Novel Measures of Culture and Their Relation to Self-regulation in Middle Childhood:

A Genetically Informed Twin Study

by

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ABSTRACT

It has been theorized that cultural variation within the family shapes children's self-regulatory competence, yet there is a dearth of research examining the relation between culture and self-regulation. Family orientation refers to the emphasis on providing support, respect, and obligation to the family system, and is important for children's functioning, yet existing literature on related constructs relies on parent-reported measures. Additionally, quantitative genetic research has neglected the role of culture in the genetic and environmental contributions on children's self-regulation. There were three main aims of this study: 1) to propose novel coding schemes and factor analytic approaches to capture family orientation, 2) to examine the relation between family orientation and self-regulation in middle childhood, and 3) to examine whether family orientation moderates the genetic and environmental influences on self-regulation in middle childhood. The sample was drawn from the Arizona Twin Project (N=710) where children (49.1% female, 55.6% White, 28.3% Hispanic/Latino) were assessed at approximately eight years of age (M_{age} = 8.38 years, SD = 0.66). Family orientation values were indexed by parent-reported familism, whereas family orientation behaviors comprised coded measures of children's family orientation and experimenter ratings of caregiver and child behavior. Outcome measures of self-regulation included the Continuous Performance Task, Flanker Task, Digit Span Backward, and parent- and teacher-reported effortful control (Temperament in Middle Childhood Questionnaire). Higher family orientation behaviors predicted positively predicted children's self-regulation, with the exception of Digit Span Backward performance, and associations were not moderated by child sex, family SES, or race/ethnicity. Twin models revealed

that differences in family orientation behaviors could be attributed to genetic, shared, and nonshared environmental influences, and additive genetic and nonshared environmental influences explained the variation across measures of self-regulation. Finally, there was no evidence that family orientation values nor behaviors moderated the genetic or environmental influences on children's self-regulation. This study highlights the complex nature of cultural variation within the family and its importance for children's self-regulatory abilities.

DEDICATION

I dedicate this dissertation to my husband, Nick. Thank you for being willing to uproot our lives and move to the desert so I could pursue my dreams. Although it was not easy, your support has never wavered. Thank you for sitting through all of my practice talks and listening to me blabber on about gene-environment interaction (sorry if it contributed to your allostatic load). And most importantly, thank you for all you have done to support our growing family. It has been a blessing to be able to raise Luca and still be able to write my dissertation and finish school. I am so excited for this new – and colder – chapter. I love you.

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Research on child development is primarily conducted using White, middle-class children and utilizes theoretical models developed by White scholars for White populations, greatly limiting our understanding of how developmental processes influence children from diverse sociocultural backgrounds (Buchanan et al., 2021). Self-regulation, defined as the ability to intrinsically shift one's behavior, attention, and emotions both voluntarily and adaptively (Eisenberg & Spinrad, 2004; Kopp, 1982), is a salient aspect of children's socioemotional functioning and is predictive of multiple positive outcomes throughout the lifespan, including academic achievement and social competence (Liew, 2012; McClelland & Cameron, 2011). It has been theorized that cultural variation within the family shapes children's self-regulatory competence in early childhood (Li-Grining, 2012), yet few studies have empirically examined the relation between culture and self-regulation. In the first years of life, executive functions develop in nonspecific ways but as children age, particular cultural values transmitted through socialization processes influence self-regulatory behaviors (Denham, 1998; Trommsdorff & Cole, 2011). However, developmental theoretical frameworks often conflate race/ethnicity with culture and conduct race/ethnic group comparisons in an initial attempt to understand the role of cultural values. Additionally, twin study designs have demonstrated additive effects of multiple genes and the role of the nonshared environment in explaining individual differences in self-regulation. However, many twin studies have neglected the role of cultural processes that could influence those estimates. Using a large, demographically diverse sample of twins in middle childhood, this study

aimed to develop novel measures of family orientation, examined the relation between family orientation and self-regulation, and tested whether family orientation moderated the genetic and environmental contributions to self-regulation. Developing novel measures of culture within the family has the potential to elucidate particular contexts that promote self-regulatory behaviors in children across various racial/ethnic and socioeconomic backgrounds.

Self-Regulation in Middle Childhood

Self-regulation is defined as the ability to govern one's behavior, attention, and emotions both voluntarily and adaptively (Eisenberg & Spinrad, 2004). Self-regulatory behaviors are carried out through intrinsic motivation as opposed to external sources of control (Kopp, 1982). For the purposes of this study, self-regulation is an umbrella term including task-based measures of executive functioning as well as parent- and teacher-reported measures of effortful control (Nigg, 2017). Self-regulation is related to a multitude of outcomes across the lifespan, including academic achievement, social competence, and health (Liew, 2012; McClelland & Cameron, 2011; Moffitt et al., 2011). Importantly, self-regulation is more predictive of school readiness than IQ or early reading or math ability (Blair, 2002; Blair & Razza, 2007), demonstrating the need to integrate this phenotype into empirical work. The development of self-regulation begins in infancy and undergoes dramatic changes throughout the first two decades of life (Gestsdóttir & Lerner, 2007; Kochanska et al., 2001). Middle childhood, spanning from ages 5 to 12, is a particularly important developmental period for self-regulation, as it is a time in which children are beginning formal schooling and increasingly interacting with the environment without their caregivers (Votruba-Drzal, 2006).

The broader parenting literature has consistently demonstrated the importance of parenting practices on the development of children's self-regulation (Demetriou, 2000; Kopp, 1982). For example, high parental warmth and low endorsement of physically punitive punishment are parenting characteristics related to higher self-regulation in middle childhood (Colman et al., 2006; Eisenberg et al., 1999). Similarly, meta-analyses show that secure parent-child attachment relationships (Pallini et al., 2018) and positive parental control (Karreman et al., 2006) are associated with better children's self-regulation. This research highlights the role that parenting plays in the development of children's self-regulation; however, this literature has been conducted largely with White middle-class convenience samples. Culture and parenting are inextricable, therefore research identifying particular cultural processes implicated in self-regulation across all children is needed.

The Role of Culture in Children's Socioemotional Development

Cultural variation within the family is thought to shape children's self-regulatory competence (Raver, 2004; Trommsdorff & Cole, 2011). More specifically, executive functions in the first few years of life develop in nonspecific ways, but as children age, self-regulatory behaviors are influenced by cultural values that are transmitted through socialization processes (Denham, 1998; Trommsdorff & Cole, 2011). Culture can be defined as ideas, behaviors, and values that are shared and disseminated by members of a community (Cavalli-Sforza & Feldman, 1981; Chiao et al., 2010; Feldman & Cavalli-Sforza, 1976).

Culture is often conflated with race/ethnicity (Causadias et al., 2018; Quintana et al., 2006). Race is a socially constructed concept that relies on categorizing individuals

based on phenotypic characteristics (e.g., skin color, facial features) to distinguish groups, and ethnicity refers to identification with a particular group that has unique cultural heritage and practices (Golash-Boza, 2016). Indeed, particular racial/ethnic groups experience unique cultural processes such as acculturation (Garcia-Coll et al., 2000; Li-Grining et al., 2021) and discrimination (Seaton et al., 2012); however, solely using race/ethnicity as a proxy for culture can lead to several issues. First, psychological research tends to attribute traits and behaviors of racial/ethnic minorities as being shaped by cultural processes and less by psychological processes whereas Whites' (e.g., European Americans) traits and behaviors are thought to be shaped by psychological processes and less by cultural influences (Causadias et al., 2018). However, racially/ethnically privileged groups are no less influenced by cultural processes than minority groups (Spencer, 2006). Additionally, using race/ethnicity and culture interchangeably results in European American or Western samples being seen as the norm or ideal manifestation of human behavior (Causadias et al., 2018; Medin et al., 2010), whereas racial/ethnic minorities are often portrayed as inherently dysfunctional or lacking positive resources (Coll et al., 2000).

Culture influences all groups of humans and is implicated in all behaviors and experiences, however psychological research often views culture as a process that is external to the individual (Super & Harkness, 1999). For example, Bronfenbrenner's (1979) bioecological model of development considers culture in the macrosystem, and although this representation suggests that culture trickles down to the individual through the exo-, meso-, and microsystems, this depiction does not capture the pervasive and vital role that culture plays in everyday human life (D'Andrade, 1990, p. 65; Super &

Harkness, 1999). Several alternative theoretical frameworks emphasize the role of culture in children's development, placing culture as a central and integral, rather than distal, influence on development.

For example, two theories have reconceptualized Bronfenbrenner's (1979) bioecological model of development to highlight culture's role across all levels of influence. First, Juang and colleagues (2012) placed culture at the core, with arrows pointing outwards to self, family, and values. The authors opted for culture to be central to the model, as they theorized that all proximal processes are cultural in nature (Juang et al., 2012). Similarly, Velez-Agosto and colleagues (2017) developed the cultural microsystem model. Rather than representing various influences in a layered, hierarchical manner, influences (e.g., family, school, political policies) are depicted in a spiral. Importantly, the influence of culture is overlayed across the entire model to represent that culture exists across both distal and proximal settings (Velez-Agosto et al., 2017). Together, these theories highlight the central role that culture plays across all domains of influence in children's development.

The Developmental Niche Theory (Super & Harkness, 1986) was developed in response to the use of experimental paradigms in psychology throughout the 1900s that attempted to isolate children's behavior in a laboratory setting. The Developmental Niche Theory states that researchers cannot understand children's development without considering the environment, asserting that culture directly influences parenting by shaping beliefs around what rearing practices are considered appropriate or effective and the needs and developmental goals for children (Le et al., 2008). More specifically, the Developmental Niche Theory has three components: 1) the physical and social settings

that the child lives in, 2) culturally regulated customs of child care and child rearing, and 3) the psychology of the caretakers (Super & Harkness, 1986).

In sum, although the aforementioned theories emphasize culture's role in children's development, research in psychology often considers culture to be a niche topic that is only applicable to racial/ethnic minorities (i.e., cultural (mis)attribution bias; Causadias et al., 2018). There is a need for psychological research to develop novel measurements of culture that go beyond solely using race/ethnicity as an indirect proxy for cultural processes. Doing so will contribute to more generalizable findings and enhance understanding of how culture influences human behavior.

Family Orientation as a Cultural Process in Childhood

The extent to which children place importance on the family system has significant implications for children's development and has been examined across several racial/ethnic groups. Familism is a broad, multidimensional construct identified in Hispanic/Latino families that comprises attitudes regarding the importance of family and behaviors that reflect how family is prioritized (Hernández & Bámaca-Colbert, 2016). Measures that assess attitudinal familism include The Familism Scale (Lugo-Steidel & Contreras, 2003), family obligation scales (Fuligni et al., 1999), and the Mexican American Cultural Values Scale (Knight et al., 2010), to name a few (see Stein et al., 2014 for additional measures). Behavioral measures of familism are less common but include themes identified in focus groups and qualitative interviews (e.g., Guilamo-Ramos et al., 2007; Nolle et al., 2012), assessments of caregiving hours to children (East & Weisner, 2009), and time spent with various family members (Updegraff et al., 2005). This study used the Mexican American Cultural Values Scale (Knight et al., 2010),

comprising three subscales that tap into various aspects of familism, including 1) support: attachment and desirability to maintain close relationships with family, 2) obligation: tangible caregiving and inclusion of family in decision-making processes, and 3) referents: using the family to define oneself (Knight et al., 2010; Sabogal et al., 1987; Zinn, 1982).

Familism is shown to be particularly important in adolescence, where attitudes surrounding familism values between parents and youth may not necessarily align (Cahill et al., 2021; Stein et al., 2014). However, there is a need to focus on earlier age groups, as middle childhood is a period where children begin to adopt and internalize their value systems (Döring, et al., 2016). There is a dearth of research prior to adolescence, but the handful of research studies that center on middle childhood demonstrate the positive effects of parental attitudinal familism on children's outcomes. In fact, Hernández and Bámaca-Colbert (2016) proposed the Behavioral Process Model of Familism that outlines the various mechanisms that link familism to youth outcomes (i.e., parenting behaviors). In addition to the indirect effects of parenting behaviors, the authors posit that parental familism and parenting behaviors also influence the development of youth familism, which in turn can directly influence positive youth outcomes, or indirectly affect them through familism-consistent youth behaviors (Hernández & Bámaca-Colbert, 2016). For example, Morcillo and colleagues (2011) showed that parental attitudinal familism was protective against antisocial behaviors through positive parent-child relationships in a sample of 5-9-year-old children from the South Bronx in New York as well as in San Juan and Caguas, Puerto Rico. Another study of Mexican American children in late childhood/early adolescence showed that parental attitudinal familism led to parenting

practices that promoted prosocial behaviors, in turn being associated with youth perception of prosocial parenting practices (Calderón-Tena et al., 2011). One study of 11–14-year-old children of immigrants found that positive parent-child relationships explained associations between parental attitudinal familism and lower youth externalizing symptoms, and meaning of life explained relations between familism and fewer depressive symptoms and greater academic motivation (Stein et al., 2020). Together, there is consistent evidence that beliefs surrounding the importance of family are associated with children's outcomes through the influence of parenting behaviors. However, more research is needed to understand children's internalization of family values, as it is likely that parental beliefs are related to children's manifestation of family orientation (e.g., compliant behavior) (Stein et al., 2014).

In addition to familism attitudes and behaviors differing across developmental stages, there is also evidence to suggest that familism has differential impacts on youth outcomes based on gender and SES. In Latino culture, it is common for families to ascribe to traditional gender roles, with fathers being seen as the head of the household (Umaña-Taylor & Updegraff, 2012), and girls often having more restrictions on their autonomy (Bámaca-Colbert et al., 2012) and more household obligations compared to boys (Raffaelli & Ontai, 2004). Familism values appear to be more protective for girls compared to boys. For example, Morcillo and colleagues (2011) demonstrated that familism was protective against the emergence of antisocial behaviors for girls across childhood and early adolescence, whereas it was only protective for 5-9-year-old boys. Other studies show that parental familism values predict fewer adolescent depressive

symptoms for females, but not males, concurrently (Cupito et al., 2015) and longitudinally into early adulthood (Zeiders et al., 2016).

Studies show that Latino families from low SES backgrounds demonstrate higher levels of familism in children (e.g., Bush et al., 2004) and parents (e.g., Taylor et al., 2012). In a similar vein, at higher levels of SES, Latino caregivers residing in the United States reported having lower family social support than those at lower levels of SES (Almeida et al., 2009). These findings reflect the need for family members to depend on one another for support, particularly when resources are scarce (Hernández & Bámaca-Colbert, 2016). For example, there was a negative relation between family obligation and GPA for Latino males (but not Latina females) adolescents from high SES backgrounds, whereas the association was non-significant for Latino adolescents from low SES households (Tokoyawa & Tokoyawa, 2019). Similarly, adolescent attitudinal familism predicted higher GPA when maternal education was low (less than high school), and lower GPA when maternal education was high (high school and beyond) (Esparza & Sánchez, 2008). Economic hardship was associated with higher depressive symptoms and risk-taking in Latina adolescent mothers, but these relations were not moderated by familism (Umaña-Taylor et al., 2011). Given the high-risk nature of the sample, the authors posited that familism values are not able to buffer the negative effects of the teen mothers' economic circumstances. In sum, the aforementioned work demonstrates that various factors differentially impact how familism is related to youth outcomes, pointing to the need to acknowledge the heterogeneity that exists both between and within groups. Additionally, more research is needed prior to adolescence.

Although cultural values within the family have generally been demonstrated as protective, the majority of the research in middle childhood relies solely on parent-reported measures, thus there is a need to integrate objective and child-reported measures of family orientation values. Super and Harkness (1999, p. 282) posit that "measurement of isolated aspects of the environment, no matter how precise, will necessarily overlook the role of culture," and this study extends the literature by taking a multimethod approach to assess family orientation as a cultural process that can be measured continuously across multiple racial/ethnic groups. Assessing family orientation as a cultural construct can help generalizability to other samples as well as improve measurement and interpretability.

Although theory has linked culture and self-regulation, there are only a few studies that have examined the relation between culture and self-regulation. Although a couple of studies have shown no mean differences in self-regulation across racial/ethnic groups nor have found that race/ethnicity was a significant moderator in the association between parenting and self-regulation (Aikens et al., 2008; Li-Grining, 2007), one recent meta-analysis found large differences in executive functioning performance between Whites and racial/ethnic minorities with between- and within-minority group comparisons (Rea-Sandin et al., 2021). This meta-analysis highlights the need to examine the social factors that account for these differences in performance. Additionally, there is a need for theoretical and empirical work to consider multiple factors beyond race/ethnicity when examining the role of family cultural values on children's regulatory development.

There is a shortage of research directly examining the role of cultural processes in children's self-regulation, however, research with racial/ethnic minority children suggests that cultural processes within the family are implicated in children's socioemotional development (Galindo & Fuller, 2010; Li-Grining, 2007). For example, one study of low-income Mexican American children demonstrated that the family learning environment and parental control were positively related to children's self-regulation (Díaz & McClelland, 2017). This mixed method study also conducted qualitative interviews and found that "respect" and "being well educated" were common expectations that parents had for their children. Another study found that familism moderated the association between parental warmth and emotional and peer adjustment in preschool children from low-income, Mexican households (Gamble & Modry-Mandell, 2008). Conversely, it has been proposed that children from less-acculturated households could experience stress related to differing family and school expectations, thus influencing their self-regulation (Galindo & Fuller, 2010; Li-Grining, 2007). Together, research has demonstrated that cultural processes within the family are important for racial/ethnic minority children. This study extends the literature by examining whether a novel measure of family orientation is related to self-regulation in middle childhood across children from diverse ethnic and socioeconomic backgrounds.

Familism is argued to be culture specific (common to Latino individuals; Grau, et al., 2009), but has also been identified in other racial/ethnic groups (Campos et al., 2014; Christophe & Stein, 2022; Schwartz, 2007; Soli et al., 2009). Given the racial/ethnic diversity of our sample, this study opted to use *family orientation* to describe the cultural process defined as an emphasis on providing support, respect, and obligation to the

family system. Additionally, this study considered both family orientation values and family orientation behaviors, as they are distinct and may differentially impact children's self-regulation (Hernández & Bámaca-Colbert, 2016; Li-Grining, 2012).

Genetic and Environmental Contributions to Self-Regulation

Quantitative genetic methodology allows researchers to parse individual differences into genetic and environmental influences in the phenotype of interest, in this case, self-regulation. One study examined the extent to which genes and the environment explain differences across the distribution of self-control in a sample of adolescents and found that heritability estimates were highest in the 50th to 60th percentiles of self-control (Schwartz et al., 2017). Previous twin research in early adolescence and adulthood has demonstrated that task-based measures of executive functioning are influenced by genetics and the nonshared environment, although there is some variability in findings (Fan et al., 2001; Polderman et al., 2006; Stins et al., 2004). Similarly, heritability estimates vary among individual studies that include questionnaire-based measures of self-regulation (e.g., Beaver et al., 2008; Goldsmith et al., 1997; Lemery-Chalfant et al., 2008), however, one meta-analysis examining the heritability of self-control found twin intraclass correlations of .85 for monozygotic (MZ) twins and .36 for dizygotic (DZ) twins in middle childhood, suggesting that broad sense heritability is implicated in differences in self-control (Willems et al., 2018).

Although previous research has demonstrated that self-regulatory behaviors are heritable in childhood and adolescence, it is clear that self-regulation is still amenable to environmental factors, including parenting and poverty (Li-Grining, 2007). For example,

random assignment to the Family Check-Up parenting-based intervention has been shown to increase children's inhibitory control across childhood (Hentges et al., 2020).

Researchers can also examine whether the genetic and environmental variance components on an outcome vary by a moderator (moderation of heritability) (Purcell, 2002). No study has explicitly tested whether a measure of the environment moderates the genetic and environmental influences on self-regulation, however, there is some research on related constructs. For example, early adversity measured in toddlerhood did not moderate the genetic and environmental contributions to executive functioning in middle childhood (Rea-Sandin, 2018). In another study, chaos in the home increased the heritability of effortful control in middle childhood (Lemery-Chalfant et al., 2013). However, the genetic and environmental influences on inattention and hyperactivity/impulsivity in middle childhood and adolescence were not moderated by socioeconomic status or chaos in the home (Gould et al., 2018). Finally, parental involvement increased heritability and decreased nonshared environmental influences on ADHD in middle childhood (Nikolas, et al., 2015). Together, more research is needed to understand the factors that influence the genetic and environmental etiology of self-regulation.

Current Study

This study has three main aims. The first goal was to broaden the study of cultural processes in child development by proposing novel coding schemes and factor analytic approaches to capture family orientation continuously within and across racial/ethnic groups. Proposed measures of family orientation were ascertained from coded videotapes, trained experimenter observations, and parent-reported measures. The measures were

then considered in an exploratory factor analysis indexing family orientation, and factors were compared to established measures to test validity (Knight et al., 2010). The second goal of the study was to examine the relation of family orientation and self-regulation in middle childhood. It was hypothesized that children higher on family orientation would demonstrate higher self-regulation in middle childhood across racial/ethnic groups, and that associations would be stronger for girls and children from families with lower SES (Almeida et al., 2009; Li-Grining, 2012; Morcillo et al., 2011). Finally, the third goal was to examine whether family orientation moderated the genetic and environmental influences on self-regulation in middle childhood. It was hypothesized that differences in measures of individual-level family orientation would be partially heritable but largely environmental, and that higher family orientation would increase the extent to which environmental influences explain differences on measures of self-regulation (Lemery-Chalfant et al., 2013; Nikolas et al., 2015; Shanahan & Hofer, 2005). Together, the development and analysis of innovative measures of family orientation can elucidate contexts that promote self-regulation for children from diverse backgrounds.

Method

Participants

Participants were drawn from the Arizona Twin Project, a large demographically diverse sample of twins followed since infancy (N = 710 youth; Lemery-Chalfant et al., 2019). Families were recruited from birth records when the twins were approximately 12 months old. The current analytic sample (data collected between 2016 and 2019) included those that participated at previous waves (73%) as well as newly recruited families (27%). Of the 401 families that opted to contact us, 329 families (82.29%)

participated at 12 months of age. Of the 329 families that participated at 12 months, 258 (78%) participated at 8 years of age, and 96 families were newly recruited at 8 years of age.

Children (MZ twin pairs = 30.2%, same-sex DZ twin pairs = 37.1%, opposite-sex DZ twin pairs = 32.7%; 49.1% female; 58.5% White, 28.5% Hispanic/Latino) were assessed at approximately eight years of age (M_{age} = 8.38 years, SD = 0.66). Table 1 comprises a detailed breakdown of the twins' race/ethnicity as reported by primary caregivers. Families were from a range of socioeconomic backgrounds such that 7% of families were considered to be living below the poverty line for a family of their size, 23% at or near the poverty line, 16.4% in lower middle class, and 53.7% in middle to upper class at this wave of data collection. Additionally, our sample is representative of the state of Arizona, with families residing in suburban (36%), metropolitan (27%), urban (13%), and rural (24%) contexts. Out of the 710 families that participated, 592 (83.4%) completed home visits, 84 (11.8%) participated out-of-state, 20 (2.8%) participated with surveys only, and 14 (2.0%) declined or aged out but have some data.

Nine individuals were excluded from analyses due to physical or cognitive disabilities (e.g., Down Syndrome, Autism). Attrition analyses indicated no significant differences between the 12-month and 8-year sample on sex, $t(269) = -.40$, $p = .69$. However, there were significantly fewer Hispanic/Latino families with 8-year data (M = .20, SD = .40) than families without (M = .32, SD = .47), $X^2(1, N = 675) = 9.44$, $p < .01$, and 12-month SES was higher in the sample of families with 8-year data (M = .17, SD = .75) than the families without (M = -.16, SD = .80), $t(267) = -3.49$, $p = .001$.

Procedure

Institutional Review Board approval was obtained at every wave of data collection. Two home visits were conducted at the 8-year wave of data collection. Primary caregivers provided written informed consent and twins assented to participation. Primary caregivers (94.9% mothers) completed online or paper surveys about the family's demographic information, familial roles and values, and their twins' effortful control. Teachers (59.7% of dyads had different teachers) completed a survey about the twins' school adjustment and effortful control. During the home visits, the twins participated in a videotaped sibling competition interaction task, the primary caregiver was involved in a videotaped parent-child interaction task separately with each twin, and the twins completed computer-based executive functioning tasks independently. A trained research assistant also assessed the home environment during the home visit, and both experimenters completed observational assessments independently after each home visit.

Measures

Proposed Cultural Measures. Multiple measures from various reporters were tested in the theorized factor of family orientation. Broadly informed by theory and the familism scale from the Mexican American Cultural Values Scale (Knight et al., 2010), these measures were selected because they potentially assess aspects of family orientation related to support (attachment and desirability to maintain close relationships with family), obligation (tangible caregiving and inclusion of family in decision-making processes), or referents (using the family to define oneself). Supplemental Material 1 contains descriptions about measures that were proposed but not included in subsequent analyses.

Parent-Child Interaction Task. The primary caregiver participated in a videotaped interaction task with each twin during the home visit (Eyeberg et al., 2003). At the beginning of the home visit, the primary caregiver was asked to recall three times in the recent past when they had a problem or argument with each twin and indicated which of the three examples was the worst. Later in the home visit, the primary caregiver sat with each twin and each dyad was instructed to discuss the problems and to identify potential solutions for 7.5 minutes.

First, a twin-level variable was formed to indicate primary caregiver family orientation. Each of the 6 topics (3 per twin) that the primary caregiver indicated to discuss were rated on a 1-4 Likert scale, with higher scores indicating higher family orientation. Coders were given the following instructions: "When a topic is brought up, evaluate the extent that it fits within the definition of family orientation (support: attachment and desirability to maintain close family relationships, obligation: tangible caregiving and inclusion of family in decision making processes, identity: using the family to define oneself, and respect: the importance for children to defer to parents both in their demeanor and in yielding to parents' wisdom on decisions)." For example, the dyad would receive a high score if the primary caregiver chose to discuss the expectation for the child to care for younger siblings because it could reflect the expectation for children to support the family. However, the dyad would receive a lower rating if the primary caregiver chose to discuss how the child has poor handwriting, as it would not reflect the value that family comes first. Then, each child's reaction to each topic was also coded on a 1-4 Likert scale (1 – Expresses disagreement with caregiver's statement and reaction is intense or does not engage whatsoever, 2 – Expresses disagreement with

statement but reaction is less intense, does not offer solutions, 3 – Child understands the issue and tries to come up with a solution or two, might need to be prompted by caregiver, and 4 – Child agrees with caregiver's statement and actively tries to come up with solutions). The most common topics included homework, household chores/cleaning up after themselves, screen time/playtime, getting ready for bed, getting ready for school/after school activities, following caregiver instructions, arguing/attitude towards caregiver, and conflict between siblings.

A total of 555 videos were coded. The author and two research assistants coded 3 sets of 10 videos before becoming reliable. Then, each research assistant coded half of the remaining videos, and the author coded every 10th video as a reliability check. Any discrepancies were resolved as a group. Rater reliability for each of the primary caregiver family orientation topics were κ = .86, .81, and .67 for the first, second, and third topics, respectively. Rater reliability for the child's response to the three topics were as follows: κ = .77, .73, and .68.

Experimenter observation of twin affect and behavior. After a 3-hour home visit, the two experimenters watched videotapes from the visit and rated multiple aspects of the twins' behavior using a version of the Bayley Rating Scales (Bayley, 1993; Lemery-Chalfant et al., 2006) that was modified to be appropriate for older children. Experimenters evaluated each item on a scale of 1 to 5, with higher scores indicating higher endorsement of the item. Eight items were hypothesized to be related to family or individual orientation: 1) Compliance with child tester, 2) Compliance with primary caregiver, 3) Avoiding/averting/resistance with primary caregiver, 4) Parent reads twins' cues and responds sensitively and appropriately, 5) Connectedness between parent and

twin, 6) Parent lack of intrusiveness, 7) Reciprocity of parent and twin, and 8) Organization/regulation of parent-twin interaction. Ratings on these items were averaged across the two raters, across the two home visits. For visit 1, there were medium positive correlations between raters for Twin A, $r = .45$, $p < .001$ and Twin B, $r = .41$, $p < .001$. For visit 2, there were moderate positive correlations between raters for Twin A, $r = .51$, $p < .001$ and Twin B $r = .55$, $p < .001$. Ratings across visits were correlated $r = .56$, $p < .001$. The 7 items were considered as individual-level indicators of family orientation.

Decision making in the family. The Decision Making Questionnaire (Dornbusch et al., 1990; Wray-Lake et al., 2010) was completed by the primary caregiver, where they indicated which member of the family makes decisions about various domains within the household: chores, appearance, homework/schoolwork, social life, bedtime/curfew, health, choosing activities, and money. Options included child, mother, father, other person, and nobody. For each domain, the family received a 1 if either parent makes the decision (or 0 if any of the other family members make the decision). The scores were summed to create a family-level variable, with higher scores indicating higher family orientation. Caregivers that make a majority of the decisions in the household, as opposed to the child, could reflect the idea that children should defer to their parents for family decisions (Lamborn et al., 1996).

Cultural Values. The familism (17 items) domain of the Mexican American Cultural Values Scale (MACVS; Knight et al., 2010) is a parent-report measure assessing cultural values for Mexican American individuals, but some items were adjusted so the measure could be administered across the entire sample. There are 3 subscales within the familism domain (alpha = .85): support (close family relationships; alpha = .77),

obligation (obligation to provide tangible support to family; alpha = .67), and referents (the reliance on communal family relationships to define oneself alpha = .73). A 5-point Likert scale was used (1 = Not at all, 2 = A little, 3 = Somewhat, 4 = Very much, 5 = Completely). Example items from the familism domain include "Family provides a sense of security because they will always be there for you" (support), "Older kids should take care of and be role models for their younger brothers and sisters" (obligation), and "Children should always do things to make their parents happy" (referents).

In addition, the other MACVS scales were included to validate the proposed family orientation variable: Respect (alpha = .86), Religion (alpha = .98), Traditional Gender Roles (alpha = .71), Material Success (alpha = .77), Competition and Personal Achievement (alpha = .73), Traditional Values (alpha = .80), and Mainstream Values (alpha = .93).

Outcome Measures

Child Effortful Control. The Temperament in Middle Childhood Questionnaire (Simonds & Rothbart, 2006) is a parent-report and teacher-report measure including the Attentional Focusing and Inhibitory Control scales assessing dimensions of Effortful Control. Primary caregivers and teachers rated the twins on a 7-point Likert scale ranging from "extremely untrue of child" to "extremely true of child." An example item from the Attentional Focusing scale includes "When building or putting something together, *Twin A/B* becomes very involved in what s/he is doing, and works for long periods," and "*Twin A/B* is good at following instructions" is an example item from the Inhibitory Control scale. In our study, Cronbach's alphas for parent reported Attentional Focusing and Inhibitory Control were .75 and .72, respectively. Cronbach's alphas for teacher reported

Attentional Focusing was .96 and .81 for Inhibitory Control. This measure has demonstrated good predictive validity (Kotelnikova et al., 2017). Scales were mean composited to indicate two variables: parent-reported and teacher-reported effortful control.

Working Memory. The Wechsler Intelligence Scale for Children Digit Span Backward task (Wechsler, 2003) was administered in the home when the twins were 8 years old. Digit Span Backward assesses working memory. The experimenter reads a series of numbers aloud and the child is asked to repeat the series backward, with each trial getting progressively more difficult. One point is given for each correct trial, and the sum score for each task was used in the analyses. This task has demonstrated good predictive validity (Conway et al., 2005).

Executive Functioning Tasks. The Psychology Experiment Building Language (PEBL; Mueller, 2013) is an open-source software system of behavioral test paradigms for research use (Mueller & Piper, 2014). This study administered the Continuous Performance Task and the Eriksen Flanker Task using the PEBL system.

Continuous Performance Task. The Continuous Performance Task (Conners, 2000) was administered on a laptop computer in which a continuous series of stimuli (letters of the alphabet) are presented on a screen, and the twins must either respond to target stimuli (any letter but X) by pressing a key or inhibit a response to non-target stimuli (the letter X). The 14-minute-long task consisted of 360 letters (in 18 consecutive blocks of 20 trials) that appeared one at a time on the screen for approximately 250 milliseconds. A "hit" score was calculated for trials where the child did not press the spacebar when presented with the letter X, and "false alarms" refer to trials where the

child failed to press the spacebar when the target (not X) was presented. A Detectability score was the dependent variable for this task and was created by calculating standardized proportion scores for hits and false alarms, and then subtracting false alarms from hits (Connors, 2000). Higher scores indicated better performance (Valiente et al., 2014). This calculation provides a measure of the ability to distinguish and detect X and non-X stimuli (Connors, 2000). This measure has established predictive validity (Conners et al., 2003).

Flanker Task. The Flanker Task (Eriksen & Eriksen, 1974) is a computer-administered paradigm where participants respond with a left or right key press to a central target arrow while ignoring congruent (e.g. >>>) or incongruent (e.g. <><) flanker arrows. The stimuli were presented on a laptop computer and participants responded using either the left or right shift key. To ensure the child understood the task, there were 12 practice trials before the actual task began, and the actual task lasted about 10 minutes. For each trial, RT and whether the response was correct was recorded. Flanking arrows pointing in the same direction were coded as congruent trials, whereas flanker arrows pointing in the opposite direction were coded as incongruent trials. Scores were treated as missing if participants correctly responded less than 25% of the time for both congruent and incongruent trials (1.6% and 8.45%, respectively; Congdon et al., 2010). Once those scores were removed, RT for congruent and incongruent trials that were greater than 3 SD from the mean were Winsorized to 3 SD from the mean. An interference score was calculated by subtracting mean congruent reaction time (RT) from mean incongruent RT, and then reverse-scoring so that higher scores indicate better performance (Mullane et al.,

2009). The Flanker task has established neuropsychological validation (Stins et al., 2004).

Covariates. Child age, sex (1 = female, 0 = male), race/ethnicity, and socioeconomic status (a standardized composite of household income, and primary and secondary caregiver education) were included as covariates and were tested as main effects and two-way interactions with the primary predictors. Two separate dummy code variables were created to index race/ethnicity: Latino and European American, with 1 indicating that parents endorsed their children as belonging in that category. For twin analyses, the effects of child sex and child age were regressed out of each variable and the residual scores were utilized, as the models become too complex with multiple covariates (McGue & Bouchard, 1984).

Analytic Plan

Prior to hypothesis testing, measures were assessed for distribution, normality, reliability, and any outliers. Variables with skewness +/- 2 or kurtosis +/- 7 were transformed to approximate normality (West et al., 1995). Zero order correlations were conducted using MPlus 7.0 (Muthén & Muthén, 2015) using the *type=complex* command to account for twin interdependence.

For Aim 1, an exploratory factor analysis was conducted using the proposed measures of family orientation. 1-, 2-, and 3-factor solutions were tested. The following variables were included: familism – support, familism – obligation, familism – referents, primary caregiver family orientation, child family orientation, child decision making, and experimenter post visit-ratings (compliance with child tester, compliance with primary caregiver, resistance with primary caregiver, sensitive parenting, parent-child

connectedness, primary caregiver lack of intrusiveness, parent-child reciprocity, and parent-child regulation). An oblique rotation was used, as it was expected for the factors to be correlated. Models were compared using the following fit indices: eigenvalues, chi-square test, RMSEA, CFI, and SRMR (Fabrigar et al., 1999). For the final model, loadings above .30 were retained (Costello & Osborne, 2005) and unstandardized factor scores were formed and used in subsequent analyses.

For Aim 2 (examining whether family orientation predicts children's self-regulation), mixed model regression analyses were conducted using MPlus 7.0 (Muthén & Muthén, 2015). Main effects of all covariates were retained in the final models, regardless of significance. With child sex, family SES, and race/ethnicity as moderators, interactions were individually tested while estimating the main effects of all family orientation variables on self-regulation. The *type=complex* command was used to account for twin interdependence, and full information maximum likelihood with robust standard errors (MLR) was used to handle missing data (Muthén & Kaplan, 1985). Predictors, moderators, and covariates were centered at zero and were used to create interaction terms. Unstandardized beta coefficients and standard errors were reported. Using the approach by Preacher et al. (2006) for nested data, simple slopes from significant interactions were probed at 1 SD below and above the mean of each moderator.

Aim 3 utilized the twin design (Neale & Maes, 2004). Unstandardized factor scores from Aim 1 were used. First, twin intraclass correlations for MZ and DZ twins were conducted using SPSS 25. To estimate genetic and environmental sources of variability (Falconer, 1989), univariate twin models were conducted using OpenMX (Neale, et al., 2016). Saturated models were used to test the assumptions of the twin

design (i.e., sex differences and rater contrast and assimilation effects). Next, full univariate twin models were fit that decompose the variance in a variable into latent additive genetic (A, linear effect of multiple genes, also known as heritability), shared environmental (C, environmental experiences that increase cotwin similarity), and non-shared environmental (E, environmental experiences that cause twins to become dissimilar as well as measurement error) factors. MZ twins share 100% of their segregating DNA, therefore the latent A is correlated 1.00 between MZ twins and .50 for DZ twins because DZ cotwins share 50% of their segregating genes. If MZ correlations more than double DZ correlations, an A, D (dominant genetic effects, or the interactive influence of the two genetic variants at a locus), and E model was estimated. D is correlated 1.00 for MZ twins, and D is correlated .25 for DZ twins because the same genetic variants at a locus are passed down from both parents 25% of the time. After full models were fit, parameters were systematically dropped, and the fit of the reduced models were compared to the full model using the -2 log likelihood chi-square test of fit. A significant loss of fit indicated that the dropped path was required to represent the data, whereas a nonsignificant loss of fit implied that the reduced model represents the observed data as well as the full model.

Moderated heritability models were tested using MPlus 7.0 (Muthén & Muthén, 2015) using full-information maximum-likelihood techniques. The extended univariate gene-environment (GxE) interaction model (Purcell, 2002; van der Sluis et al., 2012; Figure 1) was tested to investigate whether the variance components attributable to latent genetic, shared, and nonshared environmental effects on self-regulation (Continuous Performance Task, Flanker Task, Digit Span Backward, and parent- and teacher-reported

effortful control) are a function of family orientation values and behaviors. More specifically, the first variable (the moderator, M) moderates the ACE components of the second variable (the trait, T). Similar to the univariate ACE model, A paths are correlated 1.0 for MZ twins and .5 for DZ twins. Path coefficients represented the magnitude of the effect; therefore, they are expressed as linear functions of the moderator. With this model, twins can either be concordant or discordant on the moderator.

It is possible that family orientation is correlated with the genetic influences on self-regulation (gene-environment correlation) rather than moderating the genetic influences (Knopik et al., 2016). Potential gene-environmental correlational confounds between the outcome and moderator were eliminated by entering moderator values for both twins into a means model of each twin's self-regulation, and then the overlap between each twin's self-regulation and family orientation values/behaviors was residualized out of the model. Moderation was then modeled on the residual self-regulation trait variance that did not overlap with family orientation behaviors (Tomlinson et al., 2021; van der Sluis et al., 2012).

For both types of models, the Akaike's information criterion (AIC; Akaike, 1987), the Bayesian information criterion (BIC; Rafferty, 1995), and the sample size-adjusted BIC (ssBIC; Sclove, 1987) was used to evaluate model fit, with lower values indicating better fit (e.g., Tomlinson et al., 2021).

Results

Preliminary Analyses

Descriptive statistics are reported in Table 2. Table S1 contains descriptive statistics for measures that were proposed but not used in primary analyses. All variables

were normally distributed and were within acceptable ranges for skewness and kurtosis (Curran et al., 1996). Attrition analyses indicated that out-of-state and in-state families did not differ on race/ethnicity (1 = Hispanic/Latino, 0 = not Hispanic/Latino), $t(592) = -1.68$, $p = .09$, family orientation values, $t(627) = -1.24$, $p = .22$, or teacher-reported effortful control, $t(459) = .66$, $p = .51$. Out-of-state families had higher SES (M = .29, SD = .82) compared to in-state families (M = -0.06, SD = .82), $t(601) = 2.49$, $p < .05$, out-of-state families had more females (80.6%) compared to in-state families (48.6%), $X^2(1, N = 625) = 13.46$, $p < .001$, and out-of-state families had higher parent-reported effortful control (M = 3.53, SD = .54) compared to in-state families (M = 3.28, SD = .57), $t(600) = 2.63$, $p < .01$. Families with and without videotaped interactions did not differ on SES, $t(673) = -.72$, $p = .47$, child sex, $t(708) = 1.59$, $p = .11$, race/ethnicity, $t(662) = -.37$, $p = .71$, family orientation behaviors, $t(670) = 1.02$, $p = .31$, Continuous Performance Task performance, $t(578) = -.04$, $p = .97$, Flanker Task performance, $t(575) = .01$, $p = .99$, Digit Span Backward performance, $t(587) = .09$, $p = .93$, parent-reported effortful control, $t(640) = -2.01$, $p = .05$, and teacher-reported effortful control, $t(465) = -.84$, $p = .40$. Families with videotaped interactions had higher family orientation values (M = .04, SD = .94) compared to families without videotaped interactions (M = -.18, SD = .65), $t(670) = 2.52$, $p < .05$. Children with and without teacher-reported data did not differ on SES, $t(673) = 1.16$, $p = .25$, child sex, $t(708) = -1.38$, $p = .17$, race/ethnicity, $t(662) = .21$, $p = .83$, family orientation values, $t(670) = .24$, $p = .81$, Continuous Performance Task performance, $t(578) = -.48$, $p = .63$, Flanker Task performance, $t(575) = -.33$, $p = .74$, and Digit Span Backward performance, $t(587) = -.08$, $p = .94$. Family orientation behaviors were higher for children with teacher-reported data (M = 0.07, SD = .90) compared to

children without teacher-reported data (M = -0.16, SD = .93), $t(670) = 2.94$, $p < .01$ and children with teacher-reported data were rated higher on parent-reported effortful control (M = 3.34, SD = .56) compared to children without teacher-reported data (M = 3.21, SD = .55), $t(640) = 2.49$, $p < .05$.

Zero-order correlations are reported in Table 3. Table S2 contains zero-order correlations for measures that were proposed but not used in primary analyses. PC (primary caregiver) Family Orientation was not correlated with executive functioning nor effortful control, whereas Child Family Orientation was related to parent- and teacher-reported Activation Control. Child decision making was positively correlated with Digit Span Backward, parent-reported effortful control, and teacher-reported Attentional Focusing. When considering Familism – Support, Referents, and Obligation, as well as Familism – Total, only Familism – Support was significantly correlated with parent-reported Activation Control. Interestingly, experimenter post-home visit ratings were positively correlated with the Continuous Performance Task and effortful control, and weakly positively correlated with the Flanker Task and Digit Span Backward. SES was positively correlated with Digit Span Backward, parent-reported effortful control, and teacher-reported Attentional Focusing. Twin age was positively correlated with executive functioning. Sex was coded 0 for males and 1 for females and was positively correlated with the Continuous Performance Task, and parent- and teacher-reported Attentional Focusing and Inhibitory Control and negatively correlated with the Flanker Task. Finally, Latino endorsement was not correlated with any of the outcome variables, whereas European American endorsement was negatively correlated with Continuous Performance Task performance.

Correlations among predictors were also examined to inform the subsequent formation of latent variables. To begin, coded PC Family Orientation was only negatively correlated with Familism – Referents, whereas Child Family Orientation was positively correlated with experimenter post-visit ratings. Child decision making was negatively correlated with Familism. Familism subscales were all highly correlated with one another. Familism – Support was positively correlated with compliance with experimenter and PC. Familism – Obligation was negatively correlated with sensitive parenting, parent-child connectedness, and reciprocity between PC and child. Familism – Referents was negatively correlated with sensitive parenting, parent-child connectedness, parent-child intrusiveness, and reciprocity between PC and child. Finally, experimenter post-visit ratings were all positively correlated with each other.

It is possible that the time of year that the home visit was conducted could impact the types of topics/endorsement of primary caregiver family orientation. Whether children were in school or on a break (1=on break, 0=during the school year) was weakly correlated with the coded measure of primary caregiver family orientation ($r = .196$, $p < .001$) but was not significantly associated with coded child family orientation ($r = .076$, $p = .08$). Whether children were on a break was not significantly correlated with the outcome measures, therefore was not included as a covariate in subsequent analyses (rs from -.01 to .07, ps from .11 to .94).

Based on bivariate correlations and theoretical connections to familism, the following variables were included in exploratory factor analyses: PC Family Orientation, Child Family Orientation, Familism – Support, Familism – Obligation, Familism – Referents, Child Decision Making, and experimenter post-visit ratings (child compliance

with child tester, child compliance with PC, child resistance with PC, sensitive parenting, parent-child connectedness, PC lack of intrusiveness, reciprocity of PC and child, and organization of the dyad).

Aim 1: Developing novel measures of family orientation

Exploratory Factor Analysis

Table 4 presents standardized factor loadings from exploratory factor analyses that tested 1-, 2-, and 3-factor solutions of our proposed family orientation variables. The 1-factor solution showed poor model fit, $\chi^2(77) = 1725.49$, $p < .001$; SRMR = .128; RMSEA = .179; CFI = .611. Standardized loadings were low/nonsignificant for Familism – Support, Familism – Obligation, Familism – Referents, PC Family Orientation, and Child Decision Making, whereas loadings ranged from .32-.94 for Child Family Orientation and the experimenter post-visit ratings. The 2-factor solution had better model fit compared to the 1-factor solution, $\chi^2(64) = 860.65$, $p < .001$; SRMR = .062; RMSEA = .137; CFI = .812. On the first factor, all three familism subscales had loadings above .70, and the second factor comprised Child Family Orientation and the experimenter post-visit ratings. The 3-factor solution had the best model fit, $\chi^2(52) = 138.86$, $p < .001$; SRMR = .022; RMSEA = .050; CFI = .979. Similar to the 2-factor solution, the first factor comprised all three familism subscales (with loadings ranging from .73-.83). The second factor contained child compliance with child tester, child compliance with PC, child resistance with PC, and organization of the dyad (with loadings ranging from .56-.93). Finally, the third factor comprised sensitive parenting, parent-child connectedness, and reciprocity of PC and child (with loadings ranging from .82-.96). The 2-factor solution was selected as the final model, as it supports theory

surrounding attitudinal (first factor: Family Orientation Values) and behavioral (second factor: Family Orientation Behaviors) manifestations of family orientation (Hernández & Bámaca-Colbert, 2016; Knight et al., 2010). Variables that did not load on either factor (PC family orientation and child decision making) were dropped from the final model, and unstandardized factor scores were extracted for use in subsequent analyses. Family orientation values and behaviors were significantly negatively correlated (r = -.15, p < .01). Internal consistency for family orientation values was .79 and it was .88 for family orientation behaviors.

Independent samples t-tests were conducted to examine if family orientation values and behaviors differed by sex and race/ethnicity. Boys had lower levels of family orientation behaviors (M = -.07, SD = .95) compared to girls (M = .10, SD = .80), t(666) = -2.55, p < .05. Latino primary caregivers demonstrated higher levels of family orientation values (M = .15, SD = .83) compared to non-Hispanic/Latino primary caregivers (M = -.10, SD = .93), t(634) = -3.12, p < .01. Latino children had comparable levels of family orientation behaviors (M = .10, SD = .86) as non-Hispanic/Latino children (M = .01, SD = .01), t(634) = -1.17, p = .24. European American children had similar levels of family orientation behaviors (M = .04, SD = .86) compared to non-European American children (M = .04, SD = .88), t(634) = 0.10, p = .92.

The validity of the factors was assessed by examining correlations between family orientation values and behaviors with subscales (Respect, Religion, Traditional Gender Roles, Material Success, Competition and Personal Achievement, Traditional Values, and Mainstream Values) from the Mexican American Cultural Values Scale (MACVS; Knight et al., 2010) (Table 5). Family orientation values, comprised of MACVS familism

subscales, were positively correlated with all subscales (*r*s ranging from .27 to .80, *p*-values ranging from <.01 to <.001). Family orientation behaviors were significantly negatively correlated with Respect, Competition and Personal Achievement, Traditional Values, and Mainstream Values (*r*s ranging from -.08 to -.13, *p*-values ranging from >.05 to <.01) but uncorrelated with Religion, Traditional Gender Roles, and Material Success.

Aim 2: Examining associations between family orientation and self-regulation in middle childhood

We tested the main effects of family orientation values and behaviors on the Continuous Performance Task, Flanker Task, Digit Span Backward, parent-reported effortful control, and teacher-reported effortful control, controlling for child sex, family SES, and race/ethnicity (Latino and European American) (Table 6). This study also examined whether associations between family orientation values and behaviors on the Continuous Performance Task, Flanker Task, Digit Span Backward, parent-reported effortful control, and teacher-reported effortful control differed by child sex, family SES, and race/ethnicity (Latino and European American). Five models were tested with main effects of predictors and covariates predicting each outcome in turn, then interactions between covariates and predictors were tested separately. Across all interactions tested, there was one significant interaction between family orientation behaviors and SES predicting teacher-reported effortful control. Given the large number of interactions tested, this significant interaction is likely to have occurred by chance. Although it will not be interpreted, it was included in the final model.

Continuous Performance Task. Family orientation values did not predict Continuous Performance Task performance. There was a significant and positive main

effect of family orientation behaviors on performance. Child age and child sex were positively associated with performance, such that girls performed better on the task. There were no significant effects of SES and race/ethnicity.

Flanker Task. Family orientation values did not predict Flanker Task performance; however, family orientation behaviors were positively associated with performance. Child age was positively associated and child sex negatively predicted performance, such that boys performed better on the task. Race/ethnicity also significantly predicted Flanker Task performance, such that both Latino and European American children demonstrated higher performance. SES was not associated with Flanker Task performance.

Digit Span Backward. There were no main effects of family orientation values and behaviors on Digit Span Backward performance. Child age and family SES significantly predicted higher Digit Span Backward performance. There were no main effects of child sex or race/ethnicity.

Parent-reported Effortful Control. Family orientation values were not associated with parent-reported effortful control. Family orientation behaviors significantly and positively predicted parent-reported effortful control. Child age, child sex (girls higher), and SES were positively associated, whereas race/ethnicity was not associated with parent-reported effortful control.

Teacher-reported Effortful Control. Family orientation values did not predict teacher-reported effortful control. Family orientation behaviors positively predicted teacher-effortful control. Child sex was positively associated with teacher-reported

effortful control, such that teachers rated girls as being higher on effortful control. Child age, SES, and race/ethnicity did not predict teacher-reported effortful control.

Sensitivity Analyses

It is possible that family orientation values and behaviors interact to influence children's self-regulation. Therefore, sensitivity analyses were conducted where the interaction between grand-mean centered family orientation values and behaviors was used to predict children's self-regulation. However, there were no significant interactions found.

Aim 3: Examining whether family orientation moderates the genetic and environmental influences on children's self-regulation

Univariate Twin Models

Twin intraclass correlations and univariate ACE models for the Continuous Performance Task, Flanker Task, and Digit Span Backward were previously reported in a study including twins from the 8-year wave as well as 186 additional children from the 9-year wave of data collection (Rea-Sandin et al., *under review*). Twin intraclass correlations (Table 7) suggested that all variables were heritable, as MZ twins were more similar than DZ twins.

Saturated models were fit to test the assumptions of the twin design and showed that means, variances, and covariances could be equated across sex, and means and variances could be equated for all variables across zygosity groups. Univariate fit statistics and standardized parameter estimates are reported in Table 3. Additive genetic and nonshared environmental influences explained individual differences for all variables, with the exception of family orientation behaviors. More specifically, additive

genetic, shared environmental, and nonshared environmental influences explained 32%, 63%, and 5% of the variance in family orientation behaviors, respectively. For executive functioning variables (Continuous Performance Task, Flanker Task, and Digit Span Backward), additive genetic influences ranged from 27-47%. Finally, the variance in parent- and teacher-reported effortful control was largely explained by additive genetic influences (80% and 73%, respectively).

Moderated Heritability Models

Estimates and fit statistics for univariate and extended univariate GxE models can be found in Table 8. Full models were tested first, including ACE variance components and ACE moderated paths. Reduced nested models were then fit testing various combinations of variance components and moderated paths. More specifically, the C variance component was dropped first, as univariate models suggested no shared environmental influences on self-regulation. Models estimating A and E variance components and A and E moderated paths were then tested. Finally, moderated paths were subsequently dropped, with final models only estimating variance components (and no moderated paths). Across all moderators and outcomes, there was no evidence of moderated genetic and environmental variance components, as no moderation models fit significantly better than models that did not include moderation.

Discussion

This study 1) attempted to expand the measurement of family orientation in middle childhood, 2) examined how cultural variation within the family might predict children's self-regulation, and 3) considered whether genetic and environmental influences on self-regulation varied by family orientation. Middle childhood is a

developmental period characterized by increasing independence, thus, self-regulatory abilities are needed in order for children to successfully navigate family, school, and peer contexts (Votruba-Drzal, 2006). More importantly, the consideration of cultural processes previously identified in Latino, Asian, and Black families challenges notions that White, European American performance is the standard and that culture is specific to racial/ethnic minorities (Causadias et al., 2018). Understanding cultural values transmitted within the family can help elucidate particular contexts that promote children's self-regulatory behaviors that can be targeted in prevention and intervention to enhance self-regulation and well-being.

Expanding the measurement of cultural variation within the family

Existing research on family orientation and related constructs (i.e., familism) in childhood relies on the parent's endorsement of cultural values, although middle childhood is a time where children are beginning to develop their own value systems (Döring et al., 2016). The first goal of the study was to broaden the assessment of cultural processes in child development by proposing novel videotaped coding schemes and factor analytic approaches to capture family orientation. Proposed measures of family orientation were ascertained from coded videotapes, trained experimenter observations, and parent-reported measures.

Coding family orientation from videotaped interactions between primary caregivers and their children offered a rich, naturalistic opportunity to examine how cultural processes manifest within the parent-child relationship. The most common themes that emerged included too much screen time, trouble getting ready for school/bed, trouble completing homework/chores, not listening to the caregivers' demands, and

conflict between siblings. This study suggests that coding videotaped parent-child interactions is an ecologically valid measure of family orientation (Stein et al., 2014). Although it is optimal to conduct focus groups or qualitative interviews to assess familism and other cultural processes within the family (Guilamo-Ramos et al., 2007; Nolle et al., 2012), the use of parent-child discussion tasks could be a more cost-effective option, as these interactions are used broadly in research and can be coded for other behaviors, such as emotional communication (Gentzler et al., 2005) or parental control (van der Bruggen et al., 2008).

When comparing solutions from exploratory factor analyses, the 3-factor solution had the best model fit compared to the 1- and 2-factor solutions. However, the 2-factor solution was ultimately selected because the factors (family orientation values and behaviors) represented theoretically supported aspects of familism (Hernández & Bámaca-Colbert, 2016). More specifically, the family orientation values factor comprised the familism subscales from the Mexican American Cultural Values Scale (Knight et al., 2010), whereas the family orientation behaviors factor consisted of experimenter ratings of primary caregiver and child behavior, as well as the coded measure of child family orientation (Hernández & Bámaca-Colbert, 2016). The inclusion of values and behavioral manifestations of culture within the family offers a multifaceted assessment of family orientation.

The coded measure of child, but not primary caregiver, family orientation was represented in exploratory factor analyses. The discussion task prompt asked primary caregivers to recall three times in the recent past when they had a problem or argument with each twin, motivating primary caregivers to select topics relating to the family.

Therefore, variability could have been limited for primary caregiver family orientation. Additionally, primary caregivers differed in how much explanation was given for the selection of their topics. Some primary caregivers provided context for why they chose a particular topic, which made it easier to code for family orientation (e.g., the need for the child to limit screen time to focus on homework versus limiting screen time to focus on the family). On the other hand, other discussions were more ambiguous, making it more difficult to rate the extent that their chosen topics reflected family orientation. For example, many primary caregivers brought up the need for their children to assist with chores, but did not give an explanation as to why it is important to do so (e.g., to keep the house clean or because it is expected that children must obey their parents). Regardless, the parent-discussion task offers a naturalistic and unstructured setting to assess culture within the family.

The Decision Making in the Family questionnaire, which assessed the extent that caregivers made decisions across various domains within the household, was also not represented in exploratory factor analyses. The questionnaire was selected for inclusion in this study as a potential measure of familism behaviors given previous research that has considered similar measures to index familism behaviors, including hours spent caregiving children (East & Weisner, 2009), time spent with family members (Updegraff et al., 2005), and adolescent behavioral autonomy expectations (Bámaca-Colbert et al., 2012). Decision making was positively correlated with attitudinal familism in our study. However, there are likely many factors, aside from cultural beliefs, that determine who makes decisions in the household, including children's extracurricular commitments, the age-appropriateness of the domain (e.g., money), or the child's desire to make decisions.

Interestingly, the two factors, family orientation values and behaviors, were negatively correlated ($r = -.15$, $p < .01$). This contrasts with findings from a meta-analysis suggesting positive associations between familism values and warmth/support (parent-adolescent warmth; sibling intimacy) (Cahill et al., 2021; Stein et al., 2014). In previous literature, familism values have been associated with a "no-nonsense" parenting style that includes both authoritarian and warm parenting, such that parents are stricter, and show greater rejecting behaviors, but also demonstrate a comparable amount of warmth and support to their children (Hill et al., 2003; Mahrer et al., 2019). Thus, it is likely that family orientation is tapping into this "no-nonsense" style of parenting, with the values factor being related to strict, authoritarian parenting and the behaviors factor assessing warm and supportive parenting. Familism/family orientation are complex and multifaceted cultural processes, where cultural values and behaviors that center around the family system do not translate to *just* authoritarian parenting or *just* warm, sensitive parenting (Guilamo-Ramos et al., 2007).

Similarly, when examining the validity of the new factors, this study found a small, negative correlation between family orientation behaviors and both the traditional and mainstream values subdomains of the Mexican American Cultural Values Scale (Knight et al., 2010). Components of family orientation behaviors include items that center around the regulation and cohesion between the parent-child dyad, differing from traditional values that comprise beliefs that children must defer to their caregivers and mainstream values that prioritize independence (Knight et al., 2010). Additionally, family orientation behaviors include the child's endorsement of family orientation, which at this age might place an emphasis on family support and cohesion rather than gender roles,

respect, or achieving personal success. Although this study provides some evidence that children are beginning to form their own cultural values, it might not be until adolescence that youth are able to interpret parental expectations that subsequently influence their own family orientation values and behaviors (Stein et al., 2014). Although additional information on measure validity is needed, conceptual and empirical associations with the Mexican American Cultural Values Scale provide initial support of validity. This study contributes novel ways to assess cultural variation within the family as well as complements existing measures.

Associations between family orientation and children's self-regulation

The second aim of the study was to examine the relation of family orientation and self-regulation in middle childhood. It was hypothesized that children higher on family orientation would demonstrate higher self-regulation in middle childhood, and that these associations would be stronger for girls and for children from families with lower socioeconomic status. Hypotheses were partially supported, such that family orientation behaviors, but not values, predicted higher performance on the Continuous Performance Task and Flanker Task, as well as higher parent- and teacher-reported effortful control. Our hypotheses for our moderation analyses were not supported, as associations between family orientation and children's self-regulation did not vary by child sex or socioeconomic status. Our study provides initial evidence supporting theory surrounding the importance of family orientation for the development of children's self-regulation (Li-Grining, 2012).

Regression analyses showed that family orientation behaviors predicted self-regulation in middle childhood, with the exception of digit span backward, an executive

functioning task that assesses working memory ability. Working memory is conceptualized as tapping into cool regulation, with working memory skills helping children do things like complete complex math problems or understand reading material (Diamond, 2013; Zelazo & Carlson, 2012). Thus, it is possible that working memory ability is an aspect of self-regulation that is not impacted by behavioral manifestations of culture within the family.

Family orientation behaviors could support the development of children's self-regulation. For example, a household characterized by high family orientation emphasizes the need for children to put the family's needs before their own. This could, in turn, bolster children's ability to inhibit their automatic responses or desires in order to successfully function within the family system. Higher levels of connectedness within the dyad could also foster self-regulatory behaviors, with previous research suggesting that children from mother-child dyads with high levels of cooperation on a lab task demonstrated higher executive functioning skills (Hinnant et al., 2013). Other research has shown that the Family Check-Up intervention increases parents' positive behavioral support that then increases children's inhibitory control (Hentges et al., 2020). Together, this study provides preliminary evidence supporting theory and limited empirical evidence that behavioral manifestations of family orientation positively support children's self-regulation (Hernández & Bámaca-Colbert, 2016; Li-Grining, 2012).

However, family orientation values did not predict children's self-regulation. Family orientation values was defined by familism support, obligation, and referents, indexing the primary caregiver's values surrounding the family system. Theory and empirical evidence suggest that familism values influence children's adjustment through

parenting behaviors, such as parental monitoring (Hernández & Bámaca-Colbert, 2016), potentially explaining why there were no direct associations between family orientation values and children's self-regulation. For example, one study showed that parental attitudinal familism negatively predicted children's antisocial behaviors through engagement in parental monitoring (Morcillo et al., 2001).

It is also possible that family orientation values could be predictive of more emotion-laden or social behaviors, rather than "cold," cognitive outcomes, such as self-regulation. Although more research is needed to test this assertion, one recent meta-analysis by Cahill and colleagues (2021) found positive associations between familism and academic motivation, whereas associations with grades/GPA were close to zero. The authors suggest that familism values might be related to one's intrinsic motivation to succeed academically to positively represent the family, rather than being directly related to grades (Fuligni et al., 1999). Again, there is a dearth of research on the role of family orientation/familism in middle childhood. However, this study suggests that familial values provide a cultural lens that impacts how caregivers parent their children, as well as shape how children are beginning to view the world (Hernández & Bámaca-Colbert, 2016).

This study also hypothesized that children higher on family orientation would demonstrate higher self-regulation across racial/ethnic groups, and that associations would be stronger for girls and children from families with lower SES. However, our hypotheses surrounding child sex and family SES were not supported. Previous research has suggested that familism was protective against the development of antisocial behaviors for girls across childhood and early adolescence, whereas it was only

protective for boys in middle childhood (Morcillo et al., 2011). Latino families often ascribe to traditional gender roles, where girls have more household obligations (Raffaelli & Ontai, 2004) and are monitored more than boys (Bámaca-Colbert et al., 2012). It is possible that sex differences emerge in later childhood and adolescence, where family orientation might be less protective for adolescent boys because they are allowed more freedoms (Morcillo et al., 2011).

Although there was a significant interaction between family orientation and SES to predict teacher-reported effortful control, this was likely to have occurred by chance given the large number of interaction models tested. Therefore, there is little evidence that SES moderated links between family orientation and children's self-regulation. Providing support within the family system can be adaptive when resources are scarce and family must depend on one another (Bush et al., 2004; Hernández & Bámaca-Colbert, 2016; Li-Grining, 2012). That could be the case for families from low SES backgrounds in this study, but it is also possible that families from high SES households have the stability and resources to form close parent-child relationships (Dixson et al., 2017; Kraus et al., 2012). Family orientation might also be important in higher SES households, as its effects are independent of SES. The development of self-regulation across all socioeconomic contexts may be enhanced by family orientation.

In this study, mean family orientation was higher in Latino, compared to non-Hispanic/Latino families but associations with children's self-regulation were similar across racial/ethnic groups, supporting hypotheses. This finding is in-line with previous research in adults demonstrating that associations between familism and various outcomes were comparable across racial/ethnic groups (Campos et al., 2014; Christophe

& Stein, 2022; Schwartz, 2007; Soli et al., 2009). Although researchers posit that valuing and prioritizing the family is a universal, rather than specific, cultural practice (Campos et al., 2014; Hardway & Fuligni, 2006), these findings do not minimize the importance of familism for racial/ethnic minority groups, particularly Latino families.

Additionally, children's traits are both genetically and environmentally influenced, and these influences often interact, such that traits are more heritable in some contexts than others (Purcell, 2002). Familism is an important context that has yet to be considered in this manner, underscoring the need for research to use genetically informed methods to better understand how culture and biology influence human development.

Genetically-informed models

The final goal of the study was to examine the extent that differences in self-regulation are accounted for by additive genetic, shared environmental, and nonshared environmental influences, and whether these influences vary by family orientation.

Univariate twin models

Univariate twin models revealed that family orientation behaviors, which were comprised of coded child family orientation and experimenter ratings of primary caregiver and child behavior, were largely influenced by the shared environment, with the remaining variance being accounted for by additive genetic and nonshared environmental influences. This was concordant with our hypotheses. This study is the first to consider family orientation in a genetically informed design. Other twin research considering observer reports of parenting-related constructs report lower estimates of the shared environment (Klahr & Burt, 2014).

Traditional measures of parenting and the home environment are heritable (Kendler & Baker, 2997; Saudino & Plomin, 1997), as children are active contributors to the parenting they receive as well as the broader home context. This concept is referred to as gene-environment correlation, and there are three forms: passive, active, and evocative. Passive gene-environment correlation refers to the notion that parents transmit their genes and provide a rearing environment that both influence their children's development (Wilkinson et al., 2013). It could also be the case that parents' genetically influenced characteristics also contribute to the cultural context. For example, a caregiver that is high in extroversion could foster a cultural context indexed by a warm and emotionally engaging family dynamic (Belsky et al., 1995). Active gene-environment correlation occurs when a child's heritable characteristics influence their choice of environment (Wilkinson et al., 2013). It could be the case that a shy, inhibited child could actively seek out support from family members as opposed to peers. And finally, evocative gene-environment correlation occurs when a child's heritable traits elicit particular responses from others (Wilkinson et al., 2013). For example, a rambunctious child could receive stricter parenting because families with high family orientation hold the expectation that children should obey their parents' demands. Family orientation behaviors also represent the dyadic nature of the parent-child relationship, and it is likely that gene-environment correlation processes are occurring (Klahr & Burt, 2014), such that the child's heritable traits are influencing their environment – and more specifically – the dyadic interaction. In particular, the coded measure of child family orientation assessed the child's response to the primary caregiver's discussion topic, and experimenter ratings evaluate the caregiver-child dynamic throughout the entirety of the

home visits. In sum, family orientation captures familial contexts that could be important for the development of children's self-regulation.

As for our measures of self-regulation, additive genetic and nonshared environmental influences explained differences in executive functioning and effortful control in middle childhood. To begin, additive genetic influences accounted for 27% of the variance in the Continuous Performance Task, with the remaining variance being explained by the nonshared environment. One study of 8-year-old twins found that the stop-signal task, a similar measure assessing inhibitory control, was 50% heritable (Schachar et al., 2010). Similarly, the Flanker Task was 47% heritable in our study, lower than a study of Chinese adolescents and adults (89%) (Fan et al., 2001). Additive genetic influences were also lower for Digit Span Backward (32%) compared to one study of 12-year-old children from the Netherlands (56%) (Polderman et al., 2006). All of these executive functioning tasks require multiple components of executive functioning, including inhibitory control and working memory skills. Inhibitory control and working memory have a longer developmental trajectory than other components of executive functioning (Diamond, 2013), thus the difficult nature of these tasks could explain why heritability estimates in our study were lower compared to studies with older samples. In fact, twin studies consistently demonstrate increasing heritability with age due to mastery and development (Knopik et al., 2016). Therefore, it will be important to examine changes in the heritability of executive functioning and effortful control as our sample enters into adolescence.

For parent- and teacher-reported effortful control, over 70% of the variance was due to additive genetic influences, concordant with literature examining the heritability of

effortful control and related constructs in middle childhood (Goldsmith et al., 1997; Lemery-Chalfant et al., 2008; Willems et al., 2019). Effortful control is shown to have a constitutional basis and is stable across childhood (Valiente et al., 2006), and measures of effortful control are said to assess typical, emotionally relevant behavior (Toplak et al., 2013). Together, this could explain why additive genetic influences explain a majority of the variance in effortful control. The lack of shared environmental influences on effortful control across parent- and teacher-reported measures provides support that these measures are accurately assessing individual differences in children's stable temperament characteristics (Willems et al., 2019).

Moderated heritability models

For Aim 3 of the study, family orientation values (a family-level moderator) and behaviors (a child-level moderator) were tested as moderators of the heritability of measures of executive functioning and effortful control in middle childhood. Here, it was hypothesized that higher family orientation would increase the extent that environmental influences explained differences in children's self-regulation. However, across all models, there was no evidence of moderation, similar to another study with the same sample that found that early adversity assessed in toddlerhood did not moderate the heritability of executive functioning in middle childhood (Rea-Sandin, 2018). Other work in middle childhood suggests that the heritability of effortful control was moderated by chaos in the home (Lemery-Chalfant et al., 2013). Finally, chaos in the home did not moderate the genetic and environmental influences on inattention and hyperactivity/impulsivity (Gould et al., 2018), whereas parental involvement increased

the additive genetic and decreased the nonshared environmental influences on ADHD in middle childhood (Nikolas et al., 2015).

Interactions between genes the environment reflect developmental processes involving variables at multiple levels of analysis (Johnston & Edwards, 2002). Cultural variation within the family acts as a lens that influences family processes and children's outcomes (Hernández & Bámaca-Colbert, 2016). Although this study did not find evidence that family orientation values or behaviors moderated the genetic and environmental influences on children's self-regulation, behavioral manifestations of family orientation seem to be independently important for children's executive functioning and effortful control. Shanahan and Hofer (2005) assert that gene-environment interactions "reflect manifold aspects of context that exert their influence on the person as a set of variables, not individually." Therefore, it is possible that significant gene-environment effects were not detected because only considering the role of one variable on the heritability of the outcome of interest is likely to underestimate the effect of contextual factors (Shanahan & Hofer, 2005). It is also likely that the study was underpowered, as others have recommended a minimum of 500 twin pairs to achieve at least 80% power (Tucker-Drob & Bates, 2016). Regardless, this study contributes to the field of quantitative behavior genetics by considering how cultural context might impact the extent that genes and the environment contribute to variability in children's self-regulatory abilities.

Strengths and Limitations

The majority of research on familism in childhood relies on parent-reported measures (Stein et al., 2014), but this study sought to expand the measurement of culture

within the family by considering coded videotaped interactions and experimenter ratings. Multiple trained experimenters were involved in coding the parent-child discussion task and completing ratings of the home visit, reducing the risk of rater bias in the study. Next, the diverse, representative sample was another strength of the study that captured a wide range of cultural variability between families. And finally, the inclusion of task-based executive functioning and multiple reporters of effortful control assessed the broad, multifaceted nature of self-regulation (Nigg, 2017; Zelazo & Carlson, 2012).

There were also several limitations of the study. First, the nature of the discussion prompt led caregivers to list topics related to the family, potentially limiting the ability to truly capture the primary caregiver's level of family orientation. Additionally, caregivers provided varying levels of context for why a particular topic was chosen. For example, some caregivers would only state that the child needs to help out with household chores, whereas others would describe that household chores need to be completed because children are to obey their parents' wishes, making some videos more difficult to code for family orientation. However, given the naturalistic, open-ended nature of the parent-child discussion task, the same level of detail across every family would not be expected. Next, the child's endorsement of family orientation was always in response to the caregiver's topic. Although this captured the dyadic nature of family orientation, it is also important to independently assess children's values and behaviors surrounding the family.

Future Directions

This study provides preliminary evidence that coding videotaped parent-child discussions is a novel way to assess family orientation. In addition to coding the topics, future work should incorporate dynamic systems approaches to evaluate the degree to

which caregiver and child are concordant on family orientation and body language across the entirety of the discussion task (e.g., Granic et al., 2003). It is possible that increased synchrony across the course of the interaction could be indicative of higher family orientation. Next, although familism and family orientation were identified across racial/ethnic groups, associations with self-regulation could vary by other aspects of culture, including level of acculturation or racial/ethnic identity (Li-Grining, 2012; Power et al., 2022). Incorporating the perspectives of multiple family members would better contribute to our understanding of the development of children's values and behavioral manifestations of culture (e.g., Padilla et al., 2016). Another future direction includes replicating the unexpected, negative association between family orientation values and behaviors in middle childhood. In addition, bidirectional associations should be tested, as it is possible that children's self-regulation could also be predictive of endorsement of family orientation. Finally, it will be important to test whether family orientation behaviors mediate the association between values and self-regulation in middle childhood (Hernández & Bámaca-Colbert, 2016; Li-Grining, 2012).

Conclusion

Psychological research often portrays European American or Western samples as the ideal manifestation of human behavior (Causadias et al., 2018; Medin et al., 2010). This study aimed to challenge this bias by broadening the assessment of culture within the family, and considering how family orientation promotes the development of self-regulation for children from diverse sociocultural backgrounds (Coll et al., 2000). Additionally, understanding how cultural factors influence the genetic and environmental contributions to children's development can make genetically informed work more

inclusive and representative. Future work should continue to investigate how cultural values and beliefs manifest in childhood.

Table 1

Twin Race/Ethnicity

	Frequency	Percent
Non-Hispanic White	395	58.5%
Hispanic/Latino	160	23.7%
Black/African American	26	3.9%
Asian/Asian American	21	3.1%
Native American	18	2.7%
Native Hawaiian or Pacific Islander	6	0.9%
Hispanic/Latino and Black	20	3.0%
Hispanic/Latino and Asian	4	0.6%
Hispanic/Latino and Native American	8	1.2%
Not listed	6	0.9%
Did not disclose	11	1.6%

Note. Twin race/ethnicity was taken from mother- and father-reported race/ethnicity. Biracial/multiracial individuals that endorse non-Hispanic White and another racial/ethnic group were counted as the non-White group.

Table 2.

Descriptive Statistics

	Level	N	Min	Max	Mean	SD	Skewness/ Kurtosis
PC Family Orientation	F	277	1.00	4.00	2.71	0.77	-0.28/-0.39
Child Family Orientation	T	548	1.00	4.00	2.36	0.78	-0.12/-0.61
Child Decision Making	F	323	.00	8.00	3.30	2.56	0.20/-1.15
Familism – Support	F	322	1.33	5.00	4.42	0.54	-1.38/3.18
Familism – Obligation	F	322	1.40	5.00	3.70	0.70	-0.39/-0.20
Familism – Referents	F	322	1.33	4.83	3.19	0.64	-0.31/-0.04
PVR – Compliance w/ Tester	T	587	1.00	5.00	4.52	0.67	-2.07/4.99
PVR – Compliance w/ PC	T	587	1.25	5.00	4.22	0.69	-1.16/1.14
PVR – Resistance w/ PC	T	587	1.25	5.00	4.24	0.66	-1.19/1.59
PVR – Sensitive Parenting	T	587	2.00	5.00	4.08	0.65	-0.85/0.50
PVR – Connectedness	T	587	1.50	5.00	3.94	0.71	-0.72/0.14
PVR – Intrusiveness	T	587	1.50	5.00	4.06	0.68	-0.87/0.93
PVR – Reciprocity	T	587	1.25	5.00	3.84	0.74	-0.65/0.03
PVR – Regulation	T	590	1.25	5.00	4.06	0.69	-0.73/0.17
CPT	T	578	-2.13	3.70	0.09	1.22	0.11/-0.55
Flanker Task	T	574	-19.64	-5.02	-10.37	3.78	-1.06/0.25
Digit Span Backward	T	586	.00	9.00	3.95	1.39	0.39/0.35
Effortful Control – Parent	T	639	1.78	4.68	3.30	0.32	-0.14/-0.51

Effortful Control – Teacher	T	464	1.74	5.00	3.65	0.47	-0.37/-0.48
SES	F	675	-2.06	1.55	-0.04	0.83	-0.07/-0.82
Twin Age	T	674	6.96	10.26	8.45	0.69	-0.18/-0.35
Twin Sex	T	710	0.00	1.00	0.50	-	-

Note. PC=primary caregiver; PVR=Post-Visit Rating; CPT=Continuous Performance Task; F=family-level; T=twin-level. Post-visit rating scores are aggregated across the two experimenters across the two separate home visits. Twin sex was coded 0 = *male*, 1 = *female*. Sample sizes for family-level variables are listed as number of families whereas twin-level variables are listed as number of twins.

Table 3.

Zero-order correlations

	1	2	3	4	5	6	7	8	9	10
1. PC Family Orientation	-									
2. Child Family Orientation	-.05	-								
3. Parent Decision Making	.03	.04	-							
4. Familism – Support	-.02	.03	.13*	-						
5. Familism – Obligation	-.05	.01	.15**	.60***	-					
6. Familism – Referents	-.11*	-.03	.20***	.60***	.68***	-				
7. Compliance w/ Tester	-.06	.15**	.03	.17***	.08	.08	-			
8. Compliance w/ PC	-.03	.19***	-.01	.10	-.01	.03	.73***	-		
9. Lack of Resistance w/ PC	-.03	.31***	-.04	.07	-.07	-.04	.58***	.71***	-	
10. Sensitive Parenting	-.08	.19***	-.04	-.07	-.14*	-.13*	.24***	.39***	.54***	-
11. Connectedness	-.06	.25***	-.09	-.05	-.16**	-.17**	.29***	.40***	.61***	.80***
12. Lack of Intrusiveness	-.02	.13**	-.02	-.05	-.08	-.11*	.24***	.34***	.40***	.36***

13. Reciprocity	-.02	.31***	-.10	-.01	-.11*	-.13*	.43***	.55***	.70***	.75***
14. Regulation	-.02	.19***	.08	.02	-.06	-.03	.52***	.69***	.67***	.59***
15. CPT	.02	.09*	-.01	.07	.05	.02	.31***	.31***	.26***	.17***
16. Flanker Task	-.03	-.02	.01	-.03	-.02	.04	.15**	.12*	.09	.06
17. Digit Span Backward	.04	.03	-.11*	.06	.03	.03	.15**	.08	.08	.06
18. Effortful Control	.06	.06	-.19***	.10*	.04	.02	.30***	.24***	.31***	.23***
19. Effortful Control – TR	.06	.08	-.16**	.01	-.05	-.07	.30***	.32***	.24***	.18**
20. SES	-.03	.13**	-.24***	-.05	-.09	-.17**	.12*	.16**	.24***	.34***
21. Age	-.03	.01	.06	.01	.07	.12	.17***	.18***	.01	-.07
22. Sex	.02	.05	-.05	.06	.01	-.04	.19**	.26***	.22***	.05
23. Latino	-.09	.07	.13*	.13	.07	.14*	.09*	.07	.03	.03
24. European American	.08	-.03	-.20***	-.07	-.06	-.10	-.17***	-.09	-.03	.02

	11	12	13	14	15	16	17	18	19	20
11. Connectedness	-									
12. Lack of Intrusiveness	.30***	-								
13. Reciprocity	.85***	.36***	-							
14. Regulation	.55***	.39***	.65***	-						
15. CPT	.19***	.03	.23***	.19***	-					
16. Flanker Task	.07	-.01	.06	.15**	.15***	-				
17. Digit Span Backward	.06	-.03	.06	.08	.15***	.22***	-			
18. Effortful Control	.21***	.19***	.26***	.21***	.20***	.15**	.18***	-		
19. Effortful Control – TR	.20***	.16**	.25***	.25***	.29***	.12*	.16***	.49***	-	
20. SES	.36***	.16**	.30***	.17***	.05	.08	.16**	.22***	.16**	-
21. Age	-.08	-.05	-.04	.11	.12*	.23***	.14**	.09	-.05	-.15*
22. Sex	.11	.03	.09	.09	.23***	-.27***	-.04	.24***	.35***	.08
23. Latino	.03	-.05	.07	.01	.09	-.03	-.09	-.01	.01	-.29***
24. European American	.03	.06	.01	-.03	-.10*	-.05	.07	-.01	-.03	.28***

	21	22	23	24
21. Age	-			
22. Sex	.03	-		
23. Latino	.10	.01	-	
24. European American	-.17**	-.05	-.77***	-

Note. PC = primary caregiver; CPT=Continuous Performance Task; TR = teacher-report; SES = socioeconomic status. Twin sex was coded 0 = *male*, 1 = *female*. Latino and European American were coded 0 = *no*, 1 = *yes*. *$p < .05$; **$p < .01$; ***$p < .001$.

Table 4

Standardized factor loadings from 2-factor solution exploratory factor analysis of proposed family orientation measures

	1	2
Familism – Support	**.740***	.109
Familism – Obligation	**.799***	-.013
Familism – Referents	**.821***	-.004
Twin Family Orientation	.045	**.322***
Compliance with Child Tester	.269	**.547***
Compliance with PC	.207	**.678***
Lack of Resistance with PC	.144	**.809***
Sensitive Parenting	-.087	**.796***
Parent-Child Connectedness	-.107	**.858***
PC Lack of Intrusiveness	-.009	**.427***
Parent-Child Reciprocity	-.014	**.929***
Parent-Child Regulation	.120	**.754***
PC Family Orientation	-.085	-.048
Child Decision Making	-.212	.042

Note. PC=primary caregiver. Significant loadings are listed in bold. Factors that were used in subsequent analyses comprised variables with loadings >.30 (Costello & Osborne, 2005).

Table 5

Correlations between family orientation values and behaviors with subscales from the Mexican American Cultural Values Scale

	Respect	Religion	Traditional Gender Roles	Material Success	Competition and Personal Achievement	Traditional Values	Mainstream Values
Family orientation values	.67***	.34**	.34**	.27**	.41**	.80***	.37**
Family orientation behaviors	-.11**	.01	-.07	-.05	-.12**	-.08*	-.13**

Note. *$p < .05$; **$p < .01$; ***$p < .001$. Traditional Values comprises Familism, Respect, Religion, and Traditional Gender Roles subscales. Mainstream Values comprises Material Success and Competition and Personal Achievement subscales.

Table 6

Family orientation values and behaviors predicting self-regulation in middle childhood

	CPT	Flanker Task	DSB	EC	EC-TR
Intercept	**0.11(.05)***	**-10.29(.16)*****	**3.99(.06)*****	**3.30(.03)*****	**3.63(.03)*****
Age	**0.19(.09)***	**1.35(.28)*****	**0.37(.10)*****	**0.08(.04)***	-0.03(.06)
Sex	**0.39(.09)*****	**-1.66(.30)*****	-0.12(.11)	**0.17(.04)*****	**0.35(.06)*****
SES	0.01(.06)	0.41(.24)	**0.27(.09)****	**0.11(.03)****	0.08(.05)
Latino	-0.02(.19)	**1.41(.54)****	0.16(.21)	0.04(.10)	0.01(.12)
EA	0.15(.18)	**1.17(.47)***	-0.07(.20)	0.05(.09)	0.05(.10)
FO Values	0.07(.06)	-0.01(.17)	0.06(.08)	0.06(.03)	0.01(.04)
FO Behaviors	**0.32(.05)*****	**0.40(.20)***	0.07(.08)	**0.16(.03)*****	**0.16(.04)*****
FO Behaviors x SES	**-**	**-**	-	**-**	**-0.17(.06)****

Note. The effects of family orientation and covariates on outcomes were tested simultaneously. Covariates, predictors, and moderators were grand mean centered. Sex (1=female), Latino (1=Hispanic/Latino), EA=European American (1=non-Hispanic White/European American). CPT=Continuous Performance Task. DSB=Digit Span Backward. EC=effortful control; TR=teacher-report;

SES=socioeconomic status. Unstandardized partial regression coefficient estimates were reported and robust standard errors are reported in parentheses. *$p < .05$; **$p < .01$; ***$p < .001$.

Table 7

Twin Intraclass Correlations

	MZ	DZ
Family Orientation Behaviors	.95	.79
Continuous Performance Task	.25	.13
Flanker Task	.42	.26
Digit Span Backward	.33	.17
Effortful Control – Parent-report	.77	.46
Effortful Control – Teacher-report	.69	.42

MZ=monozygotic; DZ=dizygotic; PC=primary caregiver; TR=teacher-report. Twin intraclass correlations for the Continuous Performance Task, Flanker Task, and Digit Span Backward are previously reported in a study including twins from the 8-year wave as well as 186 additional children from the 9-year wave of data collection (Rea-Sandin et al., *under review*).

Table 8

Univariate twin model estimates and fit statistics

Scale	**Model**	**-2LL**	***df***	**AIC**	**Δ-2LL**	***p***	**A**	**C (or D)**	**E**
FO Behaviors	**ACE**	**1241.86**	**660**	**1249.86**			**.32 (.23, .42)**	**.63 (.53, .71)**	**.05 (.04, .07)**
	AE	1312.61	661	1318.61	70.75	<.001	.95 (.93, .96)	--	.05 (.04, .07)
	CE	1297.32	661	1297.32	55.46	<.001	**--**	.84 (.80, .87)	.16 (.13, .20)
	E	1702.70	662	1706.70	460.84	<.001	**--**	**--**	1.00 (1.00, 1.00)
CPT	ACE	2161.74	707	2169.74			.26 (.00, .70)	.01 (.00, .30)	.73 (.48, .96)
	AE	**2161.73**	**708**	**2167.73**	**-0.01**	**1.00**	**.27 (.11, .41)**	**--**	**.73 (.59, .89)**
	CE	2163.27	708	2169.27	1.53	.21	--	.17 (.06, .27)	.83 (.73, .94)
	E	2172.95	709	2176.95	11.21	.01	**--**	**--**	1.00 (1.00, 1.00)
Flanker Task	ACE	3769.01	704	3777.01			.43 (.06, .80)	.03 (.00, .28)	.54 (.00, 1.00)
	AE	**3769.05**	**705**	**3775.05**	**0.04**	**.84**	**.47 (.33, .58)**	**--**	**.53 (.42, .67)**
	CE	3773.37	705	3779.37	4.36	.04	**--**	.30 (.20, .39)	.70 (.61, .80)
	E	3805.14	706	3809.14	36.13	<.001	**--**	**--**	1.00 (1.00, 1.00)

DSB	ACE	2586.37	726	2594.37			.29 (.00, .70)	.02 (.00, .29)	.69 (.51, .87)
	AE	**2586.39**	**727**	**2592.39**	**0.02**	**0.89**	**.32 (.18, .45)**	**--**	**.68 (.55, .82)**
	CE	2588.32	727	2594.32	1.96	0.16	--	.21 (.11,.31)	.78 (.69, .89)
	E	2605.06	728	2609.06	18.69	<0.01	**--**	**--**	1.00 (1.00, 1.00)
EC	ACE	893.16	620	901.16			.71 (.49, .95)	.08 (.00, .28)	.20 (.15, .28)
	AE	**893.77**	**621**	**899.77**	**0.61**	**0.43**	**.80 (.73, .85)**	**--**	**.20 (.15, .27)**
	CE	921.62	621	927.62	28.46	<.001	**--**	.53 (.45, .61)	.47 (.39, .55)
	E	1024.70	622	1028.70	131.54	<.001	**--**	**--**	1.00 (1.00, 1.00)
EC – TR	ACE	830.80	448	838.80			.60 (.26, .93)	.11 (.00, .37)	.29 (.20, .43)
	AE	**831.41**	**449**	**837.41**	**0.61**	**0.44**	**.73 (.61, .81)**	**--**	**.28 (.19, .39)**
	CE	840.72	449	846.72	9.91	.002	**--**	.49 (.38, .58)	.51 (.42, .62)
	E	895.18	450	899.18	64.37	<.001	**--**	**--**	1.00 (1.00, 1.00)

Note. -2LL=-2 log likelihood; df=degrees of freedom; AIC=Akaike's Information Criterion; Δ=change; FO=family orientation; CPT=Continuous Performance Task; DSB=Digit Span Backward; EC=effortful control; TR=teacher-report; A=additive genetic; C=shared environment; D=dominant genetic; E=non-shared environment. A, C (D), and E are standardized variance components.

Final models are indicated in bold. ACE models for CPT, Flanker Task, and DSB are previously reported in a study including twins from the 8-year wave as well as 186 additional children from the 9-year wave of data collection (Rea-Sandin et al., under review).

Table 9.

GxE model estimates and fit statistics

Model	A	A1	C	C1	E	E1	-2LL	AIC	BIC	ssBIC
Continuous Performance Task x Family Orientation Values										
ACE, ACE moderation	.44***	.64***	.00	.00	.56***	3.28***	-1256.09	2536.18	2581.77	2543.71
AE, AE moderation	.06***	.51***			.94***	1.97***	-1222.28	2464.57	2502.56	2470.84
AE, A moderation	.33***	.01			.67***		-871.84	1761.68	1795.88	1767.33
AE, no moderation	**.33*** **				**.67*** **		**-871.86**	**1759.72**	**1790.11**	**1764.74**
Continuous Performance Task x Family Orientation Behaviors										
ACE, ACE moderation	.37***	-.45***	.00	.00	.63***	1.50***	-1064.51	2153.01	2198.60	2160.54
AE, AE moderation	.37***	-.45***			.63***	1.50***	-1064.51	2149.01	2187.00	2155.28
AE, A moderation	.28***	-.03			.72***		-860.42	1738.83	1773.03	1744.48
AE, no moderation	**.28*** **				**.72*** **		**-860.50**	**1737.01**	**1767.40**	**1742.02**
Flanker Task x Family Orientation Values										
ACE, ACE moderation	.69***	.32	.00	.00	.31***	-.32***	-1472.37	2968.74	3014.33	2976.26

AE, AE moderation	.66***	-1.48***			.34***	4.15***	-1633.54	3287.08	3325.07	3293.35
AE, A moderation	.66***	.07			.34***		-1473.60	2965.21	2999.40	2970.85
AE, no moderation	**.66*** **				**.34*** **		**-1473.67**	**2963.33**	**2993.73**	**2968.35**
Flanker Task x Family Orientation Behaviors										
ACE, ACE moderation	.75***	-1.26***	.00	.00	.25***	4.18***	-1579.76	3183.52	3229.11	3191.05
AE, AE moderation	.95***	-.22			.05***	4.77***	-1577.59	3175.19	3213.18	3181.46
AE, A moderation	.12	1.59***			.88***		-1476.56	2971.12	3005.31	2976.76
AE, no moderation	**.65*** **				**.35*** **		**-1472.17**	**2960.33**	**2990.72**	**2965.35**
Digit Span Backward x Family Orientation Values										
ACE, ACE moderation	.42***	-.54***	.00	.00	.58***	1.51***	-1084.22	2192.44	2238.03	2199.97
AE, AE moderation	.11***	.62***			.89***	2.09***	-1302.31	2624.62	2662.61	2630.89
AE, A moderation	.11*	.42**			.89***		-974.42	1966.84	2001.03	1972.48
AE, no moderation	**.36*** **				**.64*** **		**-971.71**	**1959.42**	**1989.82**	**1964.44**
Digit Span Backward x Family Orientation Behaviors										
ACE, ACE moderation	.52***	-.67***	.00	.00	.48***	1.67***	-1112.50	2249.00	2294.58	2256.52

AE, AE moderation	.70***	-.63***			.30***	1.95***	-1103.68	2227.36	2265.35	2233.63
AE, A moderation	.00	.55***			1.00***		-975.18	1968.36	2002.55	1974.00
AE, no moderation	**.36*** **				**.64*** **		**-970.63**	**1957.25**	**1987.64**	**1962.27**
Effortful Control x Family Orientation Values										
ACE, ACE moderation	-.15**	.19***	-.14**	.18**	.61***	.45***	-639.57	1303.14	1348.73	1310.67
ACE, AE moderation	-.27***	.23***	.05		.48***	.42***	-565.70	1153.40	1195.20	1160.30
ACE, A moderation	.10*	.28***	.35***		.32***		-437.82	895.64	933.63	901.91
ACE, no moderation	.45***		.20		-.25***		-436.13	890.27	924.46	895.91
AE, AE moderation	-.28***	.23***			.46***	.43***	-560.76	1141.52	1179.51	1147.79
AE, no moderation	**.49*** **				**.24*** **		**-436.92**	**889.85**	**920.24**	**894.86**
Effortful Control x Family Orientation Behaviors										
ACE, ACE moderation	.54***	-.01	.00	.21***	.46***	.24***	-442.56	909.12	954.71	916.64
ACE, AE moderation	.41***	.02	.06		.53***	-.01	-424.44	870.88	912.67	877.78
ACE, A moderation	.41***	.02	.06		.53***		-424.46	868.93	906.92	875.20
ACE, no moderation	.42***		.05		.52***		-424.83	867.66	901.85	873.30

AE, AE moderation	.48***	.02			.52***	-.01	-424.85	869.69	907.68	875.96
AE, no moderation	**.48*** **				**.52*** **		**-425.18**	**866.35**	**896.74**	**871.37**
Effortful Control – Teacher-report x Family Orientation Values										
ACE, ACE moderation	.42***	-.21***	.00	.00	.58***	.50***	-465.23	954.47	1000.06	961.99
ACE, AE moderation	.42***	-.21***	.00		.58***	.50***	-465.23	952.47	994.26	959.37
ACE, A moderation	.39***	.03	.07		.54***		-408.99	837.98	875.98	844.26
ACE, no moderation	.38***		.08		.54***		-409.42	836.86	871.05	842.50
AE, AE moderation	.13***	-.30***			.88***	.79***	-610.83	1241.67	1279.66	1247.94
AE, no moderation	**.47*** **				**.53*** **		**-409.79**	**835.58**	**865.97**	**840.59**
Effortful Control – Teacher-report x Family Orientation Behaviors										
ACE, ACE moderation	.40***	.01	.04	.08	.56***	.03	-401.60	827.20	872.79	834.73
ACE, AE moderation	.40***	.02	.05		.56***	.01	-401.64	825.29	867.08	832.18
ACE, A moderation	.40***	.02	.05		.56***		-401.64	823.29	861.28	829.56
ACE, no moderation	.40***		.05		.56***					
AE, AE moderation	.43***	-.13**			.57***	.40***	-438.02	896.06	934.05	902.33

AE, no moderation	**.45*** **	**.55*** **	**-402.01**	**820.01**	**850.41**	**825.03**

Note. -2LL=-2 log likelihood; AIC=Akaike's Information Criterion; BIC=Bayesian Information Criterion, ssBIC=sample size-adjusted BIC. A=additive genetic; C=shared environment; E=non-shared environment. A, C, and E are standardized variance components. Final models are indicated in bold. *$p < .05$, **$p < .01$, and ***$p < .001$.

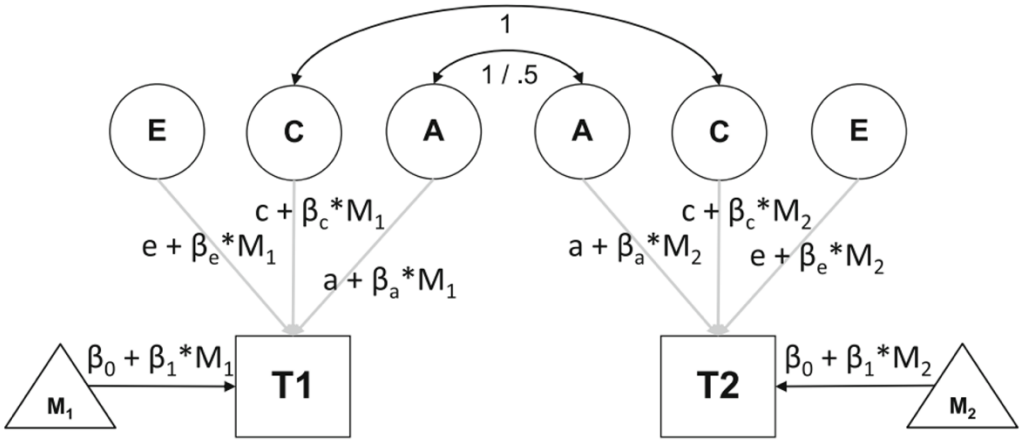

Figure 1. Moderated heritability model

Note. Moderated heritability model (showing only one twin for simplicity) that allows for the moderation of a twin-level phenotype (i.e., family orientation behaviors) on an individual-level phenotype (i.e., self-regulation). A = additive genetic variance, C = shared environmental variance, E = nonshared environmental variance, M = moderator. Equations next to each path represent the linear relationship between the path coefficient and the moderator. The overlap between each twin's self-regulation and family orientation behaviors was residualized out of the model to control for potential gene-environment correlation (van der Sluis et al., 2012).

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APPENDIX A

SUPPLEMENTAL METHODS

Proposed Cultural Measures Not Used in Analyses. The following measures were initially considered but were not used in analyses because they were not correlated with other proposed measures of family orientation.

Warm and Authoritarian Parenting. Primary caregivers completed the 32-item short form of the Parenting Styles and Dimensions Questionnaire (Robinson et al., 2001) to assesses Warm and Authoritarian parenting styles. Items were answered on a 1 (never) to 5 (always) Likert scale. An example item from the Warm parenting (alpha = .88) subscale is "I try to respond to my children's feelings or needs when they are upset." An example item from the Authoritarian parenting (alpha = .76) subscale is "I spank *Twin A/B* when s/he is disobedient." This measure has demonstrated good psychometric properties (Olivari et al., 2013).

Sibling Interaction Task. During the home visit, the twins engaged in a sibling interaction task (Madsen, 1971) that involved pulling at a string on each end of a wooden block that contained a marble. The twins sat at opposite sides of a long wooden board and attempted to bring the block closer to them and drop the marble into a hole on their side of the board by pulling on the strings. The children earned points by successfully dropping the marble into the hole in front of them. However, the two sides of the wooden block were attached with magnets, and if both children attempted to pull the block to their side at the same time, the block would come apart into two pieces releasing the marble and neither child would earn a point. Each trial consisted of either one child successfully earning a point, or the block being pulled apart.

Before starting the game, a trained research assistant told the twins that whoever had the most points at the end of the game would receive a prize. If the game ended in a tie, both twins would receive a prize. Because the game required cooperation and negotiation between the twins, the research assistant encouraged the children to stop and strategize how they were going to continue playing the game after the first 10 trials. The twin with the most points after 50 trials won the prize of two pieces of candy. The entire game was video recorded as well as a few minutes after the prize was distributed to see if the winning twin would share the prize with their cotwin.

Prosocial behavior was coded (1 = present, 0 = absent) during each marble pull of the game and for 10-second epochs when the twins were strategizing during the game and after the game was completed. Examples of prosocial behavior include agreeing or complying with their co-twin's suggestions for how to play and physical displays of cooperation (i.e., high-fives or thumbs-up). Ten percent of all episodes were double-coded by a master coder, and all coders reached greater than 90% agreement. To calculate overall prosocial behavior, the scores of each marble pull and epoch were averaged. Higher scores reflected more prosocial/cooperative behavior. Rater reliability for prosocial behavior across the 6 coders ranged from κ = .96-.98.

Number of adults in the household. How many adults, not including the primary caregiver and their current spouse or partner, live in the household as well as their relation to the caregivers were assessed. Adults that are not related to the family were not included. Having extended family members live in the household could be indicative of the need to have close relationships with extended family members (Glick et al., 1997).

Home Observation for Measurement of the Environment: Experimenters conducted the Home Observation for Measurement of the Environment (HOME) to assess physical, emotional, and social facets of the twins' home environment (Caldwell & Bradley, 2003). Questions required a yes (scored as 1) or no (scored as 0) response, with some questions being answered by the primary caregiver while others are answered through observer report. The Family Companionship (6 items, alpha = .25) and the Family Integration (4 items, alpha = .74) were included. Family Companionship comprises items relating to the family spending time together and participating in activities together. An example item includes "Family member has taken child on (or arranged for child to take) a trip of more than 50 miles from home". Family Integration includes items relating to the involvement of the primary and secondary caregiver in the child's daily life, and an example item includes "Child sees and spends some time with father or father figure 4 days a week." Items were assessed for each twin, but twins were highly correlated on both subscales (rs > .99, p < .001), therefore subscales were mean composited across twins.

Table S1

Zero-order correlations between variables not included in subsequent analyses with included variables

	Authoritarian Parenting	Warm Parenting	Family Companionship	Family Integration	# adults in the home	Child Sharing	Prosocial Behavior
PC Family Orientation	.05	.03	.01	.02	.03	.02	-.06
Child Family Orientation	-.07	.02	.06	.08	-.05	-.03	.05
Parent Decision Making	-.17**	.10	-.05	-.16*	.08	.06	-.04
Familism – Support	.14**	.19***	.14*	.09	.04	.08	.04
Familism – Obligation	.16***	.14**	.07	-.06	.12*	.02	-.02
Familism – Referents	.29***	.05	.03	-.03	.14**	.04	-.03
Compliance w/ Tester	-.15**	.07	.14**	.05	-.01	-.03	.01
Compliance w/ PC	-.24***	.10	.13*	.13*	-.09*	.07	-.02
Lack of Resistance w/ PC	-.20***	.08	.15**	.17**	-.10**	.04	.01
Sensitive Parenting	-.18**	.15*	.24***	.22***	-.21***	.03	.06
P-C Connectedness	-.13*	.12*	.18***	.23***	-.19***	.02	.01

PC Lack of Intrusiveness	-.22***	.10	.21***	.12*	-.03	.04	.05
P-C Reciprocity	-.13*	.13*	.22***	.22***	-.17***	-.07	-.02
P-C Regulation	-.18**	.07	.18**	.20***	-.16***	-.03	.02
CPT	-.05	.02	.04	.01	-.04	.03	-.01
Flanker Task	-.04	.01	.07	.04	-.08	-.02	-.05
Digit Span Backward	-.02	.01	.06	.06	-.04	.11	.03
Effortful Control	-.29***	.21***	.15**	.16**	-.12***	.06	.03
Effortful Control – TR	-.19**	.11*	.12*	.11*	-.05	.07	.04
SES	-.18**	.11*	.27***	.34***	-.24***	-.02	.03
Twin Age	.01	-.02	-.03	-.08	.09	.12	-.12*
Twin Sex	-.15**	-.01	.03	-.06	.03	.02	.09
Latino	-.02	.04	.02	-.04	.14*	.09	-.17**
European American	.02	-.03	.02	.08	-.13*	-.06	.13*

Note. PC = primary caregiver; P-C = parent-child; TR = teacher-report; SES = socioeconomic status. Twin sex was coded 0 = *male*, 1 = *female*. Latino and European American were coded 0 = *no*, 1 = *yes*. *$p < .05$; **$p < .01$; ***$p < .001$.