



# Early Temperament as a Predictor of Child Mental Health

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## Abstract

The present follow-up study examined the contribution of early temperament to mental health in preschool and school years. Participants represent a community sample of 96 children (54% female) from urban and rural areas of Russia. Temperament was measured by the Infant Behavior Questionnaire-Revised and the Early Childhood Behavior Questionnaire; mental health was assessed using the Strengths and Difficulties Questionnaire. Effortful control and negative affectivity accounted for 17% of the variance in internalizing problems and 6% in externalizing problems, and results also highlighted the contribution of lower-order traits. Our findings emphasize the importance of broadband and fine-grained early temperamental traits for later mental health in the Russian context and support the predominant role of effortful control and negative affectivity.

**Keywords** Temperament · Mental health · Infancy · Toddlerhood · Childhood · Follow-up

Many mental health problems have origins in early stages of development (Rutter et al. 2011). Mental health problems in childhood are typically categorized as “internalizing” and “externalizing.” Internalizing problems include anxiety, fears, depressive features, psychosomatic problems, and social withdrawal; whereas externalizing problems are characterized by hyperactivity, impulsivity, aggression, noncompliance, defiance, destructiveness, and antisocial behaviors (Achenbach and Rescorla 2007; Goodman and Scott 2012). Early-onset externalizing problems are relatively stable and have lifelong consequences such as low scholastic achievement, criminal offenses, substance use, violent behavior/injury, unemployment, and premature death (Goodman and Scott 2012; Tremblay 2010). Internalizing problems arising in childhood may also be stable over time and predict important life outcomes: physical health, professional achievements,

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financial security, and social relationships (Copeland et al. 2014; Goodman and Scott 2012). The onset of mental health problems in preschool and early school age is clinically significant, insofar as it increases the risk of subsequent internalizing and externalizing disorders (Costello and Maughan 2015). Therefore, identifying early predictors of child mental health problems is important for society as a whole, and represents a global public health issue. In the USA, it is estimated that only about 25% of children experiencing functional impairment are able to gain access to needed interventions, thus unmet needs for services resulting from early behavior problems are of considerable concern (Mash and Wolfe 2010). The Eurasian Child Mental Health Study showed enormous discrepancies in the global availability of child mental health services: whereas in European countries there were more than 45 child psychiatrists per 100,000 children, in Russia there were only five, and in China and India only one or two child psychiatrists for over one million children (Sourander et al. 2018).

In recent decades, numerous studies have demonstrated the importance of child temperament for mental health and multiple life outcomes. At present, the most influential model of temperament is the psychobiological model developed by Rothbart and colleagues (Rothbart and Derryberry 1981; Rothbart 2007). According to this model, temperament is conceptualized as constitutional differences in reactivity and self-regulation, influenced by heredity, maturation and experience. Reactivity refers to arousability of affect and motor activity, assessed by threshold, latency, intensity, time to peak intensity, and recovery time of the reaction. Self-regulation refers to processes such as behavioral inhibition and attentional control, serving to modulate reactivity (Rothbart and Derryberry 1981). Factor-analytic studies of temperament measured by parent questionnaires provided evidence for a hierarchical structure, including three higher-order factors, positive affectivity/surgency, negative affectivity, and regulatory capacity/effortful control, and lower-order narrowly defined traits. This temperament structure was recognizable from infancy through adolescence (Putnam et al. 2001).

Several longitudinal studies have demonstrated the links between early temperament and later mental health. Effortful control/regulatory capacity was related to externalizing and internalizing problems in children (Bridgett 2008; Eisenberg et al. 2015; Gartstein et al. 2012; Northerner et al. 2016). Negative affectivity has been widely reported as a non-specific predictor of both externalizing and internalizing problems (Abulizi et al. 2017; Bridgett 2008; Dougherty et al. 2010; Eisenberg et al. 2005; Gartstein et al. 2012). The findings for positive affectivity/surgency are less consistent. In some studies, surgency was associated with an increased risk for externalizing problems, while acting as a protective factor against internalizing symptoms (Dougherty et al. 2010; Gartstein et al. 2012; Northerner et al. 2016), yet others did not find such prospective links (Bridgett 2008; Lee 2017).

The role of fine-grained traits was examined only in a few longitudinal studies. The components of effortful control/regulatory capacity were the strongest predictors of externalizing and internalizing problems (Gartstein et al. 2012; Lee 2017). Among negative affectivity lower-order traits, anger and irritability were typically associated with externalizing problems; whereas sadness, anxiety, and fear contributed to internalizing problems (Eisenberg et al. 2009; Leve et al. 2005; Rothbart and Bates 2006). However, two recent studies demonstrated that sadness predicted both internalizing and externalizing problems (Gartstein et al. 2012; Lee 2017). For components of positive affectivity/surgency, activity level, impulsivity, and approach/positive anticipation were more closely related to externalizing than to internalizing problems (Rothbart and Bates 2006).

To date, evidence on the contribution of early temperament to later mental health comes from American and Asian studies. Therefore, the possibility of extending these findings to

other cultures requires additional research. The present study aimed to examine whether early temperament would predict mental health in Russian children. We anticipated that reduced effortful control and elevated negative affectivity would be linked to both externalizing and internalizing problems in the preschool and school years. Components of effortful control/regulatory capacity emerged as the strongest predictors of both sets of difficulties (Gartstein et al. 2012; Lee 2017), thus we anticipated that effortful control lower-order traits would decrease the risk for a spectrum of childhood mental health problems. With respect to negative affectivity lower-order traits, anger/irritability was typically associated with externalizing problems, whereas sadness and fear contributed to internalizing problems. Accordingly, anger was expected to result in greater conduct disturbance, with fear and sadness contributing to higher internalizing problem levels. Because of prior mixed findings, no specific predictions were made about the role of surgency. Given the lack of research considering its fine-grained components, our analyses of their links with behavior problems were largely exploratory.

## Method

### Sample and Procedures

This work is based on a subsample drawn from a study of early temperament that began in Novosibirsk, Russia, in 2001. Participants represent a community sample of children and their primary caregivers from urban and rural areas of Western Siberia and nearby regions, most living in Novosibirsk, Russia's third largest city. Questionnaires were distributed to parents via childcare centers and in person, including home visits, with participants providing informed consent. At Time 1, parents were asked to complete the Russian versions of the Infant Behavior Questionnaire-Revised (IBQ-R, Gartstein and Rothbart 2003) or the Early Childhood Behavior Questionnaire (ECBQ, Putnam et al. 2006) along with a brief demographic questionnaire. The total sample of 563 children was recruited; 353 parents (92% mothers) completed the IBQ-R, 345 parents (90% mothers) completed the ECBQ, of these 135 parents completed both IBQ-R and ECBQ with an interval of approximately 15 months. The results of the cross-sectional study of early temperament have been published elsewhere (Gartstein et al. 2003; Kolmagorova et al. 2008; Slobodskaya et al. 2013). At Time 2, contact details were available for 65% of the total sample, and we were able to locate and approach 133 participants from the initial study; of those, 72% completed the follow-up questionnaires.

The final follow-up sample included 96 children (54% girls); 45 were initially assessed with the IBQ-R when they were, on average, 7.1 months of age ( $SD = 2.8$ ); 27 of them were later assessed with ECBQ; 51 participants were initially evaluated using the ECBQ. As a result, the ECBQ sample consisted of 78 children assessed when they were, on average, 24.0 months of age ( $SD = 6.0$ ). At Time 2 (the follow-up evaluation reported herein), children were assessed with the Strengths and Difficulties Questionnaire (SDQ, Goodman 2001) when they were, on average, 7.8 years of age ( $SD = 2.1$ ). The average time interval between the IBQ-R and the SDQ assessment was 8.1 years ( $SD = 1.7$ ), whereas the average interval between the ECBQ and the SDQ assessment was 5.7 years ( $SD = 2.1$ ). Participants in the follow-up SDQ evaluation described in this study were representative of the original sample of 563 children in terms of demographics; compared with the rest of the sample they did not differ on most temperament traits, but scored higher on the IBQ-R soothability and ECBQ frustration and impulsivity.

The participating families were socio-economically diverse. At Time 1 (i.e., the initial temperament assessment), 72% of children lived with both biological parents, 16% with a single mother and the rest in other family types. For education, 14% of the mothers and 22% of the fathers had ten years of schooling or less, 27% of the mothers and 29% of the fathers had college education, 59% of the mothers and 49% of the fathers had university education. In terms of occupation, parents ranged from unskilled to professional workers, 21% of the mothers and 2% of the fathers were unemployed. Most data came from mothers (86%), 6% of children were rated by fathers, the rest were rated by other caregivers (e.g., grandparents).

## Measures

### Temperament

**Infant Behavior Questionnaire-Revised (Gartstein and Rothbart 2003)** This 191-item parent-report instrument yields 14 lower-order/fine-grained scales that form three higher-order factors: positive affectivity/surgency, made up of activity level, approach, high intensity pleasure, perceptual sensitivity, smiling/laughter, and vocal reactivity; negative affectivity, including distress to limitations, fear, sadness, and reversed falling reactivity; and orienting/regulatory capacity, including duration of orienting, cuddliness/affiliation, low intensity pleasure, and soothability. The Russian version has been validated, supporting good reliability of the scales (Gartstein et al. 2003), as well as configural, metric and construct invariance of the IBQ-R factor structure in the USA and Russian samples, although the association of activity with negative affectivity and covariance between positive affectivity and regulatory capacity were more pronounced in the Russian than in the US sample (Gartstein et al. 2005). The Russian version of the IBQ-R demonstrated discriminant and criterion validity across age and with respect to subsequent mental health problems (Gartstein et al. 2003, 2013). In the present study alphas for IBQ-R scales ranged from .64 to .90 with a mean of .74.

**Early Childhood Behavior Questionnaire (Putnam et al. 2006)** This 201-item parent-report instrument yields 18 lower-order scales that form three higher-order factors: surgency, made up of activity level, high intensity pleasure, impulsivity, positive anticipation, and sociability; negative affectivity, including discomfort, fear, sadness, frustration, motor activation, perceptual sensitivity, shyness, and reversed soothability; and effortful control, containing attention focusing, attention shifting, cuddliness, inhibitory control, and low intensity pleasure. The Russian version has been validated, supporting good reliability of the scales and replicability of the ECBQ factor structure, along with discriminant and criterion validity across age and with respect to concurrent mental health problems (Kolmagorova et al. 2008). In the present study, alphas for lower-order scales ranged from .70 to .90 with a mean of .78.

### Mental Health

**The Strengths and Difficulties Questionnaire (Goodman 2001)** This parent-report instrument is a brief measure for assessing child mental health. The SDQ 25 items are divided into five subscales: prosocial behavior, emotional symptoms, conduct problems, hyperactivity-inattention, and peer problems; the last four generate a total difficulties scale. The impact scale

(7 items) measures distress, social impairment/adaptive functioning, and burden to others. In addition, we used two higher-order scales (Slobodskaya and Akhmetova 2010): externalizing comprised of conduct problems and hyperactivity-inattention, and internalizing comprised of emotional symptoms and peer problems. The Russian version of the SDQ has been validated in a stratified random sample (Goodman et al. 2005).

## Results

### Correlations Between Early Temperament and Later Mental Health

**Infant Temperament and Child Mental Health** Although our infant subsample was small ( $N=45$ ), there were noteworthy longitudinal relationships between temperament traits measured in the first year of life, and mental health measured, on average, 8.1 years later. In the positive affectivity/surgency domain, lower-order traits of approach ( $r=-.41, p=.006$ ) was linked to later impact on the child's everyday life; the higher-order trait ( $r=-.25, p=.097$ ) and activity level ( $r=-.26, p=.089$ ) were marginally associated with impact. Infant high intensity pleasure was marginally associated with later peer problems ( $r=.27, p=.074$ ). In the negative affectivity domain, lower-order trait of falling reactivity was related to later conduct problems ( $r=-.31, p=.041$ ) and marginally related to impact on the child's life ( $r=-.28, p=.070$ ). In the regulatory capacity domain, low intensity pleasure was marginally associated with later prosocial behavior ( $r=.26, p=.085$ ) and impact on the child's everyday life ( $r=-.27, p=.080$ ).

**Toddler Temperament and Mental Health** Tables 1 and 2 present the prospective associations between toddler temperament measured by the ECBQ and mental health measured via the SDQ, on average, 5.7 years later. Surgency was marginally associated with later prosocial behavior and hyperactivity-inattention, whereas lower-order trait of impulsivity was related to later hyperactivity-inattention. Positive anticipation was linked to later prosocial behavior, sociability was positively related to later prosocial behavior and negatively related to emotional symptoms, internalizing problems, and (marginally) conduct problems. Activity level was marginally associated with hyperactivity-inattention in later childhood. In the negative affectivity domain, the higher-order trait was associated with later impact and (marginally) prosocial behavior; the lower-order trait of discomfort was linked to later prosocial behavior. Perceptual sensitivity was marginally associated with prosocial behavior, whereas motor activation was positively related to later hyperactivity-inattention and impact, and marginally related to later externalizing and total difficulties.

Effortful control (Table 2) was negatively associated with later emotional symptoms, total difficulties, and impact, and marginally associated with later prosocial behavior, conduct problems, externalizing, and internalizing in the predicted direction. Lower-order trait of attention shifting was positively related to later prosocial behavior, negatively related to emotional symptoms, and marginally negatively related to conduct problems, externalizing, internalizing, and impact. Inhibitory control was negatively associated with later emotional symptoms, externalizing, total difficulties, and impact, and marginally associated with conduct problems and hyperactivity-inattention. Low intensity pleasure was negatively related to conduct problems, emotional symptoms, externalizing, internalizing, total difficulties, and

**Table 1** Prospective correlations of ECBQ scales with SDQ scales

ECBQ scales	SDQ scales									
	Prosocial behavior	Conduct problems	Hyperactivity	Emotional symptoms	Peer problems	Externalizing	Internalizing	Total difficulties	Impact	
Surgency	.20†	-.07	.19†	-.19	-.08	.11	-.16	-.01	-.05	
Activity level	-.03	-.04	.21†	-.06	-.02	.14	-.05	.06	.02	
High intensity pleasure	.02	-.05	.09	-.13	-.07	.04	-.12	-.04	.04	
Impulsivity	.01	.07	.22*	-.03	-.02	.19	-.03	.11	.07	
Positive anticipation	.33***	-.04	.15	-.16	-.05	.09	-.12	-.00	-.05	
Sociability	.36***	-.20†	.05	-.34***	-.11	-.05	-.26*	-.17	-.15	
Negative affectivity	.22†	.06	.06	.06	.15	.07	.12	.11	.29*	
Discomfort	.35***	-.14	.09	.02	.12	.01	.09	.05	.24*	
Fear	.09	.11	.10	-.03	.15	.11	.07	.11	.19	
Frustration	.01	.03	.08	.07	.07	.07	.08	.09	.19†	
Motor activation	.07	.08	.23*	.09	.16	.19†	.15	.21†	.34**	
Perceptual sensitivity	.20†	.07	-.00	.04	.15	.03	.11	.08	.15	
Sadness	.15	.04	-.01	.09	.16	.01	.15	.09	.20†	
Shyness	.15	.00	-.13	-.09	-.05	-.09	-.08	-.10	-.06	
Soothability	.00	.09	-.05	.13	-.02	.00	.06	.04	.17	

N = 78. † p < .10; \*p < .05; \*\*p < .01; \*\*\*p < .001

**Table 2** Prospective correlations of ECBQ scales with SDQ scales

ECBQ scales	SDQ scales								
	Prosocial behavior	Conduct problems	Hyper-activity	Emotional symptoms	Peer problems	Exter-nalizing	Inter-nalizing	Total difficulties	Impact
Effortful control	.19†	-.20†	-.17	-.34**	-.03	-.20†	-.21†	-.25*	-.30**
Attention focusing	.09	-.10	-.17	-.20†	-.05	-.16	-.14	-.18	-.11
Attention shifting	.35**	-.20†	-.06	-.27*	-.11	-.13	-.22†	-.21†	-.22†
Cuddliness	.08	.11	.13	-.02	.16	.14	.09	.14	-.12
Inhibitory control	.00	-.20†	-.21†	-.23*	-.01	-.23*	-.14	-.23*	-.25*
Low intensity pleasure	.10	-.24*	-.21†	-.35**	-.08	-.25*	-.25*	-.30**	-.18

$N = 78$ . †  $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$

(marginally) hyperactivity-inattention; whereas attention focusing was marginally linked to emotional symptoms in later childhood.

### Models Predicting Later Mental Health from Early Temperament

We examined the contribution of early temperament to later mental health, controlling for the child's age and gender with structural equation modeling using AMOS.17 software (Arbuckle 2008). Modeling was conducted on a total follow-up sample of 96 children, 18 of whom were assessed with the IBQ-R and 78 with the ECBQ. Goodness-of-fit was assessed by  $\chi^2$  test. In addition, the comparative fit index (CFI) and root mean square error of approximation (RMSEA) were calculated. A good-fitting model is indicated by nonsignificant  $\chi^2$  values, CFI at or above .90, and RMSEA at or below .06 (RMSEA  $\leq$  .08 indicates an acceptable model fit; Hoyle 1995).

The measurement model for child mental health included two latent constructs; all SDQ subscales were used as indicators: externalizing comprised of conduct problems, hyperactivity-inattention, and prosocial behavior; internalizing consisting of emotional symptoms, peer problems, and impact (Fig. 1). The model fit the data perfectly,  $\chi^2 = 4514$ ,  $df = 8$ ,  $p = .81$ ; CFI = 1.000, RMSEA = .000. Structural model 1 tested the contribution of the three higher-order traits of early temperament: positive affectivity, negative affectivity, and effortful control, to child mental health. Structural model 2 tested the contribution of eleven lower-order traits of early temperament that appear in both the IBQ-R and ECBQ (activity, high intensity pleasure, approach/positive anticipation, perceptual sensitivity, frustration/distress to limitations, fear, sadness, soothability, cuddliness, attention focusing/duration of orienting, and low intensity pleasure) to internalizing and externalizing problems. We also tested if the effect of early temperament was conditional upon the child's gender and age at Time 1, and time interval between the two assessments.

The results showed that the initial Model 1 (Fig. 2) fit data well, with  $\chi^2 = 40.18$ ,  $df = 34$ ,  $p = .22$ ; CFI = 0.958; RMSEA = .044; child's gender and age, and time interval did not make a significant contribution. Early effortful control predicted both internalizing and externalizing,

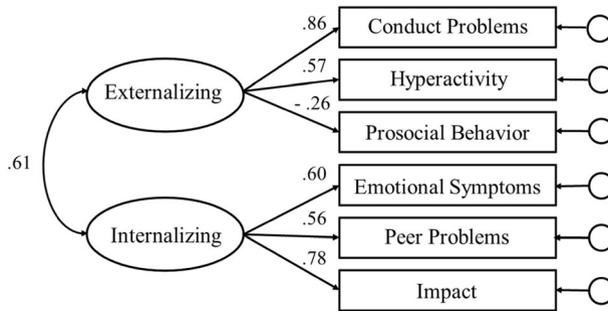


Fig. 1 A measurement model for child mental health: significant ( $p < .05$ ) regression weights.  $N = 96$

whereas negative affectivity predicted only internalizing. Overall, higher-order traits of early temperament accounted for 17% of the variance in internalizing and 6% in externalizing. The initial Model 2 (Fig. 3) showed satisfactory fit to the data, with  $\chi^2 = 91.58$ ,  $df = 66$ ,  $p = .02$ ; CFI = 0.931; RMSEA = .064; child’s gender and age, and time interval also did not make a significant contribution. Low intensity pleasure and cuddliness predicted later externalizing, whereas approach/positive anticipation and perceptual sensitivity predicted internalizing. Together, lower-order traits of early temperament accounted for 22% of the variance in internalizing and 17% in externalizing.

**Discussion**

The aim of this follow-up study was to determine the contribution of the infant and toddler temperament to Russian child mental health. This is one of the first studies examining the contribution of early temperament to later behavior problems in Russia, and in general, with respect to fine-grained predictions. We found that the strongest predictor of mental health in preschool and school age was early effortful control which contributed to both externalizing and internalizing problems. These findings confirm the existing evidence from the longitudinal

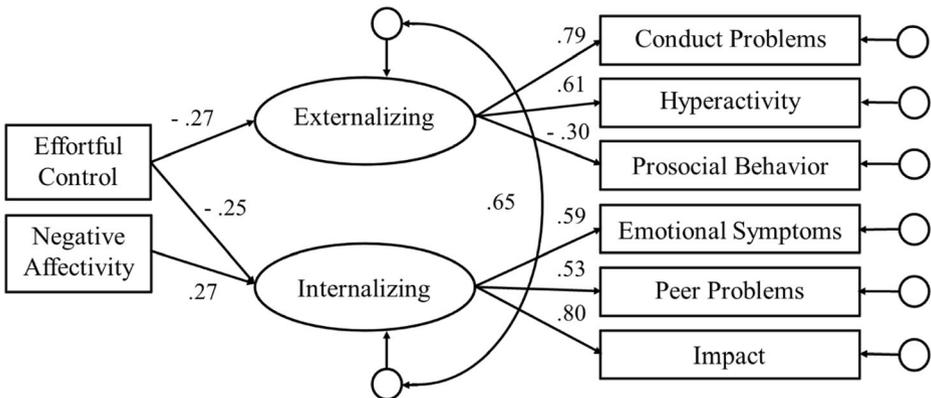
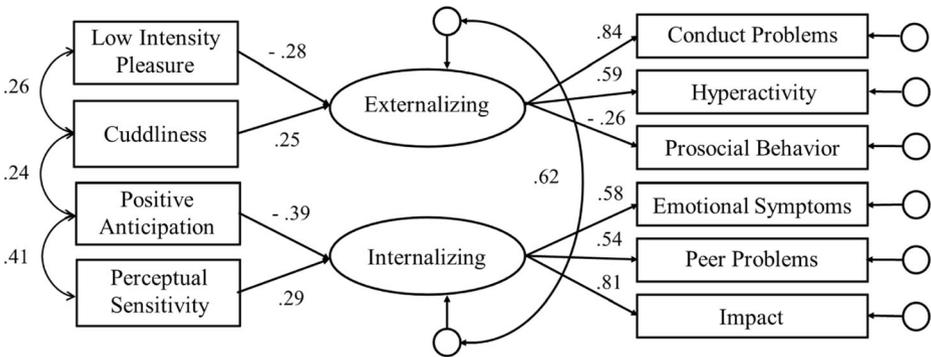


Fig. 2 Structural model of the relationship between higher-order traits of early temperament and later mental health. Only significant ( $p < .05$ ) standardized regression weights and correlations are shown.  $N = 96$



**Fig. 3** Structural model of the relationship between lower-order traits of early temperament and later mental health. Only significant ( $p < .05$ ) standardized regression weights and correlations are shown.  $N = 96$

studies with a shorter time interval between assessments relative to the current study (Bridgett 2008; Eisenberg et al. 2015; Gartstein et al. 2012; Northerner et al. 2016) and the longitudinal studies with older children (Eisenberg et al. 2005; Leve et al. 2005; Wang et al. 2015). According to a large-scale longitudinal study of mental health and important life outcomes from birth to 32 years, effortful control in childhood predicted criminal offending, substance dependence, physical health, and personal finances (Moffitt et al. 2011). Although stronger effects have been observed for externalizing, relative to internalizing difficulties in some studies (e.g., Oldenhinkel et al. 2004), results of this investigation indicated the importance of effortful control for both mental health outcomes.

At the fine-grained level, low intensity pleasure in the first 3 years of life contributed to the prediction of externalizing problems in later childhood. This trait represents children's enjoyment of low intensity activities or stimuli. We found only one longitudinal study with similar results (Gartstein et al. 2012), presumably because effortful control was mostly examined in later childhood using a more limited set of lower-order traits: inhibitory control, attention focusing, and attention shifting (e.g., Eisenberg et al. 2005, 2015; Lengua 2003). In addition, our results indicate that early cuddliness was positively associated with later externalizing problems. That is, infants and toddlers who displayed more pleasure in closeness with others exhibited significantly more externalizing problems in later childhood. This is in contrast to the findings of recent studies (Gartstein et al. 2012; Lee 2017), in which cuddliness had a protective effect for externalizing problems. The pattern of results reported in this study may thus be culture- or sample-specific, and requires replication.

Our hypothesis concerning negative affectivity in infancy and toddlerhood was partially confirmed. That is, this temperament domain predicted internalizing problems in later childhood, but not externalizing problems. In previous studies, negative affectivity was a non-specific predictor of both externalizing and internalizing problems (Abulizi et al. 2017; Bridgett 2008; Dougherty et al. 2010; Eisenberg et al. 2005; Gartstein et al. 2012), a role played by effortful control in this investigation. There is evidence that the link between negative affectivity and mental health problems is partially mediated through effortful control (Bridgett 2008; Eisenberg et al. 2004). Moreover, longitudinal studies showed that toddler negative affectivity is related to preschool effortful control (Putnam et al. 2008). However, in our study, negative affectivity was not related to effortful control. Gartstein et al. (2012) showed that negative affectivity and effortful control interacted with each other, and the combination of high negative affectivity and low effortful control greatly increased the

likelihood of mental health problems. Interestingly, a recent study of toddlers from low-income families showed that low negative affectivity to have a buffering effect with respect to relations between cumulative risk and mental health problems — internalizing and sleep problems in particular (Northerner et al. 2016). In our study, a relatively small sample size did not allow us to reveal possible interaction effects, which should be considered in the future.

At the lower-order level, perceptual sensitivity, that is sensitivity to slight stimuli from the external environment, contributed to the prediction of later internalizing problems. Other longitudinal studies, including both higher-order and lower-order temperament traits, have not found prospective associations between perceptual sensitivity and child mental health (Gartstein et al. 2012; Lee 2017). However, adolescent children of parents diagnosed with cancer rated high in perceptual sensitivity faced an increased the risk of internalizing problems (Visser et al. 2007). It has been suggested that perceptual sensitivity and a closely related trait Sensory Processing Sensitivity interact with the environment such that highly sensitive individuals score higher on internalizing problems in adverse environments, but lower in more favorable contexts (E. Aron et al. 2005; Gartstein et al. 2016). Such interactions could help explain the lack of main effects for this trait in the literature, and are consistent with the differential susceptibility model (Belsky and Pluess 2009). That is, highly sensitive individuals appear to show superior adjustment relative to those low on this trait in enriching/favorable environments, and demonstrate maladaptive outcomes under adverse conditions.

Surgency domain did not make a significant contribution to the prediction of mental health in later childhood. However, the lower-order trait of approach/positive anticipation, reflecting the excitement in the anticipation of pleasurable activities, was a protective factor for internalizing problems. This is in accord with the study in older children which showed that behavioral measures of positive anticipation of reward were associated with lower internalizing problems (Silk et al. 2006). However, in longitudinal studies with younger children this trait emerged as a risk factor for externalizing problems, but was not related to later internalizing problems (Gartstein et al. 2012; Lee 2017). Thus, the role of early approach/positive anticipation in later mental health should be verified in future studies, and may be associated with developmental as well as cross-cultural variability.

Overall, results largely confirmed our hypotheses and replicated previous studies showing that regulatory capacities and negative affectivity play a key role in predicting externalizing and internalizing problems (DeLisi and Vaughn 2014; Tackett 2006). This work contributes to the relatively small literature examining the role of infant and toddler temperament in the etiology of problem behavior (Bridgett 2008; Gartstein et al. 2012; Lee 2017; Northerner et al. 2016). Supporting earlier findings for higher-order temperament factors, our results also provided evidence for the etiological importance of lower-order traits. Whereas existing studies were conducted in Western and East Asian countries, our findings were obtained in the Russian cultural context demonstrating the cross-cultural relevance of early-appearing temperament attributes.

The current study has a number of limitations. First, the sample was not large enough to detect effects that may have been deemed statistically significant with larger samples. Second, time intervals between the initial assessment and the follow-up varied among participants, and although controlled statistically, future research should utilize more consistently timed longitudinal evaluations, also tracking outcomes into adolescence and adulthood. Third, only parent questionnaires were used. Although evidence has provided support for the validity of parental reports, in the future it would be preferable to use multiple sources of information (e.g., laboratory observations and psychophysiological indicators) and to explore the mechanisms linking early temperament to later

mental health. With respect to the latter, future research should explore potential moderation by family factors (e.g., parenting, family conflict, or cohesiveness) of links between early temperament and behavior problems noted in this investigation.

## Conclusion

This study provided empirical evidence for the importance of temperament in infancy and toddlerhood to mental health in the preschool and school years. Our results emphasize the critical impact of effortful control and negative affectivity in the first 3 years of life, confirming previous findings and extending them to the Russian culture. In addition, this study contributes to the existing literature by demonstrating a substantial role of early lower-order temperamental traits in shaping later externalizing and internalizing problems. These results could have wide implications for early prevention of externalizing and internalizing problems in children. Given that difficulties in the early years of life represent an important risk factor for later mental health problems, early prevention and intervention programs have a significant potential for reducing societal, personal, and family costs. The findings of this study could be implemented in early intervention programs aimed at providing parents with information regarding their child's temperament, and improving parent-child interaction. Temperament-based early intervention programs have been shown to increase parental responsiveness and sensitivity, leading to more optimal patterns of interaction (Neumann et al. 2016). Results reported herein may also be useful in targeting early intervention efforts, providing services to youngsters at greater risk for later difficulties.

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## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflict of interest.

**Ethical Approval** All procedures performed in this study involving human participants were in accordance with the ethical standards of the Institute of Physiology and Basic Medicine ethics committee and with the 1975 Helsinki Declaration.

**Informed Consent** Written informed consent was obtained from all participating parents included in the study and they received both written and verbal information about study aims and procedures.

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