Sociocognitive and socioemotive factors associated with early academic abilities in preschool children in Costa Rica

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dissertation entitled

SOCIOCOGNITIVE AND SOCIOEMOTIVE FACTORS ASSOCIATED WITH
EARLY ACADEMIC ABILITIES IN PRESCHOOL CHILDREN FROM COSTA RICA

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DEDICATIONS

I would like to dedicate this dissertation to my lovely wife and my beautiful children. My wife has been an incredibly support during my years at grad school. Vero agreed to make many arrangements to make this dream come true and I am very grateful to have her in my life. Ignacio and Mila are my source of never-ending energy and the happiness in my life.

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SOCIOCOGNITIVE AND SOCIOEMOTIVE FACTORS ASSOCIATED WITH EARLY ACADEMIC ABILITIES IN PRESCHOOL CHILDREN IN COSTA RICA

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ABSTRACT

This study aims at providing a multi-report, multi-method model of academic and socio-emotional preparation in preschool children that integrates bodies of previous research that have been conducted primarily in isolation. The main purpose is to test a comprehensive model of self-regulation and its links to moral reasoning, prosocial behaviors and early academic abilities. Participants were 193 Costa Rican preschool children for whom parent- and teacher- reports were collected. Also, children were evaluated with performance tests. The results showed that self-regulation is better represented as a bifactorial model with both cognitive and emotional components. Also, the study showed evidence suggesting that prosocial behaviors in preschoolers are better explained as a multidimensional construct rather than a unidimensional variable. Cognitive self-regulation showed positive links with prosocial moral reasoning, prosocial behaviors and early academic abilities, whereas emotion regulation showed only significant relations with prosocial behaviors. The relations between self-regulation and early academic abilities were direct and not mediated by prosocial moral reasoning or prosocial behaviors. The results are discussed in light of previous findings, and some implications for theories of human development and future interventions are presented.

Keywords: self-regulation, moral reasoning, prosocial behaviors, early academic abilities
Chapter 1: Background and Aims

Self-regulation includes children’s abilities to control their attention and arousal as important aspects of goal-directed behavior (Blair & Ursache, 2011; Jahromi & Stifter, 2008). Self-regulation is important to investigate because it plays a central role on children’s social positive adjustment in the preschool setting and later (Lengua, 2003). Additionally, self-regulation is a key aspect in children’s language development (Palermo et al., 2017) and positive school adjustment (Raver et al., 2011). Self-regulatory abilities allow children to control their levels of activity (both mental and behavioral) and to engage in more learning activities, which has important implications for their school success (Ursache et al., 2012).

In the present study, emotional, cognitive and behavioral aspects of self-regulation are investigated, as well as their links to other relevant sociocognitive abilities such as prosocial moral reasoning (i.e., thinking about situations that create a conflict between a person’s needs and desires and those of another; Eisenberg, Fabes, & Spinrad, 2006), prosocial behavior (i.e., acts intended to benefit others; Carlo, 2006) and early academic abilities (i.e., academic skills of children prior to formal school entry; Howes et al., 2008) (see Figure 1).

In the first chapter, the conceptual models and goals of the study are presented. In the second chapter, empirical evidence that supports the integrative model is discussed. Chapter 3 provides the methods in terms of the participants, the procedures and the instruments. Chapter 4 presents the results and Chapter 5 shows the discussion of these results, limitations and future directions.
Conceptual Model of Self-Regulation

Self-regulation encompasses both cognitive and emotional mechanisms. It can be argued that one of the cognitive components of self-regulation is executive functions (i.e., the cognitive ability to engage in planning, inhibition, problem solving and goal-directed behaviors, Miyake et al., 2000), whereas emotion regulation (i.e., the ability to control emotional reactions and their expression and the inhibition of prepotent but maladaptive reactions, Eisenberg, Smith, & Spinrad, 2016) is one of its emotional components. From a developmental perspective, it is assumed that both components are based on children’s primary temperamental characteristics (Liew, 2012; Rothbart & Jones, 1998). In the present study, the integration of these three components (executive functions, emotion regulation, and temperament) is referred to as self-regulation.

In the literature, there are several definitions of self-regulation, some of which narrow it down to the cognitive (Barkley, 2011; Blair & Ursache, 2011; Cole et al., 2017; Lipsey et al., 2017; Montroy et al., 2016), temperamental (Dane & Marini, 2014; Eisenberg et al., 2011; Rothbart et al., 2011; Rudasill et al., 2017), or emotional (Calkins & Leerkes, 2011; Dennis, 2006; Koole et al., 2011; Supplee et al., 2011) components of children’s self-regulation. Other researchers adopt a more general framework to conceptualize self-regulation, but additionally they include other concepts like identity and willpower (see Baumeister, Schmeichel, & Vohs, 2007; but also see McClelland & Cameron, 2012 for a review). This lack of consensus has compromised the conceptual clarity of self-regulation as a construct (Zhou et al., 2012), and has generated the need to implement theoretical and methodological models that will allow researchers to capture
the different modalities of self-regulation without jeopardizing its usefulness as a well-defined construct.

Several terms have been used to refer to different aspects of self-regulation. For example, some authors define self-regulation in terms of children’s cognitive abilities to come up with a plan and correct their responses to accomplish specific mentally represented tasks (Montroy et al., 2016). Others focus mainly on children’s capacity to monitor, evaluate and modify their emotional responses (Thompson, 1994), and yet others focus on children’s differences in temperamental reactivity (Montroy et al., 2016). Across the different emphases, children’s abilities to adaptively control their responses is considered, although the extent to which emotional, cognitive and temperamental aspects play a central role vary considerably. In the present study, a comprehensive approach to self-regulation will be adopted. Hence, the term self-regulation will be used to refer to children’s emotional, temperamental and cognitive abilities to regulate their goal-directed behavior (Blair & Razza, 2007; Eisenberg et al., 2000; Liew, 2012).

In the following section, the conceptual definitions of executive functions, emotion regulation and effortful control as the main components of self-regulation are provided.

**Executive functions.** Executive functions can be defined as the cognitive resources that are used in planning, inhibition, problem-solving and goal-directed behaviors (Anderson et al., 2008; Miyake et al., 2000), and are conceptualized as the main cognitive aspect of self-regulation (Blair & Razza, 2007; Miyake et al., 2000). Executive functions are similar to other sociocognitive constructs. For example, both executive function and effortful control (i.e., the ability to inhibit a dominant response
and to execute an alternative more appropriate response for the specific situation;
Rothbart, Ahadi, & Evans, 2000) refer to the inhibition of a prepotent reaction in favor of a less dominant response, but executive functions are more related to the regulation of the cognitive aspects of the response, whereas effortful control refers more to the expression of the emotional processes implicated in that action (Blair & Razza, 2007). Other researchers use the terms executive functions and executive control (i.e., the ability to update information and to inhibit irrelevant stimuli; see Hillman et al., 2014; Teper & Inzlicht, 2013) interchangeably, but in the present study the concept executive functions is chosen because it is more widely accepted in the literature about cognitive development (Miyake et al., 2000). Executive functions emerge during infancy and although the most growth occurs between 3 and 5 years of age, they do not reach their mature state until early adulthood (Diamond, 2016). Consequently, they are greatly affected by the confluence of children’s social and emotional environment and their biological characteristics (e.g., neurodevelopment; Anderson et al., 2008).

The present study focuses particularly on two executive functions, working memory and inhibitory control. The most important consideration for this decision is that both working memory and inhibitory control have been consistently linked to school readiness (Best et al., 2011), which is the outcome of interest in the present study. Working memory can be defined as the ability to hold in mind or maintain in an accessible manner information to perform specific tasks such as learning, reasoning and planning (Baddeley, 2000; Baddeley & Hitch, 1974; Cowan, 2005). Inhibitory control is the ability to inhibit irrelevant information and keep it out of the focus of attention in order to accomplish cognitive control (Durston et al., 2002), and it allows children to give
appropriate context-dependent answers to conflictive situations (Carlson & Moses, 2001; Howard et al., 2014; Martin & Huebner, 2007).

In the previous section, the cognitive aspects of self-regulation have been presented. Within the framework of self-regulation, children’s biological and temperamental characteristics also play a central role in their ability to self-regulate (Blair & Razza, 2007). Consequently, effortful control is included in the present study as the main temperament indicator of self-regulation.

**Effortful control.** Researchers interested in the role played by temperament in the development of self-regulation have focused mainly on effortful control (Eisenberg, Zhou, et al., 2005; Rothbart et al., 2001; Valiente et al., 2011), which is defined as the ability to inhibit a response that is more dominant, in order to give an alternative response that is less salient but that is more appropriate for contextual reasons, while controlling the attention according to environmental demands (Rothbart et al., 2000). The concept of effortful control usually refers to the behavioral control that allows children to show approach or withdrawal tendencies during specific situations, which can have positive or negative consequences for their adjustment to the preschool environment (Blair & Razza, 2007). It is important to mention that effortful control is an active (i.e., outcomes that can be modified by the child if needed) component of self-regulation, rather than a passive (i.e., a more automatic function that children cannot easily modify) response to the environment. Consequently, effortful control is different from fearfulness or inhibition to the unfamiliar, which are more passive inhibitory systems (Derryberry & Rothbart, 1997; Kochanska & Knaack, 2003). This distinction is important because effortful control is thought to be an important contributor to social and academic outcomes (Blair & Razza,
Recapitulating, in the present study, executive functions represent the more cognitive aspect of self-regulation, whereas effortful control is included as an indicator of children’s temperamental self-regulation. Theoretical models that emphasize the role of executive functions and temperament in the explanation of social and emotional development have also considered the role of children’s ability to regulate their emotions (Blair & Razza, 2007). Therefore, a third aspect of self-regulation, the emotional component, will be analyzed by considering children’s emotion regulation.

**Emotion regulation.** There is an important discussion about the definition, or the lack thereof, of emotion regulation (see for example Cole et al., 2004). This problem is not surprising if one considers that researchers have been arguing about the way we should define emotions for decades (Eisenberg & Spinrad, 2004). There are broad and narrow definitions of emotion regulation. From a broad perspective, Cole et al. (2004) define emotion regulation as changes in either activated emotions, or in any other processes related to activated emotions. However, researchers have criticized these types of definitions because they do not help to distinguish between emotion as a regulator and emotion as regulated (Eisenberg & Spinrad, 2004), or the processes that are affected by emotions, and the control of emotions itself. In the present study, a narrower definition of emotion regulation will be used. The framework implemented here defines it as the processes by which children manage if, when, and how they experience emotions, emotion-related physiological responses, and emotion-related motivational states, as well as the way emotions are expressed behaviorally (Eisenberg et al., 2007). This definition is

2007), whereas more reactive components are conceived to be associated with anxiety and restrained behavior (Biederman et al., 2001; Kochanska, 1991).
consistent with the one presented by Gross (2014), who defines emotion regulation as the process by which people shape which emotions they feel, when they have them, and how they experience them. It is important to clarify that emotion regulation can refer to the up- and down-regulation of both positive and negative emotions (Compas et al., 2014). Thus, emotion regulation efforts might be taken to either increase or decrease the extent to which an emotion is experienced, and these strategies are flexible and malleable (Grecucci & Sanfey, 2014; Gyurak & Etkin, 2014).

**Self-regulation: The integration of executive functions, effortful control and emotion regulation.** Executive functions and effortful control are conceptually related (Simonds et al., 2007), partially because inhibitory mechanisms underlie both constructs (Liew, 2012). However, these components are assumed to represent different aspects of self-regulation, and effortful control is generally conceptualized as the regulation of the expression of emotional processes at the behavioral level, whereas executive functions is thought to regulate the control of cognitive resources involved in goal-direct behaviors (Blair & Razza, 2007; Zhou et al., 2012). Furthermore, because emotionality is theoretically relevant to the understanding of children’s capacity to self-regulate (e.g., emotional regulation; Bridgett et al., 2013) and because emotional reactivity is assumed to be at the basis of temperament (Eisenberg et al., 2000), emotion regulation is deemed an important aspect of self-regulation in the present study.

Henceforth, self-regulation will be used to refer to the cognitive, temperamental and emotional processes associated with the development of children's abilities to control goal-directed behavior. The present study proposes to explore a general conceptual model
that analyzes the links between self-regulation, prosocial moral reasoning and prosocial behaviors, and how these components might interact to affect children’s early academic abilities.

**General Conceptual Model**

The links between some of the variables in the general model (see Figure 1) have been previously explored. However, no studies have simultaneously investigated the effects that self-regulation might have on children’s early academic abilities while taking into account the role of moral reasoning and prosocial behaviors. By studying these effects simultaneously, the present study aims at expanding knowledge about the specific mechanisms by which children’s abilities to regulate their behavior, cognition and emotions affect their progress in early scholastic achievements. Both moral reasoning and prosocial behavior are proposed in the present study as possible indirect variables that might play a role on the relation between self-regulation and early academic abilities. These predictions are based on previous research suggesting that some self-regulatory capacities might potentiate children’s moral reasoning, which in turn affects their prosocial behaviors and their learning abilities (Eisenberg, 2010; Eisenberg et al., 2006; Miller et al., 1996).

In the following sections, the general conceptual model is reviewed, and definitions and conceptual issues about its components are presented.

**Prosocial moral reasoning.** Eisenberg et al. (2006) defined prosocial moral reasoning as reasoning regarding moral dilemmas that create a conflict between the person’s needs and wants and another person’s desires, in a context where punishment, formal obligations and laws play a minimal role. This perspective is in contrast to
Kohlberg’s theoretical framework (see for example Kohlberg, 1975), which highlights the importance of justice-oriented reasoning in moral situations where the decisions are made based on ideas related to duty, law and punishment (Campbell & Christopher, 1996).

Gilligan (1982) proposed that a reflective understanding of care is a central aspect of moral reasoning. From the perspective of prosocial moral reasoning, morality is not only about avoiding wrongdoing and injustice, but morality is also about engaging in behaviors that cause good to others, and that contribute to promote connections between people. The ethics of care is based on an understanding of social relationships that enables feelings of compassion and care for others (Haidt et al., 1993; Walker, 2014).

Different levels of moral reasoning are theoretically plausible to characterize children’s reasoning about prosocial dilemmas. Eisenberg-Berg and Hand (1979) and others (Eisenberg et al., 1983, 1987) have proposed seven categories of moral reasoning in preschool children. The most basic type is authority and punishment reasoning, in which conscience is isomorphic with an anxious response to punishment, and physical consequences, rather than human values or needs, shape children’s reasoning. In a more advanced category, needs-oriented reasoning is characteristic of children who identify the needs of others, and then try to consider those needs in their reasoning. Hedonism is another type of reasoning, and it is characterized by the importance of selfish gains that the child (or someone he/she identifies with) could obtain in the situation. Pragmatic reasoning, allows children to justify certain behaviors based on practical non-moral considerations. In stereotypic reasoning, typical ideas of good and bad behaviors are used to justify the behavior, whereas in approval-oriented reasoning the most important
consideration is others’ acceptance when justifying a specific course of action. From this perspective, it is important to note that cognitive (e.g., memory, inhibitory control, perspective taking) and emotive (e.g., moderate arousal, emotion regulation) skills are necessary for higher levels of moral reasoning (Decety et al., 2016; Eisenberg et al., 2006).

Also, from a structural point of view according to this framework, higher levels of moral reasoning are not seen as integrating lower levels in a hierarchical way (Eisenberg et al., 2006). Consequently, some children might be concerned with the needs of others, without paying attention to the consequences that the situation might have for themselves. This scenario represents a possibility that young children might be genuinely interested in other-oriented factors when deciding about moral situations that represent an opportunity to help others. Hence, moral reasoning is an important predictor of prosocial behaviors (Eisenberg et al., 2006), and both constructs affect children’s adjustment in the preschool settings. In the following section, some important conceptual details about the construct of prosocial behaviors are reviewed.

**Prosocial behavior.** Prosocial behaviors, or voluntary acts aimed to benefit another (Eisenberg et al., 2006), have been shown to emerge early in development (Eisenberg et al., 1996) and to have a positive impact on preschool children’s adjustment (Denham & Holt, 1993; Eisenberg et al., 1999; Sebanc, 2003; Slaughter et al., 2002). Researchers have found that prosocial behaviors follow a consistent developmental trend, and consequently, as children age, their prosocial tendencies become more consolidated (Carlo, 2006; Eisenberg et al., 1999).
Given the positive effects of prosocial behaviors, it is likely that specific mechanisms for the development and maintenance of prosocial behaviors have been developed to facilitate and promote positive social interactions (Chakroff & Young, 2014; Reuter et al., 2011). These mechanisms have been proposed to be linked to people’s processing of rewards (Izuma et al., 2009). From a psychological point of view, the types of rewards that people obtain because of being prosocial vary tremendously.

Prosocial behaviors can be motivated by a wide range of underlying purposes. Children might act prosocially because they want to receive some benefits in return, because they want to avoid the negative consequences of not acting prosocially, or because they are motivated altruistically to help others (Batson et al., 1989). Accordingly, the types of prosocial behavior in which preschool children engage vary according to both environmental and personal factors (Iannotti, 1985). Some factors such as friendships, social context and gender role might also determine the type of prosocial behaviors that preschoolers show more frequently (Hay & Cook, 2007).

The various characteristics of prosocial behaviors highlight the importance of taking into account the multidimensionality of prosocial behaviors. Most research on prosocial behavior has conceptualized the construct as singular and unidimensional. However, there is evidence suggesting that early in life, different prosocial behaviors are weakly correlated, and considering a multidimensional model of prosocial behavior can further our understanding of the development of helping behaviors in young children (Padilla-Walker & Carlo, 2015). There are multidimensional measures of prosocial behaviors for late adolescents (Carlo & Randall, 2002) and for early adolescents (Carlo et al., 2003), but there is a lack of multidimensional measures of prosocial behaviors that
can be used by teachers or parents to report on preschool children. Rodriguez Villagra, Padilla Mora, and Fornaguera Trias (2010) published a measure of prosocial behavior for preschoolers that was modified by researchers at the University of Costa Rica (including the author of this dissertation), aimed at capturing different dimensions of prosocial behaviors (e.g., sharing, compliant helping, dire prosocial behaviors and instrumental helping), and that measure is used in the present study to capture the possible multidimensional nature of this construct in preschool children.

Previous research has suggested that some components of self-regulation might enhance children’s moral reasoning and their probabilities to act prosocially (Eisenberg, 2006). These two sociocognitive aspects (prosocial reasoning and behaviors) might have a positive impact on their learning abilities (Eisenberg, 2010; Eisenberg et al., 2006; Miller et al., 1996). Consequently, early learning abilities is included as the outcome variable in the present study, as it offers the possibility to analyze direct and indirect effects of self-regulation on functions that are crucial for children’s positive school adjustment.

**Early academic abilities.** Early academic abilities include the academic skills of children prior to entry formal school (Howes et al., 2008). Common early academic abilities that have been examined are letter-word recognition, vocabulary and math abilities. Because these skills have been shown to be important predictors of later academic achievement (Connor et al., 2006), and to be important markers of children’s school readiness (Welsh, Nix, Blair, Bierman, & Nelson, 2010), they are included in the present study as the main indicators of children’s early academic abilities.
Children’s abilities to recognize letters is an important marker of their reading skills and academic achievement (Bull et al., 2008; Palermo et al., 2017). The importance of this ability is that it helps children understand the function that each letter has when they need to read written words. Most Spanish letters are phonetically iconic (i.e., their name has the sound that the letter represents in the words; Treiman, Levin, & Kessler, 2007) and consequently are important for decoding and mental representation tasks during the reading process. Book reading at home, singing songs and exposure to media are some of the activities that have been associated with better letter-word recognition (Hood et al., 2008; Storch & Whitehurst, 2001).

Children’s vocabulary allows children to learn and organize new information. Vocabulary is important because it can enhance the task of learning to read and more importantly, is an important predictor of reading comprehension and comprehension of spoken language (Hadley et al., 2016; Quinn et al., 2015). Likewise, children’s vocabulary is greatly influenced by children’s experiences at home and because it is affected by previous experiences, is considered to be an indicator of children’s crystallized verbal intelligence, (Fitzpatrick et al., 2014).

Math abilities represent children’s skills to solve mathematical problems. In order for children to successfully find the solution to math problems, they need to come up with a plan, recognize the most important procedures they need to follow and choose the appropriate mathematical operations (Muñoz-Sandoval et al., 2004).

Once they enter preschool, children are exposed to a myriad of experiences that promote more complex social relationships characterized by constant opportunities to enhance their self-regulatory abilities (Fabes et al., 2009; Hay et al., 2009). During these
social interchanges, children can exercise their early academic abilities (Coplan & Arbeau, 2009). In the present study, self-regulation abilities, moral reasoning and prosocial behaviors are investigated as important aspects that might be associated with children’s early academic skills. That general goal is described with more details in the next section.

**Study Aims**

As previously discussed, despite a large body of research on self-regulation, the field still struggles with a consensus on the specific definition of self-regulation (Carver & Scheier, 2016), and more importantly, on what psychological functions are encompassed under the term of self-regulation (Gendolla et al., 2015). One of the aims of this project is to test a latent model of self-regulation that based on previous findings (Blair & Raver, 2015), integrates executive functions, effortful control and emotion regulation.

Self-regulation has been linked to children’s positive adjustment in several domains, including their academic achievement in the preschool context (Raver et al., 2011). Therefore, a second aim of the present study is to explore the links between self-regulation and children’s early academic abilities. The relations between specific components of self-regulation and academic abilities in preschool children have been extensively explored (see for example Blair & Razza, 2007; Espy et al., 2004; Isquith, Crawford, Espy, & Gioia, 2005; Liew, 2012). However, there is a lack of studies that have simultaneously investigated the links between the temperamental, the emotional and the cognitive aspects of self-regulation, and early academic achievement. Self-regulation deals with the control of psychological processes that unfold in complex social
environments in the preschool settings, and to better capture its effects on school readiness, it is important to take into account different modalities of self-regulation. Furthermore, for children to successfully learn in the classroom, they need to adequately regulate their levels of mental and physical activity and to avoid paying attention to irrelevant stimuli while effortfully concentrating on the relevant information (Blair, 2002). Hence, exploring the links between the components of self-regulation proposed in the present study and children’s early academic achievement can broaden our understanding of the interplay between different emotional and cognitive self-regulatory functions and their effects on children’s school readiness.

Even when the links between some self-regulatory components and early academic abilities have been explored, the studies looking at these relations have followed a more cognitive approach (Blair & Raver, 2015). These models are important and have positively impacted the implementation of interventions in the preschool setting focused on cognitive self-regulation (see for example Diamond, Barnett, Thomas, & Munro, 2007). However, it is important to note that school readiness is not only affected by children’s cognitive abilities in terms of their executive functions, but also by their sociocognitive abilities during social interactions that children engage in with other peers and teachers. Children who have an easy time getting along with other children might be at an advantageous position in terms of their school readiness compared to children with less developed social abilities, primarily because children who can establish better social relationships have access to better social support from peers and teachers, and research has shown that students’ positions in their social networks play an important role in their school success (Stadtfeld et al., 2019). Also, children with better social skills are less
likely to experience peer-rejection, which has been linked to negative academic outcomes (Webster-Stratton et al., 2008). Additionally, children who score higher on tasks of cognitive abilities have been shown to act more prosocially (Han et al., 2012) and children with higher scores on fluid intelligence have also been shown to be more prosocial (Guo et al., 2019). These results are congruent with the idea that to be more prosocial, people need to accurately understand the needs and desires of others, which require general cognitive abilities and, they also need emotional abilities to engage in prosocial behaviors. Hence, it is relevant to explore other variables that facilitate children’s social interactions and that could be possible mechanisms by which children improve their early academic achievement during less structured activities.

Previous research also indicates that children’s social skills are affected by their prosocial moral reasoning and prosocial behaviors (Carlo, 2006; Denham, McKinley, Couchoud, & Holt, 1990; Vera-Estay, Seni, Champagne, & Beauchamp, 2016). However, no previous studies have explored the relation between self-regulation and early academic achievement taking into account the indirect effects of prosocial moral reasoning and prosocial behaviors. After a literature search on child development research published in PsycINFO, PsycARTICLES and ERIC, studies that investigate the relations between self-regulation, moral reasoning, prosocial behavior and early academic abilities were not identified. Consequently, this study is proposed to investigate if both moral reasoning and prosocial behaviors (as possible mechanisms) have an indirect effect in the relation between self-regulation and early academic abilities.
Chapter 2: Literature Review

Eisenberg and Fabes (1992) proposed a model about the role of self-regulation in the expression and shaping of behaviors that are linked to emotional responding. According to this model, children who are optimally regulated (e.g., children who can flexibly use different self-regulatory mechanisms) are characterized as interpersonally engaging, sociable, and importantly for this project, prone to act prosocially when confronted with others in need. Furthermore, children who can maintain their levels of emotional and cognitive activation within an adaptive range, might be more likely to focus their attention on others’ needs, and experience sympathy for those who need help. Therefore they are likely to engage in prosocial behaviors (Eisenberg, Bernzweig, et al., 1992; Eisenberg et al., 1988). Children with optimal self-regulation are able to better manage their cognitive resources, and therefore, have an advantage in terms of their school readiness (Blair, 2002; Eisenberg & Fabes, 1992).

Evidence Supporting the Integrative Model

In this section, the evidence that supports the present conceptual model of the relations among self-regulation, moral reasoning, prosocial behaviors and early academic abilities will be presented. First, the evidence indicating a plausible model of self-regulation that integrates executive functions, emotion regulation and effortful control will be discussed. Then the relations between each of the main conceptual model’s variables will be presented.

Multidimensional nature of self-regulation. As Figure 1 shows (Paths a-c), we aim to study three core aspects of self-regulation, namely effortful control, executive control, and emotion regulation. Self-regulation allows humans to socially
interact with others, and to execute complex social cognition processes (Gestsdottir et al., 2014; Lengua, 2003; Nigg, 2016). In order to successfully perform these behaviors, children need to coordinate both their emotional and cognitive resources to conform to their plans, to their goals and in general, to social rules (Kruglanski et al., 2013). Previous research has shown that children’s cognitive abilities alone cannot explain their performance on preschool settings, but that emotion regulation and temperament also play a decisive role in their social behavior and their academic performance (Blair & Razza, 2007). Eisenberg et al. (2000) showed that children’s temperamental characteristics and their ability to regulate their emotions predicted the quality of their social relations. Children with better self-regulation capacities have been described as more ready to start learning in the preschool years than children with lower self-regulatory capacity (Gestsdottir et al., 2014), which suggests that children’s self-regulation is the integration of their capacity to control their behavioral, cognitive and temperamental characteristics (Bull et al., 2008; Van der Ven, Kroesbergen, Boom, & Leseman, 2012; Welsh, Friedman, & Spieker, 2006).

**Relations between self-regulation and early academic abilities**

*(Path a in the integrative model).* Cognitive aspects of self-regulation have been linked positively to early academic abilities (Bull et al., 2008; Espy et al., 2004; Lan et al., 2011; Sabbagh et al., 2006). Children with higher abilities to regulate their cognitive resources, are more efficient at learning new material and at keeping their focus of attention on the target learning activities.

When children are exposed to new information, they need to pay attention to the most important details and ignore the irrelevant information to successfully engage in
problem solving. Specifically, working memory abilities positively influence children’s capacities to hold information, manipulate, storage and retrieve partial results in tasks that recruit their math abilities (Bull & Lee, 2014; Fernández-Molina et al., 2015).

Additionally, when children are learning new information, they need to create and implement a plan, and for them to complete that requirement in an efficient way, they need to have the cognitive flexibility to switch between different tasks according to the requirements in the classroom. The importance of children’s ability to create and implement a plan for problem solving is also demonstrated by (Best et al., 2011), who found that children’s ability to come up with a plan to find matching information is strongly correlated with children’s abilities in both math and reading, providing additional evidence on the importance of cognitive self-regulation and early academic abilities.

Also, the temperamental aspects of self-regulation have been associated positively with early academic abilities (Blair & Razza, 2007; Liew et al., 2008). Higher levels of effortful control are related to higher performance on both math and language abilities. The research in this area has demonstrated that effortful control allows children to engage in more learning activities and to regulate their behavior during the school period (Blair & Razza, 2007).

The research on children’s self-regulatory abilities to control their emotional reactivity shows that in educational settings, if children experience high levels of frustration and negative emotionality, they are more likely to encounter difficulties when trying to learn new skills and when they need to follow instructions and solve problems (Denham, 2006; Rothbart & Jones, 1998). Also, children with higher levels of emotion
regulation are more likely to self-initiate activities that are beneficial for their learning process, and to keep trying to master their skills (Valiente et al., 2011), possibly due to their abilities to manage their emotional reactions.

Self-regulation has been shown to affect children’s capacities to internalize rules, which in turn is another component that affects children’s school early academic abilities (Kochanska et al., 2000). Self-regulation allows children to have a higher proclivity to internalize external rules (e.g., paying attention when the teacher is explaining something to the class, being respectful with other peers), and hence, they are more likely to show behavioral tendencies that contribute to their adjustment in the preschool setting.

**Relations between self-regulation, prosocial moral reasoning and prosocial behaviors (Paths b and c in the integrative model).** Research has shown that moral reasoning and prosocial behaviors are linked to goal-directed behavior at least in adults (Sachdeva et al., 2009), but research looking at these links in preschool children is more limited. More general indicators of moral behavior, for example compliance and internalization of norms (Kochanska et al., 2001) or moral motive strength (i.e., accurate identification and attribution of moral emotions; see Asendorpf and Nunner-Winkler, 1992) and their links to some aspects of self-regulation, or to general definitions of self-regulation have been explored. However, no previous research has looked at the links between self-regulation, moral reasoning and prosocial behaviors in preschool children.

Most of the research linking children’s self-regulation and their moral development has been primarily focused on children’s moral emotions and rule-compatible behaviors (Aksan & Kochanska, 2005), or has explored children’s cognitive
development and their capacity to understand and judge moral transgressions that entail an obligation not to harm others (Ball et al., 2017). Previous research also shows that children who are characterized by low approach and high levels of avoidance to the unfamiliar, are more sensitive to punishment and emotional discomfort, and as result, they are more likely to take into account others’ expectations about their wrongdoings (Kochanska, 1993). Similarly, children with high levels of temperamental self-regulation exhibit higher levels of internalization of moral standards (Kochanska & Aksan, 2006).

Studies exploring the links between some cognitive aspects of self-regulation and moral reasoning in preschoolers have focused on children’s theory of mind understanding as an indicator of their cognitive abilities (Ball et al., 2017; Caputi et al., 2012; Imuta et al., 2016) but the role of other components of cognitive self-regulation (e.g., executive functions) is unknown. In general, the studies looking at the possible relations between some aspects of self-regulation and moral reasoning in preschoolers show that typically young children focus on self-oriented consequences, rather than on moral considerations. Preschoolers also show concern for the physical, material and psychological needs of others, but showing limited self-reflective considerations (Eisenberg et al., 1983).

In short, there is a considerable amount of research on the development of self-regulation during childhood, and there is ample evidence about the integration of the distinct cognitive and emotional aspects of self-regulation (for a review, see Garon, Bryson, & Smith, 2008). There is also research on moral reasoning in preschool children (Chaparro et al., 2013; Eisenberg-Berg & Hand, 1979; Eisenberg-Berg & Neal, 1979) and on prosocial behavior development during this developmental stage (Dunfield & Kuhlmeier, 2013; Eisenberg et al., 1996; Eisenberg, Wolchik, et al., 1992; Eisenberg-
Berg & Hand, 1979; Laible et al., 2014; Rodriguez Villagra et al., 2010; Sebanc, 2003). However, there is a lack of studies that have examined the role that self-regulation plays in moral reasoning and prosocial behaviors. Based on previous findings, it is reasonable to suggest that self-regulation should be linked to moral reasoning and prosocial behaviors. Preschool children with high levels of cognitive awareness about other’s needs are likely to show high levels of empathy and hence, are more prone to engage in prosocial moral reasoning that facilitates prosocial behaviors (Eisenberg, 1986; Imuta et al., 2016). Also, when children see someone else in need, those who regulate their emotional arousal in a more adaptive way, will be more likely to engage in prosocial behaviors than those who result over aroused or under aroused (Hoffman, 2008).

**Relations between prosocial moral reasoning and helping behaviors (path d in the integrative model).** Moral reasoning is one mechanism by which children’s empathic concern is expressed through prosocial behaviors (Batson, 1991; Paulus, 2014). Moral reasoning has been described as one of the precursors of prosocial behaviors (Miller et al., 1996) and children who engage in higher levels of moral reasoning, are usually more prosocial (Eisenberg-Berg & Hand, 1979). Internalized moral reasoning tend to increase with age, whereas hedonistic helping shows a declining trend (Eisenberg et al., 1983), which might suggest that children’s motivation to engage in prosocial behaviors becomes more centered on others’ needs. Research evidence shows that preschool-aged children can evaluate and understand the causes of others’ distress, and behave prosocially as a response of others’ needs (Eisenberg & Spinrad, 2014).
Empathy and moral principles are not coherently linked during the preschool years. However, it is plausible that preschoolers can use lower types of moral reasoning in their evaluations of helping situations (Hoffman, 1991; Miller, Eisenberg, Fabes, & Shell, 1996). Their engagement in these types of other-oriented moral reasoning shows that preschoolers are not egocentric and self-centered, and that they can consider others’ perspective and feelings when making moral decisions. For example, stereotypic and approval-oriented types of moral reasoning, although not typically related to prosocial behavior in school-age children (for whom those types of reasoning are less advanced), are both considerably sophisticated for preschool children, and have been shown to allow children to focus on social standards and helping others in need (Miller et al., 1996). Hence, from previous research it can be concluded that moral reasoning is an important precursor of prosocial behaviors in preschool children.

Moral reasoning is assumed to account at least partially for children’s engagement in prosocial behaviors. Although early studies exploring the links between moral reasoning and prosocial behaviors showed mixed results (Eisenberg, 1986; Eisenberg-Berg & Hand, 1979), more recent findings show more consistency (Borke, 1971; Eisenberg et al., 2006; Miller et al., 1996). Preschool children interpret prosocial moral situations in terms of their own benefits and the possible costs of the prosocial action, at the same time that they consider the needs, wants and feelings of other people involved in the situation (Borke, 1971; Eisenberg & Spinrad, 2014). Also, some types of moral reasoning have been linked differently to specific prosocial acts (Whiting, 1985). For example, hedonistic moral reasoning has been related negatively to sharing, whereas
needs-oriented moral reasoning has been positively correlated to such type of helping (Eisenberg-Berg & Hand, 1979; Miller et al., 1996).

**Relations between prosocial moral reasoning, prosocial behavior and early academic abilities (paths e and f in the integrative model).**

Preschool centers are learning environments that emphasize learning through play activities that require interaction amongst children. During these learning spaces, children take part in unstructured activities that stimulate social interactions and constitute one of the foundations for their learning experiences and attitudes (Hanish et al., 2007).

Children with higher cognitive abilities have been shown to act more prosocially, and at least partially, to be in a better position to understand other children´s needs and desires (Han et al., 2012), which in turn has been shown to be associated with children’s prosocial behaviors (Eisenberg & Mussen, 1989). Prosocial behaviors have been linked positively to early academic abilities (Caprara et al., 2000).

Children’s moral development has important implications for children’s academic performance at school, and previous research has demonstrated for example that cooperative children have better relationships with peers and teachers than children who show lower cooperative behaviors (Bierman et al., 2009). One explanation for this result is that children with good relationships with others adjust to the preschool environment better than children with conflictive relationships with peers and teachers (Ladd, 1989; Ladd & Price, 1987). On the other hand, children who exhibit low levels of prosocial behavior and who show high levels of aggression are characterized by a lack of motivation to school and low levels of excitement about learning (Bierman et al., 2009). This is especially concerning because preschool children’s socio-emotional competence
is related to children’s ability to follow rules and to learn, and it enhances their socio-cognitive development (Bierman et al., 2009; Seifert, 2013).

Consequently, children who experience difficulties with both prosocial moral reasoning and prosocial behaviors, might be at risk of adjustment problems in the preschool environment, which could have long lasting negative effects for their educational trajectories (Brown & Lee, 2014). However, previous research has not addressed directly the links among prosocial moral reasoning, prosocial behaviors and early academic abilities. As discussed above, there are some studies on the links between prosocial behavior and academic abilities (Bierman et al., 2009; Carlo et al., 2017; Ladd, 1989; Ladd & Price, 1987), and prosocial behaviors and academic achievement in elementary school (Caprara et al., 2000) but no previous studies have explored the links among prosocial moral reasoning, prosocial behaviors and early academic abilities.

The relations between these variables are rather complex, and there is also the possibility that children’s early academic abilities might affect their subsequent moral reasoning and prosocial behaviors (Han et al., 2012). It might be the case that children who have better early academic abilities have more opportunities to help others due to their enhanced competencies (King et al., 2005). Hence, it is important to examine alternative models (e.g., reverse causal models) for the links between moral reasoning, prosocial behaviors and early academic abilities.

**Gender Differences**

Girls have been reported to outperform boys in measures of self-regulation (Matthews et al., 2009). There is evidence of these differences in the three dimensions of self-regulation that are considered in the present study, the cognitive (Wiebe et al., 2008),
emotional (Chaplin et al., 2005) and temperamental components (Else-Quest et al., 2006). However, other studies have found no gender differences in these components (Cole et al., 2009). Also, the studies that have explored these gender differences have not implemented a comprehensive model of self-regulation as the one proposed in this study.

Regarding gender differences in moral reasoning, researchers have been debating this topic since the early 1980s (Gilligan, 1982). Specifically, prosocial moral reasoning has been shown to be more common for girls than boys, with boys showing a stronger orientation toward justice-oriented moral reasoning (Gilligan & Attanucci, 1988; Jaffee & D’Zurilla, 2009). In the studies that have looked at prosocial moral reasoning in preschool children, no gender differences have been reported between boys and girls (Eisenberg-Berg & Hand, 1979; Eisenberg-Berg & Neal, 1979), although some studies with older children have reported gender differences favoring girls (Eisenberg, Cumberland, et al., 2005; Jaffee & D’Zurilla, 2009), gender differences tend to be small.

Regarding prosocial behaviors in preschoolers, girls have been shown to engage in more prosocial behaviors than boys (Nantel-Vivier et al., 2009; Sebanc, 2003; Zimmer-Gembeck et al., 2005), although meta-analytic reviews have shown that the differences depend on the method used to evaluate prosocial behaviors, with observational data showing smaller gender differences than self-reported data (Eisenberg & Fabes, 1998).

Finally, the studies exploring gender differences in early academic achievement have shown mixed results depending on the cultural group. Evidence favoring girls have been reported by research in the United States (DiPrete & Jennings, 2012) and Europe (Suchodoletz & Gunzenhauser, 2013) but not in Latin American samples (Garaigordobil & Amigo, 2010; Osorio-Valencia et al., 2017). Hence, children’s gender is considered in
the present study as a covariate, and certainly as an aspect that plays an important role on children’s socialization. Gender is included only as a covariate and not as a grouping variable because of sample size limitations to perform multigroup analyses. Considering previous studies favoring girls in prosocial self-regulation, prosocial behaviors and early academic abilities, girls are expected to outperform boys in these dimensions.

**Culture Group Differences**

The present study investigates the relations among self-regulation, moral reasoning, prosocial behaviors and early academic abilities in Costa Rican children. Given that the majority of research on these relations has been conducted with other cultural groups, culture group differences on the study variables will be briefly reviewed.

Some components of self-regulation have been analyzed from a cross-cultural perspective. For example, U.S. children’s inhibitory self-regulation has been compared to Chinese children’s inhibitory abilities, with the Asian children outperforming their peers from the U.S. (Sabbagh et al., 2006). Results show consistently that cultural practices (e.g., waiting to take turns, the way children react to given presents, the way adults’ authority is viewed) have an impact on children’s self-regulatory abilities (Oh & Lewis, 2008). In general, different sociocultural environments and socialization practices have shown differential effects on children’s self-regulation, highlighting the importance of the cultural group in the development of children’s abilities to regulate their behavior and emotions (Keller et al., 2004).

The links between cognitive aspects of self-regulation and children’s early academic abilities have also been compared between Asian and U.S. young children. For example, although Lan et al. (2011) reported no cultural effect on working memory, the
differences in inhibitory abilities found in other studies were replicated by the authors. Also, the Lan and colleagues showed significant effects of cognitive self-regulation on early academic abilities across the two cultural groups.

However, research comparing moral reasoning of preschool children from different cultural backgrounds is scarcer. A notable exception is the study by Chaparro et al. (2013), who compared children’s moral reasoning from Switzerland and Chile. The results showed that young children from Switzerland used more moral reasons to justify moral behaviors than Chilean children did.

With older samples, research has found that U.S. teens show higher levels of internalized prosocial moral reasoning than Brazilian children (Carlo et al., 1996). For example, as discussed earlier, some studies have found gender differences in prosocial behaviors in U.S. children (Sebanc, 2003), however, the same results have not been replicated in other cultures. Specifically, no gender differences have been reported in prosocial behaviors in Turkish preschool children (Laible et al., 2017).

Interestingly, gender differences have been detected when children from other regions in the American continent (e.g., South American countries) have been studied, showing that Latino children might be more inclined to show cooperative tendencies than European American children (Carlo et al., 2001). However, the question remains whether Central American children will show gender differences in prosocial behaviors and in the other study variables. Other cultural differences in prosocial behaviors have been shown with older children. For example, European American teenagers have been shown to report higher levels of altruistic prosocial behaviors than U.S. Mexican youth, who in
turn showed higher public helping and resource sharing than their peers from European American heritage (Carlo et al., 2011; Knight et al., 2015).

These results are important to mention in the present study because they provide a sense of the variety of different associations that can be identified amongst the study variables in diverse cultural contexts.

**Main Hypotheses of the Present Study**

As it can be seen from this review of the literature, the current research on self-regulation is complex and it requires the development of both conceptual and methodological approaches that can integrate the different dimensions of self-regulation. Additionally, the bodies of work on self-regulation, prosocial development (i.e., prosocial moral reasoning and prosocial behavior) and early academic abilities suggest that there could be interconnections between these dimensions that are worth exploring and that have not been addressed in previous research. Early academic abilities are determined by a myriad of cognitive, emotional and behavioral factors, and more research is required to broaden our understanding of this important predictor of children’s school adjustment not only during the preschool years, but their entire educational trajectory.

Consequently, the present study is aimed at exploring the following hypotheses:

**Hypothesis 1:** Self-regulation can be represented as a latent factor measured through children’s executive functions, emotional regulation and effortful control.

**Hypothesis 2:** Children’s prosocial moral behaviors can be represented as a latent factor through compliant helping, sharing, dire helping, instrumental prosocial behaviors and public helping.
**Hypothesis 3:** Children with higher self-regulatory abilities will show higher levels of early academic abilities, prosocial moral reasoning, and prosocial behaviors (see paths a, b and c).

**Hypothesis 4:** Both prosocial moral reasoning and prosocial behaviors will play a role as indirect variables on the relation between self-regulation and early academic abilities.

Finally, because the present study is conducted in children in Costa Rica, it is necessary to test the psychometric properties of the various study measures. We expect the various measures to demonstrate acceptable reliability and validity evidence. Furthermore, the findings are interpreted in the context of examining the hypothesized relations in a sample that is culturally distinct from the majority of prior research on these conceptual relations.
Chapter 3: Research Design and Methods

Participants

The minimal sample size required for this study is 138 children, according to the sample size calculator for structural equation modeling developed by (Soper, 2013). That calculation is based on the following criteria: the average expected effect size is .3, the a priori statistical power is .8, and the probability level is .05. These a priori estimations are commonly used in behavioral sciences (Cohen, 2013). Also, this calculation considers that a structural equation model with four latent variables, and 14 observed variables will be estimated (see figure 1). The effect size of .3 was calculated based on previous studies with preschoolers, which used structural equation models in the analyses, and investigated the relations between constructs such as self-regulation, academic preparation, and peer relationships. Among the investigations consulted that fulfilled these criteria (Denham et al., 2012; Harmeyer et al., 2016; Nayfeld et al., 2013) the average effect size was .36. However, because these studies were conducted in other contexts, a smaller effect size than the average of these investigations was used for the calculation of this project’s sample size. In addition, given that some difficulties with the possible missing data of the participants are to be expected, the final sample size for this study was set to 150 preschool children.

In total, 193 children (98 boys) participated in the study, with ages ranging from 56 months to 81 months (mean age= 69 months, SD = 6 months). Participants were recruited in five public preschool centers in San José, the capital city of Costa Rica. All of participants’ maternal language was Spanish, and on average, 41 % of their mothers had only a high school diploma (24 % of mothers reported to have completed a university
Sixty two percent of fathers reported to only have a high school diploma and 16%
of them reported to have completed a university degree.

**Procedures**

The design of this study is cross-sectional. The exploration of covariance between
naturally occurring variables is the focus of this study, that is, direct manipulation of
variables is not proposed as a fundamental element of the design.

This study used secondary data. For the original study performed at the University
of Costa Rica upon IRB approval, families of the participating children were contacted
through the preschool centers they attended, prior authorization from the principals’
offices at each preschool center.

Participating children were evaluated in a series of psychological performance
tests, through which their socio-cognitive and emotional skills, and their early academic
abilities were determined. The evaluations took place in the respective preschool centers,
with the approval of the parents through the signed informed consent. All evaluation
sessions were performed in quiet and separate rooms. Each participating child was
evaluated in three different sessions, each of which took on average 20 minutes to
complete. Assessments were performed by trained research assistants with a bachelor
degree in psychology. Research assistants took part in a series of 3 training workshops
where the specific instructions for the tasks were reviewed and during those sessions,
they had the opportunity to practice the instructions and administration of the tasks.
Additionally, each research assistant evaluated two pilot cases, supervised by the
principal investigator and one advanced research assistant with experience on the
administration of the tasks used in this study. Only after they successfully evaluated two supervised cases, they were allowed to start collecting data for this project.

**Measures**

The measures for executive functions, effortful control, prosocial behaviors and early academic abilities have been previously used with Costa Rican children, and consequently no adaptation for them was needed. However, the measures for emotion regulation and prosocial moral reasoning have not been used before in Costa Rica. Both measures were translated by the principal investigator of this project from English to Spanish. Then, bilingual undergraduate research assistants back-translated them to English. The original versions were compared with the back-translated versions for important differences or inconsistencies. Small corrections for idioms were made to a final Spanish version of the measures, which were reviewed by five Costa Rican experts in psychological research from the University of Costa Rica.

**Self-Regulation.** Performance tasks, teacher reports and parent reports were used to measure children’s self-regulatory abilities. Measures used for each of the main components are presented next.

**Executive function.** To measure inhibitory control, a modified version of the Stroop day-night task was used (Gerstadt et al., 1994). This kind of measure requires children to say moon when presented with an image of the sun and vice versa. These tasks have been shown to adequately measure preschool children’s inhibitory control abilities (Fuhs & McNeil, 2013) and importantly, they have been shown to be a valid indicator of inhibitory control in Costa Rican children (Chasiotis et al., 2006). Two
versions of Stroops were used in this study. A version with dots and lines and a version with a sun and a moon. The correlation between the two versions is 0.78, *p* < .001.

To measure children’s *working memory* abilities, self-ordered pointing tasks were used. One of the tasks used is the toy memory task (Archibald & Kerns, 1999), which has two different versions. Version A consists of six sheets with pictures of six toys. Version B has eight sheets with eight pictures of toys. For both versions, children are instructed to choose a different toy in each trial and the pictures are presented in a different spatial arrangement on each trial. The correlation between these versions was 0.23, *p* < .001.

The abstract pictures task is a modification introduced by Cragg and Nation (2010) to this test and was used in the present study as an additional indicator of children’s working memory abilities. The only difference is that instead of using pictures of toys as stimuli, pictures of abstract figures, with which children are least familiar with, are used. Similarly, for this task children were instructed to choose a different figure in each trial and the abstract pictures were presented in a different spatial arrangement on each trial. Two versions were used, one with 6 pictures and one with eight pictures. The correlation between these versions was 0.20, *p* = .006.

Short-term memory was evaluated with the forward digit span test. In this test, children are told a series of digits, and they must briefly retain the digits in their short-term memory and then repeat the digits in the same order as they were presented to them (Daneman & Carpenter, 1980). Both measures have shown adequate psychometric properties with Costa Rican children and shown to be valid to be used as indicators of children’s working memory abilities (Padilla-Mora et al., 2009). In the present study, this
measure of short-term memory was used as one of the cognitive indicators for self-regulation and it loaded significantly into a factor of executive functions (see Figure 2).

**Effortful control.** To measure effortful control, an adapted version of the Child Behavior Questionnaire (CBQ; Rothbart et al., 2001) was used. This 12-item version of the CBQ is reported by parents and has been shown to have appropriate reliability and validity coefficients (Putnam & Rothbart, 2006). Some items of this scale are “When drawing or coloring in a book, shows strong concentration” and “This child is good at following instructions”. The answers to this instrument are from "extremely false" (1) to extremely true (5). Cronbach’s alpha for this measure was 0.87.

**Emotion regulation.** To capture children’s emotion regulation abilities, a new scale to measure children’s expression and management of positive and negative emotions was developed for teachers to report on their students. This new scale was developed following Denham et al. (2003)’s approach of including children’s behaviors at the facial, vocal and behavioral levels as important aspects of their emotion regulation. Items to capture children’s abilities to regulate their emotions in both happy and angry situations were proposed to a group of experts in developmental psychology (5 researchers with a minimum of ten years of experience as a researcher in developmental psychology). Each expert rated the items in terms of their suitability for measuring emotion regulation in preschool children. The items for which the experts indicated adequate characteristics (e.g., wording, face validity, ecological validity) were selected for this study. Cognitive interviews were conducted with a group of 5 parents of preschool children to review the items and evaluate the wording of the items. A total of 4 items for measuring emotional regulation in happy situations and 4 items for measuring
emotional regulation in angry situations were administered to teachers. Cronbach’s alpha for this measure was 0.83.

**Moral Reasoning and Prosocial Behavior.** To evaluate prosocial moral reasoning, an adapted version of the measure developed by Eisenberg and Shell (1986) was used. The task involves the use of stories in the form of dilemmas, which are told to each child individually. As an introduction for the task, children are told that they are going to play a story-game, and that they will help make-up endings to each story. In these stories, the wants and needs of one character in the story conflict with the needs of another character. Importantly, in these dilemmas, laws, rules, authorities, punishment and formal obligations are not preponderant, or at least their role is minimized.

The stories are read to the participant child using the first probe, which elicits the individual’s choice of behavior for the character in the story. The individual’s reasoning is elicited at this point by asking the subject why he/she decided as he/she did. The answers for each story were audio taped and transcribed. The responses were coded with a modified version of the coding manual developed by Eisenberg and Shell (1986) (see Table 1 for category definitions). Coders were trained by the principal investigator using the cited manual. They took part in a series of sessions during which the manual was reviewed, and the categories were discussed and analyzed. During those sessions, the coders had the opportunity to code responses. Inconsistencies were discussed and resolved amongst the coders and the principal investigator of this project. Coders did not have access to children’s performance on the other measures of the study and did not know the hypothesis of this study. Appropriate inter-rater reliability was demonstrated for this measure (Kappa coefficients above .90).
Prosocial behaviors were measured using a modified version of the children’s prosocial behavior scale (Rodriguez Villagra et al., 2010). This paper and pencil report from teachers taps into children’s helping behavior in the context of the preschool center. Some items of this scale are “this child helps classmates when he/she sees that they fall and get hurt” and “helps others to "look good" before people”. Teachers used a 1 (extremely false) to 5 (extremely true) scale to answer the items. This scale has been shown to be valid and reliable in Costa Rican preschool children (Conejo et al., 2016). For this study, Cronbach’s alphas were above .8 for all sub-scales with more than 3 items. Public and compliant subscales had only two items. The correlations between each subscales’ items were 0.68 (p < 0.001) and 0.30 (p < 0.001), respectively.

**Early Academic Abilities.** Vocabulary, letter-word recognition, and mathematical abilities were measured with the Spanish version of the Battery III Woodcock-Muñoz.

**Vocabulary skills.** To measure children's expressive vocabulary, the Spanish version of the Battery III pictorial vocabulary subscale was used (Muñoz-Sandoval et al., 2004). Children’s ability in expressive vocabulary was evaluated with this measure. In this task, the examiner points to the image of an object and asks the children to say its name.

**Letter-word skills.** To evaluate children's abilities in letters and words in Spanish, the subscale of letters and words of the Battery III (Muñoz-Sandoval et al., 2004) was used. This task measures the ability of children to recognize and name letters, and to decode words.
Mathematical abilities. The sub-scale of applied problems of the Battery III was used (Muñoz-Sandoval et al., 2004). The applied problem scale assesses students' ability to analyze and solve mathematical problems by applying simple concepts about numbers.

The tasks for early academic abilities have been used previously in Costa Rica and have been shown to be valid and reliable indicators of Costa Rican preschoolers’ academic abilities (Rolla San Francisco et al., 2006; Sparks et al., 2013). In the present study, a CFA was conducted to test the factor structure of this measure and it yielded appropriate results, ($\chi^2(12)= 117.98, p = 0.004$, scaled CFI = 0.96, scaled TLI = 0.89, scaled RMSEA = 12.00 (0.00-0.18), and AGFI = 1.00).

Analyses

The data was analyzed in R within the Structural Equation Modeling framework using the lavaan package for R (Rosseel, 2012). Structural Equation Models (SEM) were estimated to test the hypothetical relations between the variables. For the models with unacceptable goodness of fit, modifications were made to the model in order to obtain the most parsimonious model that could represent the data appropriately.

First, basic assumptions regarding the distribution of the data were checked by conducting descriptive analyses. To test the fit of the main model (Figure 1), CFA and SEM models were analyzed using robust estimators (i.e., robust maximum likelihood estimator) that still calculate parameter estimates using the unbiased maximum likelihood estimator but that correct standard errors and chi-square statistics for a more robust analysis when departures from normality (e.g., skewness or kurtosis) are present (Li, 2016).
As a way of evaluating the goodness of fit of the main model (Figure 1) to the data, several goodness of fit indices were used: The Comparative Adjustment Index (CFI), the Tucker-Lewis Index (TLI), the Mean Square Error of Approximation (RMSEA) and their confidence intervals (CI). The indirect effects were tested using the model proposed by Rosseel et al. (2011), which correctly estimates the standard errors of the coefficients of the indirect effects by using a bootstrapping method. The cutoffs for appropriate fit that were used followed what Hu and Bentler (1999) and Beaujean (2014) proposed: CFI and TLI values close to .95, RMSEA values close to .06. Gender was included as a covariate to test for possible differences between boys and girls. Years of mother education was also used as a control variable in the analyses.
Chapter 4: Results

First, descriptive statistics are presented for the main study variables. Then, confirmatory factor analyses are presented for both self-regulation and prosocial behaviors. Finally, the comprehensive model is shown, where the hypothesized relations between the study variables are tested.

Descriptive Statistics and Exploratory Gender Differences

Self-Regulation. The variables used to measure self-regulation are presented in Table 2. The minimum and maximum scores for each variable are within the established range and indicate acceptable variability for each variable. The skewness and kurtosis indicators suggest that no important extreme cases or outliers exist for these variables. Table 3 shows the correlation matrix for the self-regulation variables, and because some of these variables are expected to develop rapidly during the preschool period, age is also included. Level of mother education was also included in these analyses. As expected, working memory and inhibitory control were positively correlated, as the main components of cognitive self-regulation in the study. Short-term memory and inhibition were also positively related. Effortful control was positively related to emotional regulation in both happy and angry situations. Additionally, the two types of emotion regulation evaluated in this study were positively correlated. Two indicators of cognitive self-regulation (i.e., working memory and inhibitory control) and temperamental self-regulation (i.e., effortful control) were positively correlated with age. Finally, mothers’ education was positively related to children’s short-term memory and effortful control.
An exploration of preliminary differences by gender on these variables indicated that girls outperformed boys in working memory (but only marginally), effortful control and emotion regulation in happy situations but not in angry situations (see Table 4).

**Prosocial Behavior and Moral Reasoning.** Prosocial behavior was conceptualized in the present study as a multidimensional construct. Table 5 shows the different dimensions of prosocial behavior, as well as its basic descriptive statistics. Each variable has a range between the previously established minimum and maximum. Important deviations from normal distribution according to the indicators of skewness and kurtosis are not identified in this preliminary phase. Gender differences were explored using t-tests for all the sub-types of prosocial behavior. As shown in Table 6, girls outperformed boys in two of four sub-types of prosocial behaviors. Girls showed higher scores in sharing and dire prosocial behaviors than boys, according to this teacher report.

The descriptive statistics for the different types of moral reasoning that were included are shown in Table 7. The range for each variable and their minimum and maximum values suggest that all the observed scores are according to their response scales. The skewness and kurtosis for authority, pragmatic and approval-oriented moral reasoning show that these variables have very asymmetric distributions. A closer examination of these scores showed that for authority moral reasoning, 176 children showed a score of 0 (i.e., they did not use this category), only 6 had a score of 1, and only two had a score of 2. Pragmatic moral reasoning was not used by 178 children, five children had a score of 1 and only two had a score of 2. For approval-oriented moral reasoning 173 children did not use the category in their responses and only nine had a
score of 1. Due to the restricted range of these variables, and that these types of moral reasoning were rather rare in the sample (fewer than 10 children used them), these variables were dropped from subsequent analysis. Consequently, only hedonistic, needs-oriented and stereotypic moral reasoning were used as subtypes of moral reasoning. These subtypes presented approximate linear distributions (kurtotic and skewness indicators were appropriate, see Table 7). However, after inspecting their distribution, deviations from normality were found for the three subtypes of moral reasoning. Consequently, robust estimators for the analyses including these variables will be used (i.e., robust maximum likelihood). As it can be seen in Table 8, according to the means, children used needs-oriented moral reasoning most frequently, followed by hedonistic and stereotypic moral reasoning.

Gender differences using Wilcoxon comparisons of medians were explored for hedonistic, needs-oriented and stereotypic moral reasoning. As it can be seen in Table 8, the tests showed that girls engaged in more stereotypic prosocial moral reasoning than boys. Inspecting the distribution of this variable, it was detected that more than 23% of girls scored 0.5 or higher in this variable, whereas only 7% of boys scored 0.5 or higher. No other gender differences were detected in relation to the rest of prosocial moral reasoning sub-types.

Spearman correlations between prosocial behaviors and prosocial moral reasoning are displayed in Table 9. Hedonistic moral reasoning is negatively associated with needs-oriented and stereotypic moral reasoning subtypes. When inspecting the associations amongst the subtypes of prosocial behaviors, it is interesting to note that compliant prosocial behaviors are positively associated with sharing, instrumental and dire helping.
Sharing is positively correlated with instrumental, dire and public prosocial behaviors. Instrumental helping is associated with dire and public prosocial behaviors, and finally, dire and public are also correlated. All these associations are positive, indicating important differences with the results from other studies with older children, which have reported that public helping is often negatively associated with other forms of prosocial behaviors that are more selfless.

Because hedonistic moral reasoning was negatively associated with both needs-oriented and stereotypic moral reasoning, but these two latter variables were not associated with each other, in subsequent analyses the three variables are analyzed separately.

**Early Academic Abilities.** Basic descriptive statistics for the three tasks used to measure early academic abilities are shown in Table 10. The variable letter-word recognition had important deviations from normality (e.g., skewness = 6.26; kurtosis = 43.64) in the original scale. A closer examination of its scores, showed that 94% of children scored from 1 to 11, and only 6 children showed scores higher than 11. Due to the skewness of this variable, it was recoded and converted to an ordinal scale according to the following procedure: children with scores from 1 to 5, received a score of 1; from 6 to 10, a score of 2; from 11 to 15, a score of 3, and scores higher than 16 were re-codified as 4. The re-codified variable had a range from 1 to 4 and a median of 1. The correlations between these variables were calculated with the Spearman coefficient and are shown in Table 11. All the correlations amongst the variables are significant and positive, according to the model of early academic abilities presented in the
comprehensive model for the present study. Additional analyses showed that no gender differences were detected using Wilcoxon comparison tests.

**Factorial Structures**

As part of the objectives of this study, the factorial structure of self-regulation (hypothesis 1) and prosocial behaviors (hypothesis 2) are inspected and alternative models for each construct are compared.

As for the factor structure of self-regulation, two models were compared. *Model a*, showcased a general factor of self-regulation measured through children’s executive functions, emotional regulation and effortful control. *Model b*, following the approach of (Willoughby et al., 2011), represented two types of children’s self-regulation: emotional regulation and cognitive regulation. The emotional dimension of self-regulation was measured through children’s effortful control and emotion regulation (in both happy and angry situations) whereas cognitive regulation was measured through working memory, inhibitory control and short-term memory. Table 12 shows the fit for the models of self-regulation. As it can be seen, according to the indicators used to assess fit measurement, *model a* shows a poorer fit to the data in comparison with *model b*, which has better indicators of goodness of fit. Additionally, the two models were compared using a chi square difference test.

The results of this comparison test indicated that the more restrictive model (*model a*) does not provide additional information significantly, and as a result, the least restrictive model (i.e., the model with more degrees of freedom; *model b*) must be kept as the best available representation of the data (see Table 13).
Additionally, as indicated in the hypothesis, it was expected that prosocial behaviors will be better represented as a multidimensional than a unidimensional factor. A model with a general factor of prosocial behaviors (model a) was contrasted with a model of several factors of prosocial behaviors (i.e., sharing, compliant, instrumental, dire and public helping; model b). The fit indices of these models are presented in Table 14. As it can be seen, the multidimensional model b shows a better fit to the data.

Additionally, both models were compared using a chi square comparison test. The results of this analysis are presented in Table 15. Congruent with the results presented above, model b shows a better fit to the data than model a.

**Relations between self-regulation and early academic abilities (Path e)**

A model was specified to test the relations between both cognitive and emotion related self-regulation and early academic abilities using robust maximum likelihood as the estimator. Only cognitive self-regulation showed a significant relation to early academic abilities ($b = .23, p < .001$) whereas emotion regulation did not ($b = -0.07, p < 0.353$). No effects of gender were found in these relations. The model showed an adequate fit to the data ($\chi^2(4)= 9.08, p = 0.06$, scaled CFI = 1.00, scaled TLI = 1.00, scaled RMSEA = 0.00 (0.00-0.00), and AGFI = 1.00).

A subsequent analysis amongst the observed variables that loaded into both types of self-regulation showed consistent results with the previous analysis using composite variables. Specifically, cognitive indicators of self-regulation, working memory ($b = .12, p = .041$), inhibitory control ($b = .18, p = .008$) and short-term memory ($b = .30, p < .001$) showed significant relations to early academic abilities, whereas emotional
indicators of self-regulation did not (i.e., effortful control and emotion regulation). No gender or mother’s education effects were found in this model.

**Relations between self-regulation, prosocial moral reasoning and prosocial behaviors (Paths d and f)**

To explore the relations between self-regulation, moral reasoning and prosocial behaviors (as a multidimensional factor), three models were specified. The only difference among them is that each used a different subtype of moral reasoning (needs-oriented, hedonistic or stereotypic moral reasoning). These models were analyzed separately because, as discussed in the previous section, no general factor for moral reasoning could be elucidated as a valid factorial representation of this variable. Hence, the three subtypes of moral reasoning were used as separate variables.

First, the model examining the relations between self-regulation, needs-oriented moral reasoning and prosocial behaviors showed that cognitive self-regulation had a significant relation with needs-oriented moral reasoning ($b = 0.19, p = 0.008$) and emotion regulation showed a positive relation with prosocial behaviors ($b = 0.49, p < 0.001$). This model showed an acceptable fit to the data ($\chi^2(14)= 89.38, p < 0.001$, scaled CFI = 1.00, scaled TLI = 1.00, scaled RMSEA = 0.00 (0.00-0.00)). An exploration of sex as a covariate, indicated that in this model, girls showed higher levels of emotion regulation ($b = 0.27, p = 0.001$).

The model for self-regulation, hedonistic moral reasoning and prosocial behaviors also showed an adequate fit to the data ($\chi^2(14)= 87.19, p < 0.001$, scaled CFI = 1.00, scaled TLI = 1.00, scaled RMSEA = 0.00 (0.00-0.00)). Unlike the previous model, only a relation between emotion regulation and prosocial behaviors ($b = 0.49, p < 0.001$) was
detected. The relation between cognitive self-regulation and hedonistic moral reasoning only became marginally significant ($b = -0.15, p = 0.058$; this relation is negative as expected). Girls showed higher levels of emotion regulation ($b = 0.26, p < 0.001$) and higher levels of mother education were related to lower hedonistic moral reasoning ($b = -0.16, p = 0.036$).

The third model inspecting the relations amongst self-regulation, stereotypic moral reasoning and prosocial behaviors showed an adequate fit to the data ($\chi^2(14) = 105.41, p < 0.001$, scaled CFI = 1.00, scaled TLI = 1.00, scaled RMSEA = 0.00 (0.00-0.00). Emotion regulation and prosocial behaviors were significantly related ($b = 0.60, p < 0.001$) as well as cognitive self-regulation and stereotypic moral reasoning ($b = 0.16, p < 0.001$). Girls showed higher levels of emotion regulation ($b = 0.26, p < 0.001$) and stereotypic moral reasoning ($b = 0.19, p < 0.001$).

Additionally, three models were specified to further examine the relations between self-regulation, moral reasoning and specific prosocial behaviors. The first additional model depicted the relations amongst cognitive and emotion-related self-regulation, needs-oriented prosocial moral reasoning (as an indirect variable) and each type of prosocial behavior (i.e., compliant helping, sharing, dire prosocial behaviors and public prosocial behaviors). Consistent with the previous results for needs-oriented moral reasoning, the model showed a significant and positive relation between emotional regulation and compliant prosocial behaviors ($b = 0.29, p = 0.004$), sharing ($b = 0.56, p < 0.001$), dire prosocial behaviors ($b = 0.56, p < 0.001$), instrumental prosocial behaviors ($b = 0.56, p < 0.001$) and public prosocial behaviors ($b = 0.28, p = 0.001$). No significant relations were found between self-regulation and needs-oriented prosocial moral
reasoning, or between prosocial moral reasoning and each subtype of prosocial behaviors in this model. The model showed an adequate fit to the data ($\chi^2(33)= 387.08$, $p = 0.001$, CFI = 1.00, TLI = 1.00, RMSEA = 0.00 (0.00-0.13), and AGFI = 0.98). The second additional model was similar to the previous model except that instead of needs-oriented moral reasoning, hedonism was included as the indirect variable for the relation between self-regulation and prosocial behaviors. The exact same results were found with this second model. The positive relations between emotion regulation and the same prosocial behaviors remained significant, and no significant relations were found between self-regulation and hedonistic moral reasoning, or between prosocial moral reasoning and prosocial behaviors. The exact same results were obtained when including stereotypic moral reasoning.

**Comprehensive Model**

The comprehensive models showcased the relations between the two types of self-regulation described in the factor structure section (i.e., emotional and cognitive self-regulation) as exogenous variables, moral reasoning and prosocial behaviors as possible indirect mechanisms and early academic abilities as endogenous variables. The models were estimated using robust maximum likelihood. Missing data was dealt with using full information maximum likelihood and scaled test statistics were used to evaluate the model’s goodness of fit. Missing data affected all the variables at a maximum of 10 % of cases.

Three models were fitted, one for each moral reasoning subtype (according to the previous results showing that no general factor could be identified for moral reasoning).
Comprehensive model a showcases needs-oriented moral reasoning. The model showed an adequate fit to the data ($\chi^2(93)= 113.93, p = 0.069, CFI = 0.92, TLI = 0.90, RMSEA = .00 (0.00-0.04), and AGFI = 0.99$). As it can be seen in Figure 2, cognitive self-regulation was significantly related to needs-oriented moral reasoning ($b = 0.29, p = 0.003$), prosocial behaviors ($b = 0.17, p = 0.019$) and early academic abilities ($b = 0.77, p = 0.013$), whereas emotion regulation was related only to prosocial behaviors ($b = 0.80, p < 0.001$). No significant indirect effects were found in this model, neither a direct effect from moral reasoning to early academic abilities nor from prosocial behaviors to early academic abilities.

Gender and mother education were included as covariates in comprehensive model a. The results showed that girls showed higher levels of emotion regulation than boys ($b = 0.37, p < 0.001$).

Comprehensive model b shows the subtype of hedonistic moral reasoning as the indirect variable (see Figure 3). The model showed an adequate fit to the data ($\chi^2(105) = 961.16, p < .001, scaled CFI = 0.92, scaled TLI = 0.90, scaled RMSEA = 0.07 (0.05-0.08), and AGFI = 0.99$). As it can be seen in Figure 3, cognitive self-regulation was significantly related to early academic abilities ($b = .75, p = .011$), whereas both cognitive and emotion regulation were related to prosocial behaviors ($b = .17, p = .026$ and $b = .80, p < .001$, respectively).

Interestingly, the relation between cognitive self-regulation and prosocial moral reasoning became negative for this model ($b = -0.22, p = 0.032$). This result is theoretically sound because hedonistic moral reasoning is expected to relate negatively with self-regulation, whereas the other subtypes (stereotypic and needs-oriented) are
expected to relate positively to self-regulation. Significant relations between prosocial behaviors and early academic abilities were found ($b = 0.17, p = 0.047$). No significant indirect effects were found in this model. Interestingly, this general model showed only direct effects from the exogenous variables to the endogenous variables, and only for cognitive self-regulation. Also, a significant link between prosocial behaviors and early academic abilities was identified. Gender was related positively to emotion regulation ($b = 0.37, p < 0.001$), indicating higher scores for girls than for boys in this variable.

Finally, comprehensive model $c$ shows stereotypic reasoning as the indicator of moral reasoning (see Figure 4). This model showed an appropriate fit to the data ($\chi^2(105) = 961.16, p < .001$, scaled CFI = 0.90, scaled TLI = 0.89, scaled RMSEA = 0.07 (0.06-0.09). Cognitive self-regulation was related with early academic abilities ($b = 0.78, p = 0.009$) and with stereotypic moral reasoning ($b = 0.21, p = 0.045$). Both cognitive and emotion regulation were related with prosocial behaviors ($b = .17, p = .027$ and $b = .81, p < .001$, respectively). Prosocial behaviors were related with early academic abilities ($b = .15, p = .036$). Girls showed higher levels of emotion regulation than boys ($b = 0.37, p < 0.001$), and additionally for this model, girls showed higher levels on stereotypic moral reasoning than boys ($b = 0.15, p < 0.041$). No significant indirect effects were detected in this model.
Chapter 5: Discussion

Based on prior theory and evidence, this study explored the relations amongst self-regulation and pre-academic skills, taking into account children’s moral reasoning and prosocial behaviors as possible indirect mechanisms by which both cognitive and emotional regulation might have an impact on early academic abilities. Although previous research had examined the interplay amongst some of these variables, there was a lack of a more comprehensive study that could take into account the complex relations between these constructs simultaneously. Also, previous research in the field has been conducted in United States or in Europe, and there are no studies that have examined these relations in Costa Rican preschool children.

This study examined the factorial structure of self-regulation and prosocial behaviors. It also implemented path analysis of incremental complexity to inspect the relations of these variables with early academic abilities to examine the changes on these relations when new variables were added to the model. Finally, structural equation models were specified taking into account the relevant latent variables of the constructs of interest.

Regarding hypothesis 1, the results indicated that self-regulation can be represented as a two-factor model with one dimension regarding the emotional aspects of self-regulation (i.e., emotional regulation in both happy and angry situations and effortful control), and another dimension representing cognitive self-regulation (i.e., inhibitory control, working memory and short-term memory). Concerning hypothesis 2, the results showed that indeed prosocial behaviors for preschool children can be represented as a latent variable with several dimensions: compliant helping, sharing, dire helping,
instrumental prosocial behaviors and public helping. Hypothesis 3 was also supported. Higher levels of cognitive self-regulation were associated with early academic abilities and moral reasoning whereas higher levels of both emotional and cognitive self-regulation were associated with prosocial behaviors. Hypothesis 4 was not supported as self-regulation showed only direct relations with early academic abilities. Finally, girls showed higher levels of emotion regulation, prosocial behaviors and prosocial moral reasoning than boys.

**Factor Structures Elucidated in This Study**

This study made significant contributions to further advance our knowledge about the characteristics and dimensionality of both self-regulation and prosocial behaviors. Regarding self-regulation, it was demonstrated that both cognitive and emotional aspects are important to be considered in order to adequately capture children’s self-regulatory abilities and its factor structure. The results in this respect showed that a general factor of self-regulation did not fit the data as well as a two-factor model (with both dimensions: cognitive and emotional) did. This model showed a good fit to the data and a structure that is theoretically sound. Most of previous studies exploring the relations between self-regulation and academic abilities have mainly focused on one aspect of self-regulation, either cognitive aspects (see for example Blair & Razza, 2007; Espy et al., 2004; Morrison et al., 2010) or emotional aspects (Harrington et al., 2020; Mischel et al., 1989). Although it is important to note that some studies have looked at both cognitive and emotional aspects of self-regulation in regard to academic abilities (Edossa et al., 2018; Willoughby et al., 2011), this study added new knowledge to the field by studying
both types of self-regulation in a Latin-American sample, expanding our knowledge about the importance of both factors of self-regulation.

Regarding the dimensionality of prosocial behaviors, this study presented evidence supporting the conceptualization of helping behaviors as a multidimensional construct. Although this idea is not new, and other measures of prosociality are conceptualized as multidimensional (see Carlo & Randall, 2002), these measures are designed for adolescents. Consequently, most previous studies have used unidimensional measures of prosocial behaviors with preschoolers (Al-Thani & Semmar, 2017; Tremblay, 2000). The present study showed that sharing, compliant, instrumental, dire and public prosocial behaviors are distinguishable in preschool children and that the correlations amongst them have a positive direction. This is in contrast with what has been reported with older children, because public prosocial behaviors usually show negative relations with other types of helping and with other positive outcomes (Brittian et al., 2013; Carlo et al., 2011). One possible explanation for this finding is that preschoolers are being stimulated to act prosocially by teachers and other adults, and as a result they try to look good in front of others by engaging more in public helping and other prosocial behaviors as well, whereas with older children, it has been shown that their participation in public helping is more related to lower levels of prosociality and moral reasoning (Knight et al., 2015).

**Self-Regulation and Early Academic Abilities**

When both cognitive and emotional aspects of self-regulation are explored in their relations with early academic abilities, the results showed that cognitive self-regulation, but not emotion regulation was a significant correlate of early academic abilities. These
results are consistent with other studies exploring the role of both types of self-regulation in academic achievement with preschoolers. Willoughby et al. (2011) showed that when analyzing simultaneously both types of self-regulation, only cognitive aspects of it (e.g., inhibitory control in their study) were associated with early learning. These authors used Woodcock Johnson tasks to measure early academic abilities, which allows for meaningful comparisons with the present study. That no relations between emotion-related self-regulation and early academic abilities were found is probably related to the selection of the tasks to capture early academic learning (letter-word recognition, vocabulary and applied problems) which in turn reflects a tradition of academic preparedness that focus mainly on cognitive aspects. However, previous studies have shown that emotion regulation is associated with academic achievement during the transition to school (Morrison et al., 2010) and older children (Mega et al., 2014). Taken together, these results suggest that early on, cognitive resources explain more of the academic learning that is taking place at preschool centers, but as students grow older, their academic learning is influenced by a wider range of socioemotional and sociocognitive aspects. Another possibility is that the mechanisms by which emotion regulation impacts early academic abilities were not taken into account in this study and future research should look into what specific variables could play such a role. Candidate variables might include frustration management skills, self-awareness and relationship skills.

**Moral Reasoning and Prosocial Behaviors**

Regarding moral reasoning, several aspects are worth mentioning from the results of this study. First, authority-based, approval-oriented and pragmatic moral reasoning
were used by very few children (and the majority did not use them at all), which is consistent with previous studies that have investigated prosocial moral reasoning with preschool children (Eisenberg, 2010). Unlike prohibition-oriented moral reasoning, prosocial moral reasoning in preschool children was not based on ideas regarding authority and punishment, but included references to others’ needs, hedonistic positions and stereotypical ideas about morality. That children used both others’ needs and hedonistic ideas to justify their moral judgments is consistent with previous research that has found that children are capable of making moral decisions based on varied, and even competing considerations (Wright Cassidy et al., 1997).

Secondly, needs-oriented moral reasoning was negatively associated with both hedonistic and stereotypic moral reasoning. These correlations provided evidence for the validity of the measure of prosocial moral reasoning used in this study. Theoretically, it is expected that the more other-oriented children are in their moral judgements, the lower their levels of hedonistic reasoning will be, although both orientations are expected to influence their moral reasoning at this age, primarily because their moral emotions motivate them to consider others’ needs, but at the same time they still focus on their own benefits and desires when analyzing moral dilemmas (Ongley & Malti, 2014). Third, the more common type of prosocial moral reasoning was needs-oriented, followed by hedonistic and stereotypic moral reasoning. These levels of moral reasoning suggest that the group of participating preschool children are primarily focused on the needs of others when they judge prosocial moral situations, although they also take into consideration the implications for the helper, and to a lower extent, preconceptions about what is considered to be a good or a bad person. This is consistent with the model of prosocial
moral reasoning proposed by Eisenberg et al. (2006) which predicts that preschool children would primarily base their moral reasoning in hedonistic and needs-oriented moral reasoning. This model also assumes that the importance of stereotypic moral reasoning increases in middle childhood, although some children may take stereotypic considerations into account in preschool age, which is what this study found. These finds also support the idea that young children are capable of assuming selfless oriented moral positions, contrary to what justice-oriented moral reasoning assumes (Carlo, 2013).

Regarding prosocial behaviors, the most common identified type was sharing, followed by instrumental, public and compliant helping. Dire prosocial behaviors were the less common helping behavior explored in this study. This is consistent with previous research that has shown that sharing develops rapidly during the preschool years and that it helps to develop cohesion and acceptance amongst peers (Flook et al., 2019; Ongley & Malti, 2014), which could explain why sharing was the most common helping behavior in this study. The importance of sharing is also highlighted by the fact that sharing implies a personal sacrifice of resources (specifically school materials and candies, because of the items used in this study) and is key for cooperation (Ongley & Malti, 2014).

Only one significant correlation between stereotypic moral reasoning and dire prosocial behaviors was detected in the preliminary bivariate analysis. However, this relation did not hold in subsequent analysis when other variables were taking into account. One possible explanation for the lack of relations between prosocial moral reasoning and prosocial behaviors is that other motivations to act prosocially were more important than moral judgements in defining preschool children’s prosocial tendencies. It
is important to take into account the specific types of prosocial behaviors considered in this study to understand the lack of significant relations with moral reasoning. As stated above, sharing was the most common subtype of helping, and sharing is highly related to schoolers’ need to establish new social bonds and to obtain acceptance from peers (Ongley & Malti, 2014), motivations that are not intrinsically moral. Other prosocial behavior was instrumental helping, which again, is more related to specific needs that are identified in some situations (Tavassoli et al., 2019) than to a internalized moral principle. Public prosocial behaviors are motivated by both helping others and by looking good in front of others. Finally, compliant prosocial behaviors are associated with a component of obedience (García, 2014), especially in the context of preschool education, which again attends more to a social convention than to a moral motivation itself.

Research with older children has shown that prosocial moral reasoning is related at least with altruistic prosocial behaviors (Knight et al., 2015) but in the present study, such prosocial behavior was not investigated.

Hence, these results suggest that even though moral judgements are linked to children’s prosocial behaviors, they constitute its cognitive, not its motivational dimension. As previous research has shown, being able to understand and to identify others’ needs does not necessarily entails an obligation to engage in prosocial behavior (Malti et al., 2009) and other motivations to act prosocially need to be further study, especially in preschool children.

**Self-Regulation, Moral Reasoning and Prosocial Behaviors**

The model with these variables showed that both cognitive and emotion regulation were related to prosocial behaviors and moral reasoning in distinct ways. This
study added evidence to the field showing that children’s emotional and cognitive self-regulation were associated with prosocial behaviors. On the other hand, only cognitive self-regulation was shown to be related to moral reasoning but not to prosocial behaviors. Cognitive self-regulation was positively related to both needs-oriented and stereotypic moral reasoning, and negatively related to hedonistic moral reasoning. These results were consistent across all models that were tested to examine the relation between self-regulation, moral reasoning and prosocial behaviors. Notably, no significant relations between moral reasoning and prosocial behaviors were detected in these models either. Theoretically, besides moral reasoning, one of the possible motivational mechanisms by which prosociality could be promoted is emotion regulation (Eisenberg, 2001) whereas cognitive self-regulation has been suggested to be an important contributor to children’s moral reasoning (Ball et al., 2017). This study filled a gap in our understanding about the relations amongst these variables because no previous study had tested a comprehensive model where both types of self-regulation, moral reasoning and prosocial behaviors were simultaneously examined.

This evidence expands previous findings suggesting that moral reasoning is a cognitive function and as such, that the higher the cognitive abilities, the higher the moral judgements people are able to consider (Timmons & Byrne, 2019). However, these gains in moral reasoning associated with higher cognitive abilities, do not imply that children are going to act more prosocially (and actually that is what the data showed). On the other hand, this study revealed that higher emotion-related self-regulatory abilities were indeed associated with higher prosocial behaviors. Higher abilities to control the expression of emotions and higher levels of effortful control were associated with a
tendency to show more prosocial behaviors. The results suggest that in order for children to help others and cooperate with other children, it is important for them to manage their emotional responses first. This is consistent with the idea that children need to keep their levels of emotionality in a manageable range when they see someone else in need, otherwise children tend to concentrate in their own feelings and are less likely to engage in prosocial behaviors (Batson et al., 1997). Also, children need cognitive self-regulation to identify others’ needs and to come up with a plan to act accordingly (Knight et al., 2015). This study demonstrated a positive and significant relation between cognitive self-regulation and prosocial behaviors. This finding is in contrast to other research that has reported nonsignificant relations between cognitive abilities and prosocial behaviors (O’Toole et al., 2017). The inconsistency with previous research might be related to at least two aspects of the present study. First, a set of measures were used to determine children’s cognitive abilities. Secondly, a multidimensional measure of prosocial behaviors was used. These two methodological characteristics of this study might have allowed the model to capture a relation between these two variables, whereas other studies using unidimensional measures of prosocial behaviors (see O’Toole et al., 2017) have not found this effect.

Self-Regulation, Moral Reasoning, Prosocial Behaviors and Early Academic Abilities

Finally, this study sought to take the previous findings further and to examine the contributions of self-regulation, moral reasoning and prosocial behaviors to early academic abilities. The patterns of results differed for each type of prosocial moral reasoning. When needs-oriented moral reasoning was evaluated, cognitive self-regulation
remained associated with moral reasoning and both cognitive and emotion regulation became significantly and positively associated with prosocial behaviors. However, no significant relation from either moral reasoning or prosocial behavior with early academic abilities were detected. When hedonistic moral reasoning was investigated as the indicator of moral reasoning, the results changed in one important way. The direction of the link between cognitive self-regulation and moral reasoning became negative. When stereotypic moral reasoning was analyzed as the indicator of moral reasoning, this relation between cognitive self-regulation and moral reasoning changed back to being positive. One important additional difference in this final model was detected: prosocial behaviors became significantly related with early academic abilities.

The results from the comprehensive models added important knowledge to our understanding of the complex relations amongst the study variables. First, both cognitive and emotion regulation were associated with prosocial behaviors. In all the models that did not include early academic abilities, only emotion regulation was related to prosocial behaviors. These results indicate that comprehensive models are important to be implemented because they showcase a more realistic representation of the relations amongst the sociocognitive and socioemotional abilities in children and that some relations that appear to be nonsignificant, emerge and can be detected by researchers when other variables are considered in the model.

This evidence suggests that children’s emotional and cognitive resources are important to identify others’ needs and act upon them in a prosocial way, which is consistent with previous findings (Ball et al., 2017; Chernyak et al., 2018; Eisenberg et al., 2006). Secondly, the link between cognitive self-regulation and hedonistic moral
reasoning was negative, whereas the links between cognitive self-regulation and both needs-oriented and stereotypic moral reasoning were positive. These results suggest that an important aspect of our representation of moral situations is cognitive abilities. To interpret these results, the positive relation between emotional-self-regulation and prosocial behaviors needs to be taken into account. Given that children have high emotional-self-regulation, the higher their cognitive abilities the higher the possibility that they focus in others’ needs and that they use more moral considerations when analyzing a prosocial moral dilemma. This is only a preliminary finding and future research should test this hypothesis to broaden our understanding of the interplay amongst cognition, emotional and morality.

Only when stereotypic moral reasoning is included as the indicator for moral reasoning, prosocial behaviors showed significant links with early academic abilities. Again, this is an important message for researchers because the relation between prosocial behaviors and early academic abilities changed dramatically depending on the subtype of a third variable in the model (i.e., moral reasoning). Interestingly, the relation between prosocial behaviors and early learning emerged as significant only when the most sophisticated level of prosocial moral reasoning in the study (i.e., stereotypic reasoning) was included in the model. Stereotypic moral reasoning is usually found in older children who have developed more cognitive skills (Tur-Porcar et al., 2016) which supports the idea that this type of reasoning is more advance than hedonistic and needs-oriented moral reasoning. It could be the case that this model captured the relation between prosociality and early learning because taking into account a high moral reasoning subtype, helped to reduce the error variance in prosocial behaviors, and that
allowed the model to be more precise at detecting relations between prosociality and early learning. Also, because cognitive self-regulation was related to both moral reasoning and early learning, adding a higher subtype of moral reasoning could have allowed prosocial behaviors to relate specifically to the portion of variance in early learning that was not already explained by children’s cognitive self-regulatory abilities.

This study added new evidence that helps to clarify the role of prosocial behaviors in early learning. Taking together, these results showed that because early academic abilities are mainly promoted during activities that require children to engage in relationships with others, their levels of prosociality can have an impact on their learning outcomes, at least partially. Prosocial behaviors have been shown to reduce peer rejection, which limits children’s positive relationships and early learning outcomes (Webster-Stratton et al., 2008). Prosociality can facilitate that teachers and peers engage in more productive social relationships that enable learning and that create adequate environments for children to experience and practice their emergent early academic abilities. These environments can promote social relationships that in turn stimulate children’s self-regulatory abilities (Fabes et al., 2009) and motivate children’s academic learning (Coplan & Arbeau, 2009), mainly by enhancing children’s adjustment in educational settings (Brown & Lee, 2014).

Because social behaviors are shaped within particular contexts, the previous findings need to be interpreted taking into account the cultural context in which this study was conducted. Although this was not a cross-cultural study, it is important to consider various cultural differences between Costa Rican children and children from other countries, mainly from European and European-American backgrounds, where the
The majority of research has been conducted. Cultural norms and parental expectations about children’s expression of emotions and opinions vary between these populations. For example, Costa Rican children are motivated to restrain the expression of negative emotions and disappointment when confronted with a situation that was not what they expected, which is in accordance with parents’ socialization goals in Costa Rica (Conejo & Garnier, 2011), whereas children from more individualistic cultures are permitted to demonstrate their disagreements and negative emotions in a more open way (Keller & Otto, 2009). Also, inhibitory aspects of self-regulation have been compared among children from Costa Rica, Germany and Cameroon, finding that German and Costa Rican children showed higher levels of inhibition than Cameroonian children did (Chasiotis et al., 2006).

The cultural pressure to regulate negative emotions might have affected the results in this study about emotion regulation and consequently, about self-regulation and its relation to other variables, specifically prosocial behaviors and early academic abilities. The fact that emotion regulation was related to prosocial behaviors could be due to parental expectations about children regulating their emotions and behavior to be “bien educados” (well educated, which means to behave in a way that show respect, strong moral character and good manners). Being obedient is an important aspect of being bien educado (Bridges et al., 2012) and that could be related to following requests to self-regulate and act prosocially with others. Additionally, research has shown that Latino families promote cooperation and helping behaviors within the family (Steidel & Contreras, 2003), which in turn might have an effect on children’s prosocial development.
Limitations

This study suffered from some limitations that are important to acknowledge. First, the data was cross-sectional and only captured a static image of the relations between the variables of main interest. Socio-cognitive and socio-emotive abilities suffer dramatic changes in preschool children (Anderson et al., 2008; Bull & Lee, 2014) and it is likely that the way these variables relate to each other changes over time. Also, because the data was cross-sectional, the direction of the effects cannot be discerned. For example, it could be the case that changes in early academic abilities modify the expression of children’s cognitive and emotional characteristics, due to early experiences in educational environments with teachers or classmates. These alternative explanations cannot be ruled out in this study and future longitudinal research should explore and test alternative hypotheses concerning the effects reported in this study. Also, future studies with causation hypotheses should test reverse causal models to analyze alternative causal explanations. The present study did not test such models because the data was cross-sectional, and no causal inferences were made (Leszczensky & Wolbring, 2019). It was assumed that the effects being explored were correlational and consequently, no reverse causal models were explored. Also, it is important to note that causation, even in longitudinal and experimental designs, is based on theoretical frameworks, rather than on direct observations that can be tested against the data (Kerry et al., 2012).

Although the sample size of this study offered enough statistical power to test the proposed models, it did not allow to conduct multi-group analysis or invariance tests for the factor structures elucidated in this study. This limitation is important to consider because it is unknown if the factor structures or the relation amongst the variables are
equally valid for boys and girls. Sex was used as a covariate in all the analyses, but the role of sex as a covariate did not allow to test possible differences in the factor structure or the relations amongst the variables as it only made possible to control for mean differences.

Additionally, all the participants were recruited in public schools in the capital city of Costa Rica and by no means they were representative of the various cultural groups and of the differences in socioeconomic status that characterize Costa Rican children, especially nowadays with the growing inequality that has been demonstrated recently in the country (González Pandiella & Gabriel, 2017).

Data were teacher- or parent-reported and from direct evaluations of children’s abilities with standardized tests. Although these sources of information coming from multiple reporters offered internal validity and internal consistency, their ability to clarify the extent to which the conclusions from this study apply to natural daily basis activities at the preschool centers is very limited. Also, this study did not include enough family information about their dynamics, their composition and their communities. The interpretation of the results needs to be more contextualized to children’s socioeconomic realities and the lack of information about the different levels of their context limited the interpretation of the results.

**Future Directions**

Future research should investigate how the findings from this study unfold over time, by testing the models longitudinally. When testing the models, because of the evidence presented here, both emotional and cognitive aspects of self-regulation, and multidimensional measures of prosocial behaviors should be used. The factor structures
elucidated in this study should be further investigated with invariance factor structure tests for both boys and girls. Also, factor structure invariance of these models should be demonstrated for different ages of children. It is likely that future research will have to find better factor representations of these variables for younger and older children.

Subsequent studies should also investigate the relations between prosocial behaviors and early academic abilities. The findings about their relation in this study differed depending on the subtype of prosocial moral reasoning that was included in the models. Consequently, future research needs to clarify what aspects of prosocial behaviors and moral reasoning promote early learning in order to develop potential interventions to enhance children’s academic outcomes. Also, future research should identify other mechanisms by which self-regulation affects early learning. This study showed partial evidence about the importance of prosocial behaviors, but other studies should identify other sociocognitive mechanisms.

Although the evaluation of prosocial moral reasoning was enjoyable for most children and it offered evidences of validity in this study, future research should implement evaluations that allow for a more natural assessment setting that capture children’s moral reasoning in situations that are more meaningful for them and that offer a more applied version of their moral reasoning, considering their daily basis activities.

Early academic abilities in future research should include other categories of academic learning, for example phonemic awareness, motivation, attendance persistence, attitudes toward learning and speech, among other variables associated with early academic abilities (McWayne et al., 2004; Montoya et al., 2019). Although cognitive aspects of academic learning are very important in current preschool curricula,
motivational and attitudinal aspects of early learning play an essential role in children’s academic outcomes and need to be further understood.

The present study using a multi-report, multi-method model showed that self-regulation has both emotional and cognitive aspects that need to be taken into account because they contribute differently to other sociocognitive and socioemotional abilities. Also, this study showed that in preschool children, different prosocial behaviors can be distinguished and that preschool children engage in different moral reasoning subtypes that differ in cognitive complexity and in the role that others’ needs are considered. The results also showed that self-regulation and prosocial behaviors have differential relations with early academic abilities. These findings have implications for theoretical frameworks about human development and school readiness by highlighting the importance of prosociality to children’s positive adjustment in educational and social contexts.
Table 1: Coding categories used to codify the measure of Prosocial Moral Reasoning

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authority and punishment reasoning</td>
<td>Conscience is equated with anxiety about punishment. Avoidance of punishment and unquestioning deference to power are valued in their own right. The physical consequences of an action determine its goodness regardless of human values and needs.</td>
</tr>
<tr>
<td>Hedonism</td>
<td>The child is motivated by considerations of selfish gain for himself or others he is identified with.</td>
</tr>
<tr>
<td>Psychological needs oriented or physical needs oriented (needs-oriented)</td>
<td>The actor labels or orients to the physical or psychological needs of others and appears to consider these needs in his or her reasoning.</td>
</tr>
<tr>
<td>Pragmatic reasoning</td>
<td>The child justifies a given course of action with nonmoral, practical considerations (reasons unrelated to fulfilling another’s needs).</td>
</tr>
<tr>
<td>Stereotypic reasoning</td>
<td>The child justifies a given course of action with stereotyped conceptions of good and bad behavior and/or persons.</td>
</tr>
<tr>
<td>Approval-oriented reasoning</td>
<td>The child considers other’s approval and acceptance in justifying a given course of action.</td>
</tr>
</tbody>
</table>

Note: Definitions were taken from Eisenberg (2016)
Table 2: Descriptive statistics for the variables used to measure self-regulation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>Range</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhibitory Control</td>
<td>28.3</td>
<td>7.21</td>
<td>13</td>
<td>43.5</td>
<td>30.5</td>
<td>-0.09</td>
<td>-0.69</td>
</tr>
<tr>
<td>Working Memory</td>
<td>4.24</td>
<td>1.04</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>-0.99</td>
<td>1.69</td>
</tr>
<tr>
<td>Short-term memory</td>
<td>3.68</td>
<td>0.95</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>1.08</td>
<td>5.46</td>
</tr>
<tr>
<td>Effortful Control</td>
<td>3.59</td>
<td>0.67</td>
<td>1.75</td>
<td>5</td>
<td>3.25</td>
<td>-0.07</td>
<td>-0.45</td>
</tr>
<tr>
<td>Emotion Regulation (happiness)</td>
<td>4.15</td>
<td>0.65</td>
<td>1.75</td>
<td>5</td>
<td>3.25</td>
<td>-0.76</td>
<td>0.71</td>
</tr>
<tr>
<td>Emotion Regulation (anger)</td>
<td>2.19</td>
<td>1.01</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>-0.66</td>
<td>-0.04</td>
</tr>
</tbody>
</table>
Table 3: Correlation matrix for the variables used to measure self-regulation

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Inhibitory Control</td>
<td>0.16*</td>
<td>0.31***</td>
<td>-0.07</td>
<td>-0.01</td>
<td>0.04</td>
<td>0.39***</td>
</tr>
<tr>
<td>2.</td>
<td>Working Memory</td>
<td>0.06</td>
<td>0.04</td>
<td>-0.03</td>
<td>0.08</td>
<td>0.17*</td>
<td>0.12</td>
</tr>
<tr>
<td>3.</td>
<td>Short-term memory</td>
<td>-0.1</td>
<td>-0.06</td>
<td>0.16*</td>
<td>0.11</td>
<td>0.28**</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Effortful Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Emotion Regulation (happiness)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.36***</td>
<td>-0.02</td>
</tr>
<tr>
<td>6.</td>
<td>Emotion Regulation (anger)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.03</td>
</tr>
<tr>
<td>7.</td>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.08</td>
</tr>
<tr>
<td>8.</td>
<td>Mother’s education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

*Note.* *"* = p < .05; **" = p < .01; ***" = p < .001
Table 4: Results of the tests exploring gender differences in the self-regulation variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>M (SD)</th>
<th>Boys (SD)</th>
<th>Girls (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhibitory Control</td>
<td>-0.04</td>
<td>136</td>
<td>0.990</td>
<td>28.38 (7.52)</td>
<td>28.44 (6.86)</td>
<td></td>
</tr>
<tr>
<td>Working Memory</td>
<td>-1.89</td>
<td>136</td>
<td>0.061</td>
<td>2.64 (0.83)</td>
<td>2.89 (0.70)</td>
<td></td>
</tr>
<tr>
<td>Short-term Memory</td>
<td>-0.68</td>
<td>181</td>
<td>0.497</td>
<td>3.63 (0.72)</td>
<td>3.72 (1.15)</td>
<td></td>
</tr>
<tr>
<td>Effortful Control</td>
<td>-3.41</td>
<td>130</td>
<td>0.016</td>
<td>3.44 (0.66)</td>
<td>3.81 (0.60)</td>
<td></td>
</tr>
<tr>
<td>Emotion Regulation (happiness)</td>
<td>-2.03</td>
<td>133</td>
<td>0.044</td>
<td>4.08 (0.68)</td>
<td>4.30 (0.60)</td>
<td></td>
</tr>
<tr>
<td>Emotion Regulation (anger)</td>
<td>-1.33</td>
<td>131</td>
<td>0.186</td>
<td>2.13 (1.09)</td>
<td>2.37 (0.98)</td>
<td></td>
</tr>
</tbody>
</table>

Note. df = degrees of freedom
Table 5: Descriptive statistics for the dimensions of prosocial behaviors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>Range</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliant PB</td>
<td>2.91</td>
<td>0.51</td>
<td>1</td>
<td>3.67</td>
<td>2.67</td>
<td>-0.67</td>
<td>0.35</td>
</tr>
<tr>
<td>Sharing</td>
<td>3.24</td>
<td>0.63</td>
<td>1</td>
<td>4.2</td>
<td>3.2</td>
<td>-0.62</td>
<td>0.55</td>
</tr>
<tr>
<td>Instrumental PB</td>
<td>3.18</td>
<td>0.61</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>-0.51</td>
<td>0.01</td>
</tr>
<tr>
<td>Dire PB</td>
<td>2.18</td>
<td>0.61</td>
<td>1</td>
<td>3.67</td>
<td>2.67</td>
<td>0.68</td>
<td>-0.17</td>
</tr>
<tr>
<td>Public PB</td>
<td>2.91</td>
<td>0.51</td>
<td>1</td>
<td>3.67</td>
<td>2.67</td>
<td>-0.67</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Note. PB = prosocial behavior
Table 6: Results of the tests exploring gender differences in prosocial behaviors

<table>
<thead>
<tr>
<th>Variable</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Boys</td>
</tr>
<tr>
<td>Compliant PB</td>
<td>-1.68</td>
<td>172</td>
<td>0.093</td>
<td>2.85 (0.54)</td>
</tr>
<tr>
<td>Sharing</td>
<td>-2.41</td>
<td>172</td>
<td>0.016</td>
<td>3.07 (0.66)</td>
</tr>
<tr>
<td>Instrumental PB</td>
<td>-3.36</td>
<td>171</td>
<td>&lt; 0.001</td>
<td>3.09 (0.73)</td>
</tr>
<tr>
<td>Dire PB</td>
<td>-2.45</td>
<td>172</td>
<td>0.015</td>
<td>3.13 (0.65)</td>
</tr>
<tr>
<td>Public PB</td>
<td>-1.99</td>
<td>170</td>
<td>0.047</td>
<td>2.09 (0.58)</td>
</tr>
</tbody>
</table>

Note. df = degrees of freedom
Table 7: Descriptive statistics for the types of prosocial moral reasoning

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>Range</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authority MR</td>
<td>0.05</td>
<td>0.23</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>5.57</td>
<td>33.68</td>
</tr>
<tr>
<td>Hedonistic MR</td>
<td>1.05</td>
<td>1.18</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>0.9</td>
<td>-0.2</td>
</tr>
<tr>
<td>Needs-oriented MR</td>
<td>1.86</td>
<td>1.25</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>0.13</td>
<td>-1.06</td>
</tr>
<tr>
<td>Pragmatic MR</td>
<td>0.04</td>
<td>0.22</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>6.12</td>
<td>40.76</td>
</tr>
<tr>
<td>Stereotypic MR</td>
<td>0.56</td>
<td>0.93</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>1.62</td>
<td>1.85</td>
</tr>
<tr>
<td>Approval-oriented MR</td>
<td>0.07</td>
<td>0.3</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>4.39</td>
<td>20.24</td>
</tr>
</tbody>
</table>

Note. MR = moral reasoning
Table 8: Results of the tests exploring gender differences in prosocial moral reasoning

<table>
<thead>
<tr>
<th>Variable</th>
<th>$W$</th>
<th>$p$</th>
<th>Median (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Boys</td>
</tr>
<tr>
<td>Hedonistic MR</td>
<td>4291</td>
<td>0.3019</td>
<td>0.25 (0 - 1)</td>
</tr>
<tr>
<td>Needs-Oriented MR</td>
<td>3657</td>
<td>0.378</td>
<td>0.25 (0 - 1)</td>
</tr>
<tr>
<td>Stereotypic MR</td>
<td>3271</td>
<td>0.016</td>
<td>0 (0 - 0.75)</td>
</tr>
</tbody>
</table>

Note. MR = moral reasoning; df = degrees of freedom
Table 9: Correlation matrix for the variables used to measure moral reasoning and prosocial behavior

<table>
<thead>
<tr>
<th>Variable</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hedonistic MR</td>
<td>-0.6***</td>
<td>-0.41***</td>
<td>0.03</td>
<td>-0.06</td>
<td>-0.05</td>
<td>-0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>2. Needs-Oriented MR</td>
<td>-0.08</td>
<td>-0.08</td>
<td>0.02</td>
<td>0.06</td>
<td>0.01</td>
<td>-0.02</td>
<td></td>
</tr>
<tr>
<td>3. Stereotypic MR</td>
<td>0.02</td>
<td>0.1</td>
<td>0.08</td>
<td>0.11**</td>
<td>-0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Compliant PB</td>
<td></td>
<td></td>
<td></td>
<td>0.42***</td>
<td>0.46***</td>
<td>0.44***</td>
<td>-0.05</td>
</tr>
<tr>
<td>5. Sharing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.84***</td>
<td>0.78***</td>
<td>0.16***</td>
</tr>
<tr>
<td>6. Instrumental PB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.83***</td>
<td>0.16*</td>
</tr>
<tr>
<td>7. Dire PB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.25*</td>
</tr>
<tr>
<td>8. Public PB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

* = p < .05; ** = p < .01; *** = p < .001; PB = prosocial behavior; MR = moral reasoning
Table 10: Descriptive statistics for the early academic abilities’ measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>Range</th>
<th>Skew</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter-word recognition</td>
<td>5.6</td>
<td>8.83</td>
<td>1</td>
<td>76</td>
<td>75</td>
<td>6.26</td>
<td>43.64</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>22.59</td>
<td>3.13</td>
<td>9</td>
<td>32</td>
<td>23</td>
<td>-0.79</td>
<td>2.1</td>
</tr>
<tr>
<td>Mathematical abilities</td>
<td>16.04</td>
<td>4.98</td>
<td>1</td>
<td>29</td>
<td>28</td>
<td>0.27</td>
<td>-0.24</td>
</tr>
</tbody>
</table>
Table 11: Spearman correlation matrix for the variables used to measure early academic abilities

<table>
<thead>
<tr>
<th>Variable</th>
<th>Vocabulary</th>
<th>Mathematical Abilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Letter-word recognition</td>
<td>0.41***</td>
<td>0.38***</td>
</tr>
<tr>
<td>2. Vocabulary</td>
<td></td>
<td>0.58***</td>
</tr>
</tbody>
</table>

*Note.* *** = p < .001
Table 12: Fit indicators for the tested models of self-regulation

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>p</th>
<th>Scaled CFI</th>
<th>Scaled TLI</th>
<th>Scaled’’ RMSEA (CI)</th>
<th>AGFI</th>
<th>AIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model a+</td>
<td>35.74</td>
<td>9</td>
<td>&lt; 0.001</td>
<td>0.67</td>
<td>0.45</td>
<td>0.12 (0.08 - 0.17)</td>
<td>1</td>
<td>3368.7</td>
</tr>
<tr>
<td>Model b++</td>
<td>12.45</td>
<td>8</td>
<td>0.132</td>
<td>0.95</td>
<td>0.90</td>
<td>0.05 (0.0 -0.11)</td>
<td>1</td>
<td>3347.4</td>
</tr>
</tbody>
</table>

Note. + = A unidimensional model of self-regulation
++ = A multidimensional model of self-regulation with two factors: cognitive and emotional self-regulation
**Table 13:** Chi square comparison test between the models of self-regulation

<table>
<thead>
<tr>
<th>Model</th>
<th>df</th>
<th>AIC</th>
<th>BIC</th>
<th>$\chi^2$</th>
<th>$\Delta \chi^2$</th>
<th>$\Delta$ df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model a$^+$</td>
<td>9</td>
<td>3368.7</td>
<td>3427.2</td>
<td>35.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model b$^{++}$</td>
<td>8</td>
<td>3347.4</td>
<td>3409.2</td>
<td>12.45</td>
<td>43.17</td>
<td>1</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

*Note.* df = degrees of freedom

$^+$ = A unidimensional model of self-regulation

$^{++}$ = A multidimensional model of self-regulation with two factors: cognitive and emotional self-regulation
Table 14: Fit indicators for the tested models of prosocial behaviors

*Note.* df = degrees of freedom
+ = A unidimensional model of prosocial behaviors
++ = A multidimensional model of prosocial behaviors with five factors: compliant helping, sharing, instrumental, dire and public prosocial behavior.

<table>
<thead>
<tr>
<th>Model</th>
<th>( \chi^2 )</th>
<th>df</th>
<th>p</th>
<th>Scaled CFI</th>
<th>Scaled TLI</th>
<th>Scaled RMSEA (CI)</th>
<th>AGFI</th>
<th>AIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model a+</td>
<td>192.73</td>
<td>90</td>
<td>&lt; 0.001</td>
<td>0.85</td>
<td>0.81</td>
<td>0.14 (0.12 – 0.16)</td>
<td>0.96</td>
<td>6195.32</td>
</tr>
<tr>
<td>Model b++</td>
<td>111.99</td>
<td>80</td>
<td>&lt; 0.001</td>
<td>0.92</td>
<td>0.89</td>
<td>0.10 (0.08 - 0.13)</td>
<td>0.97</td>
<td>6128.58</td>
</tr>
</tbody>
</table>
Table 15: Chi square comparison test between the models of prosocial behaviors

<table>
<thead>
<tr>
<th>Model</th>
<th>df</th>
<th>AIC</th>
<th>BIC</th>
<th>$\chi^2$</th>
<th>$\Delta \chi^2$</th>
<th>$\Delta$ df</th>
<th>$\Delta$ df</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model a$^+$</td>
<td>80</td>
<td>6195.32</td>
<td>6338.50</td>
<td>305.54</td>
<td>40.42</td>
<td>10</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Model b$^{++}$</td>
<td>90</td>
<td>6128.58</td>
<td>6303.60</td>
<td>218.80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* df = degrees of freedom  
$^+ =$ A unidimensional model of prosocial behaviors  
$^{++} =$ A multidimensional model of prosocial behaviors with five factors: compliant helping, sharing, instrumental, dire and public prosocial behavior.
Figure 1: Comprehensive theoretical model of early academic abilities to be tested in this study.

Note. PB = prosocial behavior.
Figure 2: Comprehensive model a showcasing needs-oriented moral reasoning

Note. PB = prosocial behavior.

Only significant paths are depicted.
Note. PB = prosocial behavior.

Only significant paths are depicted.
Figure 4: Comprehensive model showcasing stereotypic moral reasoning

Note. PB = prosocial behavior

Only significant paths are depicted.
References


measure. Biennial meeting of the Society for Research on Child Development, Austin, Texas.


advantaged and disadvantaged children? Learning and Instruction, 30(Supplement C), 25–31. https://doi.org/10.1016/j.learninstruc.2013.11.003


https://doi.org/10.1037/emo0000667


achievement: A cross-cultural analysis of Chinese and American preschoolers.


https://doi.org/10.1016/j.appdev.2003.08.002


https://doi.org/10.1177/0049124119882473


https://doi.org/10.1037/edu0000203


https://doi.org/10.1111/1467-9507.00232


https://doi.org/10.1073/pnas.1811388115


VITA

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Currently, Diego is an adjunct professor at the National University of Costa Rica, where he conducts research in early childhood education and developmental psychology. He is also doing research on emergent literacy in young children and he is working with families to promote shared reading and reminiscence as mechanisms that improve children’s abilities to read and write.

During his professional and academic experience, he has developed a strong commitment to enhancing children’s opportunities to attend high quality public preschool education in Costa Rica and the region. Since 2015, he has been a consultant for the Estado de la Educación, a national agency responsible for evaluating coverage rates and quality of the Costa Rican educational system. He also participates in the evaluation of family intervention programs and currently he is part of a research project that investigates the effects of programs that promote emergent literacy in Costa Rica.