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Irritability and parenting practices as mediational variables between temperament and affective, anxiety, and oppositional defiant problems

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Abstract

Irritability and parenting are potential targets for transdiagnostic studies to identify the common and core dysfunctional characteristics underlying several diagnostic pictures with the goal of addressing these issues in treatment. Our objective was to investigate the different paths from temperament to child psychopathology (affective, anxiety, and oppositional problems) through irritability and parenting using a prospective design from ages 3 to 7. A sample of 614 3-year-old preschoolers was followed at ages 4, 6, and 7. Parents answered questionnaires about temperament (age 3), irritability (age 4), parenting practices (age 6), and psychopathology (age 7). Statistical analyses were carried out through structural equation modeling (SEM) to test the mediation effect of irritability and parenting practices from temperament (negative affectivity and effortful control) through to affective, anxious, and oppositional problems. The proposed model fit the data well. SEM showed a) an indirect effect from temperament to affective problems, via irritability and positive parenting; b) a direct effect from negative affectivity to anxiety, plus an indirect effect from both temperament dimensions, via irritability and autonomy parenting practices; and c) an indirect effect from temperament to oppositional problems, via irritability and punitive parenting. Irritability and parenting are transdiagnostic mediational variables that should be focused on in intervention programs for affective, anxiety, and oppositional problems.

Irritability and parenting practices as mediational variables between temperament and affective, anxiety, and oppositional defiant problems

Temperament describes the early individual dispositions that modulate the expression of activity, reactivity, emotionality, and sociality (Goldsmith et al., 1987). Negative affectivity, which includes reactivity to anger, sadness, and fear, has been associated with internalizing and externalizing problems (Wichstrøm, Penelo, Rensvik-Viddal, de la Osa, & Ezpeleta, 2018). Effortful control includes the self-regulatory components that help to process information and modulate emotion and behavior (Rothbart, 2007), and it has been related mainly to externalizing disorders, but also to internalizing disorders (Muris, van der Pennen, Sigmond, & Mayer, 2008).

Irritability is defined as ‘an excessive reactivity to negative emotional stimuli that has an affective component (anger) and a behavioral component (aggression)’ (Leibenluft & Stoddard, 2013, p. 1473), and is characterized by easy annoyance, low frustration, touchiness, and anger/temper outbursts. Irritable persons have a low threshold for experiencing anger in response to frustration. In childhood, the prevalence of irritability is about 3.5% and levels of irritability tend to be relatively stable over time (Brotman et al., 2006; Ezpeleta, Granero, de la Osa, Trepát, & Domènech, 2016). It is a frequent reason for mental health referral and predicts negative outcomes from childhood to adulthood (Copeland, Shanahan, Egger, Angold, & Costello, 2014; Ezpeleta et al., 2016). Irritability is a shared symptom in different disorders, such as anxiety, depression, oppositional defiant disorder (ODD), bipolar disorder, post-traumatic stress disorder, and disruptive mood dysregulation disorder (American Psychiatric Association, 2013). This commonality makes irritability a target for transdiagnostic studies, which aim to identify the common and core dysfunctional characteristics (temperamental, cognitive, emotional, interpersonal) and behavioral processes underlying several diagnostic pictures in order to address these issues in treatment (Harvey,

Watkins, Mansell, & Shafran, 2004; Newby, McKinnon, Kuyken, Gilbody, & Dalgleish, 2015).

Temperament and irritability may overlap in part, given that both describe reactivity to negative emotional stimuli (Stringaris, Vidal-Ribas, Brotman, & Leibenluft, 2018).

Irritability, however, typically captures proneness to anger, while negative affectivity embraces additional negative emotions, such as discomfort, fear, sadness, and lack of soothability, besides anger.

Parenting refers to the set of characteristics that describe the behavior of parents in dealing with their children and the guidelines they establish to achieve adaptive behavior and successful socialization. Parenting has an impact on child outcomes (Maccoby, 2000).

Different theoretical models to explain major psychological disorders, such as depression, anxiety or externalizing disorders, have associated parenting dimensions with the etiological course of the psychopathology (McLeod, Weisz, & Wood, 2007; McLeod, Wood, & Weisz, 2007). It is therefore important to know the contribution of parenting in transactional models of psychopathology.

In this study we prospectively investigate the mediational role of irritability in the paths from early individual dispositions in affectivity and self-regulation through parenting practices to affective, anxiety, and ODD problems.

Temperament, irritability, and parenting

Children's behavior, in the form of negative reactivity and difficulties in self-regulation, have an impact on family members and may condition parenting (Crawford, Schrock, & Woodruff-Borden, 2011; Lengua & Kovacs, 2005). Temperament and parenting mutually shape each other (Kiff, Lengua, & Zalewski, 2011). The coercive cycle explains reciprocal aversive transactions between parents and children through a combination of operant and classical conditioning (Patterson, 2002). The negative reinforcement of a child's

anger, irritability, frustration, and negative affect that causes misbehavior might generate a positive feedback cycle in which parent-child interactions become more difficult to manage, leading to the escalation of negative parental practices and aggressive behavior over time. A positive circle is also possible, and parents might promote effortful control, which elicits more regulated, and hence more adaptive, behavior. According to Kiff et al. (2011), who reviewed the relationships between temperament and parenting, negative affectivity has been associated with less affectionate and supportive, but not necessarily harsh, parenting and effortful control elicits lower hostile, coercive, and rejective parenting. Irritable children are difficult to manage and they compromise parenting abilities. Studies have also shown that a child's irritability triggers inconsistent parenting, rejection, and harsh control (Lengua, 2006). Additional research is needed to clarify these processes.

Parenting and depression, anxiety, and ODD

Parenting has been extensively associated with various child psychopathologies (McLeod, Wood, et al., 2007; McLeod, Weisz, et al., 2007; Pinquart, 2017). Meta-analyses have shown that parental rejection and hostility, experienced as aversive by the child, increase negative feelings about oneself and cause low self-esteem and a sense of helplessness, incrementing the risk of depression (McLeod, Weisz, et al., 2007). Similarly, practices related to excessive control, such as lack of autonomy, overinvolvement, and overprotection, which facilitate dependence on parents, excessive parental regulation, both barriers to become autonomous and to control the environment, are associated with child anxiety (McLeod, Wood, et al., 2007; Moller, Nikolic, Majdandzic, & Bogels, 2016). Finally, harshness and psychological control and authoritarian, permissive, and neglectful parenting are associated with higher levels of externalizing problems (Pinquart, 2017). In this case, these forms of ineffective parenting make self-control and self-regulation difficult for the child and they model aggressive behavior, reward disruptive behavior, and impair attachment, resulting in

aggressive and hostile behavior. However, the percent of variance explained by parenting on these disorders is low, with an 8% of the variance for child depression, 4% for anxiety and 6% for externalizing problems (McLeod, Weisz, et al., 2007; McLeod, Wood, et al., 2007; Rothbaum & Weisz, 1994). Therefore, further investigation is required to know how child psychopathology is influenced by and from parenting.

Irritability and depression, anxiety, and oppositional defiant disorder

Irritability is a common symptom of child depression, anxiety, and ODD. The three disorders are highly comorbid (Lavigne, Gouze, Bryant, & Hopkins, 2014) and meta-analyses report that irritability has been associated with future depression (OR = 1.8), anxiety problems (OR = 1.7), and ODD (OR = 2.6) (Vidal-Ribas, Brotman, Valdivieso, Leibenluft, & Stringaris, 2016). Recent translational neuroscientific models propose that irritability is explained as an aberrant response to frustrative nonreward and threat (Brotman, Kircanski, Stringaris, Pine, & Leibenluft, 2017). On the one hand, irritable children have difficulties in learning when to anticipate rewards or punishments and show dysfunctional adaptation when a goal is not attained; and on the other, they have increased orientation toward threatening stimuli (Stringaris et al., 2018). Decreased striatal activity and decreased activation in frontal areas when rewards are omitted and difficulties modulating amygdala responses are the brain correlates of these dysfunctions (Stringaris et al., 2018). Like irritability, an altered reward system and difficulties in emotion recognition is postulated as critical to the development of depression (Forbes & Dahl, 2012), anxiety (Silk, Davis, McMakin, Dahl, & Forbes, 2012), and ODD (Matthys, Vanderschuren, & Schutter, 2013).

Taking the above relationships into consideration, our objective was to investigate the different paths from temperament to child psychopathology (anxiety, affective, and oppositional problems) through irritability and parenting using a prospective design in children aged 3 to 7 years. The expected associations are shown in Figure 1.

Materials and Methods

Participants

The sample ($N = 622$) was part of a large longitudinal research project focused on risk factors in developmental psychopathology (Ezpeleta, de la Osa, & Doménech, 2014).

Participants were selected in two phases. In the first phase, a random sample of 2,283 children from 54 schools in Barcelona, Spain (25.9% state, 74.1% semi-private) was contacted from the census of preschoolers in grade P3 (3 years old). In this first phase, a total of 1,278 families were screened for conduct problem scores using the *Strengths and Difficulties Questionnaire* (SDQ; Goodman, 1997) plus four additional items of ODD from the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV).

In the second phase 82.2% of the families invited to continue participated: 417 children who tested positive for behavioral problems [with a raw score of ≥ 4 on the SDQ conduct problems scale or a response option of 2 (*certainly true*) in any of the DSM-IV ODD symptoms and 205 from the screen negative group; therefore, the final sample for the follow-up resulted in 622 3-year-old children. The demographic information for the initial sample is shown in Table 1, after excluding the data for participants with all the measures missing (see the statistical analysis section). The children were assessed every year. For this study, we focused on ages 3, 4, 6, and 7. There were no differences in sex between participants who participated and those that did not participate at ages 4 ($n = 600$), 6 ($n = 482$), and 7 ($n = 461$) ($p \geq .485$). Regarding socioeconomic status (SES), there were no differences between participants who participated and those that did not at age 4 ($p = .253$), but we did find differences at ages 6 and 7, with low SES participants having a higher dropout rate than medium and high SES participants ($p \leq .006$).

The informants for the 614 participants were 68.1% mothers, 7.7% fathers, and 24.3% both.

Measures

Temperament. The *Children's Behavior Questionnaire-Short Form* (CBQ-SF; Putnam & Rothbart, 2006) measures reactive and self-regulative temperament with 94-items with a 7-point Likert response format (1: *extremely untrue of your child* to 7: *extremely true of your child*). We focused on the second order scales of negative affectivity (anger/frustration, discomfort, soothability/falling reactivity, sadness, and shyness dimensions) and effortful control (attentional focusing, inhibitory control, low intensity pleasure, perceptual sensitivity, and smiling or laughter dimensions). The questionnaire was answered by the parents when the children were 3 years old (internal consistency was $\alpha = .83$ for negative affectivity and $\alpha = .79$ for effortful control).

Irritability. In this study we focused on the dimension of irritability that corresponds to the symptoms 'touchy-easily annoyed', 'angry and resentful', and 'loses temper' (Ezpeleta, Granero, de la Osa, Penelo, & Domènech, 2012) with a 3-point ordered response format ranging from 0 (*not true*) to 2 (*somewhat true*). This dimension is one of the three dimensions of ODD obtained with the *Strengths and Difficulties Questionnaire - Parent report* (SDQ³⁻⁴; Goodman, 1997) using four items from the conduct problem scales ('often has temper tantrums or hot tempers', 'generally disobedient, usually does not do what adults request', 'often argumentative with adults' and 'can be spiteful to others') and four items about DSM-IV ODD symptoms not included in the questionnaire but added to the list of questions with the same format ('often deliberately annoys others', 'often blames others for his/her mistakes or bad behavior', 'is easily offended by things others say' and 'is often angry and resentful'). Parents answered the questionnaire when the children were 4 years old ($\alpha_o: .73$).

Parenting. The *Alabama Parenting Questionnaire-Preschool* (APQ-Pr; Frick, 1991) measures parental practices in three dimensions (24 items with a 5-point Likert response

format): positive parenting, inconsistent parenting, and punitive parenting (de la Osa, Granero, Penelo, Doménech, & Ezpeleta, 2014). Cronbach's α (and mean inter-item correlation/mean item-total corrected correlation) for the three dimension scores was .74 ($r = .22/.40$; 12 items), .66 ($r = .21/.36$; 7 items) and .52 ($r = .19/.31$; 5 items), respectively, at age 6. An autonomy scale (3 items) was included from the *Evaluation des Pratiques Educatives Parentales* (Roskam & Meunier, 2009) with the same response format as the APQ-Pr, because this practice was of interest to the study (Cronbach's α : .85). Parents answered the questionnaire when the children were 6 years old.

Psychopathology. The *Child Behavior Checklist/6-18* (CBCL⁶⁻¹⁸; Achenbach & Rescorla, 2001) is a 113-item questionnaire completed by parents which evaluates behavioral and emotional problems rated on a scale from 0 (*it's not true*) to 2 (*it is very or often true*). In this study, we focused on the DSM5-Oriented scales at age 7: affective problems, anxiety problems, and ODD problems. α_0 were .84, .81, and .87, respectively.

The *Diagnostic Interview of Children and Adolescents for Parents of Preschool Children (DICA-PPC)* (Ezpeleta, de la Osa, Granero, Doménech, & Reich, 2011) is a computerised semi-structured interview which generates diagnoses through algorithms following DSM-5. The diagnosis of ODD, major depression, separation anxiety, generalized anxiety, specific phobia, and social anxiety disorder at age 3 were grouped and the resulting variable "any disorder" was used as a covariate at baseline.

Procedure

The study was approved by the Ethics Commission of Animal and Human Experimentation of the authors' institution. The schools' principals and families were provided with a detailed description of the research project. The families that agreed to participate in the longitudinal study were recruited at the schools and they gave written consent, completed the questionnaires, and received no financial reward or compensation.

Statistical Analysis

The data were analyzed using MPlus8.2. First, bivariate correlations were calculated to study the degree of association among the children's temperament, irritability, parental practices, and psychopathology (affective, anxiety, and ODD problems). Next, we assessed the different pathways from temperament to affective, anxiety, and ODD problems through Structural Equation Modeling (SEM), which included the children's temperament (negative affectivity and effortful control) at age 3 as exogenous variables, irritability at age 4 and parental practices (positive, inconsistent and punitive parenting, and autonomy) at age 6 as mediators, and affective, anxiety, and ODD problems at age 7 as fully endogenous variables. In addition, we controlled for prior child psychopathology, by including the presence of any DSM-5 diagnosis (major depression, generalized anxiety, separation anxiety, specific phobia, social anxiety, and/or ODD) at age 3 as a covariate (labeled as any disorder; 0: *no*, 1: *yes*). Therefore, we tested a model that included several three-path mediated effects, i.e., more than a single (two-path) mediator in the causal chain between independent and dependent variables, also called micromediation chains (as cited by Taylor, MacKinnon, & Tein, 2008), where the full path coefficient for each extended chain is the product of the path coefficient for each constituent path. We considered path coefficients as small ($< .10$), medium (around $.30$) and large ($.50$) (Kline, 1998). Direct effects refer to pathways leading from the risk factor to the outcome without any mediation; indirect effects refer to mediated pathways; and total effects are the sum of the direct and all the indirect effects. For multiple mediators like ours, and as proposed by Taylor et al. (2008), we considered that mediation was present if components in the mediated pathway were statistically significant, even if the direct or the total effect of the first factor on the outcome was not significant. Since all the data were collected using a double-phase screening design, all analyses were weighted by assigning each child a value that was inverse to the probability of random selection in the

second phase of sampling. We used the robust maximum likelihood (MLR) method of estimation, which uses full information; consequently, we included all participants' data with some data available ($N = 614$), after excluding those with missing values on all the assessments. Goodness-of-fit was evaluated using the Chi-square test (χ^2), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Squared Residual (SRMR). Criteria for adequate fit included having χ^2 with a $p > .05$, RMSEA $< .06$, CFI and TLI $> .90$ (Bollen & Long, 1993), and SMSR $< .08$ (Browne & Cudeck, 1993). Additionally, we assessed the effect of sex with a multi-group approach. First, a baseline model for the whole sample was established with all parameters freely estimated across boys and girls; and then invariance for paths across both groups was tested using the scaled chi-square difference (Bryant & Satorra, 2012) for nested models (α level set at .05).

Results

The bivariate Pearson's correlations between the variables considered for the model are shown in Table 2. The model tested yielded good fit: $\chi^2(10) = 15.6$ ($p = .113$), RMSEA = .030 (90% CI = .000-.058), CFI = .991, TLI = .951, SMSR = .026. Predictive ability for affective, anxiety, and ODD problems was $R^2 = .13, .16,$ and $.22$ respectively. Table 3 shows the results of the SEM, with standardized direct and indirect effects.

Hereafter, we will refer to the short name of the variable hyphenated with the age. The path from temperament to affective problems was not direct; it was mediated by irritability or parenting. Regarding irritability, higher negative affectivity-3 ($\beta = .290$; $p < .001$) and lower effortful control-3 ($\beta = -.083$; $p = .032$) were associated with higher irritability-4, and this in turn was associated with higher affective problems-7 ($\beta = .282$ $p < .001$); thus, the indirect effects of negative affectivity-3 (.082, $p < .001$) and effortful control-3 ($-.023$, $p = .037$) on affective problems-7 mediated by irritability-4 were small but statistically significant.

Regarding parenting, higher effortful control-3 was associated with higher positive parenting-6 ($\beta = .153$; $p = .003$), and this was associated with lower affective problems-7 ($\beta = -.131$; $p = .003$); therefore, the indirect effect of effortful control-3 ($-.020$, $p = .047$) on affective problems-7 mediated by positive parenting-6 was also small but statistically significant (See Figure 1a).

The path from temperament to anxiety problems was direct and positive from negative affectivity-3 ($\beta = .145$; $p = .003$), and it was also mediated by irritability or parenting. Higher irritability-4 was associated with higher anxiety-7 ($\beta = .299$; $p < .001$); therefore, there was an indirect effect from negative affectivity-3 ($.087$; $p < .001$) and from effortful control-3 ($-.025$; $p = .034$) to anxiety-7 mediated by irritability-4. Regarding the mediation of parenting, higher effortful control-3 was associated with higher autonomy-6 ($\beta = .139$; $p = .005$), and this was associated with lower anxiety-7 ($\beta = -.111$; $p = .009$); thus, the indirect effect was also statistically significant ($-.015$; $p = .044$) (See Figure 1b).

The path from temperament to oppositional defiant problems was not direct; it was mediated by irritability and/or parenting. Higher irritability-4 was associated with higher oppositional-7 ($\beta = .314$; $p < .001$) and higher punitive-6 ($\beta = .146$; $p = .003$) and this last, in turn, was associated with higher oppositional-7 ($\beta = .278$; $p < .001$). In addition, lower effortful control-3 was associated with higher punitive parenting-6 ($\beta = -.136$; $p = .006$), and this with higher oppositional-7. Therefore, there were small but statistically significant indirect effects of negative affectivity-3 mediated by irritability-4 ($.091$; $p < .001$), of negative affectivity mediated both by irritability-4 and punitive-6 ($.012$; $p = .011$), of effortful control-3 via lower irritability-4 ($-.026$; $p = .032$), and of effortful control-3 via lower punitive-6 ($-.038$; $p = .010$) on oppositional-7 (See Figure 1c).

Regarding invariance of paths across sex, goodness-of-fit for the fully constrained multi-group model [$\chi^2(45) = 56.8$ ($p = .112$), RMSEA = .029 (90% CI = .000-.050), CFI = .981, TLI = .956, SMSR = .044] did not statistically worsened with respect to that for the

baseline multi-group model [$\chi^2(20) = 28.9$ ($p = .008$), RMSEA = .038 (90% CI = .000-.066), CFI = .986, TLI = .925, SMSR = .031]: $\Delta\chi^2(25) = 27.9$, $p = .314$. This means that complete invariance for all direct effects and, therefore, for all indirect effects was observed across boys and girls.

Discussion

The purpose was to investigate whether irritability and parenting have a differential mediational role in the relationship between temperament and affective, anxious, and oppositional problems during development from early preschool to middle childhood. We found a) an indirect effect from temperament to affective problems, via irritability and positive parenting; b) a direct effect from negative affectivity to anxiety, plus an indirect effect from both temperament dimensions, via irritability and autonomy parenting practice; and c) an indirect effect from temperament to oppositional problems, via irritability and punitive parenting. Both commonalities and differences in the paths to each problem emerged. Among the commonalities, irritability always mediated between temperament and the problems. Among the differences, we found that the paths from temperament traits to each outcome problem implied different temperament traits in a distinct mode (direct or indirect) and different parenting practices in which irritability was not always a mediational variable. Knowledge of the paths by which common factors lead to different disorders (multifinality) helps to understand psychopathological processes and to tailor interventions for each disorder.

As expected, irritability was a mediator in the path to affective, anxiety, and oppositional problems, with a bigger indirect effect from negative affectivity (ranging from .08 to .09) than from effortful control (between $-.03$ and $-.02$). According to Brotman et al. (2017), irritable children have dysfunctions in reward and threat processing. Dysfunction in reward processing is shown by: 1) deficits in instrumental learning (learning when to expect rewards and to adjust behavior to changing contingencies), 2) deficits in inhibiting responses

and processing response errors (difficulties in updating reward expectations), and 3) increased sensitivity to reward receipt and omission (heightened response to reward). Dysfunctional threat processing is shown by: 1) increased orienting to threat (directing more attention toward threatening and angry faces), 2) hostile attribution bias (interpreting others' behavior as having hostile intent), and 3) deficits in processing face emotion (wrongly labelling positive and negative face emotions). For irritable children it is hard to predict and adapt to their external environment and they have a lower threshold for interpreting stimuli as threatening and for aggressive responses. The results confirm the inclusion of anger control in treatment and preventive programs for depression, anxiety, and oppositionality. Cognitive-behavioral therapy programs tackle emotion regulation strategies (relaxation, emotional literacy, awareness of thoughts and emotional states, self-control, problem-solving, etc.) that may help to control irritability (Albano & Kendall, 2002; Lewinsohn, Clarke, Hops, & Andrews, 1990; Lochman, Boxmeyer, & Powell, 2012; Stark, Krumholz, Ridley, & Hamilton, 2009), as well as other strategies that increase rewards (i.e. programming ludic activities) or teach how to perceive thoughts and others in a more adaptive way (cognitive restructuring, taking others' perspectives) and, in so doing, diminish irritability. The component of anger control is specifically defined only for ODD [for instance the component 'attending to physiological cues of anger arousal' in the Coping Power-Child (Lochman et al., 2012)]. However, our results suggest that for depression and anxiety more specific attention to irritability may be indicated, given that it is a transdiagnostic mechanism involved in the path to these problems. In this line, transdiagnostic interventions for internalizing disorders in adolescents oriented to common vulnerabilities, such as promoting emotion understanding, has reported hopeful results and diminished the severity of the symptoms and associated functional impairment (Ehrenreich-May et al., 2017). The results may also contribute to explaining the high comorbidity between these disorders, confirming irritability as a core

component in the path to depressive, anxious, and oppositional problems (Leadbeater, Thompson, & Gruppuso, 2012).

Parenting practices were mediators between effortful control and the psychological problems. Low effortful control was mediated by less positive parenting practices, which led to later higher affective problems; by lower autonomy, leading to higher anxiety problems; and by higher punitive parenting, leading to higher oppositional problems. The associations of these practices with the psychological problems were consistent with previous literature (Kiff et al., 2011). One of the mechanisms by which effortful control ability, which is partially explained by genetic factors, may influence parenting is through gene-environment correlations (rGE) (Tiberio et al., 2016). Evocative gene-environment effects, which refer to the genetic effects on the child's behavior that may shape the interpersonal environment (child elicits certain responses from the environment) (Rutter, Moffitt, & Caspi, 2006), may be acting when a low capacity to inhibit a dominant response and shift attention to activate a non-dominant response may frustrate the parents and elicit less positive parenting, less autonomy or more punitive practices, which may lead to different psychological problems. However, in this explanation passive rGE effects could not be ruled out. Passive-rGE stem from parents and children sharing (some) genes and temperament/personality characteristics, so that both parent and child traits can affect parenting. In other words, the indirect effects of effortful control/child irritability on psychopathology through parenting may partly reflect (in addition to evocative effects) passive rGE. We did not control for parent's personality traits and, therefore, it is not possible to say definitively that child temperament, independent of parents' personality traits, evokes the parenting practices assessed in this study. Regarding treatment, parents are responsive to their children behavior and treatment and prevention may potentiate this responsiveness, directing it toward practices that enhance adaptive development. Oppositional defiant disorder treatment includes parent management training, where parenting practices are worked in depth, as the treatment of choice. For internalizing

disorders parents are involved in the child's treatment and they are included in the assigned tasks. Although parenting may be addressed indirectly (instructions to reward positively when tasks are completed, the child given autonomy after exposure, and so on), stress in specific parenting practices should be contemplated in the programs for the treatment of depression and anxiety, and even more so considering the limited impact current parent group interventions have on internalizing symptoms (Buchanan-Pascall, Gray, Gordon, & Melvin, 2018). In this sense, positive results are beginning to emerge for adolescents in Dialectical Behavioral Therapy where parents are involved in the treatment to modify their educational style and thus improve the family environment, favoring better emotional regulation mechanisms in their adolescent children (Fleischhaker et al., 2011). Also, low effortful control appears as a risk factor that leads to multifinal psychopathology and intervention in parenting practices is indicated.

Oppositionality was the most complex problem. Both irritability and parenting contributed significantly to the transactions from negative affectivity and effortful control to oppositional problems. This path connected both temperament characteristics, irritability and punitive parenting, which underscores the relevance of these variables for understanding oppositionality and the need to study this problem including multiple domains (Lavigne, Gouze, Hopkins, Bryant, & LeBailly, 2012).

Conversely, the only direct association from temperament to the psychological problems was between negative affectivity and anxiety. This direct association may be reflecting the concept of 'trait anxiety', which is strongly associated with negative affectivity, a pervasive disposition that can manifest in the absence of overt stress (King, Ollendick, & Gullone, 1991). Also, active rGE indicate that individuals select environments in accordance with their temperament traits. Consequently, the direct effect of negative affectivity on anxiety problems could reflect environmental differences as much as intrapersonal differences in reactivity to negative stimuli. This would be the case if individuals high in negative

affectivity were more likely to engage in social withdrawal, the lack of support, isolation, and paucity of positive social experiences could partly explain the anxiety problems that develop.

The results of the path analysis should be considered in light of several strengths and limitations. We explored prospectively a complex model of pathways leading to different psychological problems that included multiple domains (individual and environmental characteristics), potentially reducing the problem of bias of estimations of causal parameters (omitted variables), and this is a strength. The analyzed model simultaneously contained three different outcomes, which meant that the results were controlled by the presence of each of the different problems, in addition to the presence of a previous diagnosis at the beginning of the study. However, the magnitude of the paths was found to be mostly low, partly because the outcome variables were far removed in time from the measurement of the independent variables. Also, all the information was provided by parents and data are subject to shared method bias, which may inflate relations between study variables. Additionally, the internal consistency reliability of some of the scale scores of the parenting measure was low. Social desirability bias may influence parents to censor their responses, compromising the psychometric properties of the scale. Globally, the internal consistency of parenting measures is an issue that needs improvement (Morsbach & Prinz, 2006). Specifically, this might have attenuated the possible relationships between punitive parenting and the temperament and psychopathology variables, which showed no indirect effects involving punitive parenting for paths pertaining to anxiety and affective problems. As an alternative, and given the short length of some of the scales, we calculated both the mean inter-item correlation ($r \geq .21$ for all measures, except punitive parenting $r = .19$) and the mean item-total corrected correlation (all $r \geq .31$), which indicates at least sufficient homogeneity of the item conforming each scale score (e.g., Nunnally & Bernstein, 1994; Streiner & Norman, 2008). The explored relationships were prospective from temperament to affective, anxious, and oppositional problems, including irritability and parenting as mediational variables. Although we did not

study bidirectional relationships, some of them may be bidirectional (for instance, parenting may play a role in the development of effortful control). Future studies should ascertain these relationships using recursive models.

Synthesizing, irritability and parenting are transdiagnostic mediational variables that should be focused on in intervention programs for affective, anxiety and oppositional problems. The specificities shown by the paths to each problem are useful to tailor the interventions highlighting the most relevant pathways. Mediational models contribute to inform about the mechanisms involved in the development of psychopathology.

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Table 1.

Sociodemographic Characteristics of the Sample at Baseline (3 years old) (N = 614)

Age (years), <i>mean (SD)</i>		3.8 (0.33)
Sex, <i>n (%)</i>	Male	308 (50.2)
	Female	316 (49.8)
Socioeconomic status, <i>n (%)</i>	High	200 (32.6)
	Medium	280 (45.6)
	Low	134 (21.8)
Ethnicity, <i>n (%)</i>	Caucasian	548 (89.2)
	American Hispanic	38 (6.2)
	Asian	6 (1.0)
	Other	22 (3.6)

Table 2.

Descriptive statistics (left) and inter-correlations (right)

Measure (minimum-maximum)	<i>M (SD)</i>	1	2	3	4	5	6	7	8	9
Age 3 (<i>n</i> = 612)										
1. CBQ-negative affect (1-7)	3.79 (0.74)									
2. CBQ-effortful control (1-7)	5.26 (0.65)	-.05								
Age 4 (<i>n</i> = 600)										
3. SDQ-irritability (0-6)	1.39 (1.21)	.32	-.10							
Age 6 (<i>n</i> = 482)										
4. APQ-Pr-positive parenting (0-48)	40.97 (4.07)	.02	.15	.00						
5. APQ-Pr-punitive parenting (0-20)	3.38 (1.93)	.04	-.16	.18	-.20					
6. APQ-Pr-inconsistent parenting (0-28)	6.81 (3.28)	.12	-.16	.13	-.24	.32				
7. APQ-Pr-autonomy (0-12)	10.08 (1.86)	-.05	.15	-.11	.41	-.18	-.24			
Age 7 (<i>n</i> = 461)										
8. CBCL-affective problems (0-26)	1.26 (1.66)	.16	-.08	.31	-.14	.12	.21	-.12		
9. CBCL-anxiety problems (0-18)	2.19 (2.18)	.26	-.04	.36	-.04	.12	.15	-.16	.57	
10. CBCL-ODD problems (0-10)	1.94 (1.97)	.12	-.07	.35	-.07	.35	.24	-.09	.35	.41

Note. ODD: Oppositional Defiant Disorder problems

Table 3.

Standardized direct effects and indirect effects from temperament to depression, anxiety and OD problems (and significance levels)

X-Variable	Y-Variable	Mediator (for indirect effects)	Effect	Standardized parameter	p-value
CBQ-Negative Affect-3	SDQ-Irritability-4		Direct	.290	<.001
CBQ-Effortful Control-3	SDQ-Irritability-4		Direct	-.083	.032
CBQ-Negative Affect-3	APQ-Pr-Positive-6		Direct	.041	.417
CBQ-Effortful Control-3	APQ-Pr-Positive-6		Direct	.153	.003
CBQ-Effortful Control-3	APQ-Pr-Punitive-6		Direct	-.136	.006
CBQ-Effortful Control-3	APQ-Pr-Inconsistent-6		Direct	-.148	.003
CBQ-Effortful Control-3	APQ-Pr-Autonomy-6		Direct	.139	.005
SDQ-Irritability-4	APQ-Pr-Positive-6		Direct	.045	.306
SDQ-Irritability-4	APQ-Pr-Punitive-6		Direct	.146	.003
SDQ-Irritability-4	APQ-Pr-Inconsistent-6		Direct	.095	.040
SDQ-Irritability-4	CBCL- Affective-7		Direct	.282	<.001
SDQ-Irritability-4	CBCL-Anxiety-7		Direct	.299	<.001
SDQ-Irritability-4	CBCL-Oppositional-7		Direct	.314	<.001
APQ-Pr-Positive-6	CBCL-Affective-7		Direct	-.131	.003
APQ-Pr-Punitive-6	CBCL-Affective-7		Direct	.014	.752
APQ-Pr-Punitive-6	CBCL-Oppositional-7		Direct	.278	<.001
APQ-Pr-Inconsistent-6	CBCL-Oppositional-7		Direct	.058	.292
APQ-Pr-Autonomy-6	CBCL-Anxiety-7		Direct	-.111	.009
APQ-Pr-Autonomy-6	CBCL-Oppositional-7		Direct	-.003	.953
CBQ-Negative Affect-3	CBCL-Affective-7		Direct	.048	.295
		SDQ-Irritability-4	Indirect	.082	<.001
		APQ-Pr-Positive-6	Indirect	-.005	.453
		SDQ-Irritability-4; APQ-Pr-Positive-6	Indirect	-.002	.314
		SDQ-Irritability-4; APQ-Pr-Punitive-6	Indirect	.001	.753
CBQ-Effortful Control-3	CBCL- Affective-7		Direct	-.016	.733
		SDQ-Irritability-4	Indirect	-.023	.037
		APQ-Pr-Positive-6	Indirect	-.020	.047
		APQ-Pr-Punitive-6	Indirect	-.003	.752
		SDQ-Irritability-4; APQ-Pr-Positive-6	Indirect	.000	.377
		SDQ-Irritability-4; APQ-Pr-Punitive-6	Indirect	.000	.757
CBQ-Negative Affect-3	CBCL-Anxiety-7		Direct	.145	.003
		SDQ-Irritability-4	Indirect	.087	<.001
CBQ-Effortful Control-3	CBCL-Anxiety-7		Direct	.028	.537
		SDQ-Irritability-4	Indirect	-.025	.034
		APQ-Pr- Autonomy-6	Indirect	-.015	.044
CBQ-Negative Affect-3	CBCL-Oppositional-7		Direct	.001	.991
		SDQ-Irritability-4	Indirect	.091	<.001
		SDQ-Irritability-4; APQ-Pr-Punitive-6	Indirect	.012	.011
		SDQ-Irritability-4; APQ-Pr-Inconsistent-6	Indirect	.002	.366
CBQ-Effortful Control-3	CBCL-Oppositional-7		Direct	.019	.688
		SDQ-Irritability-4	Indirect	-.026	.032
		APQ-Pr-Punitive-6	Indirect	-.038	.010
		APQ-Pr-Inconsistent-6	Indirect	-.009	.306
		APQ-Pr- Autonomy-6	Indirect	.000	.953
		SDQ-Irritability-4; APQ-Pr-Punitive-6	Indirect	-.003	.076
		SDQ-Irritability-4; APQ-Pr-Inconsistent-6	Indirect	.000	.393

CBQ: Children Behavior Questionnaire (short-form); SDQ: Strengths and difficulties questionnaire (parent report); APQ-Pr: Alabama Parenting Questionnaire-Preschool; CBCL: Child Behavior Checklist (6-18; DSM-5 oriented scales).

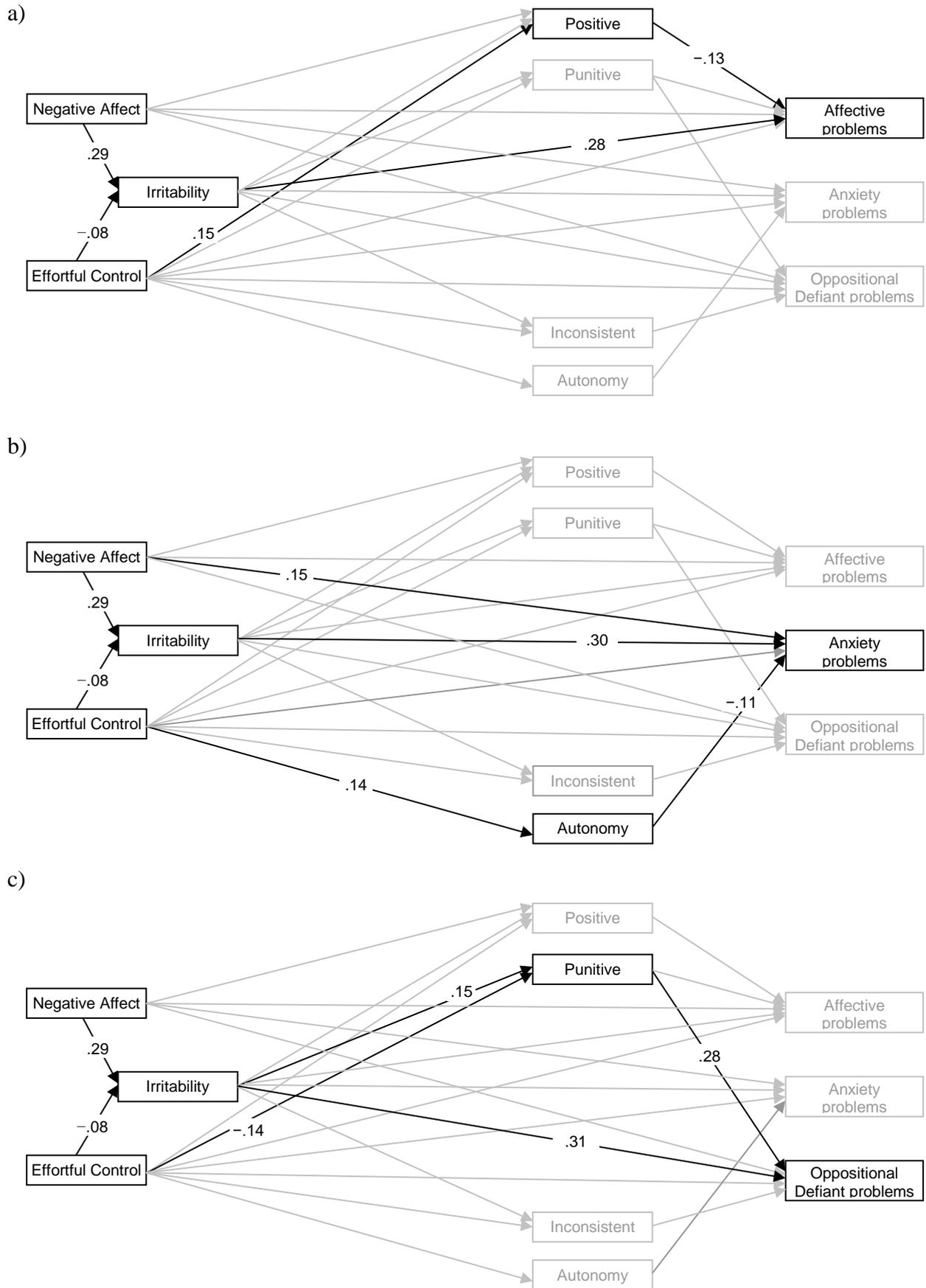


Figure 1.

Paths involved in statistically significant direct and indirect effects for Affective (a), Anxiety

(b), and Oppositional defiant (c) problems adjusted by the presence of any disorder at age 3 (not shown)(covariances between CBQ scores at age 3, between APQ-Pr scores at age 6 and between CBCL scores at age 7 are also omitted).