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## Environmental influences on neuroticism : a story about emotional (in)stability

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# Chapter 7

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## **Why Not Everybody Gets Their Fair Share of Stress: Adolescent's Perceived Relationship Affection Mediates Associations between Temperament and Subsequent Stressful Social Events.**

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## ABSTRACT

Temperamental differences are associated with subsequent stressful life events, a phenomenon that has in part been attributed to evocation. However, we remain ignorant about the mechanisms that mediate this process. In the current paper we test whether differences in ‘perceived relationship affection’ accounted for part of the prospective association between temperament and stressful social event evocation in three social domains, *viz.* parents, peers, and romantic partners. Data were derived from TRAILS, a large population cohort of Dutch adolescents ( $n= 1158$ ). Parent-reported adolescent temperament and adolescent’s perceived affection were assessed at age 11. Stressful social events that occurred between age 11 and 16 were captured using the Event History Calendar. Results indicate that adolescents evoke subsequent stressful social events based on their temperament, and that this association is partially mediated by perceived affection. Importantly, we found evidence for both generic and domain specific associations, which indicates that social domains are related yet distinct. Taken together, the findings suggest that a search for mediating variables may be a promising way promising way to increase our understanding of the mechanisms that that underlie the social stress selection principle, and that perceived relationship affect is one of the candidates.

## INTRODUCTION

Individuals may evoke life events based on individual characteristics and are therefore active agents of their own development [18,249]. These social selection and evocation processes have strong empirical support [248,256], but the underlying mechanisms remain poorly understood. Part of the prospective association between temperament and stressful life events may be mediated by third variables, but hitherto it remains unknown what kind of factors we are looking for, how they manifest themselves, how they are constituted, or where they are to be found. In this study we test whether individual differences in perceived relationship affection mediate the prospective association between temperament and the evocation of stressful social events in adolescents. A demonstration of mediation by perceived relationship affection could propel the exploration and understanding of the mechanisms that drive the social selection principle.

### Temperament and Stressful Social Events

Individual differences are thought to be particularly salient during adolescence, because this period is characterized by environmental changes and shift of focus and attachment from parents to peers [451,897]. Hallmark of adolescence is social change, including the selection of a rapidly expanding peer network, which, in contrast to family and early childhood (dyadic) peer relations, is not shaped by parental socialization [249,445,898,899]. Additionally, romantic relationships emerge. These romances can be rather intense, and function as a socializing agent that can affect subsequent development and identity formation, *e.g.* via ‘consensual validation’ or reality confirmation via comparison of perceptions [900,901]. Adolescents start to perform social roles at multiple stages, either in interaction with parents, peers, or romantic partners. Each of these stages can enable stressful social events, *e.g.*, conflicts, fights, and relationship termination [902-904].

Not all adolescents seem equally prone to evoke such stressful social events. These differences are partly accounted for by individual differences in temperament or personality [29, 195, 235, 248, 256]. Prospective twin studies showed that emotional instable (*vs.* stable) are more often exposed to subsequent stressful events, and additionally, are also more sensitive to the influence of stressful events [223, 239]. These processes of social influence and social selection are often referred to as the responsive principle [27, 100]. Other studies showed that high (*vs.* low) extraversion and conscientiousness were related to fewer stressful social events [339], and high neuroticism to smaller declines in family conflict [484], low family support [905], and more romantic relationship conflict [222,344,472].

In our TRAILS sample high (*vs.* low) frustration, low effortful control, and high intensity pleasure and affiliation and low levels of shyness were related to more stressful life events over adolescence – both social and other events such as house moves and illnesses [689,906]. Evidence thus suggests that emotional instability and to some extent also conscientiousness and extraversion predisposes individuals for more stressful social events.

### **Mechanisms Underlying Temperamental Effects on Subsequent Social Stressful Events**

Though support for evocation of stressful social events increases gradually, the mechanisms that underlie this process remain largely speculative. Temperament shapes the way adults interact with children and the activities in which children choose to participate [195,907]. This, in turn, may affect stressful social events children experience, such as peer rejection [908]. Negative affective temperaments also predict increases in problems and exacerbate the effects of other risk factors [198,909]. When children navigate into adolescence their ability to influence their environments increases. Consequently, it seems plausible that temperament becomes more predictive of stressful social events in various domains, *e.g.*, in interaction with parents, peers and romantic partners.

Temperament has been suggested to modulate cognitive and affective-emotional processes [32,902] that colour how adolescents perceive their world, a process called ‘environmental construal’ [18,123]. Additionally, the way we look at ourselves and the world around us is believed to develop from early childhood onwards based upon our interpersonal interactions and mental imaginations of how we believe others perceive us (*i.e.*, called the ‘looking glass’ self [195, 910-912]).

These belief systems, in turn, affect how adolescents perceive and experience their relationships with others and navigate in their social worlds [18,123,208,913]. Specifically, adolescents may use their temperament-dependent self-images as templates for constructing impressions of the levels of affection they perceive from intimates. It is possible that an individual’s perception of his or her relationships becomes a self-fulfilling prophecy when perceptions become internalized and influence subsequent transactions with the social environment in which the individual lives and grows [427], and thus leads them to construct relationship realities. Differences in temperament may therefore explain both the active process of self-construction (a process of internalization of perceptions) as well as how adolescent’s create trajectories for themselves as a response, which may shape how they are seen by others (an externalization process).

Indeed, previous research provided some support for the idea that temperament modulates adolescents’ perceptions of their affective relationships with others [123,538]. In addition, evidence has been found that people’s perceptions of their relationships

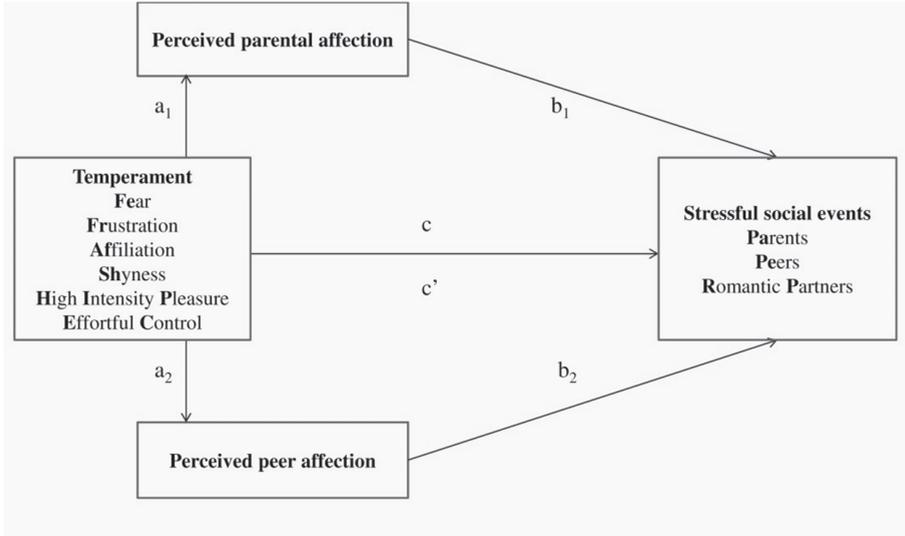
with others can influence the course and functioning of their relationships (see for a review [914]). For example, Sroufe [915] suggested that individuals who expected to be rejected also behaved in ways that made rejection from others more likely. Also, anxious expected rejection predicted social anxiety and withdrawal, while angry expected rejection – an established predictor of aggression – antedated decreased social anxiety [916]. Both anxious and angry expectations predicted increased loneliness [916], and individuals who expected to be rejected, thus who scored high (*vs.* low) on rejection sensitivity, seemed more likely to break up [917]. Perhaps subjective expectations and perceptions form a process chain that underlies part of the prospective association between temperament and stressful life events.

The proof of the pudding is in the eating, however, and to our knowledge ‘environmental construal’ (or ‘internal working models’ more general) as a mechanism underlying the association between temperament and subsequent stressful social events have not been tested by means of sophisticated mediation models. We hypothesize that temperamental differences lead to differences in perceived affect, which in turn result in the evocation of stressful social events. Specifically, in the current study we tested whether perceived relationship affection - *i.e.*, adolescents subjective, experience of care, protection, comfort and approval provided by significant others (*i.e.*, parents, peers) – mediates the prospective association between temperament and stressful social events. For example, we tested whether individuals high (*vs.* low) on temperamental frustration are more likely to perceive low relationship affection, because high frustration may be related to more anger, frustration, and withdrawal, resulting in more conflicts with significant others. We feel such evidence can bolster future aims to disentangle the extant factors that converge into the social selection principle.

### Current Study

To recapitulate, in the current study we verify whether adolescent’s perceived relationship affection mediates the association between adolescent temperament and evocation of stressful social events (see Figure 9 for a conceptual model). Perceived relationship affection is not introduced as a novel theoretical construct but as a measure for subjective interpretations of social interactions in functional terms (*e.g.*, instrumental and emotional support), alike perceived social support, perceived rejection, and felt (in) security.

We studied temperamental facets that often are considered to be part of the broader personality domains of neuroticism, extraversion and conscientiousness, because these traits have been found to show most consistent associations with psychopathology [281]. For emotional instability we included two traits (fear and frustration), for extraversion three traits (affiliation, shyness, and high intensity pleasure), and one trait related to conscientiousness (effortful control). However, because these higher-order



**Figure 9.** A Theoretical Model of How the Prospective Effect of Temperament on Stressful Social Events is Divided over Direct Effects and Mediation via Perceived Parental and Peer Affection.

domains are not clearly structured over adolescence, we only report upon the facet traits, and refrain from usage of the higher-order dimensions themselves.

The major changes in social environments during adolescence render it important to differentiate between the domains in which stressful social events take place [195,445,902]. Moreover, the interpretation of meaning of affectionate behaviours may be relatively stable within social groups across social contexts, but differ across social groups, which we therefore might compare. In this study we distinguish between the parental domain (*e.g.*, conflict with parents, running away and being thrown out of the parental home), the peer domain (*e.g.*, friendship termination after a fight or argument, being bullied), and the romantic relationships domain (*e.g.*, breaking up after a relationship or being dumped). Subsequently, we examined whether perceived affection mediates the prospective association between temperament and stressful social events. To test for spill-over effects between different social domains we examined mediation effects of both perceived parental affection and perceived peer affection in the associations between temperament and stressful social events in the parental, peer and romantic partner domain.

In line with previous studies we hypothesized that adolescents low (vs. high) on effortful control (H1a), high (vs. low) on frustration (H1b), and high on affiliation or intensity pleasure and low on shyness (H1c) experience (evoke) more subsequent stressful social events. Based on recent findings on the data used in the current study, it is hypothesize that fear does not predict subsequent stressful events [906]. Ad-

ditionally, we hypothesized that prospective associations between temperament and subsequent stressful social events are *partially* mediated by perceived relationship affection (H2). More specific, we hypothesized domain-specific associations, *viz.* perceived parental affection as the primary mediator of stressful social event evocation effects in the parental domain (H3a) and perceived peer affection as the mediator of stressful social event evocation effects in the peer domain (H3b). Lastly, we tested whether associations between temperament and subsequent stressful social events in the romantic partner domain were mediated by either perceived parental affection or perceived peer affection.

## METHODS

### Sample

The Tracking Adolescents' Individual Lives Survey (TRAILS) is a large prospective cohort study of Dutch adolescents, who are followed biennially or triennially from 11 to at least 25 years of age. The present study involves data from the first and third assessment wave. The study was approved by the Dutch Central Committee on Research Involving Human Subjects. Written informed consent was collected from the parents at wave 1, whereas for wave 3 written informed consent was obtained from both parents and adolescent. At wave 1, 2230 pre-adolescents (50.8% girls) enrolled in the study (response rate 76.0%) of whom, 1816 (response rate 81.4%, 45.3% girls) participated in wave 3. At wave 1, the mean age of the adolescents enrolled in the study was 11.09 years ( $SD = 0.56$ ). At wave 3, the mean age was 16.13 years ( $SD = 0.59$ ). Prerequisites to be included in the current study were that, at wave 1, parents had filled out the temperament questionnaire and adolescent the perceived affection list, and that, at wave 3, the adolescents were interviewed with regard to stressful social events. This resulted in a total number of 1158 adolescents participating in the current study. No differences were found between responders and non-responders with respect to teacher ratings of problem behaviours and in the associations between socio-demographic variables and mental health indicators. We examined whether individuals who were interviewed about exposure to life events differed from those who were not interviewed on the temperament and affiliation scales at age 11 years. To facilitate comparisons, partial  $\eta^2$  measures of effects were computed. The effect sizes for being interviewed were all smaller than .01, which can be interpreted as negligible effects [373]. Though we observed slightly higher attrition ( $p < .05$ ) for children with low scores on effortful control and affiliation, effect sizes were negligible (partial  $\eta = .002$  and  $.003$ ), and our results seem not seriously biased. A detailed description of the sample selection, procedures and methods can be found elsewhere [880].

### ***Procedures***

At baseline well-trained interviewers visited one of the parents or guardians (preferably the mother, 95.6%) at their homes. Parents were asked to fill out a written questionnaire, including questions about the child's temperament. Children were asked to fill out questionnaires on perceived affiliation in school. When adolescents were 16 years old, children were interviewed at a central facility in the child's home area by well-trained interviewers to collect life event data.

### **Measures**

#### ***Temperament***

Child temperament was assessed at age 11 with the short form of the parent version of the Early Adolescent Temperament Questionnaire-Revised (EATQ-R; [219,882]). The following six scales were distinguished: (i) fear (negative affect related to anticipated pain or distress, five items, Cronbachs'  $\alpha = .63$ ); (ii) frustration (negative affect related to interruption of ongoing tasks or goal blocking, five items,  $\alpha = .74$ ); (iii) shyness (slow or inhibited approach and/or discomfort in social situations, four items,  $\alpha = .84$ ); (iv) effortful control (capacity to control attention, activation and inhibition, 11 items,  $\alpha = .86$ ); (v) affiliation (desire for, and pleasure in, warmth and closeness with others, six items,  $\alpha = .66$ ); and (vi) high intensity pleasure (pleasure or enjoyment related to high stimulus intensity or novelty, six items,  $\alpha = .77$ ). Answers were rated on a five-point Likert-type scale (1= 'almost always untrue' to 5= 'almost always true'). Higher values indicated a higher presence of the temperamental trait concerned. Eight week test-retest stability of the parent-reported EATQ-R scales has been found to be moderate to good, ranging from .69 for high intensity pleasure to .85 for frustration [918].

#### ***Stressful Social Events***

Stressful social events were captured at age 16 years using the Event History Calendar (EHC), a data collection method for obtaining retrospective data about life events and activities developed by Caspi and colleagues [919]. For the present study we adapted the calendar into an interview on several life domains that lasted about 45 minutes. Participants were asked about events that occurred since baseline (*i.e.*, between ages 11-16). Detailed and accurate data about the events could be collected by proceeding serially from one life domain to another and using a month-by-month horizontal timeline. For example, with regard to school, adolescents were asked by the interviewer respectively about the dates of changing school, changing class, repeating class, as well as about their educational levels for the subsequent years. Test-retest reliability has generally been found to be reasonable to good (respectively, 72-87% in a sample of young adults [920] and > 90% in a sample of adolescents [919]). Construct validity

of the EHC was investigated in a comparative study by Belli and colleagues [921], showing reasonable correlation coefficients between a written questionnaire and the EHC (ranging from .63 to .79).

For the current study we selected all stressful social events assessed in the parental, peer, and romantic domains. Stressful social events were defined as time-discrete events likely to bring about a major change in social or relationship status (*cf.* [244,366]). Stressful events in the parental domain included being thrown out of the parental home ( $n=20$ ), having a serious fight ( $n=92$ ), and running away from home ( $n=52$ ). Stressful events in the peer domain included losing a good friend because of a fight or argument ( $n=128$ ) and being bullied ( $n=256$ ). Stressful events in the romantic partner domain included being dumped ( $n=204$ ) and breaking up (self) after a relationship ( $n=538$ ). Intercorrelations between the various events was rather low, ranging from  $r=.001$  for the correlation between losing a good friend because of a fight or argument and being dumped to  $r=.215$  for the correlation between having a fight serious fight with family members, and running away from home. For this study, three event variables were constructed indicating the number of events the adolescents experienced in the respective domains. With regard to the conflicts with parents being exposed to two ( $n=20$ ) and three ( $n=3$ ) events were merged and recoded as “ $\geq 2$  events”.

### ***Perceived Affection***

Child rated perceived parental and peer affection were measured at age 11 using two scales based on the Social Production Function (SPF) theory [922]. The SPF asserts that wellbeing can be measured in terms of universal goals, *viz.* affection, behavioural confirmation, status, comfort, and stimulation [574,923]. Perceived affection from parents (*i.e.*, an aggregated measure of perceived paternal and maternal affection, each 4 items, *e.g.*, “he/she likes being with me”,  $\alpha = .84$  for paternal affection and  $\alpha = .78$  for maternal affection) and perceived affection from classmates (4 items, *e.g.*, “my classmates enjoy being with me”,  $\alpha = .84$ ) were measured with five-point scales, with answer categories ranging from 1 (never) to 5 (always). No test-retest data of the SPF list are available.

### **Statistical Analyses**

Variables were transformed into z-scores for both the correlation and mediation analyses. Subsequently, we examined the direct effects of temperament on subsequent stressful social events, as well as the possible mediating role of perceived parental affection and perceived peer affection in these associations, as outlined in Figure 9. Three mediation analyses were performed for each of the six temperament traits, one for each of the stressful social event domains (*i.e.*, parents, peers and romantic partners). Perceived parental affection and perceived peer affection were entered si-

multaneously in the analyses, resulting in a total of 18 analyses. All mediation analyses were controlled for gender using the single multiple mediation method proposed by Preacher and Hayes [924].

The theoretical model of the prospective association between temperament and stressful social events in Figure 9 shows a direct effect on stressful social events (path  $c$ ) and the direct effect when the indirect path is controlled for (path  $c'$ ). The relationships between temperament and the two mediators are figured through path  $a_1$  and path  $a_2$ . The effects of the two mediators on stressful social events are figured through path  $b_1$  and  $b_2$ . The total indirect path from temperament to stressful social events is the sum of the two mediators. Testing a single multiple mediation model (rather than separate simple mediation models) has the advantage of allowing inter-correlations between the respective mediation variables [924]. Additionally, a single multiple mediation model enables us to quantify the extent to which perceived parental affection mediates the effect of temperament on stressful social events, conditional on the presence of perceived peer affection (and vice versa). The linear regression technique is known to remain valid when the dependent variable violates the “normality assumption” in a sample of our size [925]. However, to ensure the robustness of our results we bootstrapped all linear regression analyses ( $k = 1000$  with bias corrected confidence intervals) to obtain asymptotic 95% confidence intervals (CIs) around the indirect effects using the SPSS macro developed by Preacher and Hayes [924]. Confidence intervals not including zero reflect significant indirect effects. To enable comparison with other literature, we converted some results to Cohen’s  $d$  (standardized effect sizes), based on formulas derived from Borenstein [420] and Peterson [466]. Cohen’s  $d$  expresses differences in SD units, which we indexed as small from 0.20 to 0.49, medium from 0.50 to 0.80, and large if greater than 0.80 [373,466]. We classified correlations ( $r$ ) and betas as small if between .10 and .29, moderate between .30 and .50, and large if above .50 [373,466]. To reduce family-wise alpha inflation we only interpreted correlations that were significant at  $p < .01$ .

## RESULTS

### Descriptive Statistics

Descriptive statistics for the unstandardized variables are reported in Table 24. Table 25 presents correlations between the six temperament traits, perceived affection by parents and peers, and stressful social events in the three domains. We refrain from using higher order dimensions (*e.g.*, neuroticism composed from fear and frustration) because the higher-order domains could not be clearly distinguished over adolescence (Table 25, *cf.* overlap between frustration and effortful control).

**Table 24.** Descriptive statistics for the unstandardized variables

Temperament	N	Min	Max	Mean	SD
Fear	1196	1.00	4.60	2.41	.71
Frustration	1196	1.00	4.80	2.77	.65
Affiliation	1196	1.50	5.00	3.89	.55
Shyness	1197	1.00	5.00	2.51	.86
High intensity pleasure	1194	1.00	5.00	3.30	.93
Effortful control	1197	1.09	5.00	3.28	.69
Perceived parental affection	1162	3.00	10.00	8.64	1.27
Perceived peer affection	1183	2.00	10.00	7.41	1.40
Events parents	1197	0	2	.13	.39
0 events	1059				
1 event	115				
2 events	23				
Events peers	1197	0	2	.32	.53
0 events	849				
1 event	312				
2 events	36				
Events romantic relations	1197	0	2	.62	.66
0 events	574				
1 event	504				
2 events	119				
Gender	1197				
Female	660				
Male	537				

### Direct Effects and (Partial) Mediation

Most temperamental traits showed a direct prospective pathway to stressful social events. Adolescents high on frustration and low on effortful control were more likely to experience stressful social events in the parental and peer domain, but not with romantic partners. Adolescents high (*vs.* low) on intensity pleasure, low (*vs.* high) on shyness, and low (*vs.* high) on affiliation, were more likely to experience stressful social events in the romantic partner domain, but not with parents or peers. Only fear was unrelated to subsequent stressful events in all three domains.

Lower parental affection was observed for adolescents high (*vs.* low) on frustration and low (*vs.* high) effortful control and affiliation. Lower perceived peer affection was reported for adolescents high (*vs.* low) on frustration, and shyness, or low on effortful control and affiliation. Perceived affection, in turn, predicted stressful social events. More perceived parental affection predicted less subsequent stressful events

**Table 25.** Correlations between the study variables

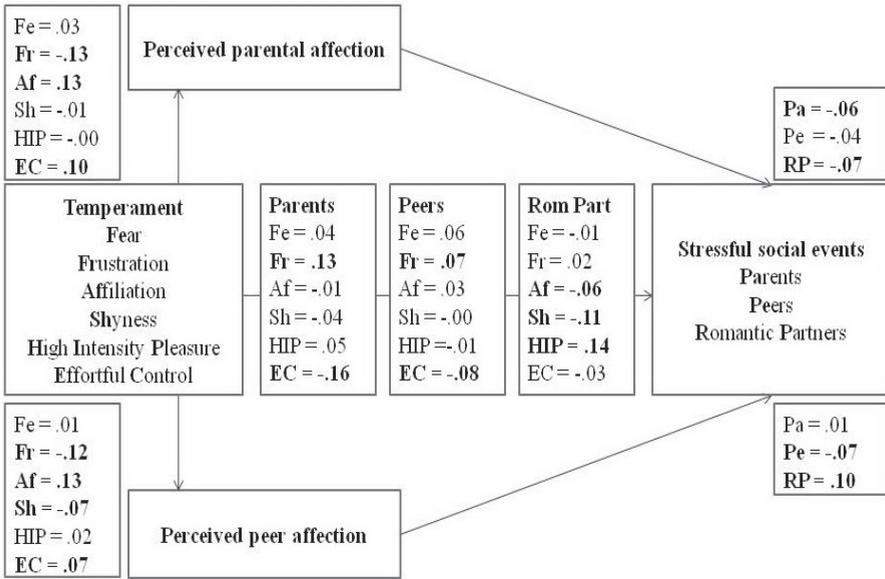
1. Fear	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
2. Frustration		.30***								
3. Affiliation		.08**	-.19***							
4. Shyness		.14***	.12***	-.29***						
5. High intensity pleasure		-.25***	-.06	.15***	-.29***					
6. Effortful control		-.23***	-.37***	.12***	-.01	.09**				
7. Perceived parental affection		.04	-.13***	.14***	-.00	-.01	.12***			
8. Perceived peer affection		.03	-.13***	.16***	-.06	.00	.10***	.46***		
9. Events parents		.05	.12***	.01	-.02	.04	-.13***	-.06	.00	
10. Events peers		.07*	.07*	.05	.02	-.03	-.07*	-.06	-.06*	.09**
11. Events romantic partners		-.01	.02	.07*	-.11***	.14***	-.02	-.01	.08**	.14***

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

in the parental domain and in the romantic partner domain, and more perceived peer affection predicted less subsequent stressful events in the peer domain but more events in the romantic partner domain. Although path coefficients varied slightly across the temperament models (*i.e.*, associations between perceived affection and stressful events were estimated in each of the univariate temperament models), they did not differ in any meaningful matter dependent on which temperament trait was included in the model (Figure 10 shows the path coefficients for events in the romantic partner domain). Furthermore, high levels of perceived affection predicted fewer subsequent social stressful events. In sum, the observed associations varied across temperament traits, stressful social event domains, and types of perceived affect (mediators).

Our bootstrapped regression models (see Table 26) showed that several of the associations between temperament and stressful social events were mediated by perceived relationship affection. Perceived parental affection mediated the associations between frustration, affiliation, and effortful control, and later stressful social events in the romantic partner domain. That is, higher levels of frustration, lower levels of affiliation and lower levels of effortful control were all related to less perceived parental affection, which in turn predicted more stressful social events in the romantic partner domain. Also, perceived parental affection mediated the associations between affiliation and stressful social events in the parental domain. So, lower affiliation was related to less perceived parental affection which, in turn, predicted more stressful social events in the romantic partner domain.

Perceived peer affection mediated the associations between respectively frustration, affiliation, shyness and effortful control, and stressful social events in both the peer and romantic partner domain. That is, higher levels of frustration and shyness and lower levels of affiliation and effortful control were related to less perceived peer



**Figure 10.** Standardized Path Coefficients for the Direct Paths.

Path coefficients of the associations between affection and stressful social events varied slightly across models

affection which, in turn predicted more stressful social events in the peer domain, but *less* in the romantic partner domain. No mediation effects were found for the associations between respectively fear and high intensity pleasure, and any of the social domains. All significant mediation effects had a rather small effect size (between  $d=0.10$  to  $0.15$ ).

### Posthoc Analyses

Multiple post-hoc analyses were performed to test the robustness of our results. First, the effects of temperamental facets on stressful social events in the romantic partner domain were repeated in the subgroup of adolescents who were involved in at least one romantic relationship between age 11 and 16. Second, we tested all temperamental effects for each of the individual stressful events. Third, multivariate mediation analyses were performed in which all temperament traits were entered simultaneously to test for (the mediation of) the independent effects of each temperamental facet adjusted for the effect of all other facets. Finally, non-parametrical Spearman partial rho tests were performed as an extra robustness check (next to our bootstrap procedure) because our dependent variables were non-normally distributed.

**Table 26.** Bootstrap results for indirect relationships (bias-corrected and accelerated CI's).

Facet	Conflict	Affection	Independent facet effects		
			Boot	SE	95% CI
Fear	Parents	Parental	-.002	.003	-.010 to .001
		Peer	.000	.001	-.002 to .004
	Peers	Parental	-.001	.002	-.009 to .001
		Peer	-.001	.003	-.009 to .003
	Partner	Parental	-.002	.003	-.010 to .001
		Peer	.001	.003	-.005 to .010
Frustration	Parents	Parental	.009	.005	-.001 to .021
		Peer	-.003	.005	-.013 to .006
	Peers	Parental	.004	.005	-.005 to .015
		Peer	<b>.009</b>	<b>.005</b>	<b>.000 to .022</b>
	Partner	Parental	<b>.009</b>	<b>.005</b>	<b>.001 to .023</b>
		Peer	<b>-.013</b>	<b>.005</b>	<b>-.028 to -.005</b>
Affiliation	Parents	Parental	<b>-.009</b>	<b>.005</b>	<b>-.023 to -.001</b>
		Peer	.001	.005	-.009 to .011
	Peer	Parental	-.005	.005	-.017 to .004
		Peer	<b>-.011</b>	<b>.006</b>	<b>-.026 to -.001</b>
	Partner	Parental	<b>-.010</b>	<b>.005</b>	<b>-.022 to -.002</b>
		Peer	<b>.013</b>	<b>.005</b>	<b>.005 to .025</b>
Shyness	Parent	Parental	.001	.002	-.003 to .007
		Peer	-.001	.003	-.007 to .005
	Peer	Parental	.000	.002	-.001 to .007
		Peer	<b>.006</b>	<b>.004</b>	<b>.001 to .017</b>
	Partner	Parental	.001	.002	-.003 to .007
		Peer	<b>-.007</b>	<b>.004</b>	<b>-.017 to -.001</b>
Surgency	Parents	Parental	.000	.002	-.005 to .005
		Peer	.000	.001	-.002 to .004
	Peer	Parental	.000	.002	-.003 to .003
		Peer	-.001	.003	-.009 to .002
	Partner	Parental	.000	.002	-.005 to .005
		Peer	.002	.003	-.004 to .010
Effortful Control	Parent	Parental	-.003	.003	-.111 to .001
		Peer	.001	.003	-.004 to .008
	Peer	Parental	.003	.004	-.013 to .004
		Peer	<b>-.005</b>	<b>.003</b>	<b>-.014 to -.000</b>
	Partner	Parental	<b>-.007</b>	<b>.004</b>	<b>-.018 to -.001</b>
		Peer	<b>.008</b>	<b>.004</b>	<b>.001 to .017</b>

*Note.*  $n = 1154$ . All models were adjusted for gender, but the adjusted models were also adjusted for the five other temperamental facets. Values in **bold** represent significant associations ( $p < .05$ ).

### ***Adolescents Involved in a Romantic Relationship***

All significant associations between temperament and stressful events in the romantic partner domain disappeared in the much smaller sample of adolescents who reported at least one romantic relationship between age 11 and 16 ( $n= 703$ ), see Appendix Table A31.

### ***Single Event Analyses***

Analyses for all single events in Appendix Table A32 showed that high (*vs.* low) fear predicted running away from home (parental domain) and being bullied (peer domain). High (*vs.* low) frustration predicted fights with parents and running away from home (parental domain) and being bullied (peer domain). Adolescents high (*vs.* low) on shyness were less likely to have a fight with their parents (parental domain) and less likely of being dumped or breaking up a relationship (partner domain). Adolescents high (*vs.* low) on surgency were more often thrown out of the parental home, and were more often dumped or broke up their romantic relationship (partner domain). Finally, adolescents high (*vs.* low) on effortful control reported fewer serious fights with parents and running away from home (parental domain), and were bullied less (peer domain). Most mediation paths by perceived relationship affection remained significant (see Appendix Table A32).

### ***Multivariate Analyses***

Multivariate analyses were performed in which all temperament traits were entered simultaneously to examine the effects of temperament traits adjusted for all other traits. Analyses showed that only part of the associations found in the univariate analyses remained in the multivariate analyses. Most importantly, the indirect effects of frustration and affiliation on stressful events via perceived affection remained when adjusting for the other temperament traits. In contrast, the effects of shyness and effortful control disappeared, suggesting that these were not robust when adjusting for other traits. Model statistics are reported in Appendix Table A33.

### ***Non-Parametric Tests***

Finally, non-parametrical Spearman partial rho tests supported the results of our univariate analyses and showed both the direct effects of temperament on stressful events occurrences and mediation of these associations by perceived parental and/or peer affection (see Appendix Table A34).

## DISCUSSION

In this paper we used data from a large cohort of adolescents, and two waves, to test whether adolescent's perceived relationship affection mediates part of the prospective association between adolescent temperament and stressful social event evocation. Our results support the hypothesis that temperamental differences are manifested in differences in stressful social event evocation, in line with previous research. Our study innovated by the observation that perceived relationship affection mediates a modest part of this association. In other words, temperaments colour the way adolescents perceive received affection, which, in turn, influences the probability of subsequent stressful social events. Our distinction between three social domains (*i.e.*, parents, peers and romantic partners) yielded support for both generic and domain-specific effects, which exemplifies the challenge of isolating mechanisms behind the stress selection principle. After having summarized our main findings these will be discussed in more detail below.

### Temperament and Subsequent Stressful Social Events

Low levels of effortful control (H1a) and high levels of frustration (H1b) were predictive of more subsequent social stressful events, in line with our hypotheses. Interestingly, this held only true for the parental and peer domain: stressful social events in the romantic partner domain were predicted by high levels of intensity pleasure and affiliation as well as low levels of shyness (all traits related to the broader personality domain of extraversion). Fear was not predictive of stress in any of the domains.

The observation that patterns were different for peers and romantic partners might be somewhat surprising insofar that relationships between peers and romantic partners are often seen as more comparable than between parents and romantic partners [902,904,926]. However, it might be that above and beyond the similarities between peer and romantic partner relations, peer relations have some resemblance with parental relations in the sense that they have both developed over years. Romantic relationships, in contrast, can develop (and finish) rather suddenly during adolescence. Consequently, temperament traits that are undesirable in social interactions (*e.g.*, high frustration) may be more visible for parents and peers who know the adolescent for years, whereas adolescents may inhibit frustration-related behaviours in the presence of their new romantic partner. This may explain why adolescents high on frustration may evoke stressful social events in the parental and peer domain, but not the romantic partner domain.

Similarly, adolescents high on effortful control may be more reliable in their friendships with peers and 'easier' to their parents, and may therefore be less likely to evoke stressful social events in these contexts. In contrast, effortful control may not be of

much importance in the newly developing - and often only short-term - romantic relationships adolescents have. This interpretation aligns with observations by Furman [927], who suggested that parent-child relationship characteristics as perceived by the adolescent were related to both i) child-peer relationship characteristics as perceived by the adolescent and ii) child-romantic partner relationship characteristics as perceived by the adolescent, although the latter two were (at least for some relationship characteristics) unrelated.

Stressful social events in the romantic partner domain were predicted by low shyness, and affiliation and high intensity pleasure; traits that are all related to the broader personality dimension of extraversion. Adolescents high on extraversion evoked more stressful events with romantic partners (in line with hypothesis H1c), but not with parents and peers. Hence, extraversion (being out-going, sociable etc.) seems more influential when engaging with romantic partners than in the more persistent relationships with parents and peers. This is consistent with evidence that high (*vs.* low) extravert adolescents engage more in romantic relationships (*e.g.*, [338-340]). It therefore seems plausible that low extravert adolescents evoke less social stressful events in the romantic partner domain simply because they are not so much involved yet in romantic relationships (a floor effect). Nonetheless, it seems unlikely that the more frequent engagement of extraverted adolescents in romantic relationships explains all of the variance, because they probably interact more with romantic partners and with their peers. The cardinal features of high extraversion are social attention and a larger impact on one's social environments in general [16,21]. Previous research indeed showed both quantitative and qualitative differences in social interactions between high extraverted adolescents [928]. Given that we did not find an associations between traits related to extraversion and subsequent stressful social events in the peer domain, it seems plausible that extraverts have not just more, but also other (*i.e.*, more intense) interaction with romantic relationships than their less extravert peers. Consequently, it seems that adolescents high on extraversion had more frequent and more intense interactions with romantic partners than adolescents whom were more reticent, resulting in both more positive and negative events. Biserial correlations indeed showed that high affiliation and surgency and low shyness predicted the presence of romantic relationships between age 11 and 16, while fear, frustration, and effortful control were unrelated (see Appendix Table A35). The association between temperament (shyness, affiliation, high intensity pleasure) and stressful events disappeared in post-hoc analyses in the subgroup of adolescents who reported at least one romantic relationship between age 11 and 16 (although the statistical power was also much lower).

### **Perceived Affection: an Intrapsychic Characteristic with Real World Consequences**

We proposed that the prospective association between temperament and subsequent stressful social events would be partially mediated by perceived relationship affection (H2). Indeed, perceived relationship affect mediated several temperament to stressful social events paths. This finding may propel the exploration of other factors that can account for part of the association between temperament and stressful event evocation, because we showed that mediation studies have the potential to provide insight in the mechanisms underlying the stress selection principle. Such insights may enable clinicians to craft prevention strategies that alleviate stress related psychopathology. More specifically, our results suggest that perceived relationship affection mediated part of the studied associations. The observed effect sizes of the various paths were small but in the range of the average observed in psychology [66,655].

Our results align with the interpretation that individuals develop internal working models based on their temperamental characteristics, which in turn modulates adolescents' perceptions of their affective relationships with others, as outlined in the introduction. Hence, perceived relationship affection, a rather complex intrapsychic characteristic, can have real-world consequences in terms of subsequent stressful social events. This is reminiscent of studies that showed that pre-conceptions of a future identity (also an intrapsychic influence) can already change temperament (or personality) in *anticipation* of future social roles [677,678,929]. Moreover, the findings confirm and extend previous research showing that people's perceptions of their relationships with others (*e.g.*, expected rejection) can become a self-fulfilling prophecy when people start behaving in ways (*e.g.*, withdrawal, aggression etc.) that elicit stressful social interaction (*e.g.*, conflicts, rejection, breakup, see [914-917])

### **Domain Specificity and Spillover**

We hypothesized that mediation by perceived relation affection would be largely domain-specific (H3). Indeed, parental affection was the primary mediator of temperamental stressful social event evocation in the parental domain (H3a), whereas perceived peer affection mediated the evocation of stressful events in the peer domain (H3b). Perceived parental affection mediated part of the association between affiliation and events in the parental domain, but surprisingly, no effect was found for the other temperamental traits. Though perceived affect may be conceptually most akin to affiliation, the association between affiliation and perceived parental affection was not much stronger than it was for frustration or effortful control. Moreover, affiliation was rated by the mother, whereas levels of perceived affection were based on adolescents' self-report, which may limit the overlap between both concepts.

With regard to *perceived peer affection*, several mediation effects were found. Adolescents lower on frustration or shyness and/or higher on affiliation or effortful control

reported more peer affection which, in turn, predicted less subsequent stressful social events in the peer domain. This suggests that, as hypothesized, adolescents perceived affection received from their peers is important in the association between temperament traits and events in the peer domain. Notably, for both frustration and effortful control no direct effects were found on stressful social events in the peer domain. This indicates that perceived peer affection mediates part of the stress-evocation effects of frustration and effortful control, whereas extraversion-driven evocation effects tend to be more independent of perceived affection.

Because *perceived romantic partner affection* was not measured in our study, we explored ‘spill-over’ effects of parental and peer affection on stressful event selection in the romantic partner domain. Findings suggested some spill-over effects. Adolescents lower on frustration and/or higher on affiliation or effortful control reported more affection from parents and peers, which, in turn, predicted subsequent stressful social events in the romantic partner domain. But whereas more perceived parental affection predicted *fewer* events in the romantic partner domain (in line with the negative association between perceived parental affection and events in the parental domain), more perceived peer affection predicted *more* events in the romantic partner domain (a positive association, diametrical to the negative association between perceived peer affection and events in the peer domain). Possibly romantic partners and peers compete for the adolescents attention [930-932], which may explain part of the negative association between peer affection and events in the romantic relationship. Moreover, the spill-over effects of perceived parental affection to the romantic domain may reflect that young adolescents use their perceptions of their parents to guide their behaviour in interaction with their (first) romantic partners [933].

Yet, we have to interpret the mentioned ‘spill-over’ effects with caution. Besides that they did not hold in the post-hoc analyses where we examined the associations only for those adolescents who reported at least 1 romantic relationship between age 11 and 16; we were unable to include perceived romantic partner affection, while part of the observed spill-over effects may reflect overlap between the perceived parental-, peer- and romantic partner affection, which might disappear when a measure of perceived romantic partner affection was included. Clearly, additional research is warranted elaborating on perceived parental and peer affection with perceived romantic partner affection, and can test our explanations of the alleged spill-over effects we observed.

Finally, multivariate analyses were performed to test the robustness of the indirect effects when adjusting for all other traits. Results showed that the effects of affiliation and frustration remained in these more conservative analyses, bolstering the robustness of the findings. However, this was not true for the indirect effects of shyness and effortful control disappeared, which suggests that these findings resulted from their

co-occurrence with the other traits, and these results should therefore be interpreted cautiously.

### **Strengths and Limitations**

Among the strengths of our study was our usage of a large sample of adolescents and data from different informants. Parents rated the adolescents temperament. Perceived affection was measured using adolescent's self-report data. The stressful social events were captured using a semi-structured and sophisticated interview method which provided information both on the nature and the timing of the event. Retrospective self-reports of stressful events have inherent limitations due to response components that may be influenced by current mental state, such as cognition, appraisal, interpretation and recall. However, this was addressed in our study by asking the participant to proceed serially from one life domain to another using a month-by-month horizontal timeline and under supervision of the interviewer. This method is known for providing detailed and accurate data about the events [919,920]. In addition, we were able to distinguish between three domains of stressful social events: parents, peers and romantic partners. This allowed us to differentiate between generic and domain specific with regard to both direct and indirect effects. Finally, to test the robustness of the findings, we tested all temperamental effects for each of the individual stressful events. The direct, as well as most mediation paths by perceived relationship affection remained significant, bolstering the robustness of the findings presented.

Despite these strengths the study is limited in several ways. First and most important, we found evidence for mediation of several temperament – stressful social event associations by perceived relationship affection, but all effects indicated only partial mediation. Moreover, the effects revealed were all very small. It would be interesting to examine whether they would hold when including constructs related to perceived affection, such as social support, attachment style or rejection sensitivity. Unfortunately, however, we did not have this data available. Nevertheless, research in older adolescents showed that felt insecurity mediates the associations between personality (i.e., attachment style) and relationships with romantic partners [934]. Additionally, Finn and colleagues [125] showed that relationship-specific interpretation bias can explain part of the association between personality (i.e., neuroticism) and relationships with romantic partners.

A related issue is that the remaining question which convergent mechanisms may underlie the association between temperament and stressful social events. For some of the paths we found indirect but no total effects. As discussed extensively by Hayes and colleagues [924], total effects are no statistical prerequisite for the existence of indirect effects. It might be, for example, that other mediation processes work in the opposite direction, thereby leading to the lack of an overall effect (see [935]). These

observations thus stress the need for future research, and clearly, other extant variables may account for additional variance. Although beyond the scope of the current study, future research may identify other and potentially stronger factors in the domain of information processing, and add other-reported mediators and outcomes. For example, parent-reported parenting styles, cognitive characteristics reported by the adolescent, parent or teacher might be important mediators to consider. Indeed, elsewhere in the current special issue evidence has been provided bolstering the importance of cognitive characteristics by showing that oral fluency partially mediates the associations between extraversion and sociometric popularity [936]. Other mechanisms suggested to underlie the association between personality and subsequent peer relations are interpersonal motives and behaviors [937].

Second, and as mentioned before, we included three domains of stressful social events in our study, but had only measures of perceived affection in the parental and peer domain. As discussed previously, this makes interpretation of the current ‘spill-over’ effects difficult. Third, it might be that temperament is not only related to an adolescent’s *perceived* relationship affection, but also to the absolute amount of affection he or she receives. Future research including a measure of perceived affection as well as a more objective measure of actually received affection (maybe even a behavioural measure) may help to disentangle this issue. Fourth, our study may be limited by the timing of the perceived affection measures. In an optimal mediation design, the mediator is assessed in between the predictor and outcome variable. In our study perceived affection was measured simultaneously with temperament. Consequently, we cannot be conclusive about the direction of the association between temperament and perceived affection. However, our research question did not fit very well to the classic mediation approach. By measuring perceived affection in-between temperament and stressful life events, we would either include stressful social events that happened before the measurement of the mediator, or we would have to exclude all events that occurred in this period, leaving us with a ‘black-time-box’ filled with events not taken into account.

Related to the direction of the association between temperament and perceived affection is the direction of the relationship between temperament and stressful events. As proposed by the social selection principle, individuals may evoke stressful events based on their temperament. However, the opposite is also true, and exposure to stress has been found to be related to (non-normative) changes in temperament [64,100,223,938]. The Correspondive Principle explicitly accounts for these bidirectional associations between temperament and stressful events, postulating that change in temperament results from mutually reinforcing person–environment transactions, including two processes both social selection and social influence (*i.e.*, stress can affect temperament and temperament can affect stress, see chapter 3 and 9 or [64, 938]). A recent study

on the TRAILS data supported the Correspondive Principle, although the effect varied between the different temperament traits [906]. Whereas stressful events were found to predict subsequent fear, stressful events were predicted by, but not predictive of, shyness and affiliation. For effortful control and frustration a fully reciprocal model was found. Consequently, future research may explore what makes frustration and effortful control different, and further research including multiple waves of temperament, perceived affection and stressful social event data may allow for more detailed test of mediation and shed more light on the causal order of the various associations.

## **CONCLUSION**

In conclusion, in this study a model was tested in which we proposed that adolescent perceived relationship affection mediates the association between adolescent temperament and evocation of stressful social events in three social domains (parents, peers and romantic partners). Findings indicate that individual's may evoke subsequent stressful social events based on their temperament and that this associations is partially mediated by adolescents' perceived relationship affection. The observed effect sizes were small but ranged around the average in psychology. This suggests that a search for third variables may be a promising way to learn to understand the mechanism that underlie the stress selection principle, and that perceived relationship affect may be one of the candidates.