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Self-Regulation In Early Childhood: The Interplay Between Family Risk,
Temperament and Teacher-Child Interactions

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Abstract

This study investigates the interplay between family risk and the quality of classroom interactions and their impact on self-regulation skills in two groups of children – children from socioeconomically disadvantaged backgrounds (at-risk) and non-risk children. Participants included 485 children ($N=93$ classrooms) – 233 ($N=47$ classrooms) of which were from socioeconomically disadvantaged areas.

Temperament was measured using teacher report. Trained observers rated classroom quality via live observations of a typical preschool day. Behavioral regulation was assessed using direct measures and emotional regulation was assessed using a teacher report. Analyses using multiple group structural equation modeling showed that at-risk children had lower levels of cool behavior regulation than non-risk children. In addition, classroom quality was positively linked to cool behavioral self-regulation. Moderating effects were additionally found between family risk and classroom quality on both hot behavioral regulation and emotional regulation. Classroom quality served as a protective factor for children exposed to more risk factors. Results showed complex associations between individual characteristics, classroom quality, and family risk, indicating a need to further explore the interplay among these variables.

Keywords: family risk, early childhood education, teacher-child interactions, behavioral self-regulation, emotional self-regulation

Self-Regulation in Early Childhood: The Interplay Between Family Risk and Teacher-Child Interactions

Increasing evidence suggests that children's self-regulation plays a key role in supporting early learning in school (Blair & Razza, 2007; McClelland et al., 2007). Self-regulation, which "consists of several aspects of controlling, directing, and planning including emotion and behavior regulation" (McClelland et al., 2007, p. 948) helps children respond and adapt to complex demands of their environments (Mezzacappa, 2004). Skills such as maintaining focus on a task, remembering instructions, suppressing a dominant response to perform a subdominant response, and regulating affect and behaviors support such adaptation as well as children's capacity to maximize opportunities for learning (Blair & Razza, 2007; McClelland & Ponitz, 2012). Throughout the course of development, children are expected to show improvements in their capacities to regulate emotions and behaviors in order to adapt to increasing demands in various settings including school (Mezzacappa, 2004; Noble, Norman, & Farah, 2005). However, many children experience problems with self-regulation. Several studies (e.g., Mezzacappa, 2004; Wanless, McClelland, Tominey, & Acock, 2011) have suggested that socioeconomically disadvantaged environments impact children's self-regulation competence and may have a profound effect on their developmental and academic trajectory.

Despite the adversities and risks present in their lives, not all children exposed to socioeconomic family risk show low levels of self-regulation. In fact, recent research has called attention to the individual variation in self-regulation among young children (Raver, Blair, Willoughby, & The Family Life Project Key Investigators, 2013) and the need to examine the interplay among different sources of influence, including both risk and positive sources (Masten, 2013). In the current

study, framed by a social-ecological systemic approach, we explore how one positive source of influence, namely supportive teacher-child interactions, interacts with family risk and individual characteristics of children (i.e., temperamental negativity) to predict self-regulation competence.

Family Risk and Self-Regulation

Recent research has provided robust evidence of the negative links between family risk and children's self-regulation (Mezzacappa, 2004; Noble et al., 2005; Wanless et al., 2011). Children who exhibit multiple family and social risk factors, including low income, low maternal education, and low occupational skills, have been shown to have more difficulty regulating their behaviors and emotions than their peers. For instance, in one study that examined the effects of sociocultural risk, results showed that socioeconomic status was implicated in multiple aspects of self-regulation task performance (Mezzacappa, 2004). Similarly, findings from a study on the role of demographic risk factors in the development of behavioral regulation showed that economically disadvantaged children began prekindergarten with significantly lower regulation than their peers (Wanless et al., 2011).

The impact of family risk on children's self-regulation can have profound and lasting effects on learning and development, as it restricts children's ability to take advantage of opportunities for learning and alters early trajectories of academic and social functioning (Mezzacapa, 2004). However, children are not impacted by family risk in the same way; important individual differences among young children have been documented (Raver et al., 2013). Given the importance of self-regulation skills for school readiness and development (McClelland et al., 2007), it is critical to identify factors that might serve to moderate the impact of risks.

Countering Family Risk: Classroom Interactions Among Teachers and Children

A vast body of literature suggests the important role of the quality of classroom interactions in promoting children's learning and development. According to various studies, positive teacher-child interactions that are defined by sensitive, warm, well-managed, and cognitively-stimulating exchanges intentionally directed to promote children's learning are linked to gains in children's literacy, language, and cognitive and social development (Mashburn et al., 2008). Notably, some studies suggest that the effects of positive classroom interactions are more marked for high-risk children (Burchinal et al., 2000).

Warm, positive classroom interactions among teachers and children may foster autonomy and responsibility and play a crucial role in self-regulation skill development (Downer et al., 2010). Children's involvement in interesting, challenging, and thought-provoking activities may be particularly useful in improving attention shifting, focusing, and inhibitory control skills – all components of self-regulation (Downer et al., 2010). Although some evidence suggests that the quality of classroom interactions is important for self-regulation competence (Hamre et al., 2014), research is still limited in examining the links between daily preschool experiences and the development of self-regulation.

Child Temperamental Negativity

Despite evidence suggesting associations between the quality of classroom interactions and children's cognitive and language skills (Burchinal et al., 2000; Mashburn et al., 2008), effects have been somewhat small and inconsistent across studies. Evidence of the positive impact of high-quality classroom interactions on social-emotional outcomes, in particular, has been mixed, with several studies reporting weak or no effects of classroom quality (NICHD ECCRN, 2006).

One possible explanation for the inconsistencies across studies is the role that

individual differences in temperament play in the relation between classroom quality and children's competence. Research suggests that the influences of classroom quality do not operate equally among all children and variation occurs as a function of temperamental characteristics (Phillips et al., 2012). Researchers have recently found that highly reactive children, although more vulnerable to low-quality environments, can also be responsive to high-quality environments (Pluess & Belsky, 2009). For example, in Pluess and Belsky's (2009) study, children with reactive temperaments showed more behavior problems when experiencing low-quality classroom interactions and fewer problems when experiencing high-quality classroom interactions than children with non-reactive temperament. These findings underline the importance of understanding more fully classroom influences that interact with temperament differences to shape children's early competence.

Early Childhood Education in Portugal

Variations in the affordability and access of early childhood education across states and countries can also aid in understanding the quality effects on child competence. For instance, in the United States, several researchers have found that children from socially disadvantaged backgrounds are less likely to be enrolled in high-quality schools than their middle-income peers (Fuller, Kagan, Caspary, & Gauthier, 2010). In contrast, in some European countries including Portugal, classroom quality is not related to characteristics associated with socioeconomic status possibly due to the fact that the vast majority of centers are publicly funded (Abreu-Lima et al., 2012). Therefore, studying the quality of classroom interactions in countries like Portugal, where children from disadvantaged families are more likely to have equal access to high-quality early childhood education, creates an opportunity to better understand whether the quality of classroom interactions is a protective factor

for family risk.

The Present Study

The current study addresses the associations between the quality of classroom interactions and self-regulation skills in children from low socioeconomic statuses or at-risk backgrounds and non-risk children. Conceptually, this study is framed by a social-ecological systemic approach, in which risk and resilience are influenced by interactions between children and several nested contexts including families, preschool settings, communities, and larger systems (Masten, 2013). Specifically, we intend to examine attenuating effects of the quality of classroom interactions on self-regulation for at-risk children, while considering the contribution of child temperamental negativity and its interplay with the quality of classroom interactions.

Given that self-regulation has been defined as a multidimensional construct (Willoughby et al., 2011), we included several measures of self-regulation to gain insight into two important aspects of self-regulation – behavioral and emotional regulation – and their subcomponents. Behavioral regulation (e.g., remembering and using information, paying attention, and inhibiting inappropriate responses; Ponitz et al., 2009), includes both cool (involved in more affectively neutral demands) and hot (emotionally arousing tasks) components, whereas emotional regulation is associated with expressing affect that is appropriate in a particular situation and quickly recovering from unpleasant episodes (Shields & Cicchetti, 1997).

In this study, we investigate the interplay between classroom interactions quality and family risk through a multiple group SEM approach. Particularly, we operationalize family risk factors at group (i.e., at-risk vs. non-risk sample) and individual levels. At the group level, we investigate the main and interactive effects of socioeconomic disadvantage. At the individual level, we examine the main and

interactive effects of the accumulation of family risk factors including low maternal education, financial hardship, unemployment, single parenting and large households. Based on the broad literature on risk and resilience, we hypothesized a robust negative main effect of family risk on the self-regulation domains at both group and individual levels. Moreover, we expected to find interactive effects of classroom quality and family risk on self-regulation such that in high family risk environments, high levels of classroom quality would act as a protective factor, whereas in the context of low family risk, classroom quality would not be associated with self-regulation outcomes. In addition to the hypothesized interactions between classroom quality and family risk, we tested whether the effects of classroom interactions quality varied according to children's reactive temperament. We expected children with reactive temperament to be more prone to

Method

Participants

Participants in this study included two groups of preschool-aged children – the at-risk group ($N= 233$) and non-risk group ($N= 252$) – living in the large metropolitan area of Porto, Portugal. At-risk children were recruited from schools participating in the Priority Intervention Territories Program (TEIP). The TEIP program is a nationally funded action that targets public schools serving populations that are considered at-risk for poverty and social exclusion and aims to decrease early school leaving by allocating more resources. At-risk children (53% boys) aged 40 to 80 months ($M= 63.6$; $SD= 9.05$) were enrolled in 47 classrooms. Five randomly selected families with a child in the target classrooms were invited to participate in the study. The number of participating children per classroom was on average 5 ($SD= 1.75$).

The non-risk group included children (56% boys) aged 35 to 76 months ($M=$

56.51; $SD= 9.97$). Non-risk children were recruited from 56 preschool classrooms selected to represent a range of socioeconomic characteristics of metropolitan Porto, including both public and private centers. Every family with dual-earner, cohabiting parents, and a child in the target classrooms was invited to participate in the study. The number of participating children per classroom was on average five ($SD= 3.41$). Table 1 presents descriptive characteristics.

Procedure

Centers', teachers', and parents' informed consents were obtained prior to data collection. Teachers were informed about the main purpose of the study, and the overall procedure, including that daily interactions and routines would be observed for a full day. Data were collected April to May 2013 – the middle of the preschool academic year. Classroom observations of teacher–child interactions were conducted by three trained observers, with observations lasting approximately two to three hours starting at the beginning of the school day. Children's behavioral self-regulation was assessed individually in a quiet room at the child's preschool center. Teachers rated children's emotional regulation and parents reported socioeconomic characteristics via a questionnaire.

Measures

Behavioral self-regulation. Cool and hot aspects of behavioral self-regulation were assessed with subtests from the Head-Toes-Knees-Shoulders (HTKS; Ponitz et al., 2009) and the Preschool Self-Regulation Assessment (PSRA; Smith-Donald et al., 2007).

The HTKS tasks instruct children to respond to oral prompts by doing the opposite from what the assessor says. For example, the Head-Toes subtest (10 items) prompts children to touch their toes when told to touch their head and vice versa. In

the current study, Cronbach's alphas were adequate for at-risk and non-risk children (.94 and .93 respectively)

Three tasks from the PSRA (Smith-Donald et al., 2007) including Toy Sort, Gift Wrap, and Snack Delay were used in this study. The Toy Sort task requires children to sort toys into bins without playing with them. In this task, the assessor records the time until the child played with the toys. This task was designed to assess compliance (Smith-Donald et al., 2007). The Gift Wrap and Snack Delay tasks were designed to tap more hot components of self-regulation, namely children's effortful control (Smith-Donald et al., 2007). In the Gift Wrap task, the child is told not to look to the present that is being noisily wrapped near him/her and the amount of time until the child peeks is recorded. The Snack Delay task requires children to wait before getting candy from under a cup. An average score from four trials (10, 20, 30, and 60 seconds) is recorded as the final score using a 4-point rating, ranging from "does not touch cup" to "eats candy."

After the tasks were administered, the assessors completed the 28-item PSRA Assessor Report (Smith-Donald et al., 2007). The Assessor Report was designed to provide an overall picture of children's (a) positive emotions and (b) attention and impulsivity during the assessor-child interaction. Items were rated using a 4-point scale. The 8-item Attention/Impulsivity subscale (e.g., pays attention during instructions), which demonstrated very good internal consistency in both non-risk and at-risk groups (.94 and .92 respectively), was used.

Behavioral regulation data reduction. A two-factor model of behavioral self-regulation that specified two latent factors representing cool (HTKS subtests and Toy Sort) and hot self-regulation (Snack Delay, Toy Wrap, and Attention/Impulsivity subtests) was tested separately for each group of children, based on prior empirical

studies (e.g., Willoughby et al., 2011). Consistent with previous findings (Smith-Donald et al., 2007), the two-factor model provided a good fit for the non-risk and at-risk group data respectively, $\chi^2(8)=13.26, p=.10, CFI=.986, RMSEA=.054, SRMR=.04$ and $\chi^2(8)=9.86, p=.27; CFI=.994; RMSEA=.033, SRMR=.039$. In contrast, a one-factor CFA model fit the data poorly, $\chi^2(9)=181.82, p<.001, CFI=.544, RMSEA=.291, SRMR=.226$ and $\chi^2(9)=67.24, p<.001, CFI=.812, RMSEA=.174, SRMR=.108$, respectively. A likelihood ratio difference test confirmed that the two-factor model fit the data better than the one-factor model in the non-risk group, $\Delta S-B\chi^2(1)=126.69, p<.001$ and at-risk group, $\Delta S-B\chi^2(1)=45.42, p<.001$.

Emotional self-regulation. Seven items from the *Emotion Regulation Checklist* (ERC; Shields & Cicchetti, 1997) were used to measure teacher perceptions of emotional regulation. Teachers were asked to rate specific characteristics of children, including mood swings, angry reactivity, and dysregulated emotions (e.g., “is prone to angry outbursts/tantrums easily”) using a 4-point scale (“almost always” to “never”). Scores were reversed so that higher scores reflected higher emotion regulation. In the current sample, the seven items were subject to confirmatory factor analyses, separately for each group, to determine the extent to which these items load onto a common factor. The one-factor model provided an adequate fit to the data, $\chi^2(14)=17.40, p=.24, CFI=.986, RMSEA=.033, SRMR=.038$ for non-risk children and, $\chi^2(14)=20.22, p=.12, CFI=.959, RMSEA=.048, SRMR=.046$, for at-risk group. Cronbach’s alphas were .91 to .94 for non-risk and at-risk groups respectively.

Temperamental negativity. Children’s temperament was measured using the Children’s Behavior Questionnaire-Short Form (CBQ, Putman & Rothbart, 2006). Teachers are asked to rate statements describing child’s temperament using a 7-point scale (1=*extremely untrue*; 7=*extremely true*). The Negative Affect subscale used in

this study has 12 items (e.g., “gets quite frustrated when prevented from doing something s/he wants to do”). Cronbach’s alphas were .77 for non-risk and .90 for at-risk groups.

Classroom interactions. The quality of interactions between teachers and children in classrooms were observed using the Classroom Assessment Scoring System (CLASS; Pianta et al., 2008). The CLASS is an observational measure that assesses the social-emotional climate and the instructional support provided in classrooms. Observers rated interactions using a 7-point Likert scale on 10 dimensions grouped into three domains (a) Emotional Support, which considers the emotional connection and the sensitivity of the teachers, (b) Classroom Organization, which includes teacher’s effectiveness in managing behavior and time, and (c) Instructional Support, which focuses on cognitive- and language-stimulating interactions.

In this study we used an overall score, which was computed as the mean of the three domains. Cronbach’s alphas for the at-risk and non-risk classrooms were .94 and .95 respectively. Prior to data collection, the observers participated in a two-day training on CLASS, followed by a certification test. During data collection, inter-rater reliabilities, based on intraclass correlation coefficients, were .70 on average ($SD = .16$), ranging from .46 and .92.

Family risk. A demographic questionnaire was used to obtain information about family and sociocultural variables. Family risk factors were dichotomized, indicating the presence (= 1) or the absence (= 0) of the specific risk factor in the life of the child and were summed to create the cumulative risk index. This approach has been shown to be adequate for the Portuguese context (Cadima et al., 2010). Risk factors included maternal and paternal education (risk= six years of education or

fewer), employment (risk= unemployed or unskilled worker), family income level (risk= family receiving financial support from the Portuguese Social Security or each parent's income below the National Minimum Salary) and household composition (risk= three or more dependents). Table 1 presents descriptive characteristics.

Data Analyses

Analyses were conducted in three phases. First, Multiple Group CFA were used to test measurement invariance of the behavioral and emotional self-regulation assessments across the two groups. Specifically, we tested a series of increasingly more restrictive confirmatory factor analysis models in which constraints to various model parameters were added including, (a) a baseline model that allowed all parameters to be freely estimated separately across groups; (b) a model in which factor loadings were constrained to be equivalent across groups; (c) a model in which the intercepts of the observed items were constrained to be equal across groups (Muthén & Muthén, 1998-2010). The decrease in model fit was sequentially compared with Satorra-Bentler's scaled chi-square difference test.

Next, we examined the main effects of classroom quality, family risk, and temperament on children's behavioral and emotional regulation controlling for children's age and sex. To examine whether group membership moderated the relations specified in the model, we fit a series of models to test the equivalence of each parameter in the models. First, a less constrained model in which the relations between predictors and self-regulation were allowed to vary across groups was estimated and then equality constraints were imposed on these relations.

Finally, we tested the moderation effects at the individual level by adding the interaction terms: classroom interactions X family risk and classroom interactions X temperamental negativity. Missing data for any one variable ranged from 0% to

15.9%. To account for missing data, Full Information Maximum Likelihood (FIML) estimation with robust standard errors was used. Models were estimated using the Mplus program, version 6.0 (Muthén & Muthén, 1998-2010). All models used the cluster option in Mplus to accommodate for the non-independence of observations and account for nesting of children within classrooms. Using Hu and Bentler's (1999) cutoff criteria for fit indexes, $RMSEA \leq .06$, $CFI \geq .95$, and $SRMR \leq .08$ indicate good model fit. This approach offers several advantages over common GLM analyses. Specifically, it improves statistical estimation a) by explicitly modeling measurement error through the use of confirmatory factor analysis; b) by having more flexible assumptions; and c) by offering the possibility to test models with multiple dependents (Ho, 2006).

Results

Descriptive Statistics

Preliminary analyses compared the demographic characteristics of the children and families and the quality of classroom interactions across the non-risk and at-risk groups (see Table 1). As expected, compared with the non-risk group, socially disadvantaged children were more likely to experience risk factors, but the levels of classroom quality were similar in both groups. Bivariate correlations, as well as means and standard deviations for temperament and self-regulation indicators are summarized in Table 2. In general, correlations were in the expected directions. Higher levels of temperamental negativity were associated with lower levels of hot behavioral regulation and emotional self-regulation. The cool behavioral regulation indicators were modestly associated with hot behavioral regulation indicators but not statistically significantly associated with emotional self-regulation indicators. Higher scores of hot behavioral regulation were associated with higher scores of emotional

regulation.

Measurement Phase: Equivalence of the Self-Regulation Measures Across Groups

As seen in Table 3, for the two-factor model of behavioral regulation, invariance for the factor loadings was supported but invariance of the indicator intercepts was not achieved. This indicated that the pattern of parameters in the model and the factor loadings were identical for the two groups, but not the intercepts of the indicators. Inspection of intercepts indicated that the non-risk group scored higher than at-risk children on the HTKS and Toy Sort tasks. The non-invariant parameters were set free when estimating the subsequent models.

Table 4 shows that for emotional regulation, invariance of the factor loadings and indicator intercepts was achieved, providing support that factor loadings and indicator intercepts were identical for the two groups. Therefore, the parameters were invariant and were constrained to be equal across groups in the further analyses.

Structural Phase: Regression Models

A series of models were fit to determine main and moderating effects of classroom quality, family risk, and temperament on behavioral regulation, controlling for child age and sex. As the first step, a fully unconstrained model in which all paths were allowed to vary across groups was specified, $\chi^2(64)=86.69, p=.003$, RMSEA=.052, CFI=.958, SRMR=.066. In this unconstrained model, as shown in Table 5, for the at-risk group, the quality of classroom interactions was positively associated with cool behavioral regulation, whereas family risk was negatively associated.

We then systematically constrained each path in a series of models in order to test whether group membership was related to particular patterns of associations.

Satorra-Bentler scaled chi-square differences between the unconstrained model and partially constrained models for most paths were non-significant and ranged from 0.001 to 3.25. Significant chi-square changes were only observed when the effects of age and temperament on hot self-regulation were constrained to be equal across groups, $\Delta S-B\chi^2(1)=128.45$ and $\Delta S-B\chi^2(1)=5.45$ respectively. Thus, the best-fit model was reached by allowing these two paths to vary across groups and constraining all other paths to be equal. In this partially constrained model, also shown in Table 5, $\chi^2(72)=89.05, p=.084, RMSEA=.042, CFI=.969, SRMR=.066$, classroom quality and family risk were significant predictors of cool behavioral regulation for both non-risk and at-risk children. Child temperament had a negative effect on hot self-regulation in the non-risk group.

Next, we tested moderating effects at the individual level and examined whether the effects of classroom interactions on children's behavioral self-regulation skills were dependent on family risk and children's temperament. For both groups, classroom quality served as a protective factor for children exposed to more risk factors in hot behavioral self-regulation (see Figure 1). Moderating effects for temperament on cool behavioral regulation in the non-risk group indicated that children with high negativity demonstrated lower levels of cool behavioral self-regulation in low-quality classrooms, but not in high quality classrooms. When each moderating effect was constrained to be equal across groups, non-significant chi-square changes were observed, indicating that equating the moderating effects did not significantly worsen the model fit and that those effects did not vary with group membership.

For emotional regulation, in both unconstrained models, $\chi^2(99)=126.23, p=.034, RMSEA=.045, CFI=.938, SRMR=.064$ and the partially constrained best fit

model, $\chi^2(102)=126.68, p=.049, RMSEA=.042, CFI=.945, SRMR=.065$, classroom quality and family risk were not significantly related to emotional regulation (see Table 6). Additionally, in the best-fit model, children with high negativity were likely to have lower emotional regulation as reported by the teachers in both groups. With regard to moderating effects, in the final best-fit model, classroom quality served as a protective factor for children exposed to more risk factors for both groups (see Figure 2).

Discussion

The aim of this study was to examine the associations between family cumulative risk, classroom quality, and behavioral and emotional regulation in two groups of children – children from socioeconomically disadvantaged backgrounds (at-risk) and non-risk children. An additional critical aim was to examine whether the associations between classroom quality and behavioral and emotional regulation were moderated by group socioeconomic status, children's family risk, and children's temperament. Several important findings emerged.

First, children from socioeconomically disadvantaged backgrounds scored lower in the cool behavioral regulation measures than non-risk children and scored equally well on both hot self-regulation and emotional regulation measures. Similarly, lower scores on cool self-regulation were associated with more sociocultural risks present in children's lives. This finding aligns with other studies suggesting that socioeconomically disadvantaged children perform less proficiently in aspects of behavioral regulation such as working memory, flexible use of attention, and inhibitory control (Mezzacappa, 2004; Wanless et al., 2011).

Another important finding was that classroom quality was positively linked to cool behavioral self-regulation. Regardless of living in a socioeconomically

disadvantaged area or the number of family risks in their lives, children experiencing higher quality classroom interactions showed higher scores on cool self-regulation. This is an important finding because behavioral regulation has been identified as a key component of school success (Blair & Razza, 2007; McClelland et al., 2007). Our results are consistent with studies showing positive associations between the quality of early childhood education and cognitive outcomes such as literacy and mathematic skills, which are considered to reflect self-regulation skills (Burchinal et al., 2000; Mashburn et al., 2008) and provide support for the importance of warm, well-managed, and cognitively stimulating interactions for cool self-regulation.

Notably, cool behavioral self-regulation was associated with both family risk and classroom quality, while hot and emotional regulation were not. By contrast, child characteristics, namely sex and temperament, were more consistently associated with emotional regulation and hot behavioral regulation. One possible explanation for these findings is the early development of both emotion regulation and hot self-regulation compared to cool behavioral regulation (Willoughby et al., 2011). Emotion regulation is thought to develop early (Willoughby et al., 2011) and therefore relies more heavily on individual characteristics such as sex and temperament. On the other hand, cool behavioral self-regulation, which is slower to develop, may be more sensitive to the presence or absence of resources in the family and classroom environments and depend more on the actual opportunities to practice skills (Wanless et al., 2013).

Group differences in the patterns of associations between child characteristics and hot behavioral regulation were observed. Temperament and age were related to hot self-regulation in the non-risk group, but not in the at-risk group. These findings are more difficult to explain. It is worth noting that children from the non-risk group

were younger than children from the socioeconomically disadvantaged group. It is possible that negativity plays a role in children's ability to delay gratification and to handle frustrating situations when they are very young and as they get older, they are better able to activate other resources (e.g., attentional redirection, withdrawal) that help them regulate their behavior in appetitive situations, regardless of their proclivity. Importantly, our findings add to the growing literature that suggests the benefits of differentiating aspects of self-regulation (Willoughby et al., 2011).

An additional main finding showed that although group differences in covariations of predictors and self-regulation were initially apparent, when tested through cross-group equality constraints, the effects of classroom quality and family risk were quite similar for both groups. It is important to note that at-risk children scored lower in the cool behavioral regulation measures than non-risk children, but there was little evidence that group membership operated as a moderator of the links between classroom quality, family risk, and self-regulation.

Nevertheless, we did find meaningful individual differences in the way children were affected by classroom quality. The effects of classroom quality on both hot and emotional regulation appeared to vary as a function of the number of family risk factors, providing further evidence of the important role that teachers can play in child development for children experiencing high levels of family risk (Burchinal et al., 2002). In addition, children's temperament seemed to interact with classroom quality in the prediction of children's cool behavioral regulation, with the results suggesting that higher-quality classroom environments were particularly important for children with high negativity. Our findings are consistent with prior research suggesting the importance of examining individual variation in children's responses to early childhood education (Pluess & Belsky, 2009) and enhance our understanding

about whether and under what conditions classroom quality influences behavioral and emotional regulation competence.

The present study offers insight into the experiences of children that might be important for them. Our findings suggest that providing high levels of emotional support, where teachers facilitate positive interactions and are aware of and respond to children's needs, better organizational support, where teachers establish predictable routines in the classroom and provide activities that are inherently interesting, and high instructional support, where teachers create opportunities for reasoning and language, and help children develop higher order thinking skills, may be an important avenue to improve children's self-regulation (Downer et al., 2010). Professional development interventions that target interactions, in which teachers receive specific feedback about their interactions with children, can be an effective way to improve the quality of classroom processes (Pianta, Mashburn, Downer, Hamre, & Justice, 2008).

Limitations and Future Directions

It is important to consider several limitations of the current study. First, associations were based on cross-sectional data, preventing inferences regarding causation. Second, classrooms in the sample were drawn from a region in Portugal, Porto. It is unclear whether these results would generalize to other regions of Portugal. Third, the number of risk factors included was limited. Future studies would benefit from the inclusion of a greater number of indicators of family sociocultural risk. Fourth, although several measures were included to index aspects of self-regulation, each aspect was assessed by either direct assessment or teacher report. Further research will undoubtedly refine our understanding of self-regulation determinants through the use of multi-method assessment. Fifth, children's age range

was very large. It is possible that the patterns of relationships vary with age and results should be interpreted in light of this limitation.

Overall, this study suggests complex interplays between family risk, classroom quality, and early self-regulation on an understudied population – Portuguese children. Given the crucial role of self-regulation skills for early school success (e.g., Blair & Razza, 2007), it will be important to investigate further early influences of self-regulation, particularly cross-cultural commonalities and differences across different moderators and self-regulation competence.

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