research on adolescence*, 15(3), 235-260.
<https://doi.org/10.1111/j.1532-7795.2005.00095.x>
- Eisenberg, N., Guthrie, I. K., Cumberland, A., Murphy, B. C., Shepard, S. A., Zhou, Q., & Carlo, G. (2002). Prosocial development in early adulthood: a longitudinal study. *Journal of personality and social psychology*, 82(6), 993. doi: 10.1037/0022-3514.82.6.993
- Eslinger, P. J., Flaherty-Craig, C. V., & Benton, A. L. (2004). Developmental outcomes after early prefrontal cortex damage. *Brain and Cognition*, 55(1), 84-103.
[https://doi.org/10.1016/S0278-2626\(03\)00281-1](https://doi.org/10.1016/S0278-2626(03)00281-1)
- Fett, A. K. J., Shergill, S. S., Gromann, P. M., Dumontheil, I., Blakemore, S. J., Yakub, F., & Krabbendam, L. (2014). Trust and social reciprocity in adolescence—a matter of perspective-taking. *Journal of adolescence*, 37(2), 175-184.
<https://doi.org/10.1016/j.adolescence.2013.11.011>
- Garon, M., Lavallée, M. M., Estay, E. V., & Beauchamp, M. H. (2018). Visual encoding of social cues predicts sociomoral reasoning. *PloS one*, 13(7), e0201099.
<https://doi.org/10.1371/journal.pone.0201099>
- Gibbs, J. C. (2010). *Moral development & reality : beyond the theories of Kohlberg and Hoffman* (2nd ed.). Boston: Allyn & Bacon.
- Gibbs, J. C. (2013). *Moral development and reality : beyond the theories of Kohlberg, Hoffman, and Haidt* (3rd ed.). New York: Oxford University Press.
- Girard, É., Terradas, M. M., & Matte-Gagné, C. (2014). Empathie, comportements pro-sociaux et troubles du comportement. *Enfance*, 2014(4), 459-480.
 doi:10.4074/S0013754514004030.
- Gleichgerrcht, E., & Young, L. (2013). Low levels of empathic concern predict utilitarian moral judgment. *PloS one*, 8(4), e60418. <https://doi.org/10.1371/journal.pone.0060418>
- Gleichgerrcht, E., Tomashitis, B., & Sinay, V. (2015). The relationship between alexithymia, empathy and moral judgment in patients with multiple sclerosis. *European Journal of Neurology*, 22(9), 1295-1303. <https://doi.org/10.1111/ene.12745>
- Greene, J. D., Sommerville, R. B., Nystrom, L. E., Darley, J. M., & Cohen, J. D. (2001). An fMRI investigation of emotional engagement in moral judgment. *Science*, 293(5537), 2105-2108. DOI: 10.1126/science.1062872

- Haidt, J. (2001). The emotional dog and its rational tail: a social intuitionist approach to moral judgment. *Psychological review*, 108(4), 814. <http://dx.doi.org/10.1037/0033-295X.108.4.814>
- Happé, F., & Frith, U. (2014). Annual research review: Towards a developmental neuroscience of atypical social cognition. *Journal of Child Psychology and Psychiatry*, 55(6), 553-577. <https://doi.org/10.1111/jcpp.12162>
- Henry, K. L., & Slater, M. D. (2007). The contextual effect of school attachment on young adolescents' alcohol use. *Journal of school health*, 77(2), 67-74. <https://doi.org/10.1111/j.1746-1561.2007.00169.x>
- Hinnant, J. B., Nelson, J. A., O'Brien, M., Keane, S. P., & Calkins, S. D. (2013). The interactive roles of parenting, emotion regulation and executive functioning in moral reasoning during middle childhood. *Cognition & emotion*, 27(8), 1460-1468. DOI: 10.1080/02699931.2013.789792
- Hoffman, M. L. (2000). *Empathy and moral development: Implications for caring and justice*. Cambridge University Press.
- Kennedy, D. P., & Adolphs, R. (2012). The social brain in psychiatric and neurological disorders. *Trends in cognitive sciences*, 16(11), 559-572. <https://doi.org/10.1016/j.tics.2012.09.006>
- Killen, M., Mulvey, K. L., Richardson, C., Jampol, N., & Woodward, A. (2011). The accidental transgressor: Morally-relevant theory of mind. *Cognition*, 119(2), 197-215. <https://doi.org/10.1016/j.cognition.2011.01.006>
- Killen, M., Rutland, A., Abrams, D., Mulvey, K. L., & Hitti, A. (2013). Development of intra- and intergroup judgments in the context of moral and social-conventional norms. *Child Development*, 84(3), 1063-1080. <https://doi.org/10.1111/cdev.12011>
- Killen, M., & Smetana, J. (2007). The biology of morality: Human development and moral neuroscience. *Human Development*, 50(5), 241-243. <https://doi.org/10.1159/000106413>
- Killen, M., Smetana, J. G., & Smetana, J. (2006). Social-cognitive domain theory: Consistencies and variations in children's moral and social judgments. In *Handbook of moral development* (pp. 137-172). Psychology Press.
- Knobe, J. (2005). Theory of mind and moral cognition: Exploring the connections. *Trends in cognitive sciences*, 9(8), 357-359. <https://doi.org/10.1016/j.tics.2005.06.011>

- Kohlberg, L. (1981). *The philosophy of moral development: Moral stages and the idea of justice (essays on moral development, volume 1)*. San Francisco: Harper & Row.
- Kohlberg, L., Levine, C., & Hewer, A. (1983). Moral stages: A current formulation and a response to critics. *Contributions to Human Development, 10*, 174.
- Krettenauer, T., & Johnston, M. (2011). Positively versus negatively charged moral emotion expectancies in adolescence: The role of situational context and the developing moral self. *British Journal of Developmental Psychology, 29*(3), 475-488. <https://doi.org/10.1348/026151010X508083>
- Krettenauer, T., Jia, F., & Mosleh, M. (2011). The role of emotion expectancies in adolescents' moral decision making. *Journal of experimental child psychology, 108*(2), 358-370. <https://doi.org/10.1016/j.jecp.2010.08.014>
- Laible, D., Eye, J., & Carlo, G. (2008). Dimensions of conscience in mid-adolescence: Links with social behavior, parenting, and temperament. *Journal of Youth and Adolescence, 37*(7), 875-887. <https://doi.org/10.1007/s10964-008-9277-8>
- Laible, D. J., Murphy, T. P., & Augustine, M. (2014). Adolescents' aggressive and prosocial behaviors: Links with social information processing, negative emotionality, moral affect, and moral cognition. *The Journal of genetic psychology, 175*(3), 270-286. <https://doi.org/10.1080/00221325.2014.885878>
- Lane, J. D., Wellman, H. M., Olson, S. L., LaBounty, J., & Kerr, D. C. (2010). Theory of mind and emotion understanding predict moral development in early childhood. *British Journal of Developmental Psychology, 28*(4), 871-889. <https://doi.org/10.1348/026151009X483056>
- Lonigro, A., Laghi, F., Baiocco, R., & Baumgartner, E. (2014). Mind reading skills and empathy: Evidence for nice and nasty ToM behaviours in school-aged children. *Journal of Child and Family Studies, 23*(3), 581-590. <https://doi.org/10.1007/s10826-013-9722-5>
- Loureiro, C. P., & Souza, D. D. H. (2013). The relationship between theory of mind and moral development in preschool children. *Paidéia (Ribeirão Preto), 23*(54), 93-101. [doi:http://dx.doi.org/10.1590/1982-43272354201311](http://dx.doi.org/10.1590/1982-43272354201311)
- Malti, T., Gasser, L., & Gutzwiller-Helfenfinger, E. (2010). Children's interpretive understanding, moral judgments, and emotion attributions: Relations to social

- behaviour. *British Journal of Developmental Psychology*, 28(2), 275-292.
<https://doi.org/10.1348/026151009X403838>
- Malti, T., Gummerum, M., & Buchmann, M. (2007). Contemporaneous and 1-year longitudinal prediction of children's prosocial behavior from sympathy and moral motivation. *The Journal of genetic psychology*, 168(3), 277-299.
<http://dx.doi.org/10.3200/GNTP.168.3.277-300>
- Malti, T., Gummerum, M., Keller, M., & Buchmann, M. (2009). Children's moral motivation, sympathy, and prosocial behavior. *Child development*, 80(2), 442-460.
<https://doi.org/10.1111/j.1467-8624.2009.01271.x>
- Malti, T., & Keller, M. (2009). The relation of elementary-school children's externalizing behaviour to emotion attributions, evaluation of consequences, and moral reasoning. *European Journal of Developmental Psychology*, 6(5), 592-614.
<https://doi.org/10.1080/17405620701497497>
- Malti, T., & Latzko, B. (2010). Children's moral emotions and moral cognition: Towards an integrative perspective. *New directions for child and adolescent development*, 2010(129), 1-10. <https://doi.org/10.1002/cd.272>
- Miller, P. A., & Eisenberg, N. (1988). The relation of empathy to aggressive and externalizing/antisocial behavior. *Psychological bulletin*, 103(3), 324.
<http://dx.doi.org/10.1037/0033-2909.103.3.324>
- Moll, J., de Oliveira-Souza, R., Eslinger, P. J., Bramati, I. E., Mourão-Miranda, J., Andreiuolo, P. A., & Pessoa, L. (2002). The neural correlates of moral sensitivity: a functional magnetic resonance imaging investigation of basic and moral emotions. *Journal of neuroscience*, 22(7), 2730-2736. DOI: <https://doi.org/10.1523/JNEUROSCI.22-07-02730.2002>
- Moll, J., Zahn, R., de Oliveira-Souza, R., Krueger, F., & Grafman, J. (2005). The neural basis of human moral cognition. *Nature Reviews Neuroscience*, 6(10), 799-809.
<https://doi.org/10.1038/nrn1768>
- Narvaez, D. (2010). The emotional foundations of high moral intelligence. *New Directions for Child and Adolescent Development*, 129, 77-94. San Francisco: Jossey-Bass.
<https://doi.org/10.1002/cd.276>

- Orobio De Castro, B., Veerman, J. W., Koops, W., Bosch, J. D., & Monshouwer, H. J. (2002). Hostile attribution of intent and aggressive behavior: A meta-analysis. *Child development, 73*(3), 916-934. <https://doi.org/10.1111/1467-8624.00447>
- Palmer, S. B., Rutland, A., & Cameron, L. (2015). The development of bystander intentions and social-moral reasoning about intergroup verbal aggression. *British journal of developmental psychology, 33*(4), 419-433. <https://doi.org/10.1111/bjdp.12092>
- Reid, C., Davis, H., Horlin, C., Anderson, M., Baughman, N., & Campbell, C. (2013). The Kids' Empathic Development Scale (KEDS): A multi-dimensional measure of empathy in primary school-aged children. *British Journal of Developmental Psychology, 31*(2), 231-256. <https://doi.org/10.1111/bjdp.12002>
- Righthand, S., & Welch, C. (2005). Characteristics of youth who sexually offend. *Journal of child sexual abuse, 13*(3-4), 15-32. https://doi.org/10.1300/J070v13n03_02
- Roberts, G., Howard, K., Spittle, A. J., Brown, N. C., Anderson, P. J., & Doyle, L. W. (2008). Rates of early intervention services in very preterm children with developmental disabilities at age 2 years. *Journal of Paediatrics and Child Health, 44*, 276-280. <https://doi.org/10.1111/j.1440-1754.2007.01251.x>
- Saelen, C., & Markovits, H. (2008). Adolescents' emotion attributions and expectations of behavior in situations involving moral conflict. *Journal of experimental child psychology, 100*(1), 53-76. <https://doi.org/10.1016/j.jecp.2008.01.002>
- Saracho, O. (2014) Theory of mind: understanding young children's pretence and mental states, *Early Child Development and Care, 184*(8), 1281-1294 <https://doi.org/10.1080/03004430.2013.865617>
- Scourfield, J., Martin, N., Lewis, G., & McGuffin, P. (1999). Heritability of social cognitive skills in children and adolescents. *The British Journal of Psychiatry, 175*(6), 559-564. <https://doi.org/10.1192/bjp.175.6.559>
- Shamay-Tsoory, S. G., Harari, H., Aharon-Peretz, J., & Levkovitz, Y. (2010). The role of the orbitofrontal cortex in affective theory of mind deficits in criminal offenders with psychopathic tendencies. *Cortex, 46*(5), 668-677. <https://doi.org/10.1016/j.cortex.2009.04.008>
- Smetana, J. G. (2010). *Adolescents, families, and social development: How teens construct their worlds*. Sussex, England: Wiley-Blackwell.

- Smetana, J. G., Jambon, M., Conry-Murray, C., & Sturge-Apple, M. L. (2012). Reciprocal associations between young children's developing moral judgments and theory of mind. *Developmental Psychology, 48*(4), 1144. DOI: 10.1037/a0025891
- Soderstrom, H. (2003). Psychopathy as a disorder of empathy. *European Child & Adolescent Psychiatry, 12*(5), 249-252. <https://doi.org/10.1007/s00787-003-0338-y>
- Sodian, B., Licata, M., Kristen-Antonow, S., Paulus, M., Killen, M., & Woodward, A. (2016). Understanding of goals, beliefs, and desires predicts morally relevant theory of mind: A longitudinal investigation. *Child development, 87*(4), 1221-1232. <https://doi.org/10.1111/cdev.12533>
- Sommer, M., Meinhardt, J., Rothmayr, C., Döhnel, K., Hajak, G., Rupprecht, R., & Sodian, B. (2014). Me or you? Neural correlates of moral reasoning in everyday conflict situations in adolescents and adults. *Social neuroscience, 9*(5), 452-470. <https://doi.org/10.1080/17470919.2014.933714>
- Statistics Canada. (2015, 26th June 2015). Median total income, by family type, by province and territory. Retrieved from <http://www.statcan.gc.ca/tables-tableaux/sum-som/101/cst01/famil108a-eng.htm>
- Turiel, E. (1983). *The development of social knowledge: Morality and convention*. Cambridge University Press.
- Underwood, B., & Moore, B. (1982). Perspective-taking and altruism. *Psychological bulletin, 91*(1), 143. <http://dx.doi.org/10.1037/0033-2909.91.1.143>
- Van den Bos, W., van Dijk, E., Westenberg, M., Rombouts, S. A., & Crone, E. A. (2011). Changing brains, changing perspectives: the neurocognitive development of reciprocity. *Psychological Science, 22*(1), 60-70. <https://doi.org/10.1177/0956797610391102>
- Veenstra, R., Lindenberg, S., Oldehinkel, A. J., De Winter, A. F., Verhulst, F. C., & Ormel, J. (2008). Prosocial and antisocial behavior in preadolescence: Teachers' and parents' perceptions of the behavior of girls and boys. *International Journal of Behavioral Development, 32*(3), 243-251. <https://doi.org/10.1177/0165025408089274>
- Veiga, G., Neto, C., & Rieffe, C. (2016). Preschoolers' Free Play--Connections with Emotional and Social Functioning. *International Journal of Emotional Education, 8*(1), 48-62. Retrieved from: <https://files.eric.ed.gov/fulltext/EJ1098789.pdf>

- Veenstra, R., Lindenberg, S., Oldehinkel, A. J., De Winter, A. F., Verhulst, F. C., & Ormel, J. (2008). Prosocial and antisocial behavior in preadolescence: Teachers' and parents' perceptions of the behavior of girls and boys. *International Journal of Behavioral Development, 32*(3), 243-251. <https://doi.org/10.1177/0165025408089274>
- Vera-Estay, E., Dooley, J. J., & Beauchamp, M. H. (2015). Cognitive underpinnings of moral reasoning in adolescence: The contribution of executive functions. *Journal of Moral Education, 44*(1), 17-33. <https://doi.org/10.1080/03057240.2014.986077>
- Vera-Estay, E., Seni, A. G., Champagne, C., & Beauchamp, M. H. (2016). All for one: Contributions of age, socioeconomic factors, executive functioning, and social cognition to moral reasoning in childhood. *Frontiers in psychology, 7*, 227. <https://doi.org/10.3389/fpsyg.2016.00227>
- Vetter, N. C., Altgassen, M., Phillips, L., Mahy, C. E., & Kliegel, M. (2013). Development of affective theory of mind across adolescence: disentangling the role of executive functions. *Developmental Neuropsychology, 38*(2), 114-125. <https://doi.org/10.1080/87565641.2012.733786>
- Vossen, H. G., Piotrowski, J. T., & Valkenburg, P. M. (2015). Development of the adolescent measure of empathy and sympathy (AMES). *Personality and Individual Differences, 74*, 66-71. <https://doi.org/10.1016/j.paid.2014.09.040>
- Walker, L. J., & Taylor, J. H. (1991). Family interactions and the development of moral reasoning. *Child development, 62*(2), 264-283. <https://doi.org/10.1111/j.1467-8624.1991.tb01530.x>
- Warden, D., & Mackinnon, S. (2003). Prosocial children, bullies and victims: An investigation of their sociometric status, empathy and social problem-solving strategies. *British Journal of Developmental Psychology, 21*(3), 367-385. <https://doi.org/10.1348/026151003322277757>
- Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence (WASI)*. San Antonio, TX: Harcourt Assessment.
- Wellman, H. M., & Miller, J. G. (2008). Including deontic reasoning as fundamental to theory of mind. *Human Development, 51*(2), 105-135. DOI: 10.1159/000115958

- Williams, A., O'Driscoll, K., & Moore, C. (2014). The influence of empathic concern on prosocial behavior in children. *Frontiers in Psychology, 5*, 425. <https://doi.org/10.3389/fpsyg.2014.00425>
- Young, L., Cushman, F., Hauser, M., & Saxe, R. (2007). The neural basis of the interaction between theory of mind and moral judgment. *Proceedings of the National Academy of Sciences, 104*(20), 8235-8240. <https://doi.org/10.1073/pnas.0701408104>
- Young, L., & Saxe, R. (2009). An fMRI investigation of spontaneous mental state inference for moral judgment. *Journal of cognitive neuroscience, 21*(7), 1396-1405. <https://doi.org/10.1162/jocn.2009.21137>

Article 2

Video game playing frequency, social cognition and social behavior in childhood

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Abstract

Background: Research to date regarding associations between video game playing frequency (VGPF) and social competence in children is far from unanimous. **Methods:** The current study aimed to explore associations between VGPF and social competence (social cognition and social behavior) in children aged 6 to 12 years ($n = 57$). Children completed measures of video game habits, social cognition (everyday executive functioning, theory of mind, empathy, moral reasoning, affect recognition), social adaptive skills, and social behavior (prosocial behavior tendencies, social problems). **Results:** Weekly VGPF was positively associated with everyday executive difficulties and social problems, and negatively associated with social adaptive skills and prosocial behavior tendencies. Better social adaptive skills, higher empathy, and lower VGPF were significant, independent predictors of prosocial behavior. Poorer empathy and everyday executive difficulties were significant, independent predictors of social problems. **Conclusions:** Findings suggest that children who play fewer video games on a weekly basis than their peers display better prosocial skills, but in this study VGPF was not associated with social behavior problems. Playing video games may not make children more likely to exhibit social problems, but limiting video game playing may allow them to have more opportunities for real-life social interaction, in turn promoting prosocial tendencies.

Keywords: video games; social competence; prosocial behavior; social problems; social cognition; childhood

Introduction

Video games and online gaming have become a leading part of the entertainment industry over the last few decades, with up to 97% of teenagers in the US reportedly playing some form of video game (Lenhart et al., 2008). The gaming world, however, is not unidimensional. Games vary by genre (e.g. action, adventure, role-playing, simulation, strategy, sports) and sub-genre (e.g. platform and shooter action games, vehicle or life simulation); different games have different purposes (e.g. educational, serious, creative), differ in terms of interface, platform and medium (e.g. consoles, mobile, online) and vary in terms of content (e.g. prosocial, violent, nonviolent). There is some consensus that the effect of video game exposure on social behavior and related cognitive and affective variables is tangible, with studies reporting both positive and negative effects (see Greitemeyer & Mügge, 2013, for a review). However, questions remain regarding the impact of the amount of time spent playing video games on general social competence. Indeed, although video game playing can at times be a social activity shared amongst physical or virtual peers, it can also be a passive and solitary activity when played alone (Lenart et al., 2008; Steinkuehler & Williams, 2006), effectively displacing crucial time spent on civic, social and community-building activities (Putman, 2000). A main concern amongst researchers and policy makers is that youth are spending an increasing amount of time playing video games, giving up real-life activities (Liu & Peng, 2009) and leaving less time for social group interactions that develop social competence (Lenhart et al., 2008; Putnam, 2000).

Social competence refers to the complex skills “required to engage socio-cognitive processes and display social behaviors” (Beauchamp & Anderson, 2010). These social behaviors may be characterized as prosocial if they have positive effects on social interactions or are motivated by the desire to benefit another person rather than one’s own goals (Eisenberg et al., 2005), or antisocial, if their core intention is to harm or disadvantage others (Kavussanu, 2009). Although definitions vary, the core concept of social competence involves the degree to which individuals engage in social behaviors and are able to successfully create and maintain positive social interactions (Anderson-Butcher, Lachini & Amorose, 2008). The development of social

competence, as proposed in the biopsychosocial framework “SOCIAL” (Socio-Cognitive Integration of Abilities Model, Beauchamp & Anderson, 2010), is underpinned by biological (e.g. brain development and integrity) determinants, as well as by children’s internal (e.g. temperament) and external (e.g. socioeconomic status, culture) characteristics (Beauchamp & Anderson, 2010), the latter including broad social experiences such as social learning opportunities and exposure to diverse social contexts (Thompson et al., 2018; Bandura, 1971). Finally, SOCIAL highlights the critical role of socio-cognitive skills in determining social competence, such as emotion processing, theory of mind, empathy and moral reasoning, all high-level cognitive processes used to perceive and process social cues (Happé & Frith, 2014; Beauchamp & Anderson, 2010; Eisenberg et al., 2015).

A bulk of research to date has focused on the negative social outcomes related to gaming, specifically with regards to violent video games and their associations with aggression, including aggressive behavior, cognition, and affect (see Anderson, 2004 and Sherry, 2001 for reviews). Links have also been found between violent video game playing and increased externalized behaviors (Milani et al., 2015), physiological arousal (Anderson & Bushman, 2001), depression (Tortolero et al., 2014), game addiction, social isolation (Kraut et al., 1998), poor quality friendships (Verheijen et al., 2018) and reduced prosocial behavior (Anderson & Bushman, 2001). Others have reported associations between violent video game playing and desensitization towards violence, changes in attitudes towards violence, as well as lower levels of empathy and moral reasoning (Funk, 2005). Several explanatory mechanisms for the negative social effects of video game playing have been proposed. Some suggest that heightened arousal due to the stimulating nature of video games may increase aggressive behaviors post-game (Dorman, 1997). Proponents of social learning theory highlight the possibility that video game playing may allow children to practice aggression in the context of a game and then be rewarded by its success (Dorman, 1997). Others suggest that some video game players express a ‘preference for virtual life’ that is associated with dependency on gaming, decreased adherence to social norms, loneliness, depression and poor social competence (Liu & Peng, 2009).

Despite reports of negative effects, findings regarding the effect of video games on social outcomes are far from unanimous (Ferguson & Colwell, 2017). Sakamoto (1994), for example, studied elementary school-aged children in Japan and found no relation between video game use and social adjustment. In fact, some evidence suggests that important cognitive, affective and social skills are enhanced or reinforced by playing video games (see Nuyens et al., 2018 and Boyle et al., 2016, for recent reviews). For example, frequency of video game playing and video game experience are associated with improved attention skills (Dye et al., 2009), executive functioning (Homer et al., 2018; Staiano et al., 2012; Strobach et al., 2012), visuospatial abilities (Ferguson, 2007; West et al., 2008), processing speed and motor control (West et al., 2013), problem solving skills (Granic et al., 2014), intellectual abilities (Glass et al., 2013), creativity (Jackson et al., 2012) and some forms of civic and social engagement (Lenhart et al., 2008). In particular, games with prosocial content, i.e., games designed to reward cooperation and helping (e.g. *Super Mario Sunshine*, *Lemmings*, *Chi Robo*), have been associated with helping behavior, prosocial affect, prosocial behavior tendencies, reduced aggression and increased levels of empathy (Greitemeyer et al., 2012; Gentile et al., 2009; Prot et al., 2014; Harrington & O'Connell, 2016; Kral et al., 2018). These positive effects on behavior are supported by the General Learning Model (Anderson & Bushman, 2002; Gentile et al., 2014), according to which social behavior is partly derived from environmental interactions and social encounters (Prot et al., 2014). Additional evidence suggests cooperative team-play games can attenuate the negative effects of violent video game playing (Velez et al., 2016; Greitemeyer et al., 2012). In theory, video games may offer safe environments for children to act out their aggressive fantasies, resulting in fewer actual displays of aggressive behavior (Dorman, 1997). Finally, there is also evidence for enhanced socio-cognitive skills, such as theory of mind and mentalizing, through in-game storytelling (Bormann & Greitemeyer, 2015).

Studies on video games thus presents diverging evidence and views on the association between the amount of time spent playing video games and social outcomes. Some of these discrepancies are likely to be due to methodological differences between studies, as well as limitations stemming from study design. Studies tend to focus on selected game types or content within a single study (e.g. violent *versus* nonviolent, cooperative *versus* competitive, online world only)

rather than on general usage (Milani et al., 2015; Ewoldsen et al., 2012; Liu & Peng, 2009). Also, few studies to date have investigated both positive and negative displays of social competence simultaneously (e.g., prosocial and externalized/aggressive behaviors), likely to be independent tendencies, underpinned by different mechanisms and etiologies, rather than comprising opposite ends of the same spectrum (Krueger et al., 2001). Moreover, current research has typically considered broad psychosocial variables such as cultural environment, socioeconomic factors, and family values and background (Funk, 2005; Harrington & O'Connell, 2016; DeCamp & Ferguson, 2017), but has rarely taken into account the specific socio-cognitive and socio-adaptive factors that underlie more global social competence in children (Beauchamp & Anderson, 2010).

A further methodological issue is that many studies have focused on small, extreme groups of individuals (e.g. addicted players, problematic games), hindering generalizability to the normative population. When studies in typically developing individuals have been performed, most of the research has focused on adolescents and adults, with few focusing on video game playing in elementary school-aged children. This developmental group is highly relevant to consider given reports that school-aged children also frequently engage in video game playing and that gaming among children is increasing in frequency and popularity (NDP Group, 2014). In addition, middle childhood is a formative period for the development of social competence given the ongoing development of social cognitive skills such as theory of mind, empathy and complex emotion understanding (Ornaghi et al., 2014). Finally, meaningful social interactions with peers, social learning and exposure to positive relationships are crucial during this period (Parker et al., 1995, Bornstein et al., 2010; Masten & Coatsworth, 1998; Ladd, 1999). For example, prosocial behavior towards peers increases throughout childhood (Eisenberg and Fabes, 1998; Eisenberg et al., 2015; Fabes et al., 1999), in parallel with socio-cognitive capacities such as empathy and moral reasoning. Kovess-Masfety and colleagues (2016) conducted one of the few studies on video games and social outcomes in elementary school children (6 to 11 years). The authors reported associations between high video game usage and higher intellectual functioning and academic competence, and no associations were found between usage and parent-, teacher- or child self-reported mental health issues. Rather, high

video game usage was associated with fewer peer relationship problems and better prosocial skills, suggesting an overall positive effect of playing video games. Conversely, in a longitudinal study, Lobel and colleagues (2017) found that gaming frequency in children 7 to 11 years was associated with increased internalizing and emotion problems (but not externalizing or peer problems) one year later. They also found that frequent competitive gaming was associated with declines in prosocial behavior, even after controlling for cooperative gaming (Lobel et al., 2017).

The goal of the current study was to explore the associations between frequency of video game playing in children and two main components of social competence, namely social cognition and social behavior (including both positive and negative aspects of behavior). The specific aims were to 1) explore the relations between children's video game playing frequency (VGPF), their socio-cognitive skills (including everyday executive functioning, theory of mind, empathy, moral reasoning, affect recognition), social adaptive skills, and social behavior (prosocial tendencies, social behavior problems); and 2) explore the contribution of VGPF to social behavior (i.e, prosocial tendencies and social problems), after taking into account demographic, socio-cognitive and social adaptive variables. We expected to find negative associations between VGPF and socio-cognitive/adaptive skills. We also hypothesized that more VGPF would be related to poorer prosocial skills as well as with more social problems, even after controlling for the contribution of socio-cognitive skills (theory of mind, empathy, moral reasoning, affect recognition) and social adaptive skills.

Methods

Participants

Fifty-seven children between 6 and 12 years (47.4% males, $M = 9.5$, $SD = 1.69$ years) participated in this study. All participants and their families were French speakers, predominantly Caucasian (98%), had no history of any psychiatric or neurological condition, had IQ levels in the low to high average range (87-129, $M = 109$, $SD = 8.5$) and were primarily from middle-class families according to their income (Statistics Canada, 2015). Participants

were identified and recruited through regular primary schools in Quebec, Canada, via invitation letters to their parents. All parents provided written informed consent prior to participation. Children received a \$30 bookstore gift card for their participation and parents received a \$5 gift card as compensation. The Research Ethics Committee of the Faculty of Arts and Science at the University of Montreal approved the study.

Measures

Demographic and Developmental Questionnaire: Parents' of participants completed a questionnaire pertaining to their child's medical, developmental and social history, as well parental education level, ethnicity, and income.

Video Game questionnaire: Parents' of participants completed a questionnaire documenting their child's video game playing habits. The questionnaire was adapted from Kuhn et al. (2014) and included the following questions: 'How many days per week does your child play video games?'; 'How many hours does your child play video games on these days on average?'; and 'How many years has your child been playing video games on a regular basis?'. Further, parents were asked to report the types of video games played by their children (e.g., building, simulation, real time strategy, racing, ball, online role playing, single-player 3D role playing, role playing, action-based role playing, click and point adventure, side scroller fighting, survival horror, adventure, platform, first-person shooter, third-person shooter, logic/puzzle, arcade, cell phone/Facebook games), in a non-mutually exclusive list of genres. Parents were also asked if their children played either mainly alone (e.g. single player games), with online interactions (e.g. multiplayer games with people not physically present with them), or with friends in person (e.g. playing multiplayer games together with people on a split screen, or single player games with people present and taking turns playing). Answers were grouped into non-social (single player game alone) and social game interaction (single and multiplayer games with online and physical interactions) categories. Games were also categorized into low violence (e.g. *Minecraft*, *Super Mario*, *Final Fantasy*) and high violence (e.g. *Call of Duty*, *Resident Evil 1-3*, *Mortal Kombat*) types. In this study, total hours played per week was used as the primary measure of video game playing frequency (VGPF).

Intellectual functioning: The Wechsler Abbreviated Scale of Intelligence (WASI, Wechsler, 1999) was used to provide an estimate of general intellectual ability based on the Vocabulary and Matrix Reasoning subtests (IQ, $M=100$, $SD = 15$).

Social cognition and social adaptive skills

Everyday executive functioning: The Behavior Rating Inventory of Executive Function, Parent Form (BRIEF-PF, Gioia, Isquith, Guy, & Kenworth, 2000), is a parent-report questionnaire for children aged 5 to 18 years, assessing emotional and behavioral manifestations of executive functioning in both home and school environments. This 86-item questionnaire provides eight scales, a Global Executive Composite (GEC), along with a Metacognition Index (MCI) (including Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor scales) and a Behavior Regulation Index (BRI) (including Inhibit, Shift and Emotional Control scales). Parents are asked to rate their child's behavior on a three-point Likert scale (never, sometimes, and often), with higher ratings indicating greater perceived executive difficulties. The BRIEF has demonstrated excellent psychometric properties such as high internal consistency ($\alpha = .80-.98$). In this study, the raw Global Executive composite was used as the main measure of everyday executive functioning, and the raw BRI and MCI were also reported.

Empathy: The Griffith Empathy Measure (GEM, Dadds et al., 2008) is a 23-item parent-report questionnaire adapted from Bryant's Index of Empathy for Children and Adolescents (Bryant, 1982) in which parents rate the empathetic abilities of their child on a nine-point Likert scale from -4 (strongly disagree) to 4 (strongly agree). This questionnaire provides three scores: Cognitive empathy (score -56 to 56), Affective empathy (score -68 to 68) and Total Empathy (score -92 to 92), with higher scores corresponding to higher levels of empathy. Cognitive empathy can be defined as "the ability to intellectually take the role or perspective of another person involving the ability to decode and label emotions and their situational cues" (Dadds et al. 2008, page 112). Affective empathy is defined as "an affective response more appropriate to, or congruent with, someone else's situation than to one's own situation" (Dadds et al. 2008, page 112). The GEM has adequate reliability and validity across gender and age ($\alpha = .81$, Dadds et al., 2008). The Total Empathy score was used as the main measure of empathy, and complementary cognitive and affective scores were also reported.

Theory of Mind (ToM): The Theory of Mind subtest from the NEPSY-II (Korkman, Kirk, & Kemp, 2007) assesses children's ability to understand others' perspectives (Verbal task) and how emotion relates to social context (Contextual task). The NEPSY-II is comprehensive, normed and multi-domain neuropsychological battery designed for use in pre-schoolers to adolescents, including normative and clinical populations. The NEPSY-II allows the administration of specific subtests or the entire battery (for a summary of normative data, see Brooks, Sherman & Strauss, 2009). The total ToM score (0-28), obtained by the total number of correct responses in the Verbal and the Contextual tasks, was used as the ToM variable in this study.

Affect recognition: The Affect Recognition subtest from the NEPSY-II (Korkman et al., 2007) assesses children's ability to recognize affect from pictures of children's faces expressing one of five basic emotions (happiness, sadness, anger, fear, disgust) or a neutral expression. This 35-item task has four conditions increasing in difficulty (number of distractors) (score 0 to 35). The total number of correct responses was used as the affect recognition variable in this study.

Moral reasoning (MR): The children's version of the Socio-Moral Reasoning Aptitude Level task (SoMoral-Child) (Beauchamp, Dooley, & Anderson, 2013; Dooley, Beauchamp, & Anderson, 2010; Vera-Estay, Seni, Champagne, & Beauchamp, 2016; Chiasson et al., 2017) is a visual, computer-based task that presents nine moral dilemmas specifically designed for children and has gender-specific versions. Each dilemma consists of: an introductory screen presenting the name of the dilemma (e.g. 'exam'); three separate screens showing first-person perspective pictures of child actors in various social scenarios representing a conflict centered on a moral domain according to Social Domain Theory (Turiel, 1983); and a final screen presenting a dichotomous decision (e.g. whether or not to engage in a particular action such as stealing from a shop, cheating at a game, etc.). Participants are then asked to provide a justification for the choice they made. Each participant's justification is recorded verbatim and subsequently scored according to a standardized coding system (Beauchamp & Dooley, 2012) based on cognitive developmental framework (Gibbs, 2010; Kohlberg, 1981; Turiel, 1983). The

MR maturity score (0-45), obtained by summing the nine justification scores, was used as the main dependent variable.

Social adaptive skills: The Social subscale from the Adaptive Behavior Assessment System-Second Edition (ABAS-II, (Harrison & Oakland, 2003) was used to assess children's social adaptive skills, as reported by their parents. The ABAS-II is a parent-report questionnaire that provides a comprehensive assessment of everyday adaptive functioning in ten skill areas (communication, community use, functional academics, home living, health and safety, leisure, self-care, self-direction, social, and work). This questionnaire has very good psychometric properties, including internal consistency ($\alpha = 0.80-0.97$) and test-retest reliability ($r = 0.70-0.90$; Harrison & Oakland, 2003). Concurrent validity is also supported by correlations (ranging from 0.70 to 0.84) between the ABAS and a number of other related developmental rating scales (Harrison & Oakland, 2003). The Social subscale, a 23-item subscale, relates to the skills needed to interact socially and get along with other people, including having friends, assisting others, expressing affection, showing and recognizing emotions, and using manners. Parents score each item using a four-point Likert scale from 0 (is not able) to 3 (always or almost always when needed). In this study, the raw Social subscale score (0-69) was used as the measure of the participant's social adaptive skills.

Social behavior

Prosocial tendencies: The parent version of the Prosocial Tendencies Measure (PTM)(Carlo & Randall, 2002), translated into French and adapted by Girard, Terradas, and Matte-Gagné (2014), was used to assess children's prosocial behavior. In this 24-item questionnaire, parents are asked to rate their child's prosocial tendencies on a five-point Likert scale from 1 (Extremely unlikely) to 5 (Extremely likely), including six types of prosocial behaviors: public, anonymous, in response to dire situations, emotional, compliant and altruistic. The original Prosocial Tendencies Measure and adapted French version are reliable and internally consistent (Carlo & Randall, 2002; Girard et al., 2014), Girard and colleagues reporting excellent internal consistency ($\alpha = .95$). In this study, the global score (0-96) was used as the measure of children's

prosocial tendencies.

Social behavior problems: The *Child Behavior Checklist* for ages 6-18 (*CBCL 6-18*, Achenbach & Rescorla, 2001) is a parent-report questionnaire on which children are rated on the presence of internalizing and externalizing problems such as anxiety, depression, rule breaking, aggressive behavior, somatic, social, and attention problems. This questionnaire has good psychometric properties (see Achenbach & Rescorla, 2001, for detailed validation studies). Items are rated from 0 (not true) to 2 (Very true or often true). In this study, the raw social problems subscale score was used.

Statistical analyses

Statistical analyses were performed using SPSS 21.0 software. Prior to all statistical analyses, data were examined for any violations of test assumptions (normality, linearity, and homoscedasticity). Partial correlation coefficients were calculated (controlling for age) to examine the relation between children's VGPF on a weekly basis and demographic variables (sex and SES), social cognition (ToM, empathy, affect recognition, MR), social adaptive skills and social behavior (prosocial tendencies and social problems). Hierarchical multiple regression analyses were used to explore the contribution of VGPF to children's prosocial tendencies (PTM) and social difficulties (CBCL), after controlling for the contribution of demographic (age, sex, SES) (Block 1) and the contribution of socio-cognitive variables significantly related to social behavior variables (Block 2).

Results

Descriptive results and correlations

Participant demographic characteristics are presented in Table 1. In Table 2, the means and standard deviations and the main inter-correlations among the study variables are displayed. As shown in Table 2, positive associations were found between participants' VGPF and age, everyday executive difficulties and social problems. Negative associations were found between VGPF and social adaptive skills and prosocial behavior tendencies. No associations were found

between VGPF and socio-demographic variables (sex, SES), intellectual functioning, or with other specific socio-cognitive skills (empathy, affect recognition, theory of mind, moral reasoning).

Video game usage

29.8% of children played video games exclusively alone (17 children), the others (40 children) reportedly playing either online or with friends. 15.8% of children played high violence video games (9 children in total).

- insert Tables 1 and 2 here -

Regression analyses

Predictors of children's prosocial behavior tendencies

The results of hierarchical regression analyses are presented in Table 3. Age, sex and SES did not significantly contribute to the prosocial tendencies score ($F(3,53) = .516, p = .67$) (Table 3). However, introducing everyday EF, social adaptive skills and empathy to the model explained 29% of the variance in prosocial tendencies scores and the change in R^2 was significant, ($F \text{ change}(3,50) = 7.230, p < .001$) with a large effect size ($f^2 = .42$). Finally, the inclusion of VGPF explained an additional 6% of the variation in prosocial behavior scores ($F \text{ change}(1,49) = 4.757, p = .034$), with a small effect size ($f^2 = .12$). Together, the variables included in the regression model explained 38% of prosocial behavior scores ($F(7,49) = 4.333, p = .001$), considered a large effect size ($f^2 = .62$). Better social adaptive skills ($\beta = .31, p = .04$), higher empathy ($\beta = .32, p = .02$), and lower VGPF ($\beta = -.28, p = .03$) were significant, independent predictors of prosocial behavior in the final model.

Predictors of children's social behavior problems

Age, sex, and SES did not significantly contribute to predicting CBCL social problems ($F(3,53) = .516, p = .67$) (Table 3). Introducing everyday EF, social adaptive skills and empathy to the model explained 29% of the variance in social problems scores and the change in R^2 was significant, ($F \text{ change}(3,50) = 7.923, p < .001$) with a large effect size ($f^2 = .42$). However, the inclusion of VGPF did not contribute significantly to the model ($F \text{ change}(1,49) = .785, p = .38$). Together, the variables included in the regression model explained 39% of social

difficulties scores ($F(7,49) = 4.518, p = .001$), considered a large effect size ($f^2 = .64$). Empathy ($\beta = .29, p = .03$) and everyday EF difficulties ($\beta = .48, p < .01$) were significant, independent predictors of social problems in the final model.

Discussion

This study examined the association between video game playing frequency (VGPF) on social behavior displays, namely prosocial behavior and social behavior problems, in elementary school-aged children, taking into account the contributions of social cognition and socio-adaptive skills. The study hypotheses were partially supported given that some significant associations were found between VGPF, socio-cognitive and social adaptive skills and behavior. The main findings indicated that lower VGPF contributes to prosocial behavior in children (after controlling for demographic and socio-cognitive/social adaptive factors), that is, children who played video games less frequently than their peers had better prosocial skills. However, the association between VGPF and parent-reported social behavior problems was not supported. Presence of social behavior problems was instead predicted only by performance on socio-cognitive measures targeting everyday executive functioning and empathy. Essentially, these results suggest that while it may not be the case that frequently playing video games makes you prone to exhibiting greater social problems, playing video games more frequently is linked to reduced prosocial tendencies.

The main results of the study suggest that spending less time per week playing video games is associated with more prosocial tendencies. This is in line with recent evidence suggesting that excessive video game play in slightly older children, aged 10 to 15, is associated with fewer displays of prosocial behavior (Pryzbylski, 2014). A possible explanation for the association between more frequent video game playing and fewer prosocial behavior displays may be that real-life interactions are more complex, more nuanced and ultimately more generalizable in terms of social learning experiences when compared to the somewhat social aspects of video game playing. Face-to-face conversations and social interactions support the development of

higher level socio-cognitive skills such advanced theory of mind, due to the presence of competing mental perspectives in a single situation (Nathanson et al., 2013), and children's social understanding is constructed significantly through social interaction (Carpendale & Lewis, 2004). Moreover, children who play video games more frequently may also miss important developmental opportunities (Pryzbylski, 2014), and real-life friendships and relationships may provide more emotional and physical support and proximity in a way that online/gaming counterparts cannot (Kowert & Oldmeadow, 2013). Finally, while engaging in video game playing in social contexts or as part of virtual worlds may function as a "third place" for informal sociability, these interactions may be almost, but not quite, as valuable as real-life social interactions (Steinkuehler & Williams, 2006); thus, the social aspect that is present in online/gaming interactions may address basic social interaction and skill learning, but may not be enough to truly promote prosocial, altruistic behaviors. This could possibly explain the current results indicating that video game playing was not associated with social difficulties in children, as the "third places" presented in games may be *social enough* not to induce social problems, but ultimately not social enough, to promote complex prosocial behaviors. This finding is of importance, given the crucial role of traditional forms of play with peers in providing positive contexts for children's psychosocial developments (Vygotsky, 1978), especially as video gaming may be considered a form of (digital) play slowly replacing physical playgrounds (Granic et al., 2014; Lobel et al., 2017). Moreover, video game playing may keep those children already vulnerable to displaying problematic social behaviors, busy enough and out of trouble, limiting exposure to social situations that could contribute to misinterpretation and aggressive or disinhibited reactions, therefore resulting in fewer displays of social difficulties. The study results also replicate Lobel and colleagues' (2017) recent findings of lack of association between gaming frequency and externalized behavior problems in a similar age group.

The discrepancy in our findings regarding the contributions of video game playing to prosocial behavior, but not to social problems, further underscores the notion that prosocial behavior and social difficulties may not be reducible to mirror constructs, but rather may come about via different mechanisms. Furthermore, the findings highlight previous claims that the causal relations between video game/internet use and social difficulties are difficult to establish. Kraut

and colleagues (1998), for example, suggest that time spent online displaces social activity, leading to social isolation, declines in psychological wellbeing and general social adjustment deficits. The mechanisms underlying the association between general video game usage and social problems is unclear, however. For example, poor social outcomes could be caused by the negative effects of spending too much time online/gaming (displacement hypothesis) or could be attributable to pre-existing social deficits, in that those with social difficulties are more drawn to video game/online usage as a way to avoid real social interactions (compensation hypothesis) (Kowert et al., 2015). A third possibility is that poor social outcomes in relation to media usage are most likely attributed not only to the displacing of general social interaction, but also to the displacing of strong ties (better quality social relationships, supported by physical proximity) that typically lay in real-life social interactions (Kraut et al., 1998).

Finally, contrary to Gentile and Anderson (2003), who reported that the effects of video game playing on social outcomes were mostly dependent on the type of content of the game played (e.g. prosocial *versus* violent), the current results indicate that playing more video games is negatively associated with prosocial behavior, regardless of the content of games played. Indeed, the children in this study played a wide range of games with varying content and types. Of note, however, few children in this study played high violence games, and the study questions did not specifically address the difference between violent and non-violent games. Nevertheless, it may be that overall time spent interacting socially is one of the most determining factors in social competence, perhaps more than the activity or game played when not participating in real-life social interactions. Although speculative, what kind of video game children play may not be as relevant as the fact that they are playing a video game, and therefore not interacting socially in real-life, missing opportunities for generalizable social experience and for refining their perception and integration of complex and competing social cues.

Strengths and limitations

Several limitations should be considered when interpreting the study findings. First, it has been suggested that the use of frequency of time played video games as a main variable may overlook the broad and diverse world of video games, particularly as it cannot capture other factors that may contribute to the level of children's involvement within gaming such as social identification

to the community of “gamers” (Kowert and Oldmeadow, 2013), which may in turn affect associations with behavior outcomes. Weekly frequency of play was nonetheless chosen as the main variable in this study because it provides a clear, quantitative variable of time spent engaging in activity, without confounds related to age-dependent cumulative effects, as with calculating lifetime exposure to gaming, for example. Further research is needed to examine which elements of a video game (difficulty, number of players, type of content, genre) might contribute to any long-term post-game behavior outcomes, both positively and negatively. Second, due to the cross-sectional nature of our study, temporal or causal relationships cannot be established between VGPF and social outcomes, and we cannot exclude the possibility of a bidirectional association between pre-existing individual differences in social competence and gaming frequency, as suggested by Gentile and colleagues (2012). Longitudinal studies should investigate clearer usage trajectories and how they modulate differences in social competence and social cognition in later years, and could shed light on short-term versus long-term social outcomes. Finally, VGPF, as well as the social behavior measures, were based on parent reports, which may present biases and can lead to both over- or under-estimation of actual time spent playing video games. Further, parents may not be fully aware of the exact distribution of time spent playing each of the different types of games.

Conclusion

This study contributes novel findings regarding the association between usage of video games (weekly video game playing frequency) and prosocial behavior tendencies in middle childhood. Results indicate that socio-cognitive (everyday executive functioning, empathy levels) and social adaptive skills logically contribute to social competence in children. Moreover, while higher video game playing frequency was not related to social problems in this study, lower video game playing frequency was associated with greater prosocial behavior displays. The absence of a negative association between frequency of play and social problems in the current research adds to the growing body of work disputing broad and all-encompassing claims that video game playing inevitably leads to socially maladapted individuals. The current study does, however, add to the discussion on positive and negative relationships to video gaming, and draws attention to the possibility that real-life, complex, and nuanced social interactions outside

of the gaming world may be critical for fostering prosocial behaviors in children, in turn laying the foundation for socially adapted adolescents and adults.

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Table 1. Sociodemographic characteristics of the participants.

<i>Variable</i>	<i>Frequency</i>	<i>%</i>
<i>Gender</i>		
Male	30	52.6
Female	27	47.4
<i>Ethnic origin</i>		
White	56	98.2
African-American	1	1.8
<i>Total gross annual household income (CAN \$)</i>		
Below 20 000 \$	3	5.3
20 000 through 39 999\$	8	14.0
40 000 through 59 999\$	13	22.8
60 000 through 79 999\$	18	31.6
80 000 through 99 999\$	12	21.1
100 000 \$ and more	3	5.3
<i>SES on the basis of the annual household income¹</i>		
High SES	5	6.3
Middle SES	57	71.2
Low SES	18	22.5
<i>Maternal education</i>		
Doctoral degree	-	-
Master's degree	-	-
Bachelor's degree	9	15.8
College	20	35.1
High school graduate	22	38.6
Incomplete high school	6	10.5
<i>Paternal education</i>		
Doctoral degree	1	1.8
Master's degree	2	3.5
Bachelor's degree	-	-
College	7	12.3
High school graduate	31	54.4
Incomplete high school	13	22.8
Missing values	3	5.3

¹ Statistics Canada, 2015.

Table 2. Main descriptive results and partial correlations adjusted for age

Variable	<i>M</i>	<i>SD</i>	<i>Partial Correlations</i>		
			Weekly hours played	Prosocial behavior	Social difficulties
Age in months	113.4	4.5	0.314*	0.005	-0.135
Gender ¹	-	-	0.252	-0.162	0.267*
SES composite z score	0.1	4.5	0.013	0.046	0.026
<i>Cognitive variables</i>					
Intellectual functioning (WASI IQ)	109.4	4.5	0.071	-0.039	-0.088
Everyday EF ^a	51.8	4.5	0.288*	-0.279*	0.506***
<i>Sociocognitive variables</i>					
Empathy (total score) ^b	35.7	4.5	-0.164	0.459**	0.032
Affect recognition ^c	21.1	4.5	0.060	-0.029	-0.201
Theory of Mind ^d	21.1	4.3	0.038	-0.020	-0.187
Moral reasoning ^e	18.4	4.5	-0.152	0.035	-0.033
Social adaptive skills ^f	57.3	4.5	-0.277*	0.488***	-0.338**
<i>Socio-behavioral variables</i>					
Prosocial behavior ^g	82.7	4.5	-0.386**	-	-0.129
Social problems ^h	2.4	2.3	0.282*	0.344	-

* $p < .05$ ** $p < .01$. *** $p < .001$

¹ Pearson correlation coefficients and Point biserial correlation coefficients for analysis including gender.

^a BRIEF-PRawGlobal executive Composite score; ^bGriffith Empathy Measure total score; ^cNEPSY-II Affect Recognition raw total score; ^dNEPSY-II Theory of Mindraw total score; ^e So-Moral, total justification score; ^fABAS-II, Social skills raw score; ^gProsocial Tendencies Measure total score;^hCBCL, Social problems raw score.

Table 3. Predictors of prosocial and aggressive behavior in childhood

Predictor	Prosocial behavior		Social difficulties	
	ΔR^2	β	ΔR^2	β
Step 1	.03		.09	
Age		.01		-.13
Gender		-.16		-.26*
SES		.05		.03
Step 2	.29**		.29***	
Age		-.20		-.10
Gender		-.02		.09
SES		.11		0.06
Everyday EF		-.05		.50***
Social skills		.35		-.21
Empathy		.32*		.29*
Step 3	.06*		.10	
Age		-.09		-.15
Gender		.02		.08
SES z score		.10		-.06
Everyday EF		.01		.48***
Social adaptive skills		.31*		-.19
Empathy		.32*		-.29*
Weekly Hours played		-.28*		.11
Total R ²	.37**		.39***	
<i>n</i>	57		57	

* $p < .05$ ** $p < .01$. *** $p < .001$

References

- Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA School-Age Forms & Profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.
- Anderson, C. A. (2004). An update on the effects of playing violent video games. *Journal of adolescence*, 27(1), 113-122.
- Anderson, C. A., & Bushman, B. J. (2001). Effects of violent video games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and prosocial behavior: A meta-analytic review of the scientific literature. *Psychological science*, 12(5), 353-359.
- Anderson, C. A., & Bushman, B. J. (2002). Human aggression. *Annual review of psychology*, 53.
- Anderson-Butcher, D., Iachini, A. L., & Amorose, A. J. (2008). Initial reliability and validity of the perceived social competence scale. *Research on Social Work Practice*, 18(1), 47-54.
- Bandura, A. *Social learning theory*. Morristown, N.J.: General Learning Press, 1971
- Beauchamp, M. H., & Anderson, V. (2010). SOCIAL: an integrative framework for the development of social skills. *Psychological bulletin*, 136(1), 39.
- Beauchamp, M. H., & Dooley, J. J. (2012). *Administration and coding manual SocioMoral Reasoning Aptitude Level Task (So Moral)* (U. o. Montreal Ed.). Canada: ABCs Laboratory.
- Beauchamp, M. H., Dooley, J. J., & Anderson, V. (2013). A preliminary investigation of moral reasoning and empathy after traumatic brain injury in adolescents. *Brain Injury*, 27(7-8), 896-902.
- Beauchamp, M. H. (2017). Neuropsychology's social landscape: Common ground with social neuroscience. *Neuropsychology*, 31(8), 981.
- Bormann, D., & Greitemeyer, T. (2015). Immersed in virtual worlds and minds: effects of in-game storytelling on immersion, need satisfaction, and affective theory of mind. *Social Psychological and Personality Science*, 6(6), 646-652.

- Bornstein, M. H., Hahn, C. S., & Haynes, O. M. (2010). Social competence, externalizing, and internalizing behavioral adjustment from early childhood through early adolescence: Developmental cascades. *Development and psychopathology*, 22(4), 717-735.
- Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., ... & Pereira, J. (2016). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers & Education*, 94, 178-192.
- Brooks, B. L., Sherman, E. M., & Strauss, E. (2009). NEPSY-II: A developmental neuropsychological assessment. *Child Neuropsychology*, 16(1), 80-101.
- Bryant, B. K. (1982). An Index of Empathy for Children and Adolescents. *Child Development*, 53(2), 413-425.
- Carlo, G., & Randall, B. A. (2002). The Development of a Measure of Prosocial Behaviors for Late Adolescents. *Journal of Youth and Adolescence*, 31(1), 31-44. doi:10.1023/A:1014033032440
- Carpendale, J. I., & Lewis, C. (2004). Constructing an understanding of mind: The development of children's social understanding within social interaction. *Behavioral and brain sciences*, 27(1), 79-96.
- Chiasson, V., Vera-Estay, E., Lalonde, G., Dooley, J. J., & Beauchamp, M. H. (2017). Assessing social cognition: age-related changes in moral reasoning in childhood and adolescence. *The Clinical Neuropsychologist*, 31(3), 515-530.
- Dadds, M. R., Hunter, K., Hawes, D. J., Frost, A. D., Vassallo, S., Bunn, P., . . . Masry, Y. E. (2008). A measure of cognitive and affective empathy in children using parent ratings. *Child Psychiatry Hum Dev*, 39(2), 111-122. doi:10.1007/s10578-007-0075-4
- DeCamp, W., & Ferguson, C. J. (2017). The impact of degree of exposure to violent video games, family background, and other factors on youth violence. *Journal of youth and adolescence*, 46(2), 388-400.
- Dooley, J. J., Beauchamp, M. H., & Anderson, V. (2010). The measurement of sociomoral reasoning in adolescents with traumatic brain injury: A pilot investigation. *Brain Impairment*, 11(2), 152-161.
- Dye, M. W., Green, C. S., & Bavelier, D. (2009). The development of attention skills in action video game players. *Neuropsychologia*, 47(8-9), 1780-1789.

- Eisenberg, N., & Fabes, R. A. (1998). Prosocial development. In W. Damon (Series Ed.) and N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 701-778). New York: Wiley.
- Eisenberg, N., Spinrad, T. L., & Knafo-Noam, A. (2015). Prosocial development. *Handbook of child psychology and developmental science*, 1-47.
- Ewoldsen, D. R., Eno, C. A., Okdie, B. M., Velez, J. A., Guadagno, R. E., & DeCoster, J. (2012). Effect of playing violent video games cooperatively or competitively on subsequent cooperative behavior. *Cyberpsychology, Behavior, and Social Networking*, *15*(5), 277-280.
- Ferguson, C. J. (2007). The good, the bad and the ugly: A meta-analytic review of positive and negative effects of violent video games. *Psychiatric Quarterly*, *78*(4), 309-316.
- Ferguson, C. J., & Colwell, J. (2017). Understanding why scholars hold different views on the influences of video games on public health. *Journal of Communication*, *67*(3), 305-327.
- Funk, J. B. (2005). Children's exposure to violent video games and desensitization to violence. *Child and Adolescent Psychiatric Clinics*, *14*(3), 387-404.
- Gentile, D. A., & Anderson, C. A. (2003). Violent video games: The newest media violence hazard. *Media violence and children*, 131-152.
- Gentile, D. A., Anderson, C. A., Yukawa, S., Ihori, N., Saleem, M., Ming, L. K.,...Sakamoto, A. (2009). The effects of prosocial video games on prosocial behaviors: International evidence from correlational, longitudinal, and experimental studies. *Personality and Social Psychology Bulletin*, *35*(6), 752e763.
- Gentile, D. A., Swing, E. L., Lim, C. G., & Khoo, A. (2012). Video game playing, attention problems, and impulsiveness: Evidence of bidirectional causality. *Psychology of Popular Media Culture*, *1*(1), 62.
- Gentile, D. A., Groves, C. L., & Gentile, J. R. (2014). The general learning model: Unveiling the teaching potential of video games. *Learning by playing: Video gaming in education*, 121-142.
- Gibbs, J. C. (2010). *Moral development & reality : beyond the theories of Kohlberg and Hoffman*: (2nd Ed.). Boston : Allyn & Bacon.

- Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworth, L. (2000). *Behavior Rating Inventory of Executive Function Professional Manual*. Odessa, Florida: Psychological Assessment Resources.
- Girard, É., Terradas, M. M., & Matte-Gagné, C. (2014). Empathie, comportements pro-sociaux et troubles du comportement. *Enfance*, 2014(4), 459-480. doi:10.4074/S0013754514004030
- Glass, B. D., Maddox, W. T., & Love, B. C. (2013). Real-time strategy game training: emergence of a cognitive flexibility trait. *PLoS One*, 8(8), e70350.
- Granic, I., Lobel, A., & Engels, R. C. (2014). The benefits of playing video games. *American psychologist*, 69(1), 66.
- Greitemeyer, T., & Mügge, D. O. (2014). Video games do affect social outcomes: A meta-analytic review of the effects of violent and prosocial video game play. *Personality and Social Psychology Bulletin*, 40(5), 578-589.
- Greitemeyer, T., Traut-Mattausch, E., & Osswald, S. (2012). How to ameliorate negative effects of violent video games on cooperation: Play it cooperatively in a team. *Computers in Human Behavior*, 28(4), 1465-1470.
- Harrington, B., & O'Connell, M. (2016). Video games as virtual teachers: Prosocial video game use by children and adolescents from different socioeconomic groups is associated with increased empathy and prosocial behaviour. *Computers in Human Behavior*, 63, 650-658.
- Harrison, P. L., & Oakland, T. (2003). *Adaptive Behavior Assessment System – Second Edition*. San Antonio, TX: Harcourt Assessment.
- Homer, B. D., Plass, J. L., Raffaele, C., Ober, T. M., & Ali, A. (2018). Improving high school students' executive functions through digital game play. *Computers & Education*, 117, 50-58.
- Jackson, L. A., Witt, E. A., Games, A. I., Fitzgerald, H. E., Von Eye, A., & Zhao, Y. (2012). Information technology use and creativity: Findings from the Children and Technology Project. *Computers in human behavior*, 28(2), 370-376.
- Kohlberg, L. (1981). *The meaning and measurement of moral development*. Worcester, Mass.: Clark University Press.

- Korkman, M., Kirk, U., & Kemp, S. L. (2007). *NEPSY II. Clinical and interpretative manual*. San Antonio, TX: Psychological Corporation.
- Kovess-Masfety, V., Keyes, K., Hamilton, A., Hanson, G., Bitfoi, A., Golitz, D., ... & Otten, R. (2016). Is time spent playing video games associated with mental health, cognitive and social skills in young children?. *Social psychiatry and psychiatric epidemiology*, *51*(3), 349-357.
- Kowert, R., & Oldmeadow, J. A. (2013). (A) Social reputation: Exploring the relationship between online video game involvement and social competence. *Computers in Human Behavior*, *29*(4), 1872-1878.
- Kowert, R., Vogelgesang, J., Festl, R., & Quandt, T. (2015). Psychosocial causes and consequences of online video game play. *Computers in Human Behavior*, *45*, 51-58.
- Kral, T. R., Stodola, D. E., Birn, R. M., Mumford, J. A., Solis, E., Flook, L., ... & Davidson, R. J. (2018). Neural correlates of video game empathy training in adolescents: a randomized trial. *npj Scientific of Learning*, *3*.
- Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukophadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being?. *American psychologist*, *53*(9), 1017.
- Krueger, R. F., Hicks, B. M., & McGue, M. (2001). Altruism and antisocial behavior: Independent tendencies, unique personality correlates, distinct etiologies. *Psychological Science*, *12*(5), 397-402.
- Kühn, S., Lorenz, R., Banaschewski, T., Barker, G. J., Büchel, C., Conrod, P. J., ... & Mann, K. (2014). Positive association of video game playing with left frontal cortical thickness in adolescents. *PloS one*, *9*(3), e91506.
- Lenhart, A., Kahne, J., Middaugh, E., Macgill, A. R., Evans, C., & Vitak, J. (2008). Teens, Video Games, and Civics: Teens' Gaming Experiences Are Diverse and Include Significant Social Interaction and Civic Engagement. *Pew internet & American life project*.
- Liu, M., & Peng, W. (2009). Cognitive and psychological predictors of the negative outcomes associated with playing MMOGs (massively multiplayer online games). *Computers in Human Behavior*, *25*(6), 1306-1311.

- Lobel, A., Engels, R. C., Stone, L. L., Burk, W. J., & Granic, I. (2017). Video gaming and children's psychosocial wellbeing: A longitudinal study. *Journal of youth and adolescence, 46*(4), 884-897.
- Milani, L., Camisasca, E., Caravita, S. C., Ionio, C., Miragoli, S., & Di Blasio, P. (2015). Violent video games and children's aggressive behaviors: an Italian Study. *SAGE Open, 5*(3), 2158244015599428.
- Nathanson, A. I., Sharp, M. L., Aladé, F., Rasmussen, E. E., & Christy, K. (2013). The relation between television exposure and theory of mind among preschoolers. *Journal of Communication, 63*(6), 1088-1108.
- NPD Group. (2014). The NPD Group: 37 Percent of US Population Age 9 and Older Currently Plays PC Games. Retrieved September, 30, 2015.
- Nuyens, F. M., Kuss, D. J., Lopez-Fernandez, O., & Griffiths, M. D. (2018). The Empirical Analysis of Non-problematic Video Gaming and Cognitive Skills: A Systematic Review. *International Journal of Mental Health and Addiction, 1-26*.
- Ornaghi, V., Brockmeier, J., & Grazzani, I. (2014). Enhancing social cognition by training children in emotion understanding: A primary school study. *Journal of Experimental Child Psychology, 119*, 26-39.
- Parker, J. G., Rubin, K. H., Price, J. M., & DeRosier, M. E. (1995). Peer relationships, child development, and adjustment: A developmental psychopathology perspective. In D. Cicchetti & D. J. Cohen (Eds.), *Wiley series on personality processes. Developmental psychopathology, Vol. 2. Risk, disorder, and adaptation* (pp. 96-161). Oxford, England: John Wiley & Sons.
- Prot, S., Gentile, D. A., Anderson, C. A., Suzuki, K., Swing, E., Lim, K. M., ... Lam, B. P. (2014). Long-term relations among prosocial-media use, empathy, and prosocial behavior. *Psychological Science, 25*(2), 358e368.
- Przybylski, A. K. (2014). Electronic gaming and psychosocial adjustment. *Pediatrics, peds-2013*.
- Putnam, R. D. (2001). *Bowling alone: The collapse and revival of American community*. Simon and Schuster.

- Sakamoto, A. (1994). Video Game Use and The Development of Sociocognitive Abilities in Children: Three Surveys of Elementary School Students 1. *Journal of applied social psychology, 24*(1), 21-42.
- Sherry, J. L. (2001). The effects of violent video games on aggression: A meta-analysis. *Human communication research, 27*(3), 409-431.
- Staiano, A. E., Abraham, A. A., & Calvert, S. L. (2012). Competitive versus cooperative exergame play for African American adolescents' executive function skills: Short-term effects in a long-term training intervention. *Developmental psychology, 48*(2), 337.
- Statistics Canada. (2015, 26th June 2015). Median total income, by family type, by province and territory. Retrieved from <http://www.statcan.gc.ca/tables-tableaux/sum-som/101/cst01/famil108a-eng.htm>
- Strobach, T., Frensch, P. A., & Schubert, T. (2012). Video game practice optimizes executive control skills in dual-task and task switching situations. *Acta psychologica, 140*(1), 13-24.
- Thompson, E. J., Beauchamp, M. H., Darling, S. J., Hearps, S. J., Brown, A., Charalambous, G., ... & Jaimangal, M. (2018). Protocol for a prospective, school-based standardisation study of a digital social skills assessment tool for children: The Paediatric Evaluation of Emotions, Relationships, and Socialisation (PEERS) study. *BMJ open, 8*(2), e016633.
- Tortolero, S. R., Peskin, M. F., Baumler, E. R., Cuccaro, P. M., Elliott, M. N., Davies, S. L., ... & Schuster, M. A. (2014). Daily violent video game playing and depression in preadolescent youth. *Cyberpsychology, Behavior, and Social Networking, 17*(9), 609-615.
- Turiel, E. (1983). *The development of social knowledge : morality and convention*. Cambridge: Cambridge University Press.
- Vera-Estay, E., Seni, A. G., Champagne, C., & Beauchamp, M. H. (2016). All for one: Contributions of age, socioeconomic factors, executive functioning and social cognition to moral reasoning in childhood. *Frontiers in Psychology, 7*(227), 1-13. doi:10.3389/fpsyg.2016.00227
- Velez, J. A., Greitemeyer, T., Whitaker, J. L., Ewoldsen, D. R., & Bushman, B. J. (2016). Violent video games and reciprocity: The attenuating effects of cooperative game play on subsequent aggression. *Communication Research, 43*(4), 447-467.

- Verheijen, G. P., Burk, W. J., Stoltz, S. E., van den Berg, Y. H., & Cillessen, A. H. (2018). Friendly fire: Longitudinal effects of exposure to violent video games on aggressive behavior in adolescent friendship dyads. *Aggressive behavior, 44*(3), 257-267.
- Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.
- Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence (WASI)*. San Antonio, TX: Harcourt Assessment.
- West, G. L., Stevens, S. A., Pun, C., & Pratt, J. (2008). Visuospatial experience modulates attentional capture: Evidence from action video game players. *Journal of vision, 8*(16), 13-13.
- West, G. L., Al-Aidroos, N., & Pratt, J. (2013). Action video game experience affects oculomotor performance. *Acta psychologica, 142*, 38-42.

General Discussion

Synthesis of dissertation objectives and results

The goal of this dissertation was to explore the main correlates that support adequate social competence in typical development, namely, social cognition and social behavior. The objectives were structured around the theoretical framework provided by the SOCIAL model (Beauchamp & Anderson, 2010), in that both socio-cognitive and environmental predictors of social functioning were considered. The first study explored how socio-cognitive skills are interrelated and associated with social behavior, focusing on two aspects of perspective taking (theory of mind, empathy) and moral reasoning. The second study investigated the contribution of external influences, as conceptualized by time spent playing video games, to social behavior, while taking into account the contributions of socio-cognitive skills. A third study, related to the first, was conducted by the candidate in parallel to this work and is presented as an appended manuscript to be submitted for publication. This study was completed in collaboration with another PhD student as part of her dissertation and investigated the links between other socio-cognitive skills (executive functioning, empathy) and social behavior in the same population of typically developing children. In the following discussion, the study results will be summarized, discussed, and interpreted in the broader context of psychological and social neuroscience research into social development. Theoretical, clinical and methodological considerations are presented in relation to the results.

Study 1: Put yourself in my shoes: Perspective taking, moral reasoning and social behavior in childhood and adolescence

The SOCIAL model provides a fertile ground for the investigation of multiple facets of social competence in typically developing children and adolescents. As suggested in the introduction, a way to reconcile both the cognitive and affective perspectives central to research on morality, is to consider the joint contributions of cognition and emotion to moral reasoning rather than explore them in isolation. The first study posited that both emotional and cognitive

factors pertaining to social competence may be components of the overarching, unifying construct of perspective taking. This integrative construct could be an explanatory paradigm joining contributing factors to social competence, moral processes, and underlying adequate social behavior in development. The contributions of two aspects of perspective taking (theory of mind and empathy) to moral reasoning were explored across the broad span of childhood and adolescence, using a developmentally appropriate task presenting everyday moral conflicts (So-Moral).

First, the findings indicated that basic and high-level theory of mind skills are associated with moral reasoning maturity in children and adolescents. These expected findings are in line with the large body of literature supporting a strong association between theory of mind and moral reasoning in more limited age groups and with different tasks (Sodian et al., 2016; Sommer et. al., 2014; Smetana, Jambon, Conry-Murray, & Sturge-Apple, 2012; Young, Cushman, Hauser & Saxe, 2007; Lane, Wellman, Olson, LaBounty, & Kerr, 2010; Baird & Astington, 2004; Killen, Mulvey, Richardson, Jampol, & Woodward, 2011). Detection of reciprocity in a social relationship, a subcategory of theory of mind, emerged as a key contributor to the way in which youth reason about a sociomoral conflict. On a conceptual level, cognitive awareness of reciprocity may be grouped alongside more advanced perspective taking abilities (second- and third-order false beliefs, for example) that become increasingly important as children age and navigate more complex social situations. The data obtained across a broad age span extends previous results using the same So-Moral task, but only in children 6 to 12 years, which shed light on the mediating role of advanced theory of mind skills in the relation between age and moral reasoning (Vera-Estay, Seni, Champagne, & Beauchamp, 2016). This implies that, with age, children become capable of using more mature moral reasoning schemes in part because they are more adept at evaluating whether second- and third-party beliefs are concordant with reality. The development of high-level theory of mind skills, which enables accurate interpretations of complex social situations, could also explain, how, as they age, youth come to differentiate between morally inappropriate behaviors based on misunderstandings (or misinterpretations) of social situations, as opposed to behaviors motivated by the desire to harm.

Second, when the participant group was divided into younger and older individuals, perspective taking abilities were predictors of moral reasoning skills in children, but not in adolescents/young adults. For children, these were expected results, in line with the contemporary perspectives emphasizing the joint roles of affective and cognitive factors in the development of moral processes (Malti & Latzko, 2010). For adolescents and young adults, no contribution of either affective (empathy) or cognitive (theory of mind) perspective taking to moral reasoning was found. One possible explanation for these results is that adolescents may rely on different socio-cognitive precursors than younger children when engaging in moral processes. As suggested by proponents of Social Domain Theory (Turiel, 1983; 2002), adolescents may use *psychological* reasoning in moral situations (rather than *moral* or *socio-conventional* reasoning). As peer relations and group dynamics become particularly important and valuable to them, adolescents may tend to favour in-group biases in morally relevant situations, or justify their decisions based on their own self, identity and autonomy, rather than rely so heavily on previously acquired, more basic perspective taking skills (Palmer, Rutland & Cameron, 2015; Killen, Rutland, Abrams, Mulvey, & Hitti, 2013).

Finally, in relation to social behavior, poorer moral reasoning skills were associated with greater parent reported displays of externalized behaviors in children and adolescents. However, no associations were found between moral reasoning maturity and prosocial behavior tendencies. The finding of an association between poorer moral reasoning skills and increased externalized behavior is consistent with theory and evidence suggesting links between immature moral processes (e.g. egocentric biases, hedonistic justifications) and externalized behaviors (Gibbs, 2013; Malti & Keller, 2009). This finding in the current data makes an additional contribution by extending these associations even within a sample of typically developing children and adolescents with low levels of disruptive behaviors, highlighting strong ties between morally immature processes and socially inappropriate behavior. This is especially relevant in the current group of youth aged up to 21 years, because evidence from studies on aggression and socially maladaptive/disruptive behaviors indicates that aggression tends to decrease with age (Tremblay, Hartup, & Archer 2005). With regard to the lack of association between moral maturity and prosocial behavior, it is probable that other socio-cognitive skills

are at play, and exhibiting more prosocial behaviors may depend more strongly on empathy, moral emotions, executive functioning and self-regulation, for example (Williams, O'Driscoll & Moore, 2014; Alessandri, Caprara, Eisenberg, & Steca, 2009; De Wall, 2008; Hoffman, 2000; Eisenberg & Miller, 1987; Veenstra et al., 2008; Diener & Kim, 2004). Indeed, as reported in the study by Vera-Estay and colleagues (Appendix), empathy and executive functioning skills were found to be independent predictors of elementary school-aged (6 to 12 years) children's prosocial behavior tendencies. In addition, the tendency to exhibit more prosocial behaviors may be better accounted for by external/environmental factors such as family functioning, socioeconomic status, family values, social participation, social exposure and interactions. The latter falling under the umbrella of *social experience*, including how children spend their time and what type of play they engage in. These links were addressed in Study 2.

Study 2: *Video game playing frequency, social cognition and social behavior in childhood*

The goal of the second study was to explore the associations between frequency of video game playing (a proxy for social experience) in children and two main components of social competence, namely social cognition and social behavior (including both positive and negative aspects of behavior). Strong evidence suggests links between video game playing, socio-cognitive and affective factors, with a special focus in the literature on the negative outcomes related to gaming, such as aggressive affect, depression, perceptions of violence and lower levels of empathy and moral reasoning (Anderson, 2004; Sherry, 2001; Tortolero et al., 2014; Funk, 2005). Conversely, some evidence suggests that important cognitive, affective and social skills (such as improved attention/executive skills, prosocial affect and social engagement) may be enhanced or reinforced by playing video games, particularly by specific game types that include prosocial content (Nuyens et al, 2018; Boyle et al., 2016). The objective of the second study was to add to the growing body of literature exploring associations between video game playing, social cognition and social behavior, in an age group less frequently focused on (elementary school-aged children). Somewhat surprisingly, the social effects of video game playing are less frequently studied in elementary school children (compared to adolescents and adults), despite reports that school-aged children frequently engage in video game playing, that gaming among younger children is increasing in frequency and popularity (NDP Group, 2014), and that middle childhood is an especially formative period for the development of social competence given the

ongoing development of socio-cognitive skills and continuing social learning exposure (Ornaghi et al., 2014; Masten & Coatsworth, 1998).

The main results of the study indicated that spending less time per week playing video games is associated with more prosocial tendencies, but no association was found with behavior problems. An explanation for the former association may be the distinct nature of real-life interactions that are effectively displaced when children spend time engaging in screen-based play. In comparison to online or screen-based play, real-life interactions may provide greater complexity, nuance, generalizability and opportunity to develop and hone socio-cognitive skills (such as perspective taking and moral processes). The absence of a negative association between frequency of video game play and social problems is of interest. First, it suggests that prosocial behavior and social problems are not mere opposites of the social competence spectrum as they are determined by different factors. Second, the lack of association aligns with a growing body of work disputing broad and all-encompassing claims that video game playing inevitably leads to socially maladapted individuals. Together, the results highlight the possibility that real-life, complex, and nuanced social interactions outside of the gaming world may be central to fostering prosocial behaviors in children.

Theoretical implications

Perspective taking as a unifying cognitive/affective construct

One of the objectives of the dissertation was to perform a joint study of both affective and cognitive aspects of social cognition, and specifically moral processes, through the overarching construct of perspective taking. Although our results vary in children and adolescents/young adults, they nevertheless indicate that both aspects of perspective taking (theory of mind and empathy) are associated with mature moral reasoning. This highlights the notion that, although variations do occur in the ways in which affective and cognitive factors contribute to social cognition and social competence development in children and adolescents, both should be taken into account if a comprehensive and accurate depiction of the social

development landscape is to be attempted. Varying theories, ideas and evidence from a range of fields in psychology can be relied on as support for the idea that subcomponents of perspective taking should be considered with regard to how they support the development of moral reasoning, and social cognition and behavior more broadly.

Developmental theorists such as Dixon and Moore (1990), for example, have suggested a dual-component view of perspective taking that is closely related to the one put forth in this dissertation: (1) the information component, related to what the interlocutor knows of the other, i.e. an accurate theory of the other's mind, and (2) the weighting component, which assesses how the interlocutor will weight different information in order to make a decision. This weighting effect could be thought of as the affective weight, i.e., the emotion elicited by the situation (Dixon & Moore, 1990; Ruby & Decety, 2004). Thus, perspective-taking abilities would, according to their view, stem from the conjunction of a cognitive and affective assessment of a situation to which an emotional weight is added. There is also evidence from studies in social neuroscience that lend indirect support to a dual-component view of perspective taking. The 'mirror neuron system' has been used as another avenue of exploration on the role of perspective taking in social behavior (Iacoboni, 2009; Beauchamp & Anderson, 2010; Frith & Frith, 2005). Mental simulation may be a representational tool to understand the self and others (Decety & Grezes, 2006), and cognitive neuroscience models of self-perception have alleged that similar brain areas and processing are involved during the execution of an action and the mental representation and observation of another's action (Grezes & Decety, 2001). Cognitive neuroscience studies point to the similarities in the neural circuits activated during the generation, imagination, as well as observation of one's own and other's behavior (Decety & Grezes, 2006), all suggesting the existence of shared representations as the possible basis for cooperation and prosocial behavior. Indeed, evidence suggests that imitation promotes empathy and perspective taking, possibly also in the sense that imitation facilitates social interactions, increases a sense of connectedness with others and increases liking by others, known as the 'chameleon effect' (Chartrand & Bargh, 1999; Iacoboni, 2009). Chartrand and Bargh's studies (1999) also revealed that individuals who tend to imitate behavior more frequently are not only better liked by peers, but also tend to exhibit more empathy, suggesting that, through (simple

motor) imitation and mimicry, we may be able feel what others feel, and therefore may respond more prosocially and compassionately to others. Such findings support shared representations accounts of social cognition and are presumed to provide some of the basic mechanisms for appropriate, cooperative and reciprocal social interaction.

Albeit speculative, another possible avenue for the role of perspective taking in accounts of prosocial behavior and social competence is from a *motivational* standpoint. There is already strong evidence for the cognitive basis of mature social and moral cognition, and data from Study 1 adds to this growing body of literature. Affective processes such as empathy and moral emotions have also been identified as playing important roles in social cognition and behavior, supported by the data (Study 1 and appended manuscript) as well as published literature (Malti, Gummerum, & Buchmann, 2007). Moreover, the contributions of affective processes to the development of social cognition (and moral processes more specifically), could be further supported by the ‘missing’ link between moral reasoning and *behavior*. Indeed, what seems to be necessary for adequate and mature moral reasoning – and sophisticated socio-cognitive skills - may not be entirely sufficient to support moral action – and prosocial behavior. That is, it is not clear if and how the cognitive processes involved in moral reasoning directly lead to action, and an adequate cognitive awareness of a social situation may not always translate into appropriate behavior: emotions and affective processes may be the motivators that fill the void towards action. Adding an affective component to cognitive awareness in socio-moral situations could add to the relation between thinking and acting morally, and between an appropriate interpretation of a social situation and the prosocial behavioral response. Thus, perspective taking skills as a whole (including cognitive and affective aspects) could strengthen the relationship between social cognition and broader social competence. However, this link between moral thinking and acting has been difficult to establish in the empirical literature.

Classic moral dilemmas in research contexts typically require individuals to make a decision involving some form of moral judgment, and an analysis the justification for the choice made, often in abstract scenarios. For example, in Kohlberg’s classic moral dilemma, Heinz

must decide to steal a drug to save his sick wife's life (Kohlberg, 1969). In the work conducted by Greene, participants must choose whether it is right to push someone in front of an incoming trolley to block it from killing five others stranded on the railway (trolley dilemma: Foot, 1978; Greene, 2007). The challenge in these dilemmas is to connect moral judgments in artificial settings to observable behavior (Saelen & Markovits, 2008; Krebs & Denton, 2005). Theorists such as Haidt (2002) have argued that the type of principled, carefully reasoned moral judgments produced by classic dilemmas are artifacts created in a research context, far from daily moral issues involving powerful sentiment and strong emotional reactions. It appears, then, that explicit reasoning cannot be the only factor to be considered to understand how real moral choices are made (Saelen & Markovits, 2008), and especially, how moral reasoning can lead to moral action in everyday life. This may be because "*most moral cognition theories share the assumption that "to know the good is to do the good"; that is, a logical understanding of how one ought to behave inevitably leads to moral behavior.*" (Arsenio & Lemerise, 2004, p. 993). Understanding what is acknowledged as right or wrong does not necessarily create the personal obligation to act appropriately (Malti, Gummerum, Keller, & Buchmann, 2009). Hypothetically, then, the gap between knowledge and action must be somehow filled by a form of motivation.

Emotions and affective processes could be considered as potential explanatory factors for the jump from knowledge to actual social behavior (Saelen & Markovits, 2008). Indeed, positively charged self-evaluative emotions (e.g. pride, happiness) have been shown to be a more powerful predictor for prosocial actions than negative self-evaluative emotions (negative emotions such as guilt) when failing to act morally (Krettenauer & Johnston, 2011). While emotional insights do have a strong cognitive component when arising in a socio-moral situation, they may also be the motivational force that impels moral actions (Hoffman, 2000). And though cognitive-developmental theorists have claimed that the level of maturity of a person's reasoning is the most determining factor in moral action, other researchers such as Hoffman (2000) have put forward the idea that affective processes, such as empathy, are the more basic motives for moral action (Malti et al., 2009). As illustrated by the '*happy victimizer*' expectancy paradigm, in which children are asked to think about the emotion a character will feel in a certain social situation, the anticipation of moral emotions reliably predicts children's

moral behavior in experimental and natural settings (Krettenauer, Malti & Sokol, 2008). One could argue that the anticipation of another's affective and cognitive mental state is closely related to the definition of perspective taking, and, figuratively, putting oneself in another's shoes. Gibbs (1995) succinctly summarized the joint contributions of cognitive and affective factors to moral processes and behavior: "*although the cognitive-developmental perspective can partially account for moral motivation, the co-motivating role of empathy (...) should be included in a more comprehensive understanding of moral behavior*" (p. 27). An integrative view of cognitive and affective contributions to moral and socio-cognitive processes may be consolidated by the overarching construct of perspective taking. Indeed, a purely intuitive and sentiment-based understanding of moral reasoning and action seems as reductive as a purely cognitive one. An innovative way of reconciling this seemingly irresolvable conflict, unifying cognition and emotion in a fundamental way, rather than describing two functions developing in parallel, is under an explanatory paradigm joining contributing factors to moral reasoning, motivating behavior and underlying moral action.

Further support for this integrative research direction has been developmental timing of both theory of mind and empathy. For example, Keller and colleagues (2006, in Malti et al., 2007) have shown that children start to differentially attribute emotions to the self and others around the same time when they develop a theory of other persons' minds (Malti et al., 2007; Flavell, 2004). Choudhury's studies (Choudhury et al., 2006) have shown that increased reaction times necessary to move from one's own perspective to another's gradually diminish with age, suggesting a gradual sophistication of perspective taking abilities. Similarly describing the developmental curve that perspective taking proficiency undergoes, Eisenberg and colleagues (2001) point out that "*the combination of prosocial emotional tendencies and the capacity and tendency to attend to others' internal states and cognitions may be necessary to attain high-level prosocial moral judgments.*" (p. 519). Conceptually, developmentally, cognitively and socio-emotionally, thus, affective processes such as empathy are self-conscious inasmuch as they first presuppose an understanding of the relation between the self and others; therefore, the anticipation of these moral emotions presupposes the cognitive ability to take another's perspective (Malti & Latzko, 2010). Longitudinal studies have also shown the same tendency,

a clear conjoint evolution of moral and prosocial reasoning and perspective taking skills (Eisenberg, 1995; Eisenberg *et al.*, 2005).

Cognitive and affective processes and their connectedness might thus hold the key to bridging the gap between knowledge and behavior: theory of mind is necessary for understanding a situation from another person's point of view, therefore making salient the moral dilemma at hand (the conflict between one's own interests and those of another). Empathy and affective processes may be the motivating vector towards acting prosocially, inasmuch as individuals *know* what the other person's situation is, and also *care* about the person's plight. Cognitive perspective taking (or theory of mind) may be a type of "information-gathering" tool that, when combined with the desire and motivation to act, makes salient the goal-directed actions that are socially adaptive. Indeed, moral reasoning refers to consideration of other's mental states, as theory of mind does. However, moral reasoning is also ultimately concerned with moral action, rather than solely knowing the truth of others' beliefs (Astington, 2004). Nucci (2001, p.196) said: "*Knowing the good is not always sufficient to motivate someone to do the good. For moral action to take place the individual must also want to do what is moral, rather than engage in actions that lead to other goals.*" (in Arsenio & Lemerise, 2004). To "do good", then, at a minimum, is to be able to understand the situation from another's point of view (Hoffman, 2000), i.e. to have a good theory of the content of the other's mind. But that is not enough: from a strict cognitive perspective, it is not clear why "doing the good" would not automatically follow from "knowing the good". What may explain that extra step from knowledge to action is empathy, a key contributor to "*doing* the good". Not only must we cognitively understand another person's situation, we must affectively 'get in their shoes', and feel empathy for them, in order to be motivated to be morally active.

Again, theory of mind skills have been shown to be necessary, but not sufficient in motivating behavior. In fact, aggressive children display a high degree of understanding the other's mind (Arsenio & Gold, 2006); they can therefore more easily attain their goals (Malti, Gasser, & Gutzwiller-Helfenfinger, 2010). It may be hypothesized that they lack the empathy

necessary to choose prosocial over antisocial behavior. Indeed, results from appended Study 3 suggest that empathy levels do contribute significantly to prosociality in typically developing children. Lee and Prentice (1988) also found that delinquent individuals display more immature modes of role-taking, logical cognition and moral reasoning than non-delinquents, reflecting a possible delay in the acquisition of empathy and cognition. Essentially, empathy and theory of mind can be considered measures of a “*prosocial disposition that are expected to motivate altruistic behavior*” (Eisenberg et al., 2002, p. 993), and empathy serves as the impetus for children who have to decide between using their theory of mind skills and understanding of another’s mind for self-serving purposes or, rather, for prosocial, morally mature ones (Malti, Gasser, & Gutzwiller-Helfenfinger, 2010). Furthermore, perspective taking proficiencies in cognitive and emotional domains seem to emerge separately in childhood, but become integrated over time, presumably in adolescence (Hinnant & O’Brien, 2007). Perhaps, even, “*to some extent, whether one sees emotion and cognition as separate or as one process depends on how broadly cognition is defined.*” (Lemerise & Arsenio, 2000, p. 107): they may just be two sides of the same coin. A coordinated understanding of others’ mental and emotional states is thus necessary to appreciate how others evaluate one’s actions as morally appropriate (or not), and the resulting emotion, and has been expected to predict a greater degree of prosocial and socially oriented moral functioning and broad social behavior (Lane, Wellman, Olson, LaBounty, & Kerr, 2010), as is supported by the results of Study 1. When considering a broader developmental perspective, it is likely that empathy and moral emotions contribute to making salient moral processes in early childhood, and that an increase in cognitive understanding of situations is related to more frequent anticipation of moral emotions as children age, such as guilt in situations of moral transgressions, for example (Malti & Latzko, 2010). Identity-related factors may also support the maturation of prosocial tendencies, such as in later adolescence, when psychological and social aspects of the self become strongly related to identity and social values are more integrated into moral identity (Daniel, Dys, Buchmann & Malti, 2014). Further normative development during adolescence may also be supported by increases in logical, abstract and socio-cognitive abilities that are partly reliant on more general, executive functioning sophistication occurring during the same developmental period. Finally, as children and adolescents age, opportunities for engaging in complex thinking, perspective taking and

social decision-making may contribute to fostering the jump from moral judgment to action (Eisenberg et al., 2005).

Interestingly, although both affective and cognitive components do appear to play a role in predicting moral reasoning skills in children, these links were not supported in the sub-group of adolescents in Study 1. Possible explanations for this are the competing conceptualizations of empathy (including emotional sharing, empathetic concern, and affective perspective taking; Decety & Cowell, 2015), as well as the complex role of empathy in morality and the fact that the relation between empathy and morality is not always direct. Indeed, empathy, when conceptualized as the capacity to share and care about others' emotions, appears to be unequally distributed amongst individuals. Some evidence suggests empathetic concern predicts more utilitarian impersonal moral judgments (Gleichgerrcht & Young, 2013); moreover, empathetic tendencies are often more strongly weighted towards members of inner groups and families, for example (Decety & Cowell, 2014). This can introduce bias and partiality in the context of moral judgments and reasoning, as it favors different moral criteria when judging in-group versus out-group harm. Decety and Cowell (2014) suggest that perspective taking may be an effective counter-balancing factor in situations where immoral action is justified by favoring kin-related interest, for example, by explicitly adopting the perspective of an out-group member, especially from a cognitive point of view, or one involving the anticipation of moral emotions. Research in social psychology has shown positive, long-term effects of explicit perspective taking in reducing in-group biases in ethnic groups engaged in violent conflict (Malhotra & Liyanage, 2005, Decety & Cowell, 2015).

The SOCIAL Model

The SOCIAL model posits that social skills and behaviors depend on the normal maturation of the brain and cognition, and that this maturation occurs broadly within a supportive environment, from early infancy through adulthood. The first component of the SOCIAL model represents two dimensions of mediators (brain development, internal/external

factors) that affect the emergence of social competence in development, interacting dynamically with cognitive functioning to determine a person's social competence. The second component of the SOCIAL model details the cognitive and affective constructs that support the integrity of social skills, in particular, socio-cognitive skills. The first study focuses on this second component of the model, detailing the interplay of specific socio-cognitive skills (perspective taking, empathy, theory of mind, moral reasoning), as well as how it relates to social behaviors. The second study focuses on those external factors that impact the development of social skills as well as their associations with social cognition.

Results from this dissertation support the model empirically. Taken together, findings suggest that distinct cognitive skills such as theory of mind contribute to a better development of social cognition, and are related to better social competence skills. Moreover, Study 1 and appended Study 3 lend added support to previous evidence that suggests that empathy is positively associated with prosocial behavior and negatively to socially inappropriate behavior in children (Alessandri, Caprara, Eisenberg, & Steca, 2009; de Waal, 2008; Eisenberg, Eggum, & Di Giunta, 2010; Eisenberg & Fabes, 1990; Eisenberg & Miller, 1987; Girard, Terradas, & Matte-Gagné, 2014; Hoffman, 2000; McMahon, Wernsman, & Parnes, 2006; Pursell, Laursen, Rubin, Booth-LaForce, & Rose-Krasnor, 2008; Roberts & Strayer, 1996; Williams, O'Driscoll, & Moore, 2014). As they relate specifically to moral reasoning, the current findings support the model's developmental accounts of a gradual sophistication of moral processes with age (also see Chiasson, Vera-Estay, Lalonde, Dooley, & Beauchamp, 2017 with the same moral reasoning task, So-Moral). This suggests that younger children use more egocentric schemas of analysis (such as fear of punishment, or the anticipation of personal benefits), and older youth use more sociocentric schemas integrating the perspective of others and abstract social values. Although this developmental tendency has been supported by cognitive-development theories (Gibbs, 2013), our results are innovative as they reveal this developmental tendency even when using a task that controls for the frequent methodological confounds that sometimes plague studies of moral reasoning, such as the presentation of extreme hypothetical scenarios, confounds related to reading and writing, and dilemmas in the third person. A more detailed analysis of the

methodological contributions of the dissertation results can be found in the following section on methodological implications.

The current studies did not cover a number of factors involved in the development of social competence skills and in the associations between socio-cognitive aspects and broad social outcomes, the most important being brain integrity and functioning, since we focused on typically developing populations of children and adolescents. In order to assess those contributions, further studies involving neuroimaging of the specific areas and networks supporting socio-cognitive skills need to be performed. A study on youth with focal brain injury in frontotemporal regions, performed by Chiasson and colleagues (2017) in our group using the same So-Moral task, revealed that patients with focal brain injuries, when compared to matched controls, had significantly poorer moral processes and empathy, as well as increased socio-behavioral problems. Another study by Vera-Estay and colleagues (manuscript to be submitted for publication) reveal differences in socio-cognitive skills (theory of mind, executive functioning), as well as social competence and behavioral tendencies, in a population of children with neurodevelopmental difficulties (Tourette's Syndrome). Taken together, results from brain-injured, neurodevelopmental, and typically developing youth add to the growing body of work supporting the integrative, bio-psycho-social integrative framework of the SOCIAL model in accounting for the complex interplay between neural, cognitive, and psychosocial factors at play in the development of social competence skills and adequate social behavior in everyday settings.

Additionally, as it relates to the SOCIAL model's second set of mediators, the dissertation results highlight the importance of considering a wide range external factors that relate to an individual's social participation, social exposure and social interactions i.e. *the social experience*. Of note, this construct is conceptualized in the second study in *quantitative* terms (weekly video game playing frequency). Although speculative, interpretation of the research results supposes that the amount of time that children dedicate to playing video games may displace a quantity of time they would have spent interacting socially. However, this

explanation would need to be tested empirically and it is possible that increased video game playing frequency does not necessarily mean fewer real social interactions. For instance, time not spent playing video games could be otherwise spent doing non-social activities, such as reading, sleeping, studying, watching television, and so on. Moreover, the data do not address the *quality* of the social interactions children might engage in while not playing video games, which is important in the promotion of adequate social skills. For example, if children are engaged in social interactions that are negative, through unhealthy peer relationships, for example, or are exposed to unfavorable social/familial environments, their social skills development may be impacted regardless of their video game playing habits. Future research is needed to address the nature of the relation between the quantity and quality of social interactions as they relate to the development of socio-cognitive and social competence.

There are other external factors not addressed directly in the thesis studies that are also likely to be associated with the development of social skills. Attachment quality, the presence of siblings as it creates opportunity for conflict resolution, and social/family values, notably, have all been linked to socio-cognitive skills and social competence (Meins et al., 2002; Kirmayer, Rousseau, & Lashley, 2007; McHale, Updegraff, & Whiteman, 2012; Sang & Nelson, 2017). Finally, SOCIAL underscores the role of internal factors in social development. These internal factors, such as personality traits and temperament, are often neglected in research on social development, although it is highly plausible that they may modulate both socio-cognitive development and broader social outcomes, as well as be a buffer against social/economic vulnerabilities.

Clinical implications

An interesting contribution of this dissertation is the question that can be raised in regard to the distinction between theoretical models stemming from clinical populations and those stemming from the study of neurotypical children. Much theory and knowledge about what

contributes to social competence has come from the study of individuals with deficits in those specific social skills (for example, individuals who exhibit aggression (Boxer, Goldstein, Musher-Eizenman, Dubow, & Heretick, 2005), have sustained brain injuries or have a diagnosis of autism spectrum disorder (Catroppa, Anderson, Morse, Haritou, & Rosenfeld, 2008)). However, the relations between social experience, social cognition and social behavior may not transfer from the literature on clinical populations to the development of children who do not have impaired socio-cognitive skills but rather, fall within the normal range. This question can be raised by looking at the data in typically developing youth: while findings do suggest some associations between socio-cognitive skills and social outcomes (Study 1), stronger predictive links are found between social outcomes and social experiences (Study 2). Simply put, it is not clear whether we can extrapolate from clinical to neurotypical. Besides, in the same logic alluded to when describing that ‘doing the good’ may not follow directly from ‘knowing the good’, the absence of certain deficits of socio-cognitive skills may be necessary for the absence of inappropriate or maladaptive behaviors, but may not be sufficient for fostering truly cooperative, other-motivated, prosocial behavior. Additionally, it is critical to investigate how the building blocks of social competence come together in typical development, not only in clinical populations, the former including individual variability and a range of different social manifestations in normative social settings. In the absence of impaired socio-cognitive skills, children may rely strongly on the building blocks of positive social interactions and experiences to construct their view of the social world and learn to adapt and react to it appropriately. To that effect, as suggested by proponents of a socio-constructivist view of social development (Vygotsky, 1978; Carpendale & Lewis, 2004; Lewis & Carpendale, 2009), it seems highly probable that youth develop healthy socio-cognitive skills through significant social interactions, and in the contexts most suited to support these, i.e. family, school and community environments.

Considerations for intervention

Taken together, results grounded in the SOCIAL framework give rise to a number of possible loci of intervention. Since findings suggest an association between the social experience and social behavioral outcomes, interventions focused on the quality and quantity of

positive and significant social interactions could yield positive effects on socio-cognitive skills and general social competence in youth, but this hypothesis needs to be tested empirically. Evidence already supports some intervention programs aimed at improving specific socio-cognitive skills such as joint attention, theory of mind, and emotion recognition in clinical populations, such as autism and schizophrenia, whose associated deficits in social cognition are well-known, albeit some with unknown long-term maintenance effects (Murza, Schwartz, Hahs-Vaughn, & Nye, 2016; Fletcher-Watson, McConnell, Manola, & McConachie, 2014; Kurtz, Gagen, Rocha, Machado, & Penn, 2016; Penn, Roberts, Combs, & Sterne, 2007). Interestingly, some intervention programs for typically developing children have shown that enhancing perspective taking skills has positive effects other socio-cognitive skills as well as on broader social competence skills, in line with Study 1 findings (Cigala, Mori & Fangareggi, 2015; Ornaghi, Brockmeier & Grazzani, 2014). Recent data also suggest acting training programs may enhance perspective taking, theory of mind, and empathetic skills in youth through imagining and enacting oneself as an imaginary other (Goldstein & Winner, 2012). Further, based on Study 2 findings, it would be interesting to explore avenues that aim to promote mature moral processes and foster prosocial behavior in neurotypical children through significant social experiences and interactions, as well as through modeling of prosocial behavior. This has been suggested through gesture (Beaudoin-Ryan & Goldin-Meadow, 2014), for example, and in everyday school contexts with teachers (Mori & Cigala, 2016).

Methodological implications

One of the original contributions of the dissertation is the use of the So-Moral task, an innovative sociomoral reasoning tool specifically designed for children and adolescents in an effort to bring to neuropsychology more ecologically valid assessment tools for social cognition.

As it specifically relates to sociomoral processes, in spite of the importance of ecologically valid tools, traditional moral reasoning testing and measurement have been hampered by numerous methodological problems. These include confounding issues of sustained attention, working memory and visual, verbal and reading skills that confound the

assessment itself (Dooley, Beauchamp & Anderson, 2010; Killen & Smetana, 2007), in addition to concerns related to the appropriateness and sensitivity of tasks designed for adults but used with young participants (Beauchamp, 2017). Moreover, traditional moral interviews used to assess moral reasoning are often obsolete, based on extreme, hypothetical moral dilemmas, and use situations that minimize personal and emotional involvement, variables identified as factors influencing moral reasoning maturity and decision-making (Greene et al., 2001; Moll et al., 2002; Orobio de Castro, Veerman, Koops, Bosch, & Monshouwer, 2002). In fact, neuroimaging studies have indicated that different brain areas are activated in making a decision in personal versus impersonal dilemmas (Greene et al., 2001; Moll et al., 2002). These findings suggest different information processing systems related to content that is personally involving and relates to day-to-day, familiar situations. In order to circumvent these methodological limitations, a first-person-perspective, ecological, developmentally sound, visual task was developed by Beauchamp and colleagues (Dooley et al. 2010; Beauchamp et al. 2013). The Socio-Moral Reasoning Aptitude Level task (So-Moral) is a first-person perspective, developmental, visual task designed to reflect both child and adolescent realities and to investigate developmental stages of moral reasoning using an ecological approach. The task has gender and age specific versions. Familiar sociomoral dilemmas are presented via sequences of pictures of children or adolescents playing out different scenarios, each involving a sociomoral conflict. The child version (6–12 years old) includes 9 dilemmas, while the adolescent version (13–21 years old) has 10 dilemmas. The main outcome variable, moral maturity, is valid across childhood and adolescence (Chiasson et al., 2017), is associated with cognitive and affective abilities such as theory of mind, executive functions and empathy (Vera-Estay, Beauchamp & Dooley, 2015; Vera-Estay et al., 2016; Garon, Lavallée, Estay, & Beauchamp, 2018), and is sensitive to brain insult and use in neurodevelopmental populations (Beauchamp et al., 2013; Beauchamp et al., in press; Chiasson et al., 2017; Garon, Forgeot d'Arc, Lavallée, Vera-Estay, & Beauchamp, 2018).

Dissertation findings further support the construct validity of the So-Moral, through demonstrated associations with other socio-cognitive functions, as well as with broader social outcome measures. Moreover, the development and use of the So-Moral highlight the many

challenges inherent to the creation and use of social cognition assessment tools within neuropsychology, such as the nature of social stimuli, test characteristics and scoring difficulties, to name a few (Beauchamp, 2017). The So-Moral may be considered an ecological assessment task, in its use of photo vignettes in the first-person perspective, with real actors conveying non-verbal cues crucial in the processing of social information outside the artificial environment of a psychology lab. Immersion versions of the So-Moral (virtual reality, video game) could be useful to further capture real-life, everyday realities of youth through dynamic and realistic stimuli. Notably, the other socio-cognitive assessment tools used in the thesis studies were more traditional paper and pencil measures and questionnaires. Admittedly, this is due to the limited number of more dynamic, or immersive socio-cognitive tasks available and may limit the overall ecological aim of the dissertation as a whole.

Limitations and Future directions

In spite of their contributions, the studies introduce a number of limitations. First, from a methodological standpoint, the assessment of social behavior outcomes is obtained through parent-report questionnaires such as the CBCL. The fact that they were not specifically designed for the assessment of social competence renders these scales less sensitive to social difficulties. Moreover, while we recognize that parents are most often valid references in the assessment of their children, perception biases cannot be ignored, be they positive or negative (due to comparisons with siblings, the direct relationship with the child, the parent's psychological state at report completion time, etc.). Other socio-cognitive skills, such as empathy, were also assessed through questionnaires, possibly limiting the associations with moral reasoning measured more ecologically. The next generation of research studies addressing the dissertation questions could look to observation and naturalistic measurement to better capture complex social processes, either in the settings in which they naturally occur, or in settings that reproduce real-life as closely as possible (Beauchamp, 2017). Second, while a broad age span of sample participants strengthens the developmental interpretations, data collection was cross-sectional and not longitudinal. While conjectures may be attempted in relation to the data, no

developmental or causal relations can be extrapolated from the results. In the same way, the dissertation objectives focus on associations between individual socio-cognitive variables, external factors and social outcomes. However, the nature itself of the SOCIAL model suggests dynamic, bi-directional relationships between external, internal, and individual socio-cognitive and social competence variables, highlighting the plausible impacts of the individual variables on external and internal factors as well. For example, it is possible that a child's mature moral reasoning abilities and sophisticated theory of mind skills may impact his/her relationship with parents, affecting family dynamics and consequent time spent engaging in activities with family members and peers. Finally, even in a dissertation concerned with exploring external factors contributing to the development of social competence skills, one cannot avoid addressing the highly limited cultural and socio-demographic variability of the sample. Subjects came from mostly Caucasian, mid- to high-SES backgrounds. Direct impacts on the results are probable; for example, video game playing time may have been over- or underestimated in relation to socio-demographic factors. Mostly, low SES variability and minimal cultural diversity limit the generalizability of dissertation results to diverse populations with diverging values, parenting practices and social norms that, according to the SOCIAL model, are bound to impact social development in complex, varying ways.

Conclusion

This dissertation falls within the scope of an effort to integrate the neuropsychological assessment of social cognition and social competence to broader outcomes in development, in order to adequately reflect our reality as social and psychological beings.

In 1973, A. R. Luria introduced neuropsychology, "*this new branch of science*" of psychological processes (Preface, p.12) in his book *The Working Brain*. He accurately predicted that "*in the next fifty years our views on the structure of mental processes will differ substantially from those we hold today; neuropsychology will deserve much of the credit for this revision and deepening of our knowledge of the internal structure of mental processes.*" (p. 343). Combined

with a wealth of knowledge in developmental and social psychology, as well as more recent advances in social neuroscience, neuropsychology is making leaps and bounds in gradually approaching the truest estimation of our social reality; that is, until more accurate truth is uncovered, as is the way of science. Research in social cognition in youth strives towards a better understanding of the optimal ways to promote the value of social life in and for itself, so that we may fully realize and appreciate its potential and fulfillment.

References - Introduction & General Discussion

- Adolphs, R. (2001). The neurobiology of social cognition. *Current opinion in neurobiology*, 11(2), 231-239.
- Adolphs, R. (2009). The social brain: neural basis of social knowledge. *Annual Review of Psychology*, 60, 693-716.
- Alessandri, G., Caprara, G. V., Eisenberg, N., & Steca, P. (2009). Reciprocal relations among self-efficacy beliefs and prosociality across time. *Journal of personality*, 77(4), 1229-1259.
- Allen, D. N., Strauss, G. P., Donohue, B., & van Kammen, D. P. (2007). Factor analytic support for social cognition as a separable cognitive domain in schizophrenia. *Schizophrenia research*, 93(1-3), 325-333.
- Anderson, C. A. (2004). An update on the effects of playing violent video games. *Journal of adolescence*, 27(1), 113-122.
- Arsenio, W. F., Gold, J., & Adams, E. (2006). Children's conceptions and displays of moral emotions.
- Arsenio, W. F., & Lemerise, E. A. (2004). Aggression and moral development: Integrating social information processing and moral domain models. *Child development*, 75(4), 987-1002.
- Astington, J. W. (2004). Bridging the gap between theory of mind and moral reasoning. *New Directions for Child and Adolescent Development*, 2004(103), 63-72.
- Baird, J. A., & Astington, J. W. (2004). The role of mental state understanding in the development of moral cognition and moral action. *New directions for child and adolescent development*, 2004(103), 37-49.
- Bandura, A. (1991). Social cognitive theory of moral thought and action. In W. M. Kurtines & J. L. Gewirtz (Eds.), *Handbook of Moral Behavior and Development* (pp. 1-45). Hillsdale, NJ: Lawrence Erlbaum Associates.

- Barrera, M., & Li, S. A. (1996). The relation of family support to adolescents' psychological distress and behavior problems. In *Handbook of social support and the family* (pp. 313-343). Springer, Boston, MA.
- Batson, C. D., Sager, K., Garst, E., Kang, M., Rubchinsky, K., & Dawson, K. (1997). Is empathy-induced helping due to self–other merging?. *Journal of personality and social psychology*, 73(3), 495.
- Batson, C. D. (2011). *Altruism in humans*. Oxford University Press, USA.
- Beauchamp, M. H. (2017). Neuropsychology's social landscape: Common ground with social neuroscience. *Neuropsychology* 31: 981-1002.
- Beauchamp, M. H., & Anderson, V. (2010). SOCIAL: An integrative framework for the development of social skills. *Psychological Bulletin*, Vol. 136(1), 39-64.
- Beauchamp, M. H., & Anderson, V. (2013). Cognitive and psychopathological sequelae of pediatric traumatic brain injury. In *Handbook of clinical neurology* (Vol. 112, pp. 913-920). Elsevier.
- Beauchamp, M. H., & Dooley, J. J. (2012). *Administration and coding manual SocioMoral Reasoning Aptitude Level Task (So Moral)*. ABCs Laboratory. University of Montreal. Canada.
- Beauchamp, M. H., Dooley, J. J., & Anderson, V. (2013). A preliminary investigation of moral reasoning and empathy after traumatic brain injury in adolescents. *Brain Injury*, 27(7-8), 896-902.
- Beaudoin-Ryan, L., & Goldin-Meadow, S. (2014). Teaching moral reasoning through gesture. *Developmental science*, 17(6), 984-990.
- Blakemore, S. J. (2008). Development of the social brain during adolescence. *Quarterly Journal of Experimental Psychology*, 61, 40-49.
- Bora, E., & Pantelis, C. (2016). Meta-analysis of social cognition in attention-deficit/hyperactivity disorder (ADHD): comparison with healthy controls and autistic spectrum disorder. *Psychological medicine*, 46(4), 699-716.
- Boxer, P., Goldstein, S. E., Musher-Eizenman, D., Dubow, E. F., & Heretick, D. (2005). Developmental issues in school-based aggression prevention from a social-cognitive perspective. *Journal of Primary Prevention*, 26(5), 383-400.

- Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., ... & Pereira, J. (2016). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers & Education, 94*, 178-192.
- Brennan, S., & Dauvergne, M. (2011). Police-reported crime statistics in Canada, 2010. *Juristat, 85*(002), 1-43.
- Bronfenbrenner, U. (1994). Ecological models of human development. *International encyclopedia of education, 3*(2), 37-43.
- Camodeca, M., & Goossens, F. A. (2005). Aggression, social cognitions, anger and sadness in bullies and victims. *Journal of Child Psychology and Psychiatry, 46*(2), 186-197.
- Carpendale, J. I., & Lewis, C. (2004). Constructing an understanding of mind: The development of children's social understanding within social interaction. *Behavioral and brain sciences, 27*(1), 79-96.
- Casebeer, W. D. (2003). Moral cognition and its neural constituents. *Nature Reviews Neuroscience, 4*(10), 840.
- Catroppa, C., Anderson, V. A., Morse, S. A., Haritou, F., & Rosenfeld, J. V. (2008). Outcome and predictors of functional recovery 5 years following pediatric traumatic brain injury (TBI). *Journal of pediatric psychology, 33*(7), 707-718.
- Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: the perception-behavior link and social interaction. *Journal of personality and social psychology, 76*(6), 893.
- Chiasson, V., Elkaim, L., Weil, A. G., Crevier, L., & Beauchamp, M. H. (2017). Moral reasoning in children with focal brain insults to frontotemporal regions. *Brain Impairment, 18*(1), 102-116.
- Chiasson, V., Vera-Estay, E., Lalonde, G., Dooley, J. J., & Beauchamp, M. H. (2017). Assessing social cognition: age-related changes in moral reasoning in childhood and adolescence. *The Clinical Neuropsychologist, 31*(3), 515-530.
- Cigala, A., Mori, A., & Fangareggi, F. (2015). Learning others' point of view: perspective taking and prosocial behaviour in preschoolers. *Early Child Development and Care, 185*(8), 1199-1215.
- Colby, A., & Kohlberg, L. (1987). *The measurement of moral judgment. Theoretical foundations and research validation* . vol. 1 Cambridge: Cambridge University Press.

- Crick, N., & Dodge, K. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin*, *115*, 74–101.
- Cummings, E. M., Goeke-morey, M. C., & Papp, L. M. (2003). Children's responses to everyday marital conflict tactics in the home. *Child development*, *74*(6), 1918-1929.
- Daniel, E., Dys, S. P., Buchmann, M., & Malti, T. (2014). Developmental relations between sympathy, moral emotion attributions, moral reasoning, and social justice values from childhood to early adolescence. *Journal of adolescence*, *37*(7), 1201-1214.
- Decety, J., & Cowell, J. M. (2014). The complex relation between morality and empathy. *Trends in cognitive sciences*, *18*(7), 337-339.
- Decety, J., & Cowell, J. M. (2015). Empathy, justice, and moral behavior. *AJOB neuroscience*, *6*(3), 3-14.
- Decety, J., & Grèzes, J. (2006). The power of simulation: imagining one's own and other's behavior. *Brain research*, *1079*(1), 4-14.
- Decety, J., & Howard, L. H. (2013). The Role of Affect in the Neurodevelopment of Morality. *Child Development Perspectives*, *7*(1), 49-54.
- Decety, J., & Jackson, P. L. (2004). The functional architecture of human empathy. *Behavioral and cognitive neuroscience reviews*, *3*(2), 71-100.
- Decety, J., & Lamm, C. (2006). Human empathy through the lens of social neuroscience. *Scientific World Journal*, *6*, 1146-1163.
- Decety, J., Michalska, K. J., Akitsuki, Y., & Lahey, B. B. (2009). Atypical empathic responses in adolescents with aggressive conduct disorder: a functional MRI investigation. *Biological psychology*, *80*(2), 203-211.
- De Waal, F. B. (2008). Putting the altruism back into altruism: the evolution of empathy. *Annu. Rev. Psychol.*, *59*, 279-300.
- Diazgranados, S., Selman, R. L., & Dionne, M. (2016). Acts of social perspective taking: A functional construct and the validation of a performance measure for early adolescents. *Social development*, *25*(3), 572-601.
- Dixon, J. A., & Moore, C. F. (1990). The development of perspective taking: Understanding differences in information and weighting. *Child Development*, *61*(5), 1502-1513.

- Dooley, J. J., Beauchamp, M., & Anderson, V. A. (2010). The measurement of sociomoral reasoning in adolescents with traumatic brain injury: A pilot investigation. *Brain Impairment, 11*(02), 152-161.
- Dumontheil, I., Apperly, I. A., & Blakemore, S.-J. (2010). Online usage of theory of mind continues to develop in late adolescence. *Developmental Science, 13*(2), 331-338.
- Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. (1991). Young children's understanding of other people's feelings and beliefs: Individual differences and their antecedents. *Child development, 62*(6), 1352-1366.
- Eddy, C. M., & Cavanna, A. E. (2013). Altered social cognition in Tourette syndrome: nature and implications. *Behavioural neurology, 27*(1), 15-22.
- Eisenberg, N., Cumberland, A., Guthrie, I. K., Murphy, B. C., & Shepard, S. A. (2005). Age changes in prosocial responding and moral reasoning in adolescence and early adulthood. *Journal of research on adolescence, 15*(3), 235-260.
- Eisenberg, N., Eggum, N. D., & Di Giunta, L. (2010). Empathy-Related Responding: Associations with Prosocial Behavior, Aggression, and Intergroup Relations. *Social Issues and Policy Review, 4*(1), 143-180.
- Eisenberg, N., & Fabes, R. A. (1990). Empathy: Conceptualization, measurement, and relation to prosocial behavior. *Motivation and Emotion, 14*(2), 131-149.
- Eisenberg, N., Guthrie, I. K., Cumberland, A., Murphy, B. C., Shepard, S. A., Zhou, Q., & Carlo, G. (2002). Prosocial Development in Early Adulthood: A Longitudinal Study. *Journal of Personality and Social Psychology, 82*(6), 993-1006.
- Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological bulletin, 101*(1), 91.
- Eisenberg-Berg, N., & Mussen, P. (1978). Empathy and moral development in adolescence. *Developmental Psychology, 14*(2), 185.
- Eisenberg, N., Zhou, Q., & Koller, S. (2001). Brazilian Adolescents' Prosocial Moral Judgment and Behavior: Relations to Sympathy, Perspective Taking, Gender-Role Orientation, and Demographic Characteristics. *Child development, 72*(2), 518-534.
- Eslinger, P. J., Flaherty-Craig, C. V., & Benton, A. L. (2004). Developmental outcomes after early prefrontal cortex damage. *Brain and Cognition, 55*(1), 84-103.

- Ferguson, C. J., & Colwell, J. (2017). Understanding why scholars hold different views on the influences of video games on public health. *Journal of Communication*, 67(3), 305-327.
- Fletcher-Watson, S., McConnell, F., Manola, E., & McConachie, H. (2014). Interventions based on the Theory of Mind cognitive model for autism spectrum disorder (ASD). *The Cochrane Database of Systematic Reviews*(3), CD008785.
- Foot, P. (1978). The problem of abortion and the doctrine of double effect. In *Virtues and vices* Oxford, UK: Blackwell.
- Franzoi, S. L., Davis, M. H., & Young, R. D. (1985). The effects of private self-consciousness and perspective taking on satisfaction in close relationships. *Journal of Personality and Social Psychology*, 48(6), 1584.
- Frischen, A., Bayliss, A. P., & Tipper, S. P. (2007). Gaze cueing of attention: visual attention, social cognition, and individual differences. *Psychological bulletin*, 133(4), 694.
- Frith, C., & Frith, U. (2005). Theory of mind. *Current Biology*, 15(17), R644-R645.
- Funk, J. B. (2005). Children's exposure to violent video games and desensitization to violence. *Child and Adolescent Psychiatric Clinics*, 14(3), 387-404.
- Garon, M., Forgeot d'Arc, B., Lavallée, M. M., Vera-Estay, E., & Beauchamp, M. (2018). Visual Encoding of Social Cues Contributes to Moral Reasoning in Autism Spectrum Disorder: An Eye-Tracking Study. *Frontiers in human neuroscience*, 12, 409.
- Garon, M., Lavallée, M. M., Estay, E. V., & Beauchamp, M. H. (2018). Visual encoding of social cues predicts sociomoral reasoning. *PloS one*, 13(7), e0201099.
- Garrigan, B., Adlam, A. L., & Langdon, P. E. (2016). The neural correlates of moral decision-making: A systematic review and meta-analysis of moral evaluations and response decision judgements. *Brain and cognition*, 108, 88-97.
- Garrigan, B., Adlam, A. L., & Langdon, P. E. (2018). Moral decision-making and moral development: Toward an integrative framework. *Developmental Review*.
- Gentile, D. A., Anderson, C. A., Yukawa, S., Ihori, N., Saleem, M., Ming, L. K.,...Sakamoto, A. (2009). The effects of prosocial video games on prosocial behaviors: International evidence from correlational, longitudinal, and experimental studies. *Personality and Social Psychology Bulletin*, 35(6), 752e763.
- Gibbs, J. C. (2010). *Moral development & reality : beyond the theories of Kohlberg and Hoffman* (2nd ed.). Boston: Allyn & Bacon.

- Gibbs, J. C. (2013). *Moral development and reality : beyond the theories of Kohlberg, Hoffman, and Haidt* (3rd ed.). New York: Oxford University Press.
- Gibbs, J. C., Basinger, K. S., & Fuller, D. (1992). *Moral Maturity: Measuring the Development of Sociomoral Reflection*. Hillsdale, NJ: Lawrence Erlbaum.
- Gilligan, C. *In a different voice: Psychological theory and women's development*. Cambridge, MA: Harvard University Press; 1982.
- Girard, É., Terradas, M. M., & Matte-Gagné, C. (2014). Empathie, comportements pro-sociaux et troubles du comportement. *Enfance*, 2014(4), 459-480.
- Gleichgerricht, E., & Young, L. (2013). Low levels of empathic concern predict utilitarian moral judgment. *PloS one*, 8(4), e60418.
- Goldstein, T. R., & Winner, E. (2012). Enhancing empathy and theory of mind. *Journal of cognition and development*, 13(1), 19-37.
- Gomes, A., Rinehart, N., Greenham, M., & Anderson, V. (2014). A critical review of psychosocial outcomes following childhood stroke (1995–2012). *Developmental neuropsychology*, 39(1), 9-24.
- Granic, I., Lobel, A., & Engels, R. C. (2014). The benefits of playing video games. *American psychologist*, 69(1), 66.
- Greene, J. D. (2007). *The secret joke of Kant's soul* (pp. 59-66). Cambridge, MA: MIT Press.
- Greene, J., & Haidt, J. (2002). How (and where) does moral judgment work? *Trends in cognitive sciences*, 6(12), 517-523.
- Greene, J. D., Sommerville, R. B., Nystrom, L. E., Darley, J. M., & Cohen, J. D. (2001). An fMRI investigation of emotional engagement in moral judgment. *Science*, 293(5537), 2105-2108.
- Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: attitudes, self-esteem, and stereotypes. *Psychological review*, 102(1), 4.
- Greitemeyer, T., & Mügge, D. O. (2014). Video games do affect social outcomes: A meta-analytic review of the effects of violent and prosocial video game play. *Personality and Social Psychology Bulletin*, 40(5), 578-589.
- Greitemeyer, T., Traut-Mattausch, E., & Osswald, S. (2012). How to ameliorate negative effects of violent video games on cooperation: Play it cooperatively in a team. *Computers in Human Behavior*, 28(4), 1465-1470.

- Grezes, J., & Decety, J. (2001). Functional anatomy of execution, mental simulation, observation, and verb generation of actions: a meta-analysis. *Human brain mapping, 12*(1), 1-19.
- Haidt, J. (2001). The emotional dog and its rational tail: a social intuitionist approach to moral judgment. *Psychological review, 108*(4), 814.
- Haidt, J. (2002). " Dialogue between My Head and My Heart": Affective Influences on Moral Judgment. *Psychological Inquiry, 13*(1), 54-56.
- Happé, F., & Conway, J. R. (2016). Recent progress in understanding skills and impairments in social cognition. *Current opinion in pediatrics, 28*(6), 736-742.
- Harlow, H. F., Dodsworth, R. O., & Harlow, M. K. (1965). Total social isolation in monkeys. *Proceedings of the National Academy of Sciences, 54*(1), 90-97.
- Harrington, B., & O'Connell, M. (2016). Video games as virtual teachers: Prosocial video game use by children and adolescents from different socioeconomic groups is associated with increased empathy and prosocial behaviour. *Computers in Human Behavior, 63*, 650-658.
- Henry, C. S., Sager, D. W., & Plunkett, S. W. (1996). Adolescents' perceptions of family system characteristics, parent-adolescent dyadic behaviors, adolescent qualities, and adolescent empathy. *Family Relations, 283-292*.
- Henry, K. L., & Slater, M. D. (2007). The contextual effect of school attachment on young adolescents' alcohol use. *Journal of school health, 77*(2), 67-74.
- Hinnant, J. B., & O'Brien, M. (2007). Cognitive and emotional control and perspective taking and their relations to empathy in 5-year-old children. *The Journal of genetic psychology, 168*(3), 301-322.
- Hoffman, M.L. (2000). Empathy and moral development: Implications for caring and justice. Cambridge: Cambridge University Press.
- Hong, Y. Y., & Chiu, C. Y. (2001). Toward a paradigm shift: From cross-cultural differences in social cognition to social-cognitive mediation of cultural differences. *Social cognition, 19*(3: Special issue), 181-196.
- Iacoboni, M. (2009). Imitation, empathy, and mirror neurons. *Annual review of psychology, 60*, 653-670.

- Iarocci, G., Yager, J., & Elfers, T. (2007). What gene–environment interactions can tell us about social competence in typical and atypical populations. *Brain and Cognition*, 65(1), 112-127.
- Innocenti, G. M. (2007). Subcortical regulation of cortical development: some effects of early, selective deprivations. *Progress in Brain Research*, 164, 23-37.
- Jessor, R. (1991). Risk behavior in adolescence: a psychosocial framework for understanding and action. *Journal of adolescent Health*.
- Kennedy, D. P., & Adolphs, R. (2012). The social brain in psychiatric and neurological disorders. *Trends in Cognitive Sciences*, 16(11), 559-572.
- Killen, M., Mulvey, K. L., Richardson, C., Jampol, N., & Woodward, A. (2011). The accidental transgressor: Morally-relevant theory of mind. *Cognition*, 119(2), 197-215.
- Killen, M., Rutland, A., Abrams, D., Mulvey, K. L., & Hitti, A. (2013). Development of intra- and intergroup judgments in the context of moral and social-conventional norms. *Child Development*, 84(3), 1063-1080.
- Killen, M., & Smetana, J. (2008). Moral judgment and moral neuroscience: intersections, definitions, and issues. *Child Development Perspectives*, 2(1), 1-6.
- Killen, M., & Smetana, J. (2007). The biology of morality: Human development and moral neuroscience. *Human Development*, 50(5), 241-243.
- Kirmayer, L. J., Rousseau, C., & Lashley, M. (2007). The place of culture in forensic psychiatry. *The Journal of the American Academy of Psychiatry and the Law*, 35(1), 98-102.
- Kohlberg, L. (1969). Stage and sequence: The cognitive-developmental approach to socialization. In D. A. Golsin (Ed.), *Handbook of socialization : Theory and research* (pp. 347-480). Chicago: Rand McNally.
- Kohlberg, L. (1981). *The philosophy of moral development: Moral stages and the idea of justice*.
- Kohlberg, L., Levine, C., & Hwer, A. (1983). *Moral stages: a current formulation and a response to critics*. Basel ; New York: Karger.
- Kral, T. R., Stodola, D. E., Birn, R. M., Mumford, J. A., Solis, E., Flook, L., ... & Davidson, R. J. (2018). Neural correlates of video game empathy training in adolescents: a randomized trial. *npj Scientific of Learning*, 3.

- Krebs, D. L., & Denton, K. (2005). Toward a more pragmatic approach to morality: a critical evaluation of Kohlberg's model. *Psychological review*, *112*(3), 629.
- Krettenauer, T., & Johnston, M. (2011). Positively versus negatively charged moral emotion expectancies in adolescence: The role of situational context and the developing moral self. *British Journal of Developmental Psychology*, *29*(3), 475-488.
- Krettenauer, T., Malti, T., & Sokol, B. W. (2008). The development of moral emotion expectancies and the happy victimizer phenomenon: A critical review of theory and application. *International Journal of Developmental Science*, *2*(3), 221-235.
- Kurtz, M. M., Gagen, E., Rocha, N. B., Machado, S., & Penn, D. L. (2016). Comprehensive treatments for social cognitive deficits in schizophrenia: A critical review and effect-size analysis of controlled studies. *Clinical Psychology review*, *43*, 80-89.
- Lane, J. D., Wellman, H. M., Olson, S. L., LaBounty, J., & Kerr, D. C. (2010). Theory of mind and emotion understanding predict moral development in early childhood. *British Journal of Developmental Psychology*, *28*(4), 871-889.
- Lee, M., & Prentice, N. M. (1988). Interrelations of empathy, cognition, and moral reasoning with dimensions of juvenile delinquency. *Journal of abnormal child psychology*, *16*(2), 127-139.
- Lemerise, E. A., & Arsenio, W. F. (2000). An integrated model of emotion processes and cognition in social information processing. *Child Development*, *71*(1), 107-118.
- Lenhart, A., Kahne, J., Middaugh, E., Macgill, A. R., Evans, C., & Vitak, J. (2008). Teens, Video Games, and Civics: Teens' Gaming Experiences Are Diverse and Include Significant Social Interaction and Civic Engagement. *Pew internet & American life project*.
- Lewis, C., & Carpendale, J. I. (2009). Introduction: Links between social interaction and executive function. *New Directions for Child and Adolescent Development*, *2009*(123), 1-15.
- Lobel, A., Engels, R. C., Stone, L. L., Burk, W. J., & Granic, I. (2017). Video gaming and children's psychosocial wellbeing: A longitudinal study. *Journal of youth and adolescence*, *46*(4), 884-897.

- López, E. E., Pérez, S. M., Ochoa, G. M., & Ruiz, D. M. (2008). Adolescent aggression: Effects of gender and family and school environments. *Journal of Adolescence*, *31*(4), 433-450.
- Luria, A.R. (1973). *The Working Brain: An Introduction to Neuropsychology*. Basic Books.
- Malhotra, D., & Liyanage, S. (2005). Long-term effects of peace workshops in protracted conflicts. *Journal of Conflict Resolution*, *49*(6), 908-924.
- Malti, T., Gasser, L., & Gutzwiller-Helfenfinger, E. (2010). Children's interpretive understanding, moral judgments, and emotion attributions: Relations to social behaviour. *British Journal of Developmental Psychology*, *28*(2), 275-292.
- Malti, T., Gummerum, M., & Buchmann, M. (2007). Contemporaneous and 1-year longitudinal prediction of children's prosocial behavior from sympathy and moral motivation. *The Journal of genetic psychology*, *168*(3), 277-299.
- Malti, T., Gummerum, M., Keller, M., & Buchmann, M. (2009). Children's moral motivation, sympathy, and prosocial behavior. *Child Development*, *80*(2), 442-460.
- Malti, T., & Keller, M. (2009). The relation of elementary-school children's externalizing behaviour to emotion attributions, evaluation of consequences, and moral reasoning. *European Journal of Developmental Psychology*, *6*(5), 592-614.
- Malti, T., & Latzko, B. (2010). Children's moral emotions and moral cognition: Towards an integrative perspective. *New directions for child and adolescent development*, *2010*(129), 1-10.
- Masten, A. S., & Coatsworth, J. D. (1998). The development of competence in favorable and unfavorable environments: Lessons from research on successful children. *American psychologist*, *53*(2), 205.
- McDonald, S. (2013). Impairments in social cognition following severe traumatic brain injury. *Journal of the International Neuropsychological Society*, *19*(3), 231-246.
- McHale, S. M., Updegraff, K. A., & Whiteman, S. D. (2012). Sibling Relationships and Influences in Childhood and Adolescence. *Journal of Marriage and the Family*, *74*(5), 913-930.

- McMahon, S. D., Wernsman, J., & Parnes, A. L. (2006). Understanding Prosocial Behavior: The Impact of Empathy and Gender Among African American Adolescents. *Journal of Adolescent Health, 39*(1), 135-137.
- Meins, E., Fernyhough, C., Wainwright, R., Das Gupta, M., Fradley, E., & Tuckey, M. (2002). Maternal mind-mindedness and attachment security as predictors of theory of mind understanding. *Child Development, 73*(6), 1715-1726.
- Moll, J., Zahn, R., de Oliveira-Souza, R., Krueger, F., & Grafman, J. (2005). The neural basis of human moral cognition. *Nature Reviews Neuroscience, 6*(10), 799-809.
- Mori, A., & Cigala, A. (2016). Perspective taking: Training procedures in developmentally typical preschoolers. Different intervention methods and their effectiveness. *Educational Psychology Review, 28*(2), 267-294.
- Murza, K. A., Schwartz, J. B., Hahs-Vaughn, D. L., & Nye, C. (2016). Joint attention interventions for children with autism spectrum disorder: a systematic review and meta-analysis. *International Journal of Language & Communication Disorders, 51*(3), 236-251.
- NPD Group. (2014). The NPD Group: 37 Percent of US Population Age 9 and Older Currently Plays PC Games. Retrieved September, 30, 2015.
- Nucci, L. (2002). Because it is the right thing to do. *Human Development, 45*, 125–129.
- Nuyens, F. M., Kuss, D. J., Lopez-Fernandez, O., & Griffiths, M. D. (2018). The Empirical Analysis of Non-problematic Video Gaming and Cognitive Skills: A Systematic Review. *International Journal of Mental Health and Addiction, 1-26*.
- Olweus, D. (1994). Bullying at school: basic facts and effects of a school based intervention program. *Journal of child psychology and psychiatry, 35*(7), 1171-1190.
- Ornaghi, V., Brockmeier, J., & Grazzani, I. (2014). Enhancing social cognition by training children in emotion understanding: A primary school study. *Journal of Experimental Child Psychology, 119*, 26-39.
- Orobio De Castro, B., Veerman, J. W., Koops, W., Bosch, J. D., & Monshouwer, H. J. (2002). Hostile attribution of intent and aggressive behavior: A meta-analysis. *Child development, 73*(3), 916-934.

- Palmer, S. B., Rutland, A., & Cameron, L. (2015). The development of bystander intentions and social-moral reasoning about intergroup verbal aggression. *British journal of developmental psychology*, 33(4), 419-433.
- Paulus, M., & Leitherer, M. (2017). Preschoolers' social experiences and empathy-based responding relate to their fair resource allocation. *Journal of experimental child psychology*, 161, 202-210.
- Piaget, J. (1932/2000). *Le jugement moral chez l'enfant*. Paris: PUF.
- Penn, D. L., Roberts, D. L., Combs, D., & Sterne, A. (2007). Best practices: The development of the Social Cognition and Interaction Training program for schizophrenia spectrum disorders. *Psychiatric Services*, 58(4), 449-451.
- Prot, S., Gentile, D. A., Anderson, C. A., Suzuki, K., Swing, E., Lim, K. M., ... Lam, B. P. (2014). Long-term relations among prosocial-media use, empathy, and prosocial behavior. *Psychological Science*, 25(2), 358e368.
- Pursell, G. R., Laursen, B., Rubin, K. H., Booth-LaForce, C., & Rose-Krasnor, L. (2008). Gender Differences in Patterns of Association Between Prosocial Behavior, Personality, and Externalizing Problems. *Journal of research in personality*, 42(2), 472-481.
- Rieffe, C., Terwogt, M. M., & Cowan, R. (2005). Children's Understanding of Mental States as Causes of Emotions. *Infant and Child Development*, 14, 259-272.
- Rieffe, C., Terwogt, M. M., Koops, W., Stegge, H., & Oomen, A. (2001). Preschoolers' appreciation of uncommon desires and subsequent emotions. *British Journal of Developmental Psychology*, 19, 259-274.
- Righthand, S., & Welch, C. (2005). Characteristics of youth who sexually offend. *Journal of child sexual abuse*, 13(3-4), 15-32.
- Roberts, W., & Strayer, J. (1996). Empathy, Emotional Expressiveness, and Prosocial Behavior. *Child Development*, 67(2), 449-470.
- Ruby, P., & Decety, J. (2004). How would you feel versus how do you think she would feel? A neuroimaging study of perspective-taking with social emotions. *Journal of cognitive neuroscience*, 16(6), 988-999.

- Sakamoto, A. (1994). Video Game Use and The Development of Sociocognitive Abilities in Children: Three Surveys of Elementary School Students 1. *Journal of applied social psychology, 24*(1), 21-42.
- Saelen, C., & Markovits, H. (2008). Adolescents' emotion attributions and expectations of behavior in situations involving moral conflict. *Journal of experimental child psychology, 100*(1), 53-76.
- Sang, S. A., & Nelson, J. (2017). The effect of siblings on children's social skills and perspective taking. *Infant and Child Development, e2023*.
- Saracho, O. N. (2014). Theory of mind: understanding young children's pretence and mental states. *Early child development and care, 184*(8), 1281-1294.
- Scourfield, J., Martin, N., Lewis, G., & McGuffin, P. (1999). Heritability of social cognitive skills in children and adolescents. *The British Journal of Psychiatry, 175*(6), 559-564.
- Shamay-Tsoory, S. G. (2011). The neural bases for empathy. *The Neuroscientist, 17*(1), 18-24.
- Sherry, J. L. (2001). The effects of violent video games on aggression: A meta-analysis. *Human communication research, 27*(3), 409-431.
- Sodian, B., Licata, M., Kristen-Antonow, S., Paulus, M., Killen, M., & Woodward, A. (2016). Understanding of goals, beliefs, and desires predicts morally relevant theory of mind: A longitudinal investigation. *Child development, 87*(4), 1221-1232.
- Sommer, M., Meinhardt, J., Rothmayr, C., Döhnel, K., Hajak, G., Rupprecht, R., & Sodian, B. (2014). Me or you? Neural correlates of moral reasoning in everyday conflict situations in adolescents and adults. *Social neuroscience, 9*(5), 452-470.
- Smetana, J. G., Jambon, M., Conry-Murray, C., & Sturge-Apple, M. L. (2012). Reciprocal associations between young children's developing moral judgments and theory of mind. *Developmental Psychology, 48*(4), 1144.
- Stevens, V., De Bourdeaudhuij, I., & Van Oost, P. (2002). Relationship of the family environment to children's involvement in bully/victim problems at school. *Journal of youth and Adolescence, 31*(6), 419-428.
- Thompson, E. J., Beauchamp, M. H., Darling, S. J., Hearps, S. J., Brown, A., Charalambous, G., ... & Jaimangal, M. (2018). Protocol for a prospective, school-based standardisation study of a digital social skills assessment tool for children: The Paediatric Evaluation

- of Emotions, Relationships, and Socialisation (PEERS) study. *BMJ open*, 8(2), e016633.
- Tomasello, M. (1995). Joint attention as social cognition. In C. Moore & P. J. Dunham (Eds.), *Joint attention: Its origins and role in development* (pp. 103-130). Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.
- Tortolero, S. R., Peskin, M. F., Baumler, E. R., Cuccaro, P. M., Elliott, M. N., Davies, S. L., ... & Schuster, M. A. (2014). Daily violent video game playing and depression in preadolescent youth. *Cyberpsychology, Behavior, and Social Networking*, 17(9), 609-615.
- Tousignant, B., Eugène, F., & Jackson, P. L. (2017). A developmental perspective on the neural bases of human empathy. *Infant Behavior and Development*, 48, 5-12.
- Tremblay, R. E., Hartup, W. W., & Archer, J. (2005). *Developmental origins of aggression*. Guilford Press: New York.
- Turiel, E. (1983). *The development of social knowledge : morality and convention*. Cambridge: Cambridge University Press.
- Turiel, E. (2002). *The culture of morality : Social development, context and conflict*. Cambridge: Cambridge University Press.
- Van Vugt, E., Gibbs, J., Stams, G. J., Bijleveld, C., Hendriks, J., & van der Laan, P. (2011). Moral development and recidivism: A meta-analysis. *International journal of offender therapy and comparative criminology*, 55(8), 1234-1250.
- Veenstra, R., Lindenberg, S., Oldehinkel, A. J., De Winter, A. F., Verhulst, F. C., & Ormel, J. (2008). Prosocial and antisocial behavior in preadolescence: Teachers' and parents' perceptions of the behavior of girls and boys. *International Journal of Behavioral Development*, 32(3), 243-251.
- Vera-Estay, E., Dooley, J. J., & Beauchamp, M. H. (2015). Cognitive underpinnings of moral reasoning in adolescence: The contribution of executive functions. *Journal of Moral Education*, 44(1), 17-33.
- Vera-Estay, E., Seni, A. G., Champagne, C., & Beauchamp, M. H. (2016). All for one: Contributions of age, socioeconomic factors, executive functioning, and social cognition to moral reasoning in childhood. *Frontiers in psychology*, 7, 227.

- Verhofstadt, L. L., Buysse, A., Ickes, W., Davis, M., & Devoldre, I. (2008). Support provision in marriage: The role of emotional similarity and empathic accuracy. *Emotion, 8*(6), 792.
- Vygotsky, L. S. (1934). *Thought and language*. Cambridge, MA: MIT Press.
- Vygotsky, L. S. (1978). *Mind in society : the development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman Eds.). Cambridge, Massachusetts: Harvard University Press.
- Werner, N. E., & Crick, N. R. (2004). Maladaptive peer relationships and the development of relational and physical aggression during middle childhood. *Social Development, 13*(4), 495-514.
- Williams, A., O'Driscoll, K., & Moore, C. (2014). The influence of empathic concern on prosocial behavior in children. *Frontiers in Psychology, 5*, 425.
- Young, L., Cushman, F., Hauser, M., & Saxe, R. (2007). The neural basis of the interaction between theory of mind and moral judgment. *Proceedings of the National Academy of Sciences, 104*(20), 8235-8240.
- Young, L., & Saxe, R. (2009). An fMRI investigation of spontaneous mental state inference for moral judgment. *Journal of cognitive neuroscience, 21*(7), 1396-1405.

Appendix

Children's empathy and social behavior: The mediating role of executive functioning.

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Abstract

Prosocial and aggressive behaviors are cornerstones of social functioning in childhood; however, developmental differences in aggression and prosociality are not fully understood. While empathy is thought to motivate prosocial actions and inhibit aggressive impulses, research also indicates that it is related to socio-cognitive skills such as executive functioning (EF). The current study aims at understanding the impacts of developmental changes in EF and empathy on social behavioral tendencies. We explored the relationship between EF, empathy and prosocial and aggressive tendencies in typically developing children ($n=80$, 49% males, $M = 9.3$, $SD = 1.7$ years), the potential mediating role of EF in the relation between empathy and prosociality and aggression, as well as the combined contribution of children's EF and empathy to these social behavioral tendencies. Along with significant inter-relations between EF, empathy and prosociality and aggression, results indicate that EF partially mediates the relationship between empathy and prosociality and fully mediates the association with aggression. Moreover, whereas prosociality is predicted by EF and empathy, aggressive tendencies are predicted by age and EF. These results contribute to a better understanding of the individual factors that support adapted social interactions during childhood and highlight the role of EF in social development.

Keywords: prosocial behavior, aggressive behavior, executive functioning, empathy, social skills, childhood.

1. Introduction

During childhood and adolescence, appropriate social functioning is considered a hallmark of healthy development, and is a good predictor of social adaptation in adulthood (John, 2001). High quality social functioning is critical for the development of satisfying and lasting relationships and has been shown to have an impact on physical and psychological wellbeing across the lifespan (Cacioppo, 2002; Cacioppo, Berntson, Sheridan, & McClintock, 2000). Social functioning is a broad construct encompassing a range of complex behaviors that emerge during social interactions (Yager & Ehmann, 2006). In particular, prosocial and aggressive behaviors represent two core aspects of social interactions that can affect the overall quality of social functioning (Rubin, Bukowski, & Parker, 2006) and adequate regulation of these behaviors is considered a crucial aspect of children's social development (Eisenberg, Spinrad, & Knafo, 2015; Eisner & Malti, 2015). Prosocial behavior refers to «voluntary actions that are intended to help or benefit another individual or group of individuals » (Eisenberg & Mussen, 1989, page 3), while aggressive behavior is described as actions intended to injure or irritate another person, including physical and non-physical aggression (Huesmann, 2007).

The first manifestations of prosocial and aggressive tendencies emerge during infancy and early childhood (Paulus, 2014; Reebye, 2005; Warneken & Tomasello, 2006); however, middle childhood is a particularly critical developmental period during which self/other differentiation increases and social interactions (including prosocial and aggressive behaviors) become more deliberate and self-regulated, and in turn influence peer interactions and relationships (Harter, 2012; Hoffman, 2000; Peters, Cillessen, Riksen-Walraven, & Haselager, 2010). Despite the relevance of prosocial and aggressive behaviors in relation to children's social functioning, the factors that predict individual differences in these behaviors in children are not fully understood. Even normal variations in the socio-cognitive skills that underpin these social behaviors could potentially translate into inter-individual differences in social functioning. As such, the current study focused on exploring the contribution of two socio-cognitive skills, executive functioning (EF) and empathy, to prosocial and aggressive behavioral tendencies during childhood.

Predictors of Prosocial and Aggressive Behaviors

For some, prosocial and aggressive behavior represent polar ends of a broader social construct

related to interpersonal problem-solving strategies, because they lead to opposite social outcomes (Eron & Huesmann, 1984; Wiegman & van Schie, 1998). Prosocial tendencies are associated with a variety of positive outcomes, including higher academic achievement (Bandura, Pastorelli, Barbaranelli, & Caprara, 1999; Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo, 2000; Miles & Stipek, 2006; Vitaro, Brendgen, Larose, & Tremblay, 2005; Wentzel, 1993), physical and mental health (Bandura et al., 1999; Flynn, Ehrenreich, Beron, & Underwood, 2015; Penner, Dovidio, Piliavin, & Schroeder, 2004), peer acceptance, peer preference and popularity (Denham, McKinley, Couchoud, & Holt, 1990; Layous, Nelson, Oberle, Schonert-Reichl, & Lyubomirsky, 2012; Peters et al., 2010; Warden & MacKinnon, 2003; Wentzel, Barry, & Caldwell, 2004) and social adaptation (Pursell, Laursen, Rubin, Booth-LaForce, & Rose-Krasnor, 2008). In contrast, aggressive tendencies during childhood are related to negative outcomes, such as academic difficulties (Kokko, Tremblay, Lacourse, Nagin, & Vitaro, 2006; Miles & Stipek, 2006), peer rejection (Tomada & Schneider, 1997) and poor social functioning more generally (Brennan, Shaw, Dishion, & Wilson, 2015; Coie, Lochman, Terry, & Hyman, 1992).

Other studies suggest, however, that prosociality and aggression should not be considered merely as mirror behaviors, but instead as related, but separate constructs on which a number of individual and environmental factors may exert their influence differentially during development (Doctoroff, Greer, & Arnold, 2006; Kokko et al., 2006; Miles & Stipek, 2006; Obsuth, Eisner, Malti, & Ribeaud, 2015; Pursell et al., 2008; Romano, Tremblay, Boulerice, & Swisher, 2005). This view suggests that prosocial and aggressive behavior may not be determined by the same substrates and underscore the importance of considering their predictors separately. In line with this multifactorial conception of social behavior, the Socio-Cognitive Integration of Abilities Model (SOCIAL, Beauchamp & Anderson, 2010, see Figure 1), proposes a bio-psycho-social approach to explaining the emergence of social function/behaviors based on a dynamic interplay between cognitive (e.g. executive functioning), socio-emotional (e.g. empathy, theory of mind) and communication (e.g. pragmatics) skills. These skills, in turn, are mediated by internal (e.g. gender) and environmental factors (e.g. socioeconomic status), as well as by brain development and integrity. This model highlights the contribution of socio-cognitive skills, such as executive functioning and empathy, to the development of adapted

social functioning and the possibility that these socio-cognitive skills may play an important role in shaping prosocial and aggressive behavioral tendencies.

Executive functions refer to a broad range of skills implicated in regulating thinking and behavior (Kerr & Zelazo, 2004). This set of skills develops mainly throughout childhood and adolescence, mediated largely by the maturation of the frontal lobes (Anderson, Jacobs, & Anderson, 2008; Baddeley, 2002). Empathy is defined as “the ability to experience and understand what others feel without confusion between oneself and others” (Decety and Lamm, 2006, p. 1146). Given that psychological and neuropsychological theories propose a reciprocal influence between social interactions and executive functioning during development (for a review, see Lewis & Carpendale, 2009), it is plausible that children’s EF may influence the display and regulation of relevant social interactions, such as prosocial and aggressive behaviors (Sokol, Miller, Carpendale, Young, & Iarocci, 2010). Interestingly, Decety and Lamm (2006) further suggest that EF and empathy have a significant inter-relation in modulating social behavior. According to the empirical model proposed by these authors, empathy involves both bottom-up and top-down information processing, with EF acting as a modulator of basic affective and cognitive information. Consistent with this model, studies have found that executive deficits are related to poorer empathy in healthy (Vetter, Altgassen, Phillips, Mahy, & Kliegel, 2013; Ze, Thoma, & Suchan, 2014) and clinical population (Decety & Moriguchi, 2007; Eslinger, Moore, Anderson, & Grossman, 2011; Eslinger et al., 2007; Konstantakopoulos et al., 2014; Thoma et al., 2011; Yeh, Lo, Tsai, & Tsai, 2015).

Executive functioning, empathy and prosocial tendencies

Theoretically, empathy is considered one of the key motivators of prosocial actions since the perception of another’s emotion automatically activates shared representations in the observer, generating a matching emotional state that drives prosocial behavior. This state-matching becomes more complex as social understanding and perspective-taking skills evolve during development, facilitating a more global understanding of another’s situation, which enables an appropriate prosocial response (de Waal, 2008; Hoffman, 2000). Empirically, there is ample evidence to suggest that high level empathy is related to increased prosocial behavior in children and adults (G. Alessandri, Caprara, Eisenberg, & Steca, 2009; de Waal, 2008; Eisenberg,

Eggum, & Di Giunta, 2010; Eisenberg & Fabes, 1990; Eisenberg & Miller, 1987; Girard, Terradas, & Matte-Gagné, 2014; Hoffman, 2000; McMahon, Wernsman, & Parnes, 2006; Pursell et al., 2008; Roberts & Strayer, 1996; Williams, O’Driscoll, & Moore, 2014). However, other factors have to be considered to fully explain prosocial tendencies, since a meta-analysis conducted by Eisenberg and Miller (1987) indicates that the association between empathy and prosocial behavior tends to be low to moderate, suggesting additional contributions by other skills. In this regard, it is likely that EF is also a predictor of prosocial behavior since some studies have demonstrated an association between prosocial behavior and specific EF skills. For instance, effortful control and self-regulation, two EF constructs (Rueda, Posner, & Rothbart, 2005; Zhou, Chen, & Main, 2012), are positively associated with prosocial tendencies throughout development (G Alessandri et al., 2014; Diener & Kim, 2004; Eisenberg et al., 1996; Moore, Barresi, & Thompson, 1998; Veenstra et al., 2008). In one of the few studies exploring the mediating role of EF in the relation between empathy and prosocial behavior, Lockwood, Seara-Cardoso, and Viding (2014) found that healthy adults who display higher cognitive and affective levels of empathy are more prosocial, but also that this association is mediated by emotion regulation skills, which are considered “hot” components of EF (Zelazo & Cunningham, 2007). The impact of emotion regulation is in keeping with the conclusions of Batson and Shaw (1991), proposing that difficulties in regulating emotions, specifically, personal distress, may interfere with prosocial behavior. More indirectly, a neuroimaging study conducted by Thijssen et al. (2015) with 464 children aged 6 to 9 years, detected an association between prosocial behavior and cortical thickness in regions associated with EF (inhibitory control).

Executive functioning, empathy and aggressive tendencies

Empathy is considered to be one of the fundamental internal processes that suppresses the expression of aggression, by providing an automatized representation of the emotions of the person toward whom the potential aggressive action is directed (Peterson & Flanders, 2005; Preston & de Waal, 2002). This theoretical view is supported by studies demonstrating that children and adolescents with poorer empathy tend to display more aggressive behaviors, including physical, verbal and relational aggression (Batanova & Loukas, 2011; Decety, Michalska, Akitsuki, & Lahey, 2009; Kaukiainen et al., 1999; Schultz, IZard, & Bear, 2004;

Strayer & Roberts, 2004). Affective empathy, however, appears more consistently related to aggression in adolescence than in childhood, according to a review conducted by Lovett and Sheffield (2007). Moreover, a meta-analysis by Miller and Eisenberg (1988) concludes that the relation between empathy and aggression is stable only in studies using report measures, but not in studies using direct measures. Hence, as pointed out by Maibom (2012), whereas broadly empathy and aggression seem to be negatively related, differences in terms of sample composition (e.g. age, gender) and measurement tools influences the presence and strength of this relationship.

Extensive literature suggests that difficulties in the regulation of aggressive behavior are related to executive deficits in pediatric (Ellis, Weiss, & Lochman, 2009; Giancola, Martin, Tarter, Pelham, & Moss, 1996; Giancola & Mezzich, 2000; Monette, Bigras, & Guay, 2015; Riccio, Hewitt, & Blake, 2011; Séguin & Zelazo, 2005) and adult clinical groups (Moffitt, 1993), but also in healthy children (Granvald & Marciszko, 2016; Raaijmakers et al., 2008) and adults (Hoaken, Shaughnessy, & Pihl, 2003; Paschall & Fishbein, 2002; Ready, Stierman, & Paulsen, 2001), suggesting that even normal inter-individual differences in EF may be related to variations in aggressive behavior. As highlighted by Eisner and Malti (2015), while the influence of executive skills on the regulation of aggression is widely accepted, it is interesting to note that this relation is present even in childhood and adolescence, when executive skills are not fully mature. Understanding this link during healthy development may contribute to delineating the mechanisms that encourage the regulation of aggression.

The current study

Given the role of empathy in promoting prosocial behaviors and its contribution to moderating or inhibiting aggressive behaviors (Eisenberg et al., 2010; Hoffman, 2000; Masten, Morelli, & Eisenberger, 2011; Morelli, Rameson, & Lieberman, 2014; Richardson, Hammock, Smith, Gardner, & Signo, 1994), as well as the relation between executive deficits and poorer empathy (Decety & Moriguchi, 2007; Eslinger et al., 2011; Eslinger et al., 2007; Konstantakopoulos et al., 2014; Thoma et al., 2011; Vetter et al., 2013; Yeh et al., 2015; Ze et al., 2014), it seems highly likely that EF and empathy may be important determinants of prosocial and aggressive

behaviors. However, to our knowledge, no study has explored the combined influence of both EF and empathy on prosocial or aggressive tendencies in healthy childhood, an important gap considering the role assigned by theoretical models to EF in the development of socially adaptive behavior (Beauchamp & Anderson, 2010; Crick & Dodge, 1994; Decety & Lamm, 2006; Yeates et al., 2007). The present study explores the contribution of children's everyday EF and empathy to their prosocial and aggressive behavioral tendencies, and the potential mediating role of EF in the relation between empathy and prosociality and aggression. Given that studies exploring gender, socioeconomic status and age-related differences in prosocial and aggressive behaviors have not been conclusive (Archer, 2004; Bandura et al., 1999; Doctoroff et al., 2006; Flynn et al., 2015; Girard et al., 2014; Kokko et al., 2006; Lindeman, Harakka, & Keltikangas-Järvinen, 1997; McMahan et al., 2006; Peters et al., 2010; Piff, Kraus, Côté, Cheng, & Keltner, 2010; Romano et al., 2005; Schultz et al., 2004; Tremblay, Hartup, & Archer, 2005), we also sought to control for these variables in line with the multifactorial approach proposed in the SOCIAL model (Beauchamp & Anderson, 2010). Specifically, the study aimed to: 1) Assess the link between everyday EF, empathy, prosociality, aggression and sociodemographic variables (age, gender, socioeconomic status); 2) assess the link between empathy and children's prosocial and aggressive tendencies, and explore potential differences in the mediating role of everyday EF on the relation between empathy and prosocial versus aggressive tendencies; 3) compare the combined contribution of everyday EF and empathy on children's prosocial versus aggressive tendencies, after controlling for the impact of sociodemographic variables. Based on the current literature, we expected to find a significant interrelation between executive and empathic skills and prosocial and aggressive tendencies, with the strongest associations between empathy and prosociality, and between EF and aggression. Further, we expected to find a significant mediation effect of everyday EF on the relation between empathy and children's prosocial and aggressive behavioral tendencies. We also expected that everyday EF and empathy would predict prosociality and aggression, with everyday EF making the largest contribution to aggression, and empathy making the largest contribution to prosociality.

2. Methods

Participants

The current study was conducted as part of a larger project examining the role of socio-cognitive skills on social functioning during middle childhood. The mothers of eighty children between 6 and 12 years (39 males, $M = 9.3$, $SD = 1.7$ years) completed a series of questionnaires regarding their child's social functioning. Children were predominantly Caucasian (93%), had no history of any psychiatric or neurological condition, had IQ levels in the low to high average range (WASI IQ, (Wechsler, 1999)= 87-129, $M=108.3$, $SD=10.1$), and were primarily from middle-class families according to their income (Statistics Canada, 2015). Participants were identified and recruited through regular primary schools in Quebec, Canada, via invitation letters sent to the parents. All parents provided written informed consent prior to participation. Participants received a 30\$ bookstore gift card to thank them for their participation and encourage literacy. The Research Ethics Committee of the Faculty of Arts and Sciences at the University of Montreal approved the study.

Measures

Intellectual functioning: Children's intellectual functioning was measured for descriptive purposes. The Wechsler Abbreviated Scale of Intelligence (WASI, Wechsler, 1999) was used to provide an estimate of general intellectual ability based on the Vocabulary and Matrix Reasoning subtests (IQ, $M=100$, $SD = 15$).

The mothers of the participants completed the following measures.

Demographic and Developmental Questionnaire: This is an in-house questionnaire pertaining to children's medical, developmental and social history, as well parents' education level, ethnicity, and income. Scores on maternal and paternal education along with family income were standardized and averaged into a composite index of SES.

Everyday executive functioning: The Behavior Rating Inventory of Executive Function, Parent Form (BRIEF-PF,(Gioia, Isquith, Guy, & Kenworth, 2000), is a parent-report questionnaire for children aged 5 to 18 years, assessing emotional and behavioral manifestations of executive functioning in both home and school environments. This 86-item questionnaire provides eight scales, a Global Executive Composite (GEC), along with a Metacognition Index (MCI) (including Initiate, Working Memory, Plan/Organize, Organization of Materials and Monitor scales) and a Behavior Regulation Index (BRI) (including Inhibit, Shift and Emotional Control

scales). Parents are asked to rate their child's behavior on a three-point Likert scale (never, sometimes, and often), with higher ratings indicating greater perceived executive difficulties. In this study, the raw Global Executive composite was used as the main measure of everyday executive functioning, whereas the raw BRI and MCI were used as complementary measures.

Empathy: The Griffith Empathy Measure (GEM, (Dadds et al., 2008) is a 23-item parent-report questionnaire adapted from Bryant's Index of Empathy for Children and Adolescents (Bryant, 1982) in which parents rated the empathetic abilities of their child on a nine-point Likert scale from -4 (strongly disagree) to 4 (strongly agree). This questionnaire provides three scores: Cognitive empathy (score -56 to 56), Affective empathy (score -68 to 68) and Total Empathy (score -92 to 92), with higher scores corresponding to higher levels of empathy. Cognitive empathy can be defined as "the ability to intellectually take the role or perspective of another person involving the ability to decode and label emotions and their situational cues" (Dadds et al. 2008, page 112). Affective empathy is defined as "an affective response more appropriate to, or congruent with, someone else's situation than to one's own situation" (Dadds et al. 2008, page 112). The GEM has adequate reliability and validity across gender and age (Dadds et al., 2008). Total empathy score was used as the main measure of empathy, whereas the affective and cognitive scores were used as complementary measures, in order to distinguish the specific link between each aspect of empathy and social behavior.

Prosocial tendencies: The parent version of the Prosocial Tendencies Measure (Carlo & Randall, 2002), translated into French and adapted by Girard et al. (2014) was used to assess children's prosocial behavior. In this 24-item questionnaire, parents are asked to rate the prosocial tendencies of their child on a five-point Likert scale from 1 (Extremely unlikely) to 5 (Extremely likely), including six types of prosocial behaviors: public, anonymous, in response to dire situations, emotional, compliant and altruistic. The Prosocial Tendencies Measure as well as its adapted French version are reliable and internally consistent (Carlo & Randall, 2002; Girard et al., 2014). In this study, the global score (0-96) was used as the measure of children's prosocial tendencies.

Aggressive behavior: The *Child Behavior Checklist* for ages 6-18 (*CBCL 6-18*),(Achenbach &

Rescorla, 2001) is a parent-report questionnaire on which children are rated on internalizing and externalizing problems such as anxiety, depression, rule breaking, aggressive behavior, somatic, social, and attention problems. Items are rated from 0 (not true) to 2 (Very true or often true). In this study, the raw aggressive behavior subscale score was used as the measure of children's aggressive behaviors.

Statistical analyses

Statistical analyses were performed using SPSS 21.0 software and the PROCESS macro for mediation analysis (Hayes, 2012). Prior to all statistical analyses, data were examined for any violations of test assumptions (normality, linearity and homoscedasticity). Pearson correlation coefficients were calculated to examine the relationship between the main measures of the study, with an interest in the association between EF and empathy and prosocial and aggressive behavior.

In order to examine whether everyday EF plays a mediating role on the relation between empathy and children's prosocial and aggressive behavior, we performed two simple mediation analyses, using the PROCESS macro provided by Hayes (2012). Three hierarchical regressions were also conducted in order to explore the combined contribution of age and gender (step 1), executive functioning (step 2), and empathy (step 3) on children's prosocial and aggressive behavior. In mediation analyses, the statistical significance of the obtained regression coefficients was determined by obtaining a bias-corrected 95% confidence interval by bootstrapping based on 1,000 resamples. Results corresponding to $p < .05$ were considered statistically significant.

3. Results

Descriptive results and inter-correlations of the main study variables

Participant demographic characteristics are presented in Table 1. In Table 2, the means and

standard deviations and the main inter-correlations among the study variables are displayed.

insert Tables 1 and 2 here –

As shown in Table 2, children's EF and empathy scores were moderately related. Prosocial behavior was moderately associated with empathy and EF, as well as with less frequent aggressive behavior. More specifically, prosociality was moderately linked to fewer difficulties in metacognition and behavioral regulation, and better affective and cognitive empathy. Age and gender, however, were not related to prosociality. Aggressive tendencies were related to poorer EF and empathy, with poorer behavioral regulation showing a strong association. Aggressive tendencies were moderately associated with poorer metacognitive skills and poorer cognitive empathy, while affective empathy was not related to it. Boys and younger children presented higher scores in aggression. SES was not correlated with the study variables.

Mediation analyses

Two simple mediation analyses were performed in order to explore the mediating role of everyday EF on the relation of empathy with prosocial and aggressive tendencies. As shown in Figure 2, everyday EF partially mediated the relation between empathy and prosociality and fully mediated the relation between empathy and aggression. The indirect effect via everyday EF is small for prosociality ($k^2 = 0.09$, 95% BC CI [.024, .184]) and medium for aggression ($k^2 = 0.17$, 95% BC CI [.028, .326]).

Insert Figure 2.

Regression analyses

These analyses explored the contribution of age, gender, everyday EF, and empathy to prosocial and aggressive tendencies. Considering that SES was not correlated with the study variables, it was not included as a control variable in the subsequent analyses.

- insert Table 3 here –

Predictors of children's prosocial behavioral tendencies

Age and gender did not significantly contribute to prosociality ($F(2,76) = 1.748$, $p = .18$) (Table 3). However, introducing everyday EF to the model explained 11% of the variance in prosocial

tendencies scores and the change in R^2 was significant, (F change (1,75) = 9.884, $p = .002$), although the effect size was small ($f^2 = .12$). Finally, the inclusion of empathy in Step 3 explained an additional 7% of the variation in prosocial tendencies scores, (F change (1,74) = 6.346, $p = .014$), with a small effect size ($f^2 = .07$). Together, the variables included in the regression model explained 18% of prosocial behavior scores ($F(4,74) = 5.374$, $p = .001$), considered a medium effect size ($f^2 = .29$). Both, everyday EF ($\beta = -.30$, $p = .007$) and empathy ($\beta = .28$, $p = .014$) were significant, independent predictors of prosocial tendencies in the final model.

Predictors of children's aggressive behavioral tendencies

Age and gender explained 19% of the variance in aggressive tendencies ($F(2,76) = 8.747$, $p < .001$) (Table 3) with a medium effect size ($f^2 = .23$). The inclusion of everyday EF to the model explained an additional 32% of the variance in aggressive tendencies and the change in R^2 was significant, (F change (1,75) = 49.347, $p < .001$), with a large effect size ($f^2 = .66$). After entry of empathy in Step 3, the total variance explained by the model as a whole was 51% ($F(4,74) = 19.463$, $p < .001$); however, the independent contribution of empathy was not significant (F change (1,74) = .452, $p = .50$). In the final model, only age ($\beta = -.24$, $p = .007$) and everyday EF ($\beta = .59$, $p < .001$) were significant, independent predictors of aggressive tendencies.

4. Discussion

The primary goal of this study was to explore individual differences in children's prosocial and aggressive behavioral tendencies in relation to their everyday EF and empathetic skills, as well as, the relationship between both socio-cognitive skills. Consistent with our hypothesis, we found that children with better everyday executive skills were perceived as more empathetic in their social interactions, in line with the empathy model proposed by Decety and Lamm (2006) and previous research (Decety & Moriguchi, 2007; Eslinger et al., 2011; Eslinger et al., 2007; Konstantakopoulos et al., 2014; Thoma et al., 2011; Vetter et al., 2013; Yeh et al., 2015; Ze et al., 2014). This result contributes to understanding the association between empathy and EF, demonstrating that the association between empathy and EF is not only present in clinical

populations known to have EF deficits, but also in typically developing children. Moreover, this relation is present even when empathy and EF are not fully mature, which may indicate a continuous inter-influence during development.

Children's prosocial behavioral tendencies and its relation with executive functioning and empathy

Given the theoretical and empirical support for the association between empathy and prosocial behavior, we hypothesized that there would be a significant relation between these variables in healthy children. Consistent with this hypothesis, we found that children who have more empathetic tendencies display more prosocial behaviors in their everyday life. Interestingly, although both cognitive and affective components of empathy were significantly related to prosocial tendencies, the correlation was stronger with cognitive empathy. This component represents the “ability to intellectually take the role or perspective of another person involving the ability to decode and label emotions and their situational cues” (Dadds et al. 2008), suggesting that prosocial actions not only rely on the affective reactions that inform us of another’s distress, but especially on a cognitive understanding of the situation that provoked the emotional reaction. Presumably, affective empathy contributes to alerting the child of the emotional relevance of the situation through a physical emotional reaction (e.g. pain, fear, etc.). Cognitive empathy, on the other hand, provides the perspective of the other in need, by allowing the child to understand the emotion within the context of the specific social situation and offering cues for displaying an appropriate response that contributes to reducing or eliminating distress in others.

Consistent with our hypothesis regarding EF and prosocial tendencies, the results of this study revealed that children’s everyday EF was *moderately* linked to their prosocial tendencies. Specifically, children’s prosociality was positively related to both their capacity to regulate behaviors (including emotional regulation, inhibition and flexibility) and their metacognitive skills, such as planning, initiation, working memory, monitoring and organization. The association with behavioral regulation is consistent with previous research (Batson & Shaw, 1991; Hughes, White, Sharpen, & Dunn, 2000; Lockwood et al., 2014), suggesting that difficulties in regulating behaviors in general, and emotions in particular, may hamper the

display of prosocial actions. Children overwhelmed with their own emotions or behavior may be less psychologically available to detect the emotional and behavioral cues that are indicative of the distress of another person, or may be less able to establish the self-other distinction, distancing themselves from other's emotions, in order to help them. Interestingly, within metacognition, the skill showing the strongest association with prosociality was initiation, i.e. the ability to begin an action and to independently generate ideas, responses, or problem-solving strategies (Gioia et al., 2000), suggesting that even when other executive skills are related to prosocial behavioral tendencies, the ability to initiating organized actions for problem-solving may particularly facilitate the display of prosocial actions. This result sheds light on the cognitive aspects involved in the decision-making process of helping, where it is not only important to empathize with the person in need, but also to be able to determine what concrete actions need to be engaged, in line with claims proposing that top-down information processing, particularly EF, act as a modulator of basic affective and cognitive information in the preparation of a behavioral social response (Decety & Lamm, 2006), and with Crick and Dodge's (1994) model of social information processing. Moreover, with regard to the consistent positive relation between prosocial behaviors and peer relationships (Layous et al., 2012; Warden & MacKinnon, 2003; Wentzel et al., 2004) and the reciprocal influence between social interactions and EF during development (Fernyhough, 2010; Lewis & Carpendale, 2009; Vygotsky, 1978), it is also plausible that prosocial children have more social opportunities to engage in positive social interactions that contribute to the training and improvement of EF skills.

Children's aggressive behavioral tendencies and its relation with executive functioning and empathy

Based on the literature described in the introduction, we anticipated finding a strong negative association between children's EF and aggressive tendencies and a low to moderate negative relation with empathy. As expected, we found that greater aggressive tendencies were *strongly* related to poorer executive skills and *moderately* related to poorer empathy. Aggression was *moderately* related to cognitive empathy and metacognition and *strongly* related to behavioral regulation skills (including emotional regulation, inhibition and flexibility), but not related to affective empathy. These results provide interesting insights about the role of emotion

processing in aggression. First, the results suggest that in healthy children, those showing more aggressive behavior do not have fewer affective reactions when they witness another's distress, in keeping with the study conducted by Lovett and Sheffield (2007) in which affective empathy was related to aggression during adolescence, but not in childhood. However, more aggressive children had poor emotional regulation and inhibitory skills, in consonance with previous studies (Ellis et al., 2009; Giancola et al., 1996; Giancola & Mezzich, 2000; Monette et al., 2015; Riccio et al., 2011; Séguin & Zelazo, 2005). Thus, despite having an adequate capacity to react emotionally to another's distress, poorer regulation of their own negative emotions during conflictual social interactions may lead children to impulsive aggression. Moreover, the results indicate that cognitively, healthy children displaying more aggressive behaviors had more difficulties understanding the situation from the other's point of view, but were also less metacognitive in their everyday life. Hence, it is likely that aggressive children misunderstand social situations more frequently, being exposed to conflictual interactions that they face having less emotional and behavioral control, which increases the possibility of an aggressive response.

EF as a mediator of the relation between empathy and prosocial/aggressive tendencies

The second aim of this study was to assess the mediating role of EF in the relation between empathy and prosocial and aggressive tendencies. As hypothesized, we found a significant mediation effect of everyday EF on the relation between empathy and children's prosocial and aggressive tendencies. Whereas the association between empathy and prosociality has been theoretically and empirically supported, this study provides a novel finding demonstrating that, in middle childhood, everyday EF plays a mediating role in this relationship, in keeping with (Decety & Lamm, 2006) empathy model in which top-down information processing influences bottom-up information. Moreover, this result is consistent the study conducted by Lockwood et al. (2014), in which the link between empathy and prosociality was mediated by emotion regulation skills, albeit in adults. The current study found a similar result with typically developing children using a measure that explores the use of an array of EF skills in everyday settings. This suggests that whereas the relationship between empathy and prosociality is explained in part by executive skills underlying empathy (for instance, inhibition and flexibility necessary for reaching self/other differentiation and perspective-taking), there is a significant

direct association that seems to be related exclusively to the core construct of empathy, namely, automatized emotional reactions and internal representations that emerge when we witness another's distress (Hoffman, 2000).

On the other hand, we observed that inter-individual differences in EF in typically developing children fully explain the relationship between empathy and aggression. If we consider that aggression scores were significantly related to global and cognitive empathy scores, but not to affective empathy, it is likely that executive skills are strongly implicated in the process of taking another's point of view during social situations, explaining the full mediation. According to this result, aggressive tendencies in healthy children would not be associated with less sensitivity to another's distress, but to poorer understanding of another's point of view. The mediating role of EF also provides interesting information for understanding inconsistencies in the results concerning the relation between empathy and aggressive behavior (Maibom, 2012), since inter-individual differences in EF have shown to affect this association.

The predictive role of EF and empathy in prosocial and aggressive behavioral tendencies

Grounded in the multifactorial approach proposed by the SOCIAL model, the third goal of this study was to explore the combined contribution of empathy and EF to children's prosocial and aggressive tendencies, after controlling for sociodemographic variables. As observed in other studies, children's prosocial tendencies were not explained by age (Flynn et al., 2015; Girard et al., 2014), nor by gender (Doctoroff et al., 2006), but EF had a small though significant effect on prosociality. Interestingly, empathy made a significant additional contribution to prosociality in typically developing children. Empathy and EF are independent predictors of children's prosocial tendencies and together they have a medium effect on the variability in children's prosociality, which is theoretically relevant considering the multiple factors that influence prosocial behavior. Consistent with the idea that prosocial and aggressive behavior are not influenced in the same manner, we observed that age and gender had a medium effect on aggressive tendencies, in keeping with the studies on physical aggression (Tremblay & Naguin, 2005), which indicate that boys showed more aggressive behaviors than girls and that aggression tends to decrease from early to middle childhood, as it becomes replaced by more adaptive forms of conflict resolution. Despite the contribution of age and gender, everyday EF had an additional

large effect on aggressive tendencies, which indicates that, in typically developing children, executive skills are fundamental in the regulation of aggression. The inclusion of empathy, however, had no additional effect on aggression, in line with the full mediation described above. In the final model, age and everyday EF were significant, independent predictors of aggressive behavioral tendencies.

Limitations and Conclusions

This study provides novel information about the links between EF, empathy and prosocial and aggressive behavioral tendencies in typically-developing children. To our knowledge, this is the first study exploring the different mediating role of EF in the relationship between empathy and prosocial and aggressive tendencies in middle childhood and contributes to an understanding of how EF may directly and indirectly influence social interactions in particular, and social development in general. Moreover, this study confirms the claim that prosocial and aggressive behavior should not be considered merely as mirror behaviors, since despite their association, we observed that age gender, EF, and empathy contributed differently to them. Furthermore, given the role of EF in social interactions observed in this study, it would seem important to incorporate interventions oriented towards enhancing children's EF into school- and community-based prevention programs focused on fostering positive social interactions in childhood. Group activities (ex.: circle time, role-playing) to raise children's awareness of the benefits of using their EF skills in the analysis of social conflicts may encourage more proactive and self-controlled social behaviors (ex. compare the outcomes of an impulsive reaction when faced with an ambiguous social situation to a more reflexive reaction after analyzing the situation from several points of view). Moreover, given the link between EF, empathy and prosocial and aggressive tendencies, promoting EF skills in more general school activities (ex.: encouraging metacognitive thinking and self-regulated behaviors during classroom activities) could also benefit classroom social climate.

In spite of these contributions, the present study has some limitations that need to be taken into account. First, prosocial and aggressive behavior are influenced by multiple interactive factors. In this study, we focused on two individual socio-cognitive skills relevant to the regulation of social interactions according to literature; however, a modest sample size limited inclusion of

additional environmental, cultural, and individual variables that could also contribute to prosocial and aggressive behaviors, such as school climate, family and personal attitudes, and beliefs, etc. These could be explored in a larger sample in order to build an even more comprehensive view of the proximal and distal predictors of prosocial and aggressive behavior. Moreover, further studies using a longitudinal design could more accurately explore how the development of these socio-cognitive skills during childhood predicts later prosocial and aggressive tendencies. The measures used in this study were based on parent-report in order to obtain information about children's abilities and behavior in everyday situations. We recognize, however that other sources of information, such as third party reports or direct observational assessment could have provided a richer appreciation of children's behavior. Also, it is relevant to consider that the measure of aggressive behavior utilized in this study is a behavior problem scale and not a specific measure of aggression, as such it mainly addresses direct verbal and physical aggression. The results are therefore not generalizable to indirect or relational aggression, which tend to be more frequent with age and amongst girls (Vaillancourt, 2005). Finally, the correlational findings of this study highlighted the contribution of EF and empathy to prosocial and aggressive behaviors in a cross-sectional design, and while we explored the contribution of EF to social interactions, psychological and neuropsychological theories propose that social interactions also have a central role in the development of EF skills (Fernyhough, 2010; Lewis & Carpendale, 2009; Vygotsky, 1978) and the results may therefore also be explained in the inverse direction. Thus, prevention programs fostering positive social interactions could potentially also contribute to the enhancement of children EF. These bidirectional influences may be explored in future research in educational contexts by exploring the effects of promoting EF skills on the quality of peer relationships and on the social climate in the classroom, as well as the impact of cooperative and inclusive classroom climate on students EF skills.

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Table 1. Sociodemographic characteristics of the participants.

Table 1

<i>variable</i>	<i>Frequency</i>	<i>%</i>
<i>Gender</i>		
Male	39	48.8
Female	41	51.2
<i>Ethnic origin</i>		
White	74	92.5
Hispanic	4	5
African-American	2	2.5
<i>Total gross annual household income (CAN \$)</i>		
Below 20 000 \$	6	7.5
20 000 through 39 000 \$	12	15
40 000 through 59 000 \$	18	22.5
60 000 through 79 000 \$	22	27.5
80 000 through 99 000 \$	17	21.3
100 000 \$ and more	5	6.3
<i>SES on the basis of the annual household income¹</i>		
High SES	5	6.3
Middle SES	57	71.2
Low SES	18	22.5
<i>Maternal education</i>		
Doctoral degree	3	3.7
Master's degree	2	2.5
Bachelor's degree	10	12.5
College	29	36.3
High school graduate	28	35
Incomplete high school	8	10
<i>Paternal education</i>		
Doctoral degree	1	1.2
Master's degree	4	5
Bachelor's degree	5	6.2
College	16	20
High school graduate	35	43.8
Incomplete high school	16	20
Missing values	3	3.8

¹ Statistics Canada, 2015.

Table 2. Main descriptive results and correlations¹

Variable	<i>M</i>	<i>SD</i>	<i>Correlation</i>				
			Age	Gender	SES	Prosocial behavior	Aggressive behavior
Age in months	111	20.1	1	.03	-.08	.02	-.32**
Gender	-	-	.03	1	-.01	-.21	.28*
SES composite z score	0.2	.7	-.08	-.01	1	.01	.09
Intellectual functioning (WASI IQ)	108.3	10.1	.18	.05	-.03	.07	-.10
Prosocial behavior ^a	81.4	12.3	.02	-.21	.01	1	.28*
Aggressive behavior ^b	6.6	5.5	-.32**	.28*	.09	-.28*	1
Everyday EF difficulties ^c	119	23.5	-.11	.30**	.15	-.38**	.66**
Behavioral regulation difficulties ^d	45.1	9.9	-.18	.28*	.11	-.35**	.82**
Metacognition difficulties ^e	74.2	15.9	-.04	.27*	.13	-.35**	.46**
Empathy (total score) ^f	32.8	23.1	.33**	-.17	-.05	.33**	-.30**
Cognitive empathy ^g	25	14.1	.31**	-.20	-.04	.46**	-.49**
Affective empathy ^h	23.5	18.6	.28*	-.16	-.04	.26*	-.14

* $p < .05$ ** $p < .01$. *** $p < .001$

¹ Pearson correlation coefficients and Point biserial correlation coefficients for analysis including gender.

^a Prosocial Tendencies Measure total score ^b CBCL, Raw Aggressive behavior score; ^c BRIEF-P Raw Global executive Composite score

^d BRIEF-P Raw Behavioral Regulation Index score; ^e BRIEF-P Raw Metacognition Index score; ^f Griffith Empathy Measure total score

^g Griffith Empathy Measure Cognitive empathy score; ^h Griffith Empathy Measure Affective empathy score.

Table 3. Predictors of prosocial and aggressive behavior in childhood

Predictor	Prosocial behavior		Aggressive behavior	
	ΔR^2	β	ΔR^2	β
Step 1	.04		.19***	
Age		.02		-.33**
Gender		-.21		.29**
Step 2	.11**		.32***	
Age		-.02		-.26**
Gender		-.10		.11
Everyday EF difficulties		-.35**		.60***
Step 3	.07**		.00	
Age		-.11		-.24**
Gender		-.07		.10
Everyday EF difficulties		-.30**		.59***
Empathy		.28*		-.06
Total R^2	.22**		.51***	
<i>n</i>	80		80	

* $p < .05$ ** $p < .01$. *** $p < .001$

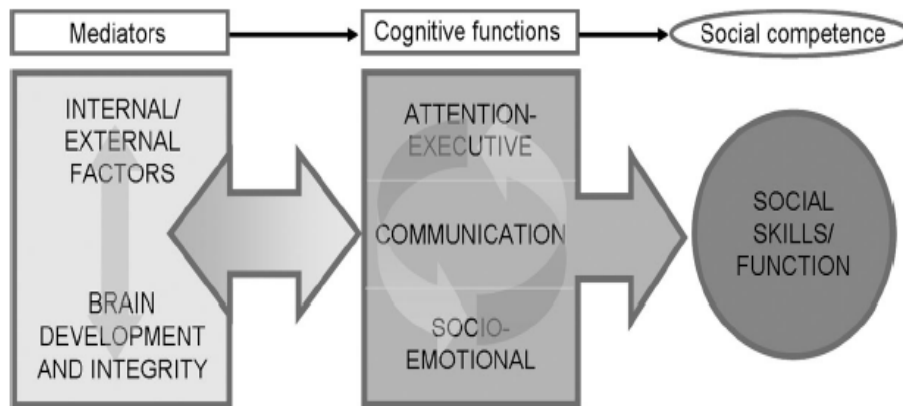


Figure 1: The socio-cognitive integration of abilities model (SOCIAL, Beauchamp & Anderson, 2010).

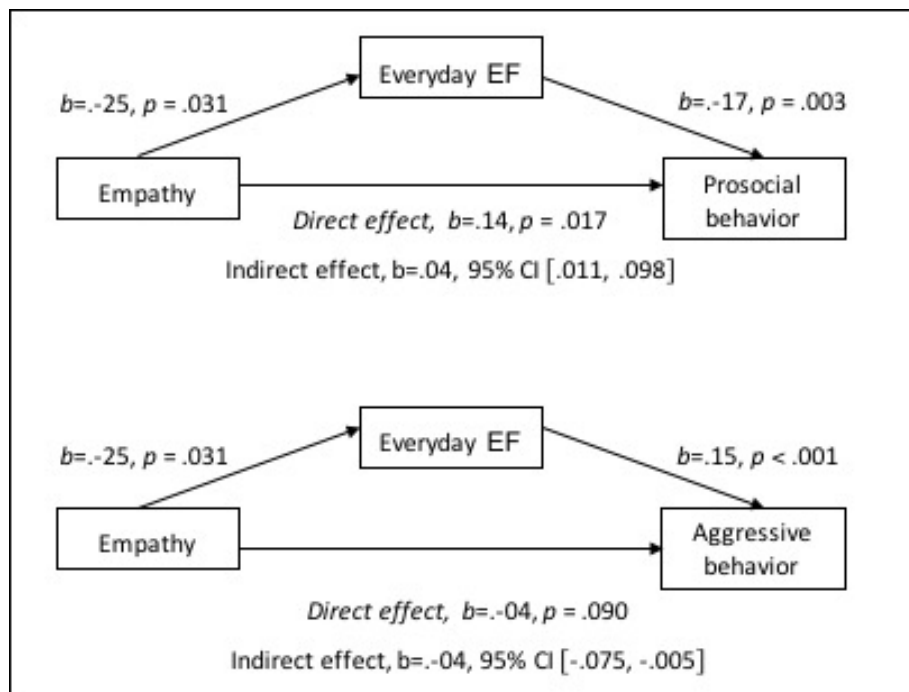


Figure 2: The mediating role of EF on the relationship between empathy and prosocial and aggressive behavior.

References

- Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA School-Age Forms & Profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.
- Alessandri, G., Caprara, G. V., Eisenberg, N., & Steca, P. (2009). Reciprocal Relations Among Self-Efficacy Beliefs and Prosociality Across Time. *Journal of Personality*, 77(4), 1229-1259. doi:10.1111/j.1467-6494.2009.00580.x
- Alessandri, G., Luengo, B. P., Eisenberg, N., Zuffianò, A., Milioni, M., Vecchione, M., & Caprara, G. V. (2014). Prosociality During the Transition From Late Adolescence to Young Adulthood: The Role of Effortful Control and Ego-Resiliency. *Personality and Social Psychology Bulletin*, 40(11), 1451-1465. doi:10.1177/0146167214549321
- Anderson, V., Jacobs, R., & Anderson, P. J. (2008). *Executive Functions and the Frontal Lobes. A Lifespan Perspective*. New York: Psychology Press. Taylor & Francis Group.
- Archer, J. (2004). Sex Differences in Aggression in Real-World Settings: A Meta-Analytic Review. *Review of General Psychology*, 8(4), 291-322. doi:10.1037/1089-2680.8.4.291
- Baddeley, A. D. (2002). Fractionating the central executive. In D. Stuss & R. T. Knight (Eds.), *Principles of Frontal Lobe function* (pp. 246-260). New York: Oxford University Press.
- Bandura, A., Pastorelli, C., Barbaranelli, C., & Caprara, G. V. (1999). Self-efficacy pathways to childhood depression. *Journal of Personality and Social Psychology*, 76(2), 258-269. doi:10.1037/0022-3514.76.2.258
- Batanova, M. D., & Loukas, A. (2011). Social Anxiety and Aggression in Early Adolescents: Examining the Moderating Roles of Empathic Concern and Perspective Taking. *Journal of Youth and Adolescence*, 40(11), 1534-1543. doi:10.1007/s10964-011-9634-x
- Batson, C. D., & Shaw, L. L. (1991). Evidence for Altruism: Toward a Pluralism of Prosocial Motives. *Psychological Inquiry*, 2(2), 107-122.

- Beauchamp, M. H., & Anderson, V. (2010). SOCIAL: An integrative framework for the development of social skills. *Psychological Bulletin. American Psychological Association, Vol. 136*(1), 39-64. doi:10.1037/a0017768
- Brennan, L. M., Shaw, D. S., Dishion, T. J., & Wilson, M. N. (2015). The Predictive Utility of Early Childhood Disruptive Behaviors for School-Age Social Functioning. *Journal of Abnormal Child Psychology, 43*, 1187–1199. doi:10.1007/s10802-014-9967-5
- Bryant, B. K. (1982). An Index of Empathy for Children and Adolescents. *Child Development, 53*(2), 413-425.
- Cacioppo, J. T. (2002). Social neuroscience: understanding the pieces fosters understanding the whole and vice versa. *Am Psychol, 57*(11), 819-831.
- Cacioppo, J. T., Berntson, G. G., Sheridan, J., & McClintock, M. K. (2000). Multilevel integrative analyses of human behavior: social neuroscience and the complementing nature of social and biological approaches. *Psychological Bulletin, 126*(6), 829-843.
- Caprara, G. V., Barbaranelli, C., Pastorelli, C., Bandura, A., & Zimbardo, P. G. (2000). Prosocial Foundations of Children's Academic Achievement. *Psychological Science, 11*(4), 302-306.
- Carlo, G., & Randall, B. A. (2002). The Development of a Measure of Prosocial Behaviors for Late Adolescents. *Journal of Youth and Adolescence, 31*(1), 31-44.
doi:10.1023/A:1014033032440
- Coie, J. D., Lochman, J. E., Terry, R., & Hyman, C. (1992). Predicting early adolescent disorder from childhood aggression and peer rejection. *J Consult Clin Psychol, 60*(5), 783-792. doi:10.1037/0022-006X.60.5.783
- Crick, N., & Dodge, K. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin, 115*, 74–101.
- Dadds, M. R., Hunter, K., Hawes, D. J., Frost, A. D., Vassallo, S., Bunn, P., . . . Masry, Y. E. (2008). A measure of cognitive and affective empathy in children using parent ratings. *Child Psychiatry Hum Dev, 39*(2), 111-122. doi:10.1007/s10578-007-0075-4
- de Waal, F. B. (2008). Putting the altruism back into altruism: the evolution of empathy. *Annu Rev Psychol, 59*, 279-300. doi:10.1146/annurev.psych.59.103006.093625
- Decety, J., & Lamm, C. (2006). Human empathy through the lens of social neuroscience. *ScientificWorldJournal, 6*, 1146-1163. doi:10.1100/tsw.2006.221

- Decety, J., & Meyer, M. (2008). From emotion resonance to empathic understanding: A social developmental neuroscience account. *Development and Psychopathology*, 20(Special Issue 04), 1053-1080. doi:10.1017/S0954579408000503
- Decety, J., Michalska, K. J., Akitsuki, Y., & Lahey, B. B. (2009). Atypical empathic responses in adolescents with aggressive conduct disorder: A functional MRI investigation. *Biol Psychol*, 80(2), 203-211. doi:<http://dx.doi.org/10.1016/j.biopsycho.2008.09.004>
- Decety, J., & Moriguchi, Y. (2007). The empathic brain and its dysfunction in psychiatric populations: implications for intervention across different clinical conditions. *BioPsychoSocial Medicine*, 1(1), 1-21. doi:10.1186/1751-0759-1-22
- Denham, S. A., McKinley, M., Couchoud, E. A., & Holt, R. (1990). Emotional and Behavioral Predictors of Preschool Peer Ratings. *Child Development*, 61(4), 1145-1152. doi:10.1111/j.1467-8624.1990.tb02848.x
- Diener, M. L., & Kim, D.-Y. (2004). Maternal and child predictors of preschool children's social competence. *Journal of Applied Developmental Psychology*, 25(1), 3-24. doi:<http://dx.doi.org/10.1016/j.appdev.2003.11.006>
- Doctoroff, G. L., Greer, J. A., & Arnold, D. H. (2006). The relationship between social behavior and emergent literacy among preschool boys and girls. *Journal of Applied Developmental Psychology*, 27(1), 1-13. doi:<http://dx.doi.org/10.1016/j.appdev.2005.12.003>
- Eisenberg, N., Eggum, N. D., & Di Giunta, L. (2010). Empathy-Related Responding: Associations with Prosocial Behavior, Aggression, and Intergroup Relations. *Social Issues and Policy Review*, 4(1), 143-180. doi:10.1111/j.1751-2409.2010.01020.x
- Eisenberg, N., & Fabes, R. A. (1990). Empathy: Conceptualization, measurement, and relation to prosocial behavior. *Motivation and Emotion*, 14(2), 131-149.
- Eisenberg, N., Fabes, R. A., Karbon, M., Murphy, B. C., Wosinski, M., Polazzi, L., . . . Juhnke, C. (1996). The Relations of Children's Dispositional Prosocial Behavior to Emotionality, Regulation, and Social Functioning. *Child Development*, 67(3), 974-992. doi:10.1111/j.1467-8624.1996.tb01777.x
- Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological Bulletin*, 101(1), 91-119. doi:10.1037/0033-2909.101.1.91

- Eisenberg, N., & Mussen, P. (1989). *The roots of prosocial behavior in children*. Cambridge England ; New York: Cambridge University Press.
- Eisenberg, N., Spinrad, T., & Knafo, A. (2015). Prosocial development. In M. E. Lamb & R. M. Lerner (Eds.), *Handbook of Child Psychology and Developmental Science, Vol. 3: Social, Emotional and Personality Development* (7th ed., pp. 610-656). New York: Wiley.
- Eisner, M. P., & Malti, T. (2015). Aggressive and violent behavior. In M. E. Lamb & R. M. Lerner (Eds.), *Handbook of Child Psychology and Developmental Science, Vol. 3: Social, Emotional and Personality Development* (pp. 794-841). New York: Wiley.
- Ellis, M. L., Weiss, B., & Lochman, J. E. (2009). Executive Functions in Children: Associations with Aggressive Behavior and Appraisal Processing. *Journal of Abnormal Child Psychology*, 37(7), 945–956. doi:10.1007/s10802-009-9321-5
- Eron, L. D., & Huesmann, L. R. (1984). The Relation of Prosocial Behavior to the Development of Aggression and Psychopathology. *Aggressive Behaviour*, 10, 201-211. doi:10.1002/1098-2337(1984)10:3<201::AID-AB2480100304>3.0.CO;2-S
- Eslinger, P. J., Moore, P., Anderson, C., & Grossman, M. (2011). Social cognition, executive functioning, and neuroimaging correlates of empathic deficits in frontotemporal dementia. *J Neuropsychiatry Clin Neurosci*(1545-7222 (Electronic)). doi:10.1176/appi.neuropsych.23.1.74.
- Eslinger, P. J., Moore, P., Troiani, V., Antani, S., Cross, K., Kwok, S., & Grossman, M. (2007). Oops! Resolving social dilemmas in frontotemporal dementia. *Journal of Neurology, Neurosurgery, and Psychiatry*, 78(5), 457-460. doi:10.1136/jnnp.2006.098228
- Fernyhough, C. (2010). Vygotsky, Luria and the Social Brain. In B. W. Sokol, U. Müller, J. I. M. Carpendale, A. R. Young, & G. Iarocci (Eds.), *Self and social regulation social interaction and the development of social understanding and executive functions* (pp. 1 texte électronique). New York ; Oxford: Oxford University Press.
- Flynn, E., Ehrenreich, S. E., Beron, K. J., & Underwood, M. K. (2015). Prosocial Behavior: Long-term Trajectories and Psychosocial Outcomes. *Social Development*, 24(3), 462-482. doi:10.1111/sode.12100

- Giancola, P. R., Martin, C. S., Tarter, R. E., Pelham, W. E., & Moss, H. B. (1996). Executive cognitive functioning and aggressive behavior in preadolescent boys at high risk for substance abuse/dependence. *Journal of Studies on Alcohol*, 57(4), 352-359. doi:10.15288/jsa.1996.57.352
- Giancola, P. R., & Mezzich, A. C. (2000). Executive cognitive functioning mediates the relation between language competence and antisocial behavior in conduct-disordered adolescent females. *Aggressive Behavior*, 26(5), 359-375. doi:10.1002/1098-2337(2000)26:5<359::AID-AB2>3.0.CO;2-B
- Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworth, L. (2000). *Behavior Rating Inventory of Executive Function Professional Manual*. Odessa, Florida: Psychological Assessment Resources.
- Girard, É., Terradas, M. M., & Matte-Gagné, C. (2014). Empathie, comportements pro-sociaux et troubles du comportement. *Enfance*, 2014(4), 459-480. doi:10.4074/S0013754514004030
- Granvald, V., & Marciszko, C. (2016). Relations between key executive functions and aggression in childhood. *Child Neuropsychology*, 22(5), 537-555. doi:10.1080/09297049.2015.1018152
- Harter, S. (2012). *The construction of the self: developmental and sociocultural foundations* (2nd ed.). New York, NY: Guilford Press.
- Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [White paper]. Retrieved from <http://www.afhayes.com/public/process2012.pdf>.
- Hoaken, P. N. S., Shaughnessy, V. K., & Pihl, R. O. (2003). Executive cognitive functioning and aggression: Is it an issue of impulsivity? *Aggressive Behavior*, 29(1), 15-30. doi:10.1002/ab.10023
- Hoffman, M. L. (2000). *Empathy and moral development: implications for caring and justice*. Cambridge, U.K. ; New York: Cambridge University Press.
- Huesmann, L. R. (2007). The Impact of Electronic Media Violence: Scientific Theory and Research. *The Journal of adolescent health: official publication of the Society for Adolescent Medicine*, 41(6 Suppl 1), S6-13. doi:10.1016/j.jadohealth.2007.09.005

- Hughes, C., White, A., Sharpen, J., & Dunn, J. (2000). Antisocial, angry, and unsympathetic: "Hard-to-manage" preschoolers' peer problems and possible cognitive influences. *Journal of Child Psychology and Psychiatry*, *41*(2), 169-179.
- John, K. (2001). Measuring Children's Social Functioning. *Child Psychology & Psychiatry Review*, *6*(4), 181-188.
- Kaukiainen, A., Björkqvist, K., Lagerspetz, K., Österman, K., Salmivalli, C., Rothberg, S., & Ahlbom, A. (1999). The relationships between social intelligence, empathy, and three types of aggression. *Aggressive Behavior*, *25*(2), 81-89. doi:10.1002/(SICI)1098-2337(1999)25:2<81::AID-AB1>3.0.CO;2-M
- Kerr, A., & Zelazo, P. D. (2004). Development of "hot" executive function: the children's gambling task. *Brain Cogn*, *55*(1), 148-157.
- Kokko, K., Tremblay, R. E., Lacourse, E., Nagin, D. S., & Vitaro, F. (2006). Trajectories of Prosocial Behavior and Physical Aggression in Middle Childhood: Links to Adolescent School Dropout and Physical Violence. *Journal of Research on Adolescence*, *16*(3), 403-428. doi:10.1111/j.1532-7795.2006.00500.x
- Konstantakopoulos, G., Oulis, P., Ploumpidis, D., Patrikelis, P., Nikitopoulou, S., Papadimitriou, G. N., & David, A. S. (2014). Self-rated and performance-based empathy in schizophrenia: The impact of cognitive deficits. *Social Neuroscience*, *9*(6), 590-600. doi:10.1080/17470919.2014.934395
- Layous, K., Nelson, S. K., Oberle, E., Schonert-Reichl, K. A., & Lyubomirsky, S. (2012). Kindness Counts: Prompting Prosocial Behavior in Preadolescents Boosts Peer Acceptance and Well-Being. *PLoS One*, *7*(12), e51380. doi:doi:10.1371/journal.pone.0051380
- Lewis, C., & Carpendale, J. I. (2009). Introduction: Links between social interaction and executive function. *New Dir Child Adolesc Dev*, *2009*(123), 1-15. doi:10.1002/cd.232
- Lindeman, M., Harakka, T., & Keltikangas-Järvinen, L. (1997). Age and gender differences in adolescents' reactions to conflict situations: Aggression, prosociality, and withdrawal. *Journal of Youth and Adolescence*, *26*(3), 339-351. doi:10.1007/s10964-005-0006-2
- Lockwood, P. L., Seara-Cardoso, A., & Viding, E. (2014). Emotion Regulation Moderates the Association between Empathy and Prosocial Behavior. *PLoS One*, *9*(5), e96555. doi:10.1371/journal.pone.0096555

- Lovett, B. J., & Sheffield, R. A. (2007). Affective empathy deficits in aggressive children and adolescents: A critical review. *Clin Psychol Rev*, 27(1), 1-13.
doi:<http://dx.doi.org/10.1016/j.cpr.2006.03.003>
- Maibom, H. L. (2012). The many faces of empathy and their relation to prosocial action and aggression inhibition. *Wiley Interdisciplinary Reviews: Cognitive Science*, 3(2), 253-263. doi:10.1002/wcs.1165
- Masten, C. L., Morelli, S. A., & Eisenberger, N. I. (2011). An fMRI investigation of empathy for 'social pain' and subsequent prosocial behavior. *Neuroimage*, 55(1), 381-388.
doi:<http://dx.doi.org/10.1016/j.neuroimage.2010.11.060>
- McMahon, S. D., Wernsman, J., & Parnes, A. L. (2006). Understanding Prosocial Behavior: The Impact of Empathy and Gender Among African American Adolescents. *Journal of Adolescent Health*, 39(1), 135-137.
doi:<http://dx.doi.org/10.1016/j.jadohealth.2005.10.008>
- Miles, S. B., & Stipek, D. (2006). Contemporaneous and Longitudinal Associations Between Social Behavior and Literacy Achievement in a Sample of Low-Income Elementary School Children. *Child Development*, 77(1), 103–117. doi:10.1111/j.1467-8624.2006.00859.x
- Miller, P. A., & Eisenberg, N. (1988). The relation of empathy to aggressive and externalizing/antisocial behavior. *Psychological Bulletin*, 103(3), 324-344.
doi:10.1037/0033-2909.103.3.324
- Moffitt, T. E. (1993). The neuropsychology of conduct disorder. *Development and Psychopathology*, 5(1-2), 135-151.
- Monette, S., Bigras, M., & Guay, M. C. (2015). Executive functions in kindergarteners with high levels of disruptive behaviours. *British Journal of Developmental Psychology*, 33(4), 446-463. doi:10.1111/bjdp.12105
- Moore, C., Barresi, J., & Thompson, C. (1998). The Cognitive Basis of Future-oriented Prosocial Behavior. *Social Development*, 7(2), 198-218. doi:10.1111/1467-9507.00062
- Morelli, S. A., Rameson, L. T., & Lieberman, M. D. (2014). The neural components of empathy: Predicting daily prosocial behavior. *Social Cognitive and Affective Neuroscience*, 9(1), 39-47. doi:10.1093/scan/nss088

- Obsuth, I., Eisner, M. P., Malti, T., & Ribeaud, D. (2015). The developmental relation between aggressive behaviour and prosocial behaviour: A 5-year longitudinal study. *BMC Psychology*, 3(1), 16. doi:10.1186/s40359-015-0073-4
- Paschall, M. J., & Fishbein, D. H. (2002). Executive cognitive functioning and aggression: a public health perspective. *Aggression and Violent Behavior*, 7(3), 215-235. doi:[http://dx.doi.org/10.1016/S1359-1789\(00\)00044-6](http://dx.doi.org/10.1016/S1359-1789(00)00044-6)
- Paulus, M. (2014). The emergence of prosocial behavior: Why do infants and toddlers help, comfort, and share? *Child Development Perspectives*, 8(2), 77–81. doi:10.1111/cdep.12066
- Penner, L. A., Dovidio, J. F., Piliavin, J. A., & Schroeder, D. A. (2004). Prosocial Behavior: Multilevel Perspectives. *Annu Rev Psychol*, 56(1), 365-392. doi:10.1146/annurev.psych.56.091103.070141
- Peters, E., Cillessen, A. H. N., Riksen-Walraven, J. M., & Haselager, G. J. T. (2010). Best friends' preference and popularity: Associations with aggression and prosocial behavior. *International Journal of Behavioral Development*, 34(5), 398-405. doi:10.1177/0165025409343709
- Peterson, J. B., & Flanders, J. L. (2005). Play and the Regulation of Aggression. In R. E. T. J. Archer, W. W. Hartup, & W. Willard (Ed.), *Developmental origins of aggression* (pp. 133-157). New York: Guilford Press.
- Piff, P. K., Kraus, M. W., Côté, S., Cheng, B. H., & Keltner, D. (2010). Having less, giving more: The influence of social class on prosocial behavior. *Journal of Personality and Social Psychology*, 99(5), 771-784. doi:10.1037/a0020092
- Preston, S. D., & de Waal, F. B. (2002). Empathy: Its ultimate and proximate bases. *Behav Brain Sci*, 25(1), 1-20.
- Pursell, G. R., Laursen, B., Rubin, K. H., Booth-LaForce, C., & Rose-Krasnor, L. (2008). Gender Differences in Patterns of Association Between Prosocial Behavior, Personality, and Externalizing Problems. *Journal of research in personality*, 42(2), 472-481. doi:10.1016/j.jrp.2007.06.003
- Raaijmakers, M. A. J., Smidts, D. P., Sergeant, J. A., Maassen, G. H., Posthumus, J. A., van Engeland, H., & Matthys, W. (2008). Executive Functions in Preschool Children with

- Aggressive Behavior: Impairments in Inhibitory Control. *Journal of Abnormal Child Psychology*, 36(7), 1097-1107. doi:10.1007/s10802-008-9235-7
- Ready, R. E., Stierman, L., & Paulsen, J. S. (2001). Ecological validity of neuropsychological and personality measures of executive functions. *The Clinical Neuropsychologist*, 15(3), 314-323. doi:10.1076/clin.15.3.314.10269
- Reebye, P. (2005). Aggression During Early Years — Infancy and Preschool. *The Canadian Child and Adolescent Psychiatry Review*, 14(1), 16–20.
- Riccio, C. A., Hewitt, L. L., & Blake, J. J. (2011). Relation of Measures of Executive Function to Aggressive Behavior in Children. *Appl Neuropsychol*, 18(1), 1-10. doi:10.1080/09084282.2010.525143
- Richardson, D. R., Hammock, G. S., Smith, S. M., Gardner, W., & Signo, M. (1994). Empathy as a cognitive inhibitor of interpersonal aggression. *Aggressive Behavior*, 20(4), 275-289. doi:10.1002/1098-2337(1994)20:4<275::AID-AB2480200402>3.0.CO;2-4
- Roberts, W., & Strayer, J. (1996). Empathy, Emotional Expressiveness, and Prosocial Behavior. *Child Development*, 67(2), 449-470.
- Romano, E., Tremblay, R. E., Boulerice, B., & Swisher, R. (2005). Multilevel Correlates of Childhood Physical Aggression and Prosocial Behavior. *Journal of Abnormal Child Psychology*, 33(5), 565-578. doi:10.1007/s10802-005-6738-3
- Rubin, K. H., Bukowski, W., & Parker, J. (2006). Peer interactions, relationships, and groups. In N. Eisenberg (Ed.), *Handbook of child psychology: Social, emotional, and personality development* (6th ed., pp. 571-645). New York: Wiley.
- Rueda, M. R., Posner, M. I., & Rothbart, M. K. (2005). The Development of Executive Attention: Contributions to the Emergence of Self-Regulation. *Developmental Neuropsychology*, 28(2), 573-594. doi:10.1207/s15326942dn2802_2
- Schultz, D., Izard, C. E., & Bear, G. (2004). Children's emotion processing: Relations to emotionality and aggression. *Development and Psychopathology*, 16(02), 371-387.
- Séguin, J. R., & Zelazo, P. D. (2005). Executive function in early physical aggression. In J. Archer, R. E. Tremblay, W. W. Hartup, & W. Willard (Eds.), *Developmental origins of aggression* (pp. 307–329). New York: Guilford Press.

- Sokol, B. W., Miller, U., Carpendale, J. I. M., Young, A. R., & Iarocci, G. (2010). *Self and social regulation : social interaction and the development of social understanding and executive functions*. Oxford ; New York: Oxford University Press.
- Strayer, J., & Roberts, W. (2004). Empathy and Observed Anger and Aggression in Five-Year-Olds. *Social Development, 13*(1), 1-13. doi:10.1111/j.1467-9507.2004.00254.x
- Thijssen, S., Wildeboer, A., Muetzel, R. L., Bakermans-Kranenburg, M. J., El Marroun, H., Hofman, A., . . . White, T. (2015). Cortical thickness and prosocial behavior in school-age children: A population-based MRI study. *Social Neuroscience, 10*(6), 571-582. doi:10.1080/17470919.2015.1014063
- Thoma, P., Zalewski, I., von Reventlow, H. G., Norra, C., Juckel, G., & Daum, I. (2011). Cognitive and affective empathy in depression linked to executive control. *Psychiatry Res, 189*(3), 373-378. doi:<http://dx.doi.org/10.1016/j.psychres.2011.07.030>
- Tomada, G., & Schneider, B. H. (1997). Relational aggression, gender, and peer acceptance: Invariance across culture, stability over time, and concordance among informants. *Developmental Psychology, 33*(4), 601-609. doi:10.1037/0012-1649.33.4.601
- Tremblay, R. E., Hartup, W. W., & Archer, J. (2005). *Developmental origins of aggression*. Guilford Press: New York.
- Vaillancourt, T. (2005). Indirect Aggression among Humans: Social Construct or Evolutionary Adaptation? In W. W. H. R. E. Tremblay, & J. Archer (Ed.), *Developmental origins of aggression* (pp. 158-177). New York: Guilford Press.
- Veenstra, R., Lindenberg, S., Oldehinkel, A. J., De Winter, A. F., Verhulst, F. C., & Ormel, J. (2008). Prosocial and antisocial behavior in preadolescence: Teachers' and parents' perceptions of the behavior of girls and boys. *International Journal of Behavioral Development, 32*(3), 243-251. doi:10.1177/0165025408089274
- Vetter, N. C., Altgassen, M., Phillips, L., Mahy, C. E. V., & Kliegel, M. (2013). Development of Affective Theory of Mind Across Adolescence: Disentangling the Role of Executive Functions. *Developmental Neuropsychology, 38*(2), 114-125. doi:10.1080/87565641.2012.733786
- Vitaro, F., Brendgen, M., Larose, S., & Tremblay, R. E. (2005). Kindergarten Disruptive Behaviors, Protective Factors, and Educational Achievement by Early Adulthood. *Journal of Educational Psychology, 97*(4), 617-629. doi:10.1037/0022-0663.97.4.617

- Vygotsky, L. S. (1978). *Mind in society : the development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman Eds.). Cambridge, Massachusetts: Harvard University Press.
- Warden, D., & MacKinnon, S. (2003). Prosocial children, bullies and victims: An investigation of their sociometric status, empathy and social problem-solving strategies. *British Journal of Developmental Psychology*, *21*(3), 367-385. doi:10.1348/026151003322277757
- Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science*, *311*(5765), 1301-1303. doi:10.1126/science.1121448
- Wechsler, D. (1999). *Wechsler Abbreviated Scale of Intelligence (WASI)*. San Antonio, TX: Harcourt Assessment.
- Wentzel, K. R. (1993). Does being good make the grade? Social behavior and academic competence in middle school. *Journal of Educational Psychology*, *85*(2), 357-364. doi:10.1037/0022-0663.85.2.357
- Wentzel, K. R., Barry, C. M., & Caldwell, K. A. (2004). Friendships in Middle School: Influences on Motivation and School Adjustment. *Journal of Educational Psychology*, *96*(2), 195-203. doi:10.1037/0022-0663.96.2.195
- Wiegman, O., & van Schie, E. G. M. (1998). Video game playing and its relations with aggressive and prosocial behaviour. *British Journal of Social Psychology*, *37*(3), 367-378. doi:10.1111/j.2044-8309.1998.tb01177.x
- Williams, A., O'Driscoll, K., & Moore, C. (2014). The influence of empathic concern on prosocial behavior in children. *Frontiers in Psychology*, *5*, 425. doi:10.3389/fpsyg.2014.00425
- Yager, J. A., & Ehmann, T. S. (2006). Untangling Social Function and Social Cognition: A Review of Concepts and Measurement. *Psychiatry*, *69*(1), 47-68. doi:10.1521/psyc.2006.69.1.47
- Yeates, K. O., Bigler, E. D., Dennis, M., Gerhardt, C. A., Rubin, K. H., Stancin, T., . . . Vannatta, K. (2007). Social Outcomes in Childhood Brain Disorder: A Heuristic Integration of Social Neuroscience and Developmental Psychology. *Psychological Bulletin*, *133*(3), 535-556. doi:10.1037/0033-2909.133.3.535

- Yeh, Z.-T., Lo, C.-Y., Tsai, M.-D., & Tsai, M.-C. (2015). Mentalizing ability in patients with prefrontal cortex damage. *Journal of Clinical and Experimental Neuropsychology*, 37(2), 128-139. doi:10.1080/13803395.2014.992864
- Ze, O., Thoma, P., & Suchan, B. (2014). Cognitive and affective empathy in younger and older individuals. *Aging & Mental Health*, 18(7), 929-935. doi:10.1080/13607863.2014.899973
- Zelazo, P. D., & Cunningham, W. A. (2007). Handbook of emotion regulation. In J. J. Gross (Ed.), *Handbook of emotion regulation* (First ed., pp. 135-158). New York: Guilford Press.
- Zhou, Q., Chen, S. H., & Main, A. (2012). Commonalities and Differences in the Research on Children's Effortful Control and Executive Function: A Call for an Integrated Model of Self-Regulation. *Child Development Perspectives*, 6(2), 112-121. doi:10.1111/j.1750-8606.2011.00176.x

