Chapter 6

Adolescent family instability and mental health problems:
The role of self-regulation capacities

Abstract

Adolescent family instability is a considerable adaptive challenge in an increasingly turbulent developmental period. Using data from a prospective population cohort of 2230 Dutch adolescents, we tested risk-buffering interactions between adolescent family instability and self-regulation capacities on mental health. We used two self-regulation capacities that could allow adolescents to cope relatively well with family instability: (1) effortful control, and (2) attentional flexibility (in this case, measured with a set-shifting task). Adolescent family instability was associated with internalizing problems and externalizing problems. The risk-buffering effects of effortful control were found for externalizing problems but not for internalizing problems. There were no risk-buffering effects of attentional flexibility on both types of mental health problems. Effortful control is likely to benefit adolescents’ ability to channel their frustrations in adaptive ways in the presence of family instability. Additionally, (attentional) set-shifting tasks might have a limited predictive value for risk-buffering research.
Adolescent family instability, mental health problems, and self-regulation capacities

Introduction
An important function of the family environment is to provide adolescents with stability, cohesiveness and predictability during their increasingly turbulent and demanding lives (Forman & Davies, 2003; Gestsdottir & Lerner, 2008). Most adolescents experience a stable family environment but some are exposed to family instability. Family instability is defined as an accumulation of common disruptive family events that undermine the predictability and stability of family life from the adolescents’ perspective (Ackerman, Kogos, Youngstrom, Schoff, & Izard, 1999; Forman & Davies, 2003). Put in other words, family instability is a cumulative risk measure that includes disruptive family events that ‘happen’ to the adolescent, like parental divorce, residential moves, parental illness and changes in family composition (e.g. Forman & Davies, 2003). Family instability is associated with both internalizing problems and externalizing problems (e.g. Adam & Chase-Lansdale, 2002; Forman & Davies, 2003). Thus, being exposed to family instability poses an adaptive challenge for adolescents.

Although, family instability “happens” to adolescents, some might fare better than others under these unstable family conditions. The risk-buffering model states that favorable individual characteristics mitigate the effects of family risk on mental health (e.g. Veenstra, Lindenberg, Oldehinkel, De Winter, & Ormel, 2006; Wills, Sandy, Yeager, & Shinar, 2001). Good self-regulation has been proposed to be a key protective factor for coping relatively well with adversity (e.g. Buckner, Mezzacappa, & Beardslee, 2003, 2009; Lengua, Bush, Long, Kovacs, & Trancik, 2008). Self-regulation consists of a set of capacities that are modifiable and can be learned and improved (Buckner et al., 2009), and could therefore be an important target for improving mental health under conditions of cumulative contextual (family) risk (Ackerman et al., 1999; Henry, Caspi, Moffitt, & Silva, 1996; Lengua, 2002; Lengua et al., 2008). As far as we know, little is known about the contribution of self-regulation on adolescents’ adjustment to family instability. Because family instability is relatively common in Western societies (e.g. Marcynyszyn, Evans, & Eckenrode, 2008), this type of adversity is likely to contribute substantially to the prevalence of mental health problems. Investigating interaction effects between adolescent family instability and self-regulation can help to differentiate the adolescents who are either protected against or vulnerable to family instability. This prospective study will therefore test two self-regulation capacities that could allow adolescents to cope relatively well with family instability: (1) effortful control, and (2) attentional flexibility.

A core aspect of self-regulation is the temperamentally-based capacity for effortful control (e.g. Gardner, Dishion, & Connell, 2008; Lengua et al., 2008; Oldehinkel, Hartman, Ferdinand, Verhulst, & Ormel, 2007). Effortful control is the ability to (voluntarily) regulate attention and behavior (e.g. Oldehinkel et al., 2007). Adolescents with effortful control are likely to have the ability to respond to the demands of family instability with a range of behaviors and emotions that are socially acceptable and sufficiently flexible (e.g. Derryberry & Rothbart, 1997; Eisenberg et al., 2009; Eisenberg, Spinrad, & Morris, 2002). On the other hand, adolescents with low effortful control may find it more difficult to respond appropriately
An important underpinning of effective self-regulation may be the ability to focus and shift attention (Buckner et al., 2003; Gardner et al., 2008; Lengua et al., 2008). Attentional flexibility reflects the central cognitive ability to disengage attention away from one source and then moving and reengaging it to another (e.g. Stahl & Pry). It provides adolescents with the capacity to generate a diversity of ideas, consider behavioral alternatives, and respond to new or changing situations (Stahl & Pry, 2005). Attentional flexibility can be assessed with (computerized) set-shifting tasks, which measure the ability to switch between two competing and unpredictable response sets (Brunnekreef et al., 2007; De Sonneville, 1999; Stahl & Pry, 2005). The assumption is that the better and faster adolescents are at these set-shifting tasks, the more flexible they are at adapting to change (Shouten, Oostrom, Peters, Berloop, & Jennkens-Schinkel, 2000; Stahl & Pry, 2005). However, set-shifting tasks have rarely been tested in stress research. This study therefore extends previous research on risk-buffering interactions by testing whether attentional flexibility (in this case, measured with a set-shifting task) moderates the risk of adolescent family instability on mental health.

As far as we know, our study is the first to investigate whether good self-regulation capacities are protective factors in the presence of adolescent family instability. Another contribution of our study is that we use two different approaches for operationalizing self-regulation: (1) parent-reported effortful control, and (2) an attentional flexibility (in this case, set shifting) task. Consistent with the risk-buffering model, the effect of adolescent family instability on mental health problems was expected to be weaker for adolescents with high effortful control and attentional flexibility compared to those with low self-regulation capacities. These hypotheses were tested in a prospective large population cohort of adolescents, using two broad-band domains of mental health as outcome measures: internalizing problems and externalizing problems.
Methods

Sample

Subjects were participants of the ‘TRacking Adolescents’ Individual Lives Survey’ (TRAILS), a prospective cohort study of Dutch adolescents, aimed at explaining the development of mental health from pre-adolescence into adulthood. A detailed description of the sampling procedure and methods is provided in Huisman et al. (2008). So far, three data collection waves have been completed: T1 (2001-2002), T2 (2003-2004) and T3 (2005-2007). Participants will be followed until (at least) the age of 24.

Of all the children approached (N = 3145), 6.7% (n = 211) were excluded because of mental or physical incapability or language problems. Of the remaining 2934 children, 76.0% (N = 2230, mean age = 11.09, SD = 0.56, range = 10.0 - 12.0, 50.8% girls) were enrolled in the study (i.e. both child and parent agreed to participate). Of the 2230 baseline participants, 96.4% (N = 2149) participated in the first follow-up (mean age = 13.56, SD = 0.53, range = 12.0 - 15.0, 51.0% girls), held two to three years after baseline (T1) (mean number of months = 29.44, SD = 5.37, range = 16.69 - 48.06). The second follow up (T3) was completed with 81.4% of the original number of participants (N = 1816), mean age = 16.27 years; SD = 0.73 and 52.3% girls. Written informed consent was obtained from the parents and from the adolescents themselves at all three assessment waves. The present study is based on data from both the baseline (T1) and second follow-up (T3) assessment wave.

Measures

Internalizing and externalizing problems - Two broad domains of mental health problems were included in this study: internalizing and externalizing problems. Internalizing problems include the narrow-band domains Anxious/Depressed, Withdrawn/Depressed and Somatic Complaints, while externalizing problems encompass Aggressive Behavior and Rule-Breaking Behavior. These problems were assessed at baseline (T1) and the second follow-up (T3) with the parent-rated Child Behavior Checklist (CBCL)(Achenbach, 1991a), the Youth Self Report (YSR) (Achenbach, 1991b), and the Teacher Checklist of Psychopathology (TCP).

The TCP was developed by TRAILS to reduce the respondent burden for teachers, as each had multiple participants to report on. The TCP is composed of descriptions of problem behaviors similar to Achenbachs’ Teacher Report Form (Achenbach, 1991c), which is the teacher-report version of the CBCL and YSR. The TCP yields the same syndrome and domain scales as the TRF, CBCL and YSR, but based on (sets of) single vignettes rather than sets of items. For example, the vignette for Withdrawn/Depressed is: “The adolescent wants to be alone rather than to have company. He/she is withdrawn and has little contact with others. The adolescent doesn’t show initiative or shows a lack of energy”; and the vignette for Aggressive behavior is: “The adolescent is conflictuous and challenges others. He/she bullies others and physically attacks them. The adolescent has an explosive and unpredictable nature. He/she gets easily frustrated by others and frequently uses abusive language”. Response options for each description of the TCP ranged from 0 (not applicable) to 4 (very clearly or frequently
applicable). The TCP vignettes correlated around 0.60 with the full TRF syndrome scales filled out by a small sample of teachers (Ferdinand, 2003, internal report available on request).

The validity of the scales for internalizing problems and externalizing problems have been documented (Achenbach, 1991a, 1991b, 1991c) and reiterated in a Dutch sample (Verhulst, Van der Ende, & Koot, 1996, 1997). In our sample, the reliability statistics for the baseline sample (T1) were as follows: CBCL-internalizing (32 items, \( \alpha = 0.85 \)), CBCL-externalizing (35 items, \( \alpha = 0.90 \)), YSR-internalizing (31 items, \( \alpha = 0.87 \)), YSR-externalizing (32 items, \( \alpha = 0.85 \)); TCP-Internalizing (3 vignettes, \( \alpha = 0.71 \)), TCP-externalizing (2 vignettes, \( \alpha = 0.78 \)). For the second follow-up sample (T3) the reliability statistics were: CBCL-internalizing (32 items, \( \alpha = 0.88 \)), CBCL-externalizing (35 items, \( \alpha = 0.90 \)), YSR-internalizing (31 items, \( \alpha = 0.89 \)), YSR-externalizing (32 items, \( \alpha = 0.88 \)); TCP-Internalizing (3 vignettes, \( \alpha = 0.66 \)), TCP-externalizing (2 vignettes, \( \alpha = 0.75 \)).

The agreement between parent-reported, adolescent-reported, and teacher-reported internalizing and externalizing problems was moderate (\( r = 0.23 - 0.38 \) for internalizing problems and \( 0.35 - 0.42 \) for externalizing problems). Each informant perceives different aspects of problem behavior and differences between informants are meaningful. An additional advantage for using multiple informants is that it reduces the bias associated with monoinformant information. Mental health problems that are rated as present by multiple informants are assumed to be more severe (generalized) than problems rated by only one informant (e.g. Noordhof, Oldehinkel, Verhulst, & Ormel, 2008; Verhulst, Koot, & Van der Ende, 1994). Based on these considerations, we used the mean of the standardized parent, adolescent, and teacher scores as a measure of internalizing and externalizing problems. When data of one informant was missing or unreliable (for internalizing: CBCL: T1 n = 157, T3 n = 257, YSR: T1 n = 41, T3 n = 9, TCP: T1 n = 281, T3 n = 772; for externalizing: CBCL: T1 n = 148, T3 n = 257, YSR: T1 n = 32, T3 n = 1, TCP: T1 n = 279, T3 n = 757), the composite score was based on the other informants. The composite scores of T1 and T3 internalizing problems and externalizing problems were subsequently standardized to mean zero and standard deviation one (z-scores). The T1 measure reflects mental health problems during pre-adolescence, while the T3 measure reflects mental health problems during late adolescence.

**Family instability** – Adolescent family instability was assessed at the second follow up (T3), by the Event History Calender (EHC) (Caspi, Moffitt, Thorton et al., 1996). Test-retest reliability as well as validity of the EHC have been reported to be moderate to good (e.g. Belli, Shay, & Stafford, 2001; Caspi et al., 1996; Freedman, Thorton, Camburn, Alwin, & Young-De Marco, 1988). Of the 1816 T3 participants, 83% (n = 1513, 55% girls) participated in the EHC. Responders and non-responders of the EHC did not differ regarding the prevalence of T3 total mental health problems, emotional problems and behavioral problem behaviors and baseline socio-economic position. Responders included more girls (responders: 55%; non-responders: 42%; \( \chi^2 = 31.58, df = 1, p < .01 \)).

Based on the revised family instability index (Forman & Davies, 2003), we selected the following disruptive family events from the EHC: changes in residence, parental divorce, romantic relationships of biological parents after divorce, changes in family composition, death
Adolescent family instability, mental health problems, and self-regulation capacities of family member, serious somatic illness of family member. In addition, we selected mental health problems of family members, parental addiction (alcohol or drugs) and longterm conflict between family members because these events can also have a considerable disruptive effect on family life from the adolescents’ perspective. The term ‘family’ pertained to biological parents, brothers and sisters, step parents, stepbrothers and sisters, half brothers and sisters, foster brothers and sisters. The events were selected if adolescents had experienced them in the period between T1 and T3 (age range approximately between 11 and 16 years). The number of disruptive family events experienced in this period was used as a measure of family instability during adolescence. Fifty-eight percent experienced at least one disruptive event (mean score = 1.04, SD = 1.24; range = 0 - 8).

Effortful control – Effortful control was assessed at baseline (T1) by the parent version of the Early Adolescent Temperament Questionnaire-Revised (EATQ-R; Putnam, Ellis, & Rothbart, 2001). The EATQ-R is a 62-item questionnaire based on the temperament model developed by Rothbart and colleagues (Putnam et al., 2001; Rothbart, Ahadi, & Evans, 2000). Rothbarts’ model distinguishes three components of effortful control: activation control (the capacity to perform an action when there is a tendency to avoid it), attention control (the capacity to focus attention as well as to shift attention when desired) and inhibitory control (the capacity to plan and to suppres inappropriate responses). But these components failed to emerge as separate factors in the TRAILS sample (Oldehinkel et al., 2007). The effortful control items could be rated on a five-point scale ranging from 1 = hardly ever true to 5 = almost always true (T1: 11 items, α = 0.86). Example items are: ‘When interupted or distracted, forgets what s/he was about to say (R)’, ‘Has a difficult time tuning out background noise and concentrating when trying to study (R)’, ‘Is often in the middle of doing one thing and then goes off to do something else without finishing it (R)’, ‘Pays close attention when someone tells him / her how to do something’. Higher scores reflect more effortful control (mean score = 3.21, SD = 0.69; range = 1.03 – 5.32).

Attentional flexibility – Attentional flexibility was assessed at baseline (T1), as part of the Amsterdam Neuropsychological Tasks Program (ANT; De Sonneville, 1999). The participants performed multiple tasks, including a Shifting Set Task, which measured attentional flexibility (see for a detailed description of the ANT; Brunnekreef, et al., 2007). In the Shifting Set Task, a horizontal bar, consisting of ten squares, was permanently presented in het center of a computer screen. In each trail, a colored square moved across the bar in a randomly varied direction (i.e. either to the left or to the right). The task consisted of three parts, each requiring different responses (see Brunnekreef et al., 2007). Part 1 (10 practice trials, 40 task trails) required spatially compatible responses: children were instructed to copy the direction of the movement of the green-colored square (i.e. a left movement required pressing the left mouse button and a right movement required pressing the right mouse button). Part 2 (10 practice trails, 40 task trails) required spatially incompatible responses: children were instructed to ‘mirror’ the direction of the movement of the red-colored square (i.e. a left movement required pressing the right mouse button and a right movement required pressing the left mouse button), and should thus inhibit (spatially compatible) responses. In part 3 (16
practice trails, 80 task trials) the color of the moving square randomly alternated between green and red, hereby making both the direction of the movement and the color changes unpredictable. When the color of the square was green after a movement, a spatially compatible response was needed (as in part 1). When the color of the square was red after a movement, a spatially incompatible response was required (as in part 2). A response had to be initiated within 150 - 6000 milliseconds (msec) (i.e. the Valid Response Window), otherwise the trial was automatically replaced by a new trial. The fixed postresponse interval was 250 msec.

Attentional flexibility was constructed from the reaction times, by subtracting the mean reaction time of the compatible responses of part 1 from the mean reaction time of the compatible responses of part 3. Lower scores denoted more attentional flexibility. The intercorrelations between attentional flexibility and the other measures of the ANT were low to moderate (from $r = 0.16$ with Baseline Speed to $r = 0.32$ with Inhibition of Prepotent Responses). Outliers with an absolute $z$-score greater than or equal to -4 or 4 were excluded from the analyses (n = 4) (see Brunnekreef et al., 2007). To make this measure comparable to the other study variables, we multiplied the scores by -1. Thus, for our analyses, higher scores reflect more attentional flexibility (mean score = -666.63, SD = 224.54; range = -1629.39 to 319.64).

**Statistical analyses**

Missing data on any of the variables were handled by multiple imputation, using the ICE (Imputation by Chained Equations) approach available in the statistical package Stata (StataCorp, 2007). Given other variables in the dataset, we created five datasets with imputed missing values, which were joined in subsequent analyses (Royston, 2005). After multiple imputation, we were able to use data from all 2230 baseline participants for the multivariate regression analyses, which prevents bias due to selective attrition.

Multiple linear regression analyses were used to test the moderating effects of effortful control and attentional flexibility on the association between family instability during adolescence and internalizing and externalizing problems. To ease the interpretation of the interaction effects, all continuous variables were standardized to $M = 0$ and $SD = 1$. The interaction terms of family instability and the self-regulation capacities were the product of two $z$-scores but were not standardized themselves. The correlation between effortful control and attentional flexibility was very weak ($r = 0.06$; see Table 1). Thus, it was appropriate to use both measures separately in the analyses. For each mental health outcome, we tested the main and interaction effects of adolescent family instability and effortful control, as well as the main and interaction effects of adolescent family instability and attentional flexibility. We report the unstandardized regression coefficients to be able to compare the study variables on the same scale, and to ease the interpretation of the interaction effects (Table 2 and 3).

We adjusted these models for T1 mental health problems because prior mental health problems have been shown to be important risk factors for later internalizing problems and externalizing problems (Kessler & Magee, 1994) as well as for stressful experiences (e.g.
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Hammen, 2006). We also adjusted all analyses for co-morbidity (Kessler, Davis, & Kendler, 1997). Because the prevalence of internalizing problems and externalizing problems tends to differ for boys and girls (e.g. Leadbeater, Blatt, & Quilan, 1995), the analyses were adjusted for gender as well (dummy coded: 0 = girls, 1 = boys).

In case of a significant interaction effect, we wrote out multiple equations using simple slope analysis to provide an impression of the effect size and facilitate the interpretation (Aiken & West, 1991). In these analyses, low and high levels of the predictor indicate one standard deviation below and above the mean, respectively, while holding all other variables to their sample means.

Results

Descriptive statistics

The correlations are presented in Table 1. As opposed to effortful control, attentional flexibility was not statistically significantly correlated with adolescent family instability, nor with internalizing problems and externalizing problems.

Effects of family instability and self-regulation capacities on adolescents’ mental health

Adolescent family instability was associated with internalizing problems and externalizing problems, both unadjusted and adjusted for gender, T3 co-morbidity and T1 mental health problems (Table 2). Effortful control was also associated with both internalizing problems and externalizing problems but did not remain statistically significant when adjusted for T1 mental health problems (Table 2, model 3). Attentional flexibility was not associated with internalizing problems and externalizing problems (Table 3).

The interaction between adolescent family instability and effortful control on externalizing problems was statistically significant (Table 2, model 4). Simple slope analyses (Aiken & West, 1991) revealed that the effect of family instability on externalizing problems was not statistically significant for adolescents with high effortful control \( (B = 0.04, t = 1.34, p = .18) \), whereas it was a statistically significant effect for adolescents with low effortful control \( (B = 0.14, t = 5.71, p < .001) \). These results are represented in Figure 1. Attentional flexibility did not buffer the effect of family instability on internalizing or externalizing problems.
Table 1. Correlations between the study variables.

<table>
<thead>
<tr>
<th></th>
<th>1. Internalizing Problems T3&lt;sup&gt;a&lt;/sup&gt;</th>
<th>2. Externalizing Problems T3&lt;sup&gt;a&lt;/sup&gt;</th>
<th>3. Adolescent Family Instability&lt;sup&gt;b&lt;/sup&gt;</th>
<th>4. Effortful Control</th>
<th>5. Attentional Flexibility</th>
<th>6. Internalizing Problems T1&lt;sup&gt;a&lt;/sup&gt;</th>
<th>7. Externalizing Problems T1&lt;sup&gt;a&lt;/sup&gt;</th>
<th>8. Gender (0 = girls; 1 = boys)</th>
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<tbody>
<tr>
<td>1</td>
<td>0.33***</td>
<td>0.16***</td>
<td>0.18***</td>
<td>-0.14***</td>
<td>-0.04</td>
<td>-0.26***</td>
<td>-0.06*</td>
<td>-0.26***</td>
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<td>2</td>
<td></td>
<td>0.41***</td>
<td>0.16***</td>
<td>-0.26***</td>
<td>-0.02</td>
<td>0.09***</td>
<td>-0.27***</td>
<td>-0.12**</td>
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<td>3</td>
<td></td>
<td></td>
<td>0.18***</td>
<td>-0.06*</td>
<td>0.00</td>
<td>0.06*</td>
<td>0.00</td>
<td>-0.17***</td>
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<td>4</td>
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<td>0.04</td>
<td>-0.02</td>
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<sup>a</sup> Score is based on the mean standardized parent, adolescent and teacher reports.

<sup>b</sup> Sumscore (total range between 0 and 8 disruptive family events) and based on self-report.

**Bold:** statistically significant correlation; * p<.05, ** p<.01, ***p<.001
Table 2. Main effects and interaction effects of adolescent family instability and effortful control on mental health problems.

<table>
<thead>
<tr>
<th></th>
<th>Internalizing problems(^a)</th>
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<tr>
<td></td>
<td>Model 1(^b)</td>
<td>Model 2(^c)</td>
<td>Model 3(^d)</td>
<td>Model 4(^e)</td>
<td>Model 1(^b)</td>
<td>Model 2(^c)</td>
<td>Model 3(^d)</td>
<td>Model 4(^e)</td>
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<td></td>
<td>(B'(p))</td>
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<tr>
<td>Adolescent Family Instability (FI)(^g)</td>
<td>0.15 (&lt;.001)</td>
<td>0.06 (&lt;.01)</td>
<td>0.04 (&lt;.05)</td>
<td>0.04 (&lt;.05)</td>
<td>0.17 (&lt;.001)</td>
<td>0.14 (&lt;.001)</td>
<td>0.10 (&lt;.001)</td>
<td>0.10 (&lt;.001)</td>
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<td>Effortful Control (EFC)(^h)</td>
<td>-0.12 (&lt;.001)</td>
<td>-0.10 (&lt;.05)</td>
<td>-0.01 (.80)</td>
<td>-0.01 (.78)</td>
<td>-0.25 (&lt;.001)</td>
<td>-0.18 (&lt;.001)</td>
<td>-0.06 (.16)</td>
<td>-0.06 (.16)</td>
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<td>FI*EFC</td>
<td>-0.05 (&lt;.01)</td>
<td>0.03 (.26)</td>
<td>-0.05 (&lt;.01)</td>
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\(^a\)Score is based on the mean standardized parent, adolescent and teacher reports.

\(^b\)Model 1 is unadjusted.

\(^c\)Model 2 is adjusted for gender and co-morbidity (T3 externalizing problem for T3 internalizing problems; T3 internalizing problems for T3 externalizing problems).

\(^d\)Model 3 is adjusted for gender, co-morbidity and T1 internalizing problems (for T3 internalizing problems) or T1 externalizing problems (for T3 externalizing problems).

\(^e\)Model 4 is the risk-buffering interaction between adolescent family instability and effortful control on T3 mental health, adjusted for gender, co-morbidity and T1 mental health.

\(^f\)Unstandardized regression coefficient.

\(^g\)Sumscore (total range between 0 and 8 disruptive family events), based on self-report.

\(^h\)Higher scores reflect more effortful control.

**Bold**: statistically significant effect.

Note: All study variables in the analyses were standardized to mean zero and standard deviation one (z-scores).
Table 3. Main effects and interaction effects of adolescent family instability and attentional flexibility on mental health problems.

<table>
<thead>
<tr>
<th></th>
<th>Internalizing problems$^a$</th>
<th>Externalizing problems$^a$</th>
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<tbody>
<tr>
<td></td>
<td>Model 1$^b$</td>
<td>Model 2$^c$</td>
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<td>---</td>
<td>$B'$ ($p$)</td>
<td>$B'$ ($p$)</td>
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<tr>
<td>Adolescent Family Instability (FI)$^g$</td>
<td><strong>0.15</strong> (&lt;.001)</td>
<td>0.06 (&lt;.01)</td>
</tr>
<tr>
<td>Attentional flexibility (ATF)$^h$</td>
<td>-0.04 (.06)</td>
<td>-0.02 (.45)</td>
</tr>
<tr>
<td>FI*ATF</td>
<td>-0.00 (.94)</td>
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</tbody>
</table>

$^a$Score is based on the mean standardized parent, adolescent and teacher reports.

$^b$Model 1 is unadjusted.

$^c$Model 2 is adjusted for gender and co-morbidity (T3 externalizing problem for T3 internalizing problems; T3 internalizing problems for T3 externalizing problems).

$^d$Model 3 is adjusted for gender, co-morbidity and T1 internalizing problems (for T3 internalizing problems) or T1 externalizing problems (for T3 externalizing problems).

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$^f$Unstandardized regression coefficient.

$^g$Sumscore (total range between 0 and 8 disruptive family events), based on self-report.

$^h$Higher scores reflect more attentional flexibility.

**Bold**: statistically significant effect.

Note: All study variables in the analyses were standardized to mean zero and standard deviation one ($z$-scores).
Adolescent family instability, mental health problems, and self-regulation capacities

Family instability during adolescence is a considerable adaptive challenge in a turbulent developmental period (e.g. Forman & Davies, 2003; Gestsdottir & Lerner, 2008). In our study, adolescent family instability was associated with both internalizing and externalizing mental health problems, but relatively stronger with externalizing problems. Based on the risk-buffering model, we hypothesized that adolescents with high self-regulation capacities would experience fewer mental health problems because of family instability than adolescents with low self-regulation capacities. Self-regulation capacities were operationalized in two ways: by parent-reported effortful control, and by an attentional flexibility task.

The hypothesized risk-buffering effect of effortful control showed different patterns for internalizing problems and externalizing problems. Consistent with the risk-buffering model, family instability did not result in externalizing problems in adolescents with high effortful control, whereas adolescents with low effortful control did experience externalizing problems. These results support the idea that under unpredictable and changing family circumstances effortful control allows adolescents to channel frustration and anger in appropriate ways (e.g. Derryberry & Rothbart, 1997; Eisenberg et al., 2009). For adolescents with low effortful control, parental monitoring and supervision (e.g. having clear expectations and enforcing limits and rules) might serve an important role in facilitating self-regulation (e.g. Henry et al., 1996; Lengua, Wolchik, Sandler, & West, 2000) as well as preventing them from engaging in antisocial behaviors (e.g. Kiesner, Dishion, Poulin, & Pastore, 2009; Laird,
Family instability undermines effective parenting and is likely to disrupt parental monitoring activities (e.g. Davies, Winter, & Cicchetti, 2006; Forman & Davies, 2003; Milan & Pinderhughes, 2006), without which adolescents with low effortful control could be at greater risk for developing externalizing problems (e.g. Henry et al., 1996; Lengua et al., 2000).

Contrary to the risk-buffering model, effortful control did not significantly buffer the effect of family instability on internalizing problems. Put in other words, adolescent family instability increased the chance of developing internalizing problems, irrespective of adolescents’ effortful control capacities. This could mean that individual characteristics that protect against developing internalizing problems differ from those that protect against developing externalizing problems in the presence of family instability. A core aspect of emotion-regulation is the temperament-based capacity for positive emotionality, which is more affective in nature than effortful control (Yap, Allen, & Sheeber, 2007). Positive emotionality refers to the tendency to frequently experience a positive mood, and includes traits such as enthusiasm, cheerfulness, and excitement seeking (Lengua et al., 2000; Wills et al., 2001; Yap et al., 2007). Adolescents with high positive emotionality are likely to focus on the positive aspects of their environment rather than to dwell on the negative aspects, and to maintain a positive mood despite negative or unpredictable family experiences (e.g. Lengua et al., 2000; Wills et al., 2001). Thus, adolescents’ capacity for positive emotionality may be a more relevant protective characteristic against developing internalizing problems in the presence of family instability than effortful control.

Our results suggest that effortful control is an intervention target for ameliorating or preventing externalizing problems in the presence of family instability. The aim of prevention and interventions should be to reduce risk as well. However, the disruptive family events that together compose family instability (e.g. parental divorce, parental illness, new partners of biological parents and parental or sibling addiction) “happen” to the adolescent and are difficult to prevent or change. Thus, we propose that a more suitable intervention strategy in the context of family instability is to enhance adolescents’ self-regulation skills, which can indeed be learned and improved by training (e.g. Rueda, Posner, & Rothbart, 2005; Rueda, Rothbart, McCandliss, Saccamanno, & Posner, 2005).

Attentional flexibility did not show any statistically significant main effects on internalizing or externalizing problems, nor interactions with adolescent family instability. The results are in line with previous correlational research, which suggest very weak or absent associations between attentional control tasks and mental health (e.g. Muris, Mayer, Van Lint, & Hofman, 2008; Muris, Van der Pennen, Sigmond, & Mayer, 2008; Verstraeten, Vasey, Claes, & Bijaebier, 2010). This is the first prospective study to show that attentional flexibility does not protect against internalizing problems and externalizing problems in the presence of adolescent family instability. Hence, our findings do not support the assumption that a good performance at an attentional flexibility (in this case, set-shifting) task reflects a better capacity to adapt to change (Shouten et al., 2000; Stahl & Pry, 2005), or at least, we did not find evidence for a health-promoting effect of such an adaptive capacity. The set-shifting task was
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part of a larger test-battery that was administered under low-stress conditions, while problems with attentional set-shifting may only become manifest when adolescents experience stress (Muris, Van der Pennen et al., 2008). This implies that the effect of performance-based attentional flexibility on subsequent mental health problems might only be observed when measured under stressful or taxing task conditions (Muris, Van der Pennen et al., 2008).

Limitations and strengths

A limitation of this study is the retrospective nature of the assessments of family instability, which may have been subject to memory bias. The events that were included in the family instability measures were obtained from an interview with the adolescents. The adolescents reported the events graphically on a calendar using a month-to-month horizontal timeline. This visual aid likely helped them to reconstruct past experiences more accurately. Nonetheless, we cannot exclude the possibility of (memory) bias but it would most likely have led to an underestimation of the results.

Another limitation is that our assessment of family instability is not exhaustive. It is possible that there are other stressful family events that disrupt the continuity, cohesiveness, and stability of family life from the perspective of the adolescent but that were not measured in our sample. However, we were able to categorize most stressful family-related events into a family instability measure on the basis of the revised family instability index (Forman & Davies, 2003), which makes our results comparable to previous research.

Not all family risk factors in our sample were included in the family instability measure. Family instability reflects the accumulation of multiple “fateful” disruptive family events, that is, family events that are not dependent on the behavior of the adolescent (e.g. Forman & Davies, 2003). Based on this conceptualization, we omitted parenting difficulties because parenting is bi-directional and reciprocal by design; the adolescent is an active participant in the parenting process, they elicit parenting behavior and respond in ways that shape parenting (e.g. Gallagher, 2002; Kerr & Stattin, 2003; Lengua et al., 2000). However, we acknowledge that parenting difficulties could be present in the causal chain between family instability and mental health problems (e.g. Forman & Davies, 2003).

It is also not evident that all of the events that were included in the measure of family instability are necessarily undesirable (e.g. residential moves, changes in family composition), nor necessarily unpredictable or stressful. Nonetheless, family instability is a cumulative risk index, which means that the level of instability is the result of the accumulation of multiple disruptive family events. Put in other words, the assumption is that the more disruptive family events, the higher the level of family instability.

Important assets of this longitudinal study are the size and representativeness of our sample, the use of multiple outcome measures, the use of multiple informants for both the predictors and the outcome measures, and the use of interview data to assess adolescent family instability. Another important asset is that we used both a questionnaire-based and a performance-based approach for operationalizing self-regulation capacities. Hence, we feel that, despite the before-mentioned limitations, this study has significant merits.
Conclusion

Adolescent family instability is likely to enhance the chance of developing internalizing problems and externalizing problems during an already taxing developmental period. Under these unpredictable family circumstances, effortful control protects adolescents from developing externalizing problems but not from developing internalizing problems. Our results further suggest that (attentional) set-shifting tasks might have a limited predictive value for risk-buffering research.