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BRIEF REPORT

Examining Stress in Adolescents' Daily Lives: Feasibility of Triadic Paradigms

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How adolescents and their parents cope with adolescent stress is relevant for child well-being. (In)congruencies between parent and child perceptions of child stress may be important sources of information for understanding family functioning. However, research assessing the occurrence of stressful events in adolescents' daily lives from the perspective of both adolescents and their parents is lacking, likely because this type of research comes with numerous challenges. Therefore, this pilot study examined the feasibility of two different paradigms, daily diary and the experience sampling method (ESM), for triadic (child–mother–father) assessment of adolescent stress in daily life. Twenty family triads participated either in the diary paradigm (receiving one survey per day) or the ESM paradigm (receiving multiple surveys per day). Results indicated that both paradigms seemed doable to participants in terms of experienced burden, and individual compliance to the paradigms was sufficient. The absolute number of reported stressors was similar across paradigms. In addition, both paradigms captured convergence and divergence in the family members' reports of adolescent stress and between- and within-family differences therein. However, diary participants experienced lower burden and missed relatively less assessments (higher individual and triadic compliance) than ESM participants, suggesting higher data quality. In all, these findings suggest that although both paradigms may be feasible, a diary paradigm may be preferred to capture triadic family reports of adolescent stress.

Keywords: early adolescence, stress, triad, experience sampling method, daily diary

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How adolescents and their caregivers cope with the adolescent's stressors is relevant for child well-being. Therefore, it is important to chart what happens in adolescents' daily life, both from adolescents' and their caregivers' perspectives. Because such studies are challenging, the current pilot study explored and compared the feasibility of two different paradigms, that is, daily diaries and the experience sampling method (ESM), for assessing daily life experiences from the perspective of early adolescents and two of their caregivers (mother and father) in general, and for assessing perceptions of adolescent stressors in particular.

Family Members' Perceptions of Stress in Adolescence

Adolescence is considered a time of heightened stress, including everyday stressors related to normative life changes in this period such as increased salience of peer and romantic relationships and physical maturation (Casey et al., 2010). When adolescents lack the ability to adequately cope with such stressors, this increases their risk to develop psychological problems (Compas et al., 2017). One important resource for dealing with stress is support of close others (e.g., Dujardin et al., 2016; Zimmer-Gembeck & Skinner, 2011), and even though gaining a certain level of independence from

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parents is a developmental task in this period, parents remain an important source of support in (early) adolescence (e.g., Nickerson & Nagle, 2005).

One factor contributing to parents' ability to provide timely and effective support is for them to perceive their child's stress (Waters & Waters, 2006). However, parents and adolescents' perception of the adolescents' stress may not necessarily converge (Lohman & Jarvis, 2000). Different factors related to the adolescent, parent, and their interaction can contribute to (in)congruencies in perception, for example, adolescents' tendency to disclose distress, parents' sensitivity to their child's signals, and the attunement of parent–child communication (Bosmans et al., 2020, 2022). In general, studies increasingly suggest that parent–child (in)congruencies in perception can yield valuable information for our understanding of family functioning (e.g., Human et al., 2016; Janssen et al., 2021), calling for the integration of child and parent reports to allow examining (mis)matches between them (De Los Reyes et al., 2019).

Research on parent–child relationships traditionally mainly focused on mothers, but there has been a growing awareness of the importance of other caregivers, such as fathers (Schoppe-Sullivan & Fagan, 2020). Also from a family systems perspective (Bowen, 1966), it is preferred to not solely focus on the mother–child relationship but study several family members, as relationships between family members do not function independently but interact dynamically. Thus, research contexts should ideally include the broader family system (Cowan & Cowan, 2019).

Taken together, this calls for research integrating the perspectives of several family members. However, most research on adolescent stress to date only includes the perspective of either the adolescent or one of the parents. To our knowledge, only one study assessed several family members' (adolescent, mother, and father) perceptions of adolescent stress (Lohman & Jarvis, 2000), and this study was limited in that it used a one-time assessment, that is, asking family members to recall which stressors occurred in a certain time interval.

Such single retrospective reports are limited because their accuracy can be decreased by recall biases (Van den Bergh & Walentynowicz, 2016), and they usually lack the specificity to capture phenomena that can vary within individuals depending on time or context. These limitations can be remedied using ambulatory assessment (AA) paradigms (e.g., daily diaries, ESM), in which experiences are assessed repeatedly, close to the moment of occurrence, and in real life. Some AA research on stressors in daily life in adolescence exists (e.g., Burkhart et al., 2017; Schneiders et al., 2006; Verhees et al., 2023); however, those studies solely used reports by the adolescent. One reason for the lack of daily life studies in several family members is that such studies come with numerous challenges.

Challenges of Triadic Measurement of Families in Daily Life

Studies that aim to include several family members' experiences of everyday events using AA methods are confronted with several challenges. First, two important topics in AA research in general are participant burden (i.e., how burdensome the study is to participants) and compliance rate (i.e., the proportion of answered surveys or "beeps"). AA studies typically require responding to the same questions repeatedly over a period of time, which can be burdensome for participants. If participants experience high burden, this may lead to low compliance rates, compromising data quantity and quality (Eisele et al., 2022). As the aim of triadic family research is to map answers of multiple family members onto one another, the compliance of all individuals at the same time point (triadic compliance) is important. Triadic compliance is likely to be lower than individual compliance, as a timepoint is considered missing when one family member does not answer. Relatedly, surveys should be sent to family members at the same time, and response delay, that is, the time it takes participants to start answering the beeps relative to when it was sent, should ideally be short. This way, family members' responses to the same beep are close in time, increasing the chances that family members report on the same experiences. Note, however, that shortening the time intervals to answer may lead to an increase in missing data. Finally, for several research questions, including those about (in)congruencies between children and their parents' perception of adolescent stress, it is important to capture family members when they have been in contact, as this provides the opportunity for children to disclose and parents to notice their child's stress.

A limited number of AA studies to date included adolescents and both caregivers but did not focus on adolescent stress. Specifically, in a study on affect and parenting, 60 adolescents and both parents received four beeps per day for 2 weeks (Janssen et al., 2021; Veenman et al., 2024). After deleting individuals with a compliance lower than 60%, triadic compliance was 53% (Veenman et al., 2024). Allowed response delay was long (one to 3 hr), and the last beep of the day was sent to children and parents at different times, limiting the ability to map family members' responses onto one another. Another feasibility study on family functioning included 15 adolescents and one or both parents (Swendeman et al., 2020). Participants received four daily beeps for 2 weeks, and timing of the beeps was adjusted to their *individual* schedules. Individual compliance was high (>70%). No information on response delay was provided. These studies provided first insights into the feasibility of triadic AA assessment families in general but cannot speak to the feasibility of different triadic AA paradigms for examining general or stress-specific (mis)matches in perception because they (a) did not compare different paradigms, (b) did not send beeps to different family members at the same time and/or allowed response delay was rather long, and (c) did not assess stressful events.

The Present Study

The current pilot study aimed to examine and compare the feasibility of two different AA paradigms, that is, daily diaries and ESM, for assessing daily life experiences in early adolescence from the perspective of adolescents (11–13 years old) and both their mother and father. Triads participated either in the daily diary paradigm, receiving one beep per day, or in the ESM paradigm, receiving multiple beeps per day. Diary and ESM items concerned, among others, contact between family members and stress experienced by the adolescent. Following the AA period, participants reported on their experiences with the study, for example, burden. We examined and compared the feasibility of the two paradigms in terms of three aspects of general feasibility of triadic parent–adolescent AA paradigms, that is, (a) compliance, (b) burden, and (c) contact between family members, and two feasibility aspects specific

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to the assessment of adolescent stress, that is, the ability of the paradigms to capture (d) occurrences of adolescent stress and (e) convergence between family members concerning adolescent stress.

Method

Participants

Families from Flanders, Belgium, were recruited by distributing flyers via social media, schools, and acquaintances of students involved in the project. We aimed to recruit a total of 20 families, allowing us to pilot each of the two paradigms (i.e., diary and ESM) in 10 families. Inclusion criteria were as follows: adolescents are 12 or 13 years old, all three family members live together, and they own a smartphone. We deviated from the age criterion in two cases, in which adolescents were 11 years old but turned 12 within 2 months of participation. The total sample consisted of 20 families (i.e., 60 individuals), of which half participated in the dairy paradigm and half participated in the ESM paradigm. On average, adolescents (7 boys, 13 girls) were 12.20 years old (SD = 0.62), mothers were 43.35 years old (SD = 4.08), and fathers were 45.10 years old (SD = 5.11). All adolescents (100%) and most mothers (95%) and fathers (95%) had Belgian nationality. The majority of parents (100% of mothers and 85% of fathers) received higher education (bachelor/master/PhD). Sample demographics did not differ between study paradigms (see Supplemental Table S1).

Procedure

After indicating interest to participate, families received an information letter and informed consent form and partook in an online intake session. All participating family members provided active informed consent. The study comprised (a) background questionnaires (of which only demographic questions were used in the present study), (b) diary/ESM period, and (c) evaluation questionnaire. Following the study, all participants received a voucher with a maximum value of 30 euros, dependent on their response compliance. The study was approved by the Social and Societal Ethics Committee KU Leuven (G-2022-4703-R2).

For the diary/ESM part, all participants installed the application m-Path (https://m-path.io/landing/) on their smartphone. Via this app, diary participants received one beep per day for 14 consecutive days at 7 p.m. They were asked to complete the beep right before going to bed. Reminders were sent at 9 p.m. for adolescents and at 10 p.m. for parents, and surveys expired after 5 hr. ESM participants received four beeps on weekdays between 4.30 p.m. and 8.30 p.m. and nine beeps on weekend days between 10.15 a.m. and 8.30 p.m. for 10 consecutive days.[1] Beeps were sent semirandomly within predetermined 15-min time intervals, and there was always at least 1 hr between two consecutive beeps. Beeps were sent at the same time to members within one family. Allowed response delay was 30 min; that is, surveys expired after 30 min. This specific expiration time was not communicated to participants, but they were asked to complete the beep as soon as possible after receiving it. Average actual response delay in the ESM study was 4.76 min (SD = 7.18). This study was not preregistered. We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

Measures

Diary/ESM Surveys

The full set of diary/ESM questions for adolescents and parents is available at https://osf.io/5hrbe/. Here, we focus on a subset of questions concerning stressful events and contact.

Adolescents. In both paradigms, the occurrence of stressful events was assessed with the multiple choice question: "Think about the most stressful event you experienced today (diary)/since the last beep (ESM). Indicate which description(s) fit(s) best." Response options were as follows: I had the feeling that something did not work out; I was scared; I was angry; I had a conflict; I was sad; I was sick (diary only); there was something else that gave me stress; I did not experience anything stressful. Selecting multiple descriptions was possible. For the current purposes, this variable was recoded into a binary variable indicating the absence (0 = "I did not experience anything stressful") versus presence of a stressful event (1 = all other response options).[2] If a stressful event occurred, stress severity was assessed: "How bad was this experience for you?". Participants rated the item on a scale ranging from 0 (*not bad*) to 100 (*very bad*). In the diary questionnaire, we also assessed the experience and severity of a second stressful event that day.[3]

Parents. Parents' perception of stressful experiences by their child was assessed with the question, "Think about the most stressful event you think your child has experienced today (diary)/since the last beep (ESM). Indicate which description(s) fit(s) best." Response options were the same as for children, except for the additional answer option: "I don't know." Also for parents, this variable was recoded to reflect the absence (0 = "He/she did not experience anything stressful" or "I don't know") versus presence of a stressful event (1 = all other response options). Additionally, we assessed contact with partner and child.[4] In the ESM study, two yes-or-no questions were asked: "Have you had contact with your partner/child since the last beep?". In the diary study, two open-ended questions were asked: "How much time did you spend with your partner/child today? (in hours)," which was recoded to reflect the absence (0 hr) versus presence (> 0 hr) of contact.

Evaluation Questionnaire

All participants received an evaluation questionnaire following the diary/ESM period. Burden was assessed with the item "How much effort did it take you to complete the questions every evening (diary)/day (ESM)?" rated on a scale ranging from 0 (no effort at all) to 100 (a lot of effort), where a score of 50 indicated neutral. Additional questions were asked to gain more insight into missing

[1] These time spans were chosen based on the expectation that families are more likely to have been in contact during these hours, as school on weekdays finishes between 3 p.m. and 5 p.m. in Flanders (Onderwijs Vlaanderen, 2023).

[2] Five times an ESM participant (adolescent or father) checked the box "did not experience anything stressful" or (father) "I don't know" and another box that indicated something stressful did occur. These instances were coded as a stressful event having occurred.

[3] In both paradigms, we additionally asked adolescents about their support-seeking following the stressful experience. These items and a description of adolescents' answers to them are reported in Supplemental Material S1.

[4] We planned to ask similar contact questions to adolescents, but a mistake was made when programming those items in the ESM paradigm (i.e., items asked about contact today instead of since the last beep). Therefore, only parents' contact items were used here.

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data; responses to these questions are summarized in Supplemental Material S2. All participants, except one ESM father, completed the questionnaire.

Results

Compliance

Individual compliance was defined as the proportion of completed beeps relative to the number of planned beeps (i.e., 14 for diary and 60 for ESM).[5] Triadic compliance was defined as the proportion of beeps completed by all three family members relative to the number of scheduled beeps. Individual compliance per participant and triadic compliance per family, respectively, are shown in Supplemental Figures S1a and S1b. Mean individual compliance in the diary paradigm was 94% (SD = 8) for adolescents, 94% (SD = 8) for mothers, and 94% (SD = 7) for fathers. Mean individual compliance in the ESM paradigm was 72% (SD = 17) for adolescents, 75% (SD = 13) for mothers, and 73% (SD = 27) for fathers. Across family members, individual compliance was higher for diary than for ESM participants, $t(37.13) = 5.49$, $p < .001$.[6] Mean triadic compliance was 84% (SD = 10) in the diary paradigm and 49% (SD = 25) in the ESM paradigm. Triadic compliance was higher in the diary paradigm than in the ESM paradigm, $t(11.87) = 4.23$, $p < .01$.

Burden

In the diary paradigm, burden was on average 29.10 (SD = 21.88) for adolescents, 33.70 (SD = 26.90) for mothers, and 25.70 (SD = 29.19) for fathers. In the ESM paradigm, average burden was 44.10 (SD = 23.24) for adolescents, 52.00 (SD = 19.88) for mothers, and 64.89 (SD = 23.72) for fathers. Burden per participant is depicted in Supplemental Figure S2.[7] Across family members, burden was significantly higher for ESM than for diary participants, $t(57) = -3.75$, $p < .001$.

Contact Between Family Members

Parents in the diary paradigm indicated to have had contact with their child in the vast majority of beeps they responded to, that is, mothers on average in 98% (SD = 7) and fathers in 99% (SD = 3) of days (see Supplemental Figure S3a). Similarly, they had contact with their partners on most days (mothers: M = 96%, SD = 7; fathers: M = 96%, SD = 5; see Supplemental Figure S3b). Looking at triadic contact, on average both parents indicated to have spent at least some time with their child in 97% (SD = 7), and with their child as well as their partner in 96% (SD = 8) of the beeps all family members responded to. Also in the ESM paradigm, mothers and fathers reported to have been in contact with their child on most of the beeps they responded to, that is, on average, 80% (SD = 12) and 68% (SD = 21), respectively. This was also the case for contact with their partner (mothers: M = 77%, SD = 15; fathers: M = 85%, SD = 12). On average, both parents indicated to have had contact with their child in 65% (SD = 23), and with their child as well as the other parent in 57% (SD = 25) of the beeps to which all three family members responded. Triadic contact was higher in the diary compared to the ESM paradigm; both parents had contact with child: $t(10.81) = 4.12$, $p < .01$; both parents had contact with child and each other: $t(10.74) = 4.79$, $p < .001$.

Occurrence of Stress

In the diary paradigm, the average number of days on which adolescents reported that they experienced at least one stressful event was 6.30 (SD = 3.77); see Supplemental Figure S4. A second stressful event was indicated by adolescents on 1.20 days on average (SD = 1.81). Supplemental Figure S5 shows descriptors of stressful events that were selected by adolescents. On average, across participants and stressors, stress severity was rated at 69.85 (SD = 24.98). Mothers reported that their child experienced a stressful event on average on 6.50 days (SD = 4.06) and fathers on 5.80 days (SD = 4.39).

In the ESM paradigm, the average number of beeps on which adolescents reported to have experienced a stressor was 9.70 (SD = 5.72). Looking at the number of reported stressors per day, on only 11 days (across participants and days), more than two stressors were reported. The average stress severity rating was 49.24 (SD = 26.33) across adolescents and stressors. On average, mothers reported their child experienced a stressful event 8.70 times across the sampling period (SD = 8.56) and fathers 7.30 times (SD = 7.33).

Comparing adolescent reports across the two paradigms, the total number of stressors reported per adolescent across the sampling period did not significantly differ, $t(18) = -0.91$, $p = .372$. Stressors in the diary paradigm were rated as more severe than those in the ESM paradigm, $t(170) = 5.21$, $p < .001$.

Convergence Between Family Members Concerning the Occurrence of Adolescent Stressors

In the diary paradigm, when children reported a stressor, on average across families, mothers saw the child's stress 56% of times (SD = 34) and fathers 59% of times (SD = 34; see Supplemental Figure S6a).[8] When children did *not* report a stressor, on average, mothers also did not report a stressor in 60% of times (SD = 23) and fathers 67% of times (SD = 38; Supplemental Figure S6b). Looking at triadic agreement, when the child reported a stressor, the proportion of times both parents also did was on average 34% (SD = 33). At least one of the parents saw the stressor in 81% of times on average (SD = 20). When the child did not report a stressor, both parents also did not report a stressor in 46% of times (SD = 32).

When children in the ESM paradigm reported a stressor, on average across families, mothers also reported a stressor in 49% of times (SD = 28) and fathers in 41% (SD = 37; see Supplemental Figure S6c). When children did not report a stressor, mothers also did not 86% of times (SD = 15) and fathers in 82% (SD = 26; Supplemental Figure S6d). Concerning triadic agreement, when the

[5] All planned beeps were actually sent to the participants, except for one adolescent in the diary paradigm who received 11 instead of 14 beeps due to a scheduling mistake.

[6] As some of our tests included small samples and not all variables adhered to a normal distribution, we performed nonparametric sensitivity analyses, i.e., Mann–Whitney U tests, for all t tests reported in the article. Moreover, as individuals were nested within families, we ran additional multilevel regression analyses for individual outcomes (i.e., individual compliance and individual burden) to account for dependency within families. These sensitivity analyses did not result in different conclusions.

[7] Across participants, burden correlated negatively with individual compliance, $r(57) = -.34$, $p < .01$.

[8] Note that this only concerns the first stressor of the day reported by children, as parents did not report on a second stressful event.

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child reported a stressor, the average proportion of times both parents also reported a stressor was 34% across families ($SD = 38$). At least one of the parents saw the stressor in on average 62% of times ($SD = 35$). When the child did not report a stressor, 78% of times both parents also did not report a stressor ($SD = 24$).

Comparing triadic agreement across paradigms, there was no difference concerning the proportion of times both parents reported a stressor when the child did, $t(18) = 0.01$, $p = .993$, but parents' reports of no stress converged with the child's more often in the ESM paradigm, $t(17) = -2.47$, $p < .05$.

Discussion

The current pilot study set out to examine the feasibility of triadic daily diary and ESM studies in general, focusing on (a) compliance, (b) burden, (c) contact between family members, and for the assessment of (dis)agreement in parent–child perception of early adolescent stress, specifically examining (d) frequency of stress reports and (e) parent–child convergence in reports of adolescent stress.

Looking at feasibility indicators for triadic family AA assessment in general, we found that, overall, both paradigms seemed doable to participants in terms of experienced burden, individual compliance was sufficient, and we assessed family members mostly during times when they had been in contact with each other. However, some differences in favor of the diary paradigm were found as well: Diary participants experienced lower burden, triadic contact was higher in the diary paradigm, and there were relatively less missing timepoints (higher individual and triadic compliance) in the diary paradigm. Triadic compliance in the ESM paradigm was 49% on average (comparable with a previous triadic ESM study; Veenman et al., 2024). This low triadic compliance may be of concern, as missing about half of the data can compromise data quality as information about a lot of timespans is missing, and if noncompliance would be systematic (e.g., participants miss beeps when they experience stress), results can be biased (Eisele et al., 2022).

Next, we examined the feasibility of the paradigms specifically in terms of capturing adolescents' experiences of stress. Whether or not adolescents reported a stressor varied across beeps and across participants. On average, in both paradigms, we found a relatively low prevalence of stressors (<1 per day), and on the majority of days, adolescents reported less than two stressors, which may question the need to assess stressful experiences multiple times per day. Looking at absolute numbers, the ESM paradigm did not capture significantly more stressors than the diary paradigm. Additionally, stressors were rated as more severe in the diary paradigm. We may have captured less severe stressors with ESM by repeatedly asking about the most stressful event since the last beep rather than about the most severe stressor of the day as in the diary paradigm, or we may have missed more severe stressors in ESM as there were more missing datapoints. Alternatively, recall bias may have contributed to an overestimation of stress severity in the diary period, as even short recall periods can bias reports (Te Braak et al., 2023). Finally, we found variation between and within families in both paradigms concerning whether parents noticed their child's experience of stress. On average, across families, the proportion of times both parents noticed their child's stress was equal across paradigms. In all, these findings suggest that both paradigms are fit to capture within- and between-family differences in stress perception (in)congruencies.

Limitations

We recruited a small number of families as well as a homogenous sample, which limits the generalizability of our findings. Relatedly, we focused on triads, whereas from a family systems perspective, all family members (e.g., siblings) should be included. Although testing polyads is a relevant endeavor for future research, we considered testing mother–father–child triads a first and important step given the continuing importance of parents as attachment figures in adolescence (e.g., Nickerson & Nagle, 2005). In addition to assessing feasibility of triadic paradigms, we also aimed to compare the diary and ESM paradigms. The number of assessment days as well as the total number of assessments differed between the two paradigms, which can be considered a limitation. Of note, the total number of assessments does generally not relate to compliance in ESM studies, but more assessments per day might negatively affect compliance (Wrzus & Neubauer, 2023). Finally, with the present study design, we cannot be sure whether parents and children reported on the same stressful events.

Recommendations and Conclusion

The current pilot study provided insights into the feasibility of a triadic diary and ESM paradigm for assessing adolescent stress. Both paradigms seemed doable to participants in terms of experienced burden, individual compliance was sufficient, and we assessed family members mostly during times when they had been in contact with each other. Additionally, in both paradigms, a similar absolute number of stressors was captured. Both paradigms captured convergence and divergence in the family members' reports of adolescent stress, as well as between- and within-family differences therein. Some differences between paradigms in favor of the diary paradigm were found as well: higher compliance, lower burden, and higher frequency of contact between family members. In addition, as most children on most days did not report multiple stressful events, asking about such events more than once per day may be superfluous, although other factors, for example, recall bias, may naturally inform decisions on sampling frequency as well (van Roekel et al., 2019). Moreover, future studies are recommended to consider their planned analyses when deciding on the total number of planned beeps, as this affects the type of statistical analyses that can be performed with sufficient power (Lafit et al., 2021). Finally, future studies on triadic (in)congruence of adolescent stress may consider asking participants to very shortly describe the stressful event to allow checking whether family members report on the same stressful event, a recommendation that may be more feasible for paradigms with a lower number of assessments per day. In all, the present study's findings suggest that, although both paradigms may be feasible, a diary paradigm may generally be preferred to capture triadic family reports of adolescent stress.

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