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Disorganized attachment in adolescence: Emotional and physiological dysregulation during the Friends and Family Interview and a conflict interaction

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Abstract

The current study examined the effects of attachment on autonomy, relatedness, and emotion regulation during an attachment interview (Friends and Family Interview; FFI) and a Parent×Child Conflict interaction (Family Interaction Task; FIT) in 49 adolescents (11 to 17 years old). Disorganized adolescents displayed behaviors promoting autonomy and relatedness less frequently and at a lower extent than organized ones in the FIT with mothers but not with fathers. Disorganized adolescents also showed a steeper decrease in heart rate variability (HRV) than organized ones, during both the FFI and the FITs. Moreover, disorganized adolescents responded with a more marked increase in skin conductance level to the FIT with mothers than organized individuals. Dismissing adolescents showed behaviors promoting autonomy and relatedness less frequently and to a lesser extent than secure ones, while displaying more often behaviors undermining autonomy and relatedness in the FITs. Dismissing adolescents also showed a more pronounced decrease in HRV during the FFI than secure and preoccupied individuals; no differences were found between these groups in HRV during the FITs. The results suggest that disorganized adolescents had more difficulties in regulating their emotions during both the FFI and the FITs, whereas dismissing individuals seemed effectively challenged only during the interview.

Keywords: adolescence, autonomy and relatedness, disorganized attachment, emotion regulation, physiological reactivity

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Adolescence is often seen as a sensitive developmental period, as a lot of changes occur at biological, cognitive, affective, and social levels (Moretti & Peled, 2004). Emotional development in adolescence should lead to a realistic and coherent sense of identity that allows a person to learn how to cope with stress and manage emotions as well as to relate to others (Steinberg, 2001). The quality of attachment is considered a crucial factor in adolescents' development of identity and their emotional adjustment (Moretti & Peled, 2004; Zimmermann, Mohr, & Spangler, 2009). Bowlby (1969/1982) was first to sustain that during adolescence most children still have a strong attachment toward their parents, even if the Child × Parent relationship is changing and adolescents begin to have significant relationships with others. The relationship between adolescents and parents becomes increasingly goal corrected, and a more "negotiated" partnership develops. During this process, children increasingly express their need for autonomy, while at the same time parents sensitively provide

protection and limits to children's goals (Allen & Tan, 2016). Previously learned patterns of responding to parents or main caregivers do not fit anymore with the adolescents' need for autonomy and with the major emotional and social development tasks they are facing. Instead, a new balance between adolescents' attachment behaviors and their exploration urges needs to be achieved. To do so, adolescents have to decrease their dependence to follow their need for exploration (Allen & Miga, 2010).

Although increasingly independent, adolescents still seek emotional support from their parents, and in particular their mothers, more so than from friends when they need a safe haven (Allen et al., 2003; Kerns, Mathews, Koehn, Williams, & Siener-Ciesla, 2015). In the context of emotion regulation, several studies have addressed the question of how adolescents' internal working models of attachment are related to the quality of interactions with their parents (e.g., Allen et al., 2003; Becker-Stoll, Fremmer-Bombik, Wartner, Zimmermann, & Grossmann, 2008). Allen and colleagues (overview: Allen & Tan, 2016) have focused especially on how a goal-corrected partnership can be reflected in the solving of a disagreement. Within this framework, the primary task of the relationship between adolescents and their parents is to achieve a "state of autonomous relatedness," which allows for autonomy while maintaining relatedness with the parent (Bowlby, cited in Murphey, Silber, Coelho, Hamburg, & Greenberg, 1963). The first is operationalized as the ability to

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display behaviors that allow individuals to differentiate themselves from the other (e.g., independence of thought), while the latter is defined as the capacity to express interest, involvement, and validation for what the other person thinks and feels. On the one hand, security of attachment during adolescence has been linked to better abilities in handling conflicts with parents, being able to engage in a more productive discussion where there is a genuine balance between the efforts to display autonomy and the willingness to preserve the relationship. On the other hand, attachment insecurity, and in particular dismissing attachment, has been linked with less autonomy and relatedness during such interactions (Allen et al., 2003; Becker-Stoll et al., 2008; Zimmermann et al., 2009).

Attachment theory offers important insights on how internal working models of attachment can influence emotion regulation (Cassidy, 1994). Research employing physiological measures of autonomic nervous system activity (e.g., heart rate variability – HRV) can provide insight in how attachment processes are related to psychological states and behaviors (Spangler & Zimmermann, 1999). The current study investigated how different attachment patterns are related to different emotion regulation strategies both from a behavioral and a physiological point of view. Securely attached individuals usually display their emotions with flexibility and openness. This flexibility theoretically arises from the early interactions they experienced with their caregivers: they consider their parents as a secure base from which they can explore the surrounding environment and as a safe haven in case of a threat (Ainsworth, Blehar, Waters, & Wall, 1978). At times of stress, secure children have a representation of their parents as emotionally available and will, therefore, actively express their needs in an open and direct manner, without hiding how they feel (Cassidy, 1994; Waters et al., 2009). Individuals with a dismissing attachment strategy display a more deactivating strategy when experiencing stress, trying to minimize their emotions and distress (Cassidy, 1994; Hesse, 2016). Nevertheless, results from psychophysiological studies suggest that this suppression strategy is only partially effective in that it is only overt behavior that is suppressed, but autonomic arousal is high (Dozier & Kobak, 1992; Roisman, Tsai, & Chiang, 2004; Spangler & Zimmermann, 1999). Moreover, this strategy can be maladaptive in social contexts or in interactions with significant others, for example in a situation where they need to discuss a disagreement and find a constructive solution with their parents (Beijersbergen, Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2008; Cassidy & Kobak, 1988; Hesse, 2016). Preoccupied persons are more prone to show over-activation of their attachment system with the result of experiencing more negative emotions and maximizing their expression (Borelli, Ensink, Hong, Sereno, Drury & Fonagy, 2018; Cassidy, 1994).

For the assessment of physiological stress responses in terms of changes in the autonomic nervous system (ANS) activity, several indicators have been developed, with heart rate (HR), HRV, and electrodermal activity (EDA) being among the most widely used noninvasive measures (Bradley & Lang, 2007). Heart rate is often measured in terms of inter-beat intervals (IBI), indicating the time between two heart beats, while HRV represents IBI variations over time, which can be expressed in terms of the root mean of squared successive differences (RMSSD) (Berntson, Quigley, & Lozano, 2007). EDA changes reflect changes in the activity of palmar sweat glands in response to emotional arousal (Dawson, Schell, & Filion, 2007). These measures of ANS activity are differentially affected by the sympathetic (SNS) and the parasympathetic branches (PNS) of the ANS: while IBI is modulated by both the SNS and the PNS, RMSSD mainly reflects vagal

tone (PNS) (Berntson et al., 2007). EDA is solely influenced by the SNS (Bradley & Lang, 2007). These indicators may interact but are not interchangeable and, therefore, might not show the same results or activation when used in the same context (e.g., Beijersbergen et al., 2008; Roisman et al., 2004).

The association between attachment and physiological stress responses has mostly been studied in infants (Groh & Narayan, 2019; Spangler & Grossmann, 1993) and in adults (Reijman, et al., 2016; Hane & Fox, 2016), while such investigations in adolescents are rare (Beijersbergen et al., 2008; Borelli et al., 2018; Kungl, Leyh & Spangler, 2016; Spangler & Zimmermann, 1999). Only three studies have examined psychophysiological responses during the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1984) – two in adult samples and one in a group of adolescents (Gander & Buchheim, 2015). This line of research is based on Fowles (1980) framework, which aims to identify the physiological correlates that are related to a "deactivating state of mind"; he suggested that behavioral activation is associated with increases in HR, whereas behavioral inhibition is associated with increased EDA. The first two studies found supporting evidence that a deactivating strategy (typical of a dismissing attachment pattern) is associated with behavioral inhibition – that is, increased EDA – supporting the notion that dismissing individuals mainly employ an inefficient deactivation strategy to stressful questions (Dozier & Kobak, 1992; Roisman et al., 2004). The third study by Beijersbergen et al. (2008) found that dismissing adolescents showed lower IBI reactivity than secure and preoccupied ones during the interview, and the authors concluded that dismissing individuals successfully employed a deactivation strategy during the interview. The results of the first two studies are in line with each other, while the third shows a different picture: the authors hypothesized that adolescents – different from adults – do not have enough time to integrate their attachment experiences in their memories and are still in a transitory developmental phase. Therefore, they may show a different pattern of physiological activation during the attachment interview as compared to what has been observed in adults (Beijersbergen et al., 2008). Concerning differences between resolved and unresolved individuals, only the study of Beijersbergen et al. (2008) investigated this issue, but no differences were found.

Emotion regulation strategies can be investigated not only during attachment interviews but also in other situations where attachment behaviors are elicited; for example, during conflict interactions (e.g., Allen et al., 2003). Parent×Child conflict interactions can provide information about behaviors related to autonomy (i.e., exploration) and relatedness (i.e., attachment) during adolescence: attachment security is characterized by adolescent showing efforts to obtain autonomy while at the same time preserving relatedness with the caregiver. Nevertheless, if these behaviors are unbalanced, the interactions might be the expression of insecure attachment patterns (Allen & Tan, 2016). This applies also to psychophysiological responses: in the study by Beijersbergen et al. (2008), dismissing adolescents showed higher IBI reactivity during a conflict interaction with their mothers than secure and preoccupied ones. In another study with adult couples, participants who were classified as dismissing showed an increase in EDA reactivity during a conflict interaction with their partner, whereas individuals who were classified as preoccupied responded with an increase in HRV; in contrast, securely attached individuals showed lower EDA levels, suggesting that secure individuals are open to discussion and can flexibly share their emotions with their partners (Roisman, 2007).

Table 1. Descriptive statistics: demographics and covariates

	Secure (n = 13) M (SD)	Dismissing (n = 14) M (SD)	Preoccupied (n = 8) M (SD)	Disorganized (n = 14) M (SD)
Age	14.5 (2.18)	14.2 (1.65)	13.9 (1.23)	14.0 (2.06)
Parental education	4.27 (1.64)	3.64(1.81)	4.56 (2.26)	3.96 (1.94)
Physical activity	2.31 (0.63)	2.21 (0.58)	2.25 (1.04)	2.29 (0.61)
Smoking	0.46 (1.13)	0.36 (1.08)	0.00 (0.00)	0.07 (0.27)
	N (%)	N (%)	N (%)	N (%)
Sex (N female)	7 (53.8)	4 (28.6)	4 (50.0)	9 (64.3)

In the present study, we used a narrative approach to assess the state of mind with respect to attachment, and to expand knowledge on psychophysiological reactions during an attachment interview and during a conflict interaction task in a sample of adolescents and their parents. The aim of the study was to investigate the association between physiological processes and the attachment system. Investigating the psychophysiology of attachment is important since (a) theoretical assumption can be validated, (b) evidence for the regulatory function of the attachment system can be explored, and (c) the comparison between emotional and physiological responses can shed new light on processes that are not accessible verbally or behaviorally (Spangler & Zimmermann, 1999), in particular during adolescence – a crucial period for the development of emotion regulation capacities (Moretti & Peled, 2004). We hypothesized that responses indicative of autonomy and relatedness are more marked in secure adolescents than dismissing and preoccupied ones (H1.1), and in organized individuals than disorganized ones (H1.2); and that dismissing adolescents show lower psychophysiological reactivity during the attachment interview than secure and preoccupied ones (H2). Furthermore, we expected disorganized adolescents to show higher reactivity than organized ones during the attachment interview (H3). Concerning the conflict interaction task with mothers and fathers, we hypothesized that dismissing individuals show higher reactivity than those with secure and preoccupied attachment representations (H4) and, finally, we expected that disorganized adolescents show more reactivity than those classified as organized (H5).

Method

Participants

Participants were 49 adolescents (24 females and 25 males) and their mothers (N = 40) and fathers (N = 28). Families were consecutively recruited between August 2016 and April 2019; most of them lived in the Greater Region of Luxembourg. The project was developed in Luxembourg but was also advertised in two nearby regions of Germany, which shares a border with Luxembourg. Both countries use the same language and cultural affinities are high. The research was presented to the families as a study investigating family relations as well as mental health and wellbeing in adolescence. Not all fathers participated in the project and there were seven families with more siblings taking part in the study (six families with two siblings, one family with three siblings). The mean age of the adolescents at the time of the assessment was 14.2 years (SD = 1.83) with a range from 11 to 17 years. Twenty-three adolescents lived with both their biological parents, nineteen had separated or divorced parents, and seven were adopted. The mean age of adolescents at the time of divorce was 4.2 years (SD = 2.64). Country of origin of the adoptees were Haiti (n = 1), Peru (n = 1), South Africa (n = 3), and South Korea (n = 2); mean age at adoption was 1.1 years (SD = 0.73). Adolescents had either German (n = 34) or Luxembourgish (n = 15) nationalities (Table 1). We conducted an a priori power calculation for F-test statistics using G*Power 3.1 (Erdfelder, Faul, & Buchner, 1996). Previous research (Beijersbergen et al., 2008) suggested a medium effect size of attachment on physiological stress responses. Therefore, in the current study we also assumed a medium effect size of $\eta = .13$. Based on this effect size, to achieve a power of $1 - \beta = .80$ ($\alpha = .05$), the required sample size was 57 ($\lambda = 8.36$). To overcome the effects of possible drop-outs, we aimed at overrecruiting with a target sample size of 70 participants; however, despite great effort we could only recruit 49 participants.

Parents with different nationalities (all from the neighbor countries) participated in the study: 66% of the mothers were German, 22% were Luxembourgish, 4% Belgian, and 7% had other or multiple nationalities of the European Union (EU). Regarding the fathers, 57% were German, 34% were Luxembourgish, and 9% had other or multiple EU nationalities. According to ISCED 2011, 31% of the mothers had a lower secondary education, 22% an upper secondary education, 12% a post-secondary nontertiary education, 2% a short-cycle tertiary education, 14% a bachelor's degree, 16% a master's degree, and 2% a doctoral degree. In the fathers' group, 29% had a lower secondary education, 29% an upper secondary education, 8% a post-secondary nontertiary education, 3% a bachelor's degree, and 31% a master's degree (UNESCO Institute for Statistics, 2012). The mean age of mothers was 46.4 years (SD = 6.23) and that of the fathers was 49.0 years (SD = 7.88).

Procedure

The project was approved by the Ethics Review Panel of the University of Luxembourg (ATTACH, ERP-16-033). Participants were recruited in the regions of Rhineland-Palatinate and Saarland in Germany and in Luxembourg with flyers, online announcements (e.g., eBay), and articles in local newspapers (e.g., Trierischer Volksfreund, Luxemburger Wort). The study was also advertised through charities, parental and youth associations, schools, and adoption and state agencies (e.g., Pro Familia, Caritas, Red Cross, Luxembourgish Ministry of Education,

Children and Youth). Exclusion criteria were: adolescents receiving psychiatric treatment or a diagnosis of learning difficulties, parental history of mental illness, and parents or adolescents not speaking German, English, or French. Families were given a gift voucher with an average value of 200€ for their participation (depending on the number of participating family members).

The study design included three separate visits to collect data and one or two organizational meetings. Interested participants would contact the first or the last author (AD, CV), followed by a nonbinding presentation meeting. On this occasion, more detailed information about the project was provided, and inclusion and exclusion criteria of family members were assessed. Parents and adolescents also received a copy of the informed consent, which they were given time to read so that any arising questions could be addressed. Thereafter the core assessment sessions were scheduled, which lasted 2–3 hours each. Two meetings took place at the family home, while the last visit was organized at the Clinical Psychophysiology Laboratory of the University of Luxembourg.

During the first meeting, parent(s) were presented with the consent form for signature, and mothers and fathers signed a declaration of consent. For 12 families it was not possible to obtain the consent of the biological father for one or more of the following reasons: (a) the mother had full custody of the child, (b) the mother declared to be in charge concerning medical and psychological evaluations, (c) the father was at an unknown location and had no contact with the mother and the child, (d) the father had deceased. Next, parent(s) answered the first part of a sociodemographic interview about family history and then mothers and fathers were separately administered attachment-based interviews and a questionnaire.

The second meeting took place with the adolescents only; boys and girls were also asked to sign an informed consent (with previous parental permission) to (a) acknowledge that they were important actors in the project, (b) make them understand that any detailed information that they provided would not have been divulged to their parents, friends, relatives or acquaintances without their previous approval, and (c) reassure the teens about the presence of video-recording during the interview and the interaction task, which might have been a source of stress. Adolescents completed a brief sociodemographic interview and later they were administered an attachment interview (Steele, Steele, & Kriss, 2014); one interview was conducted in English, since the child had multiple mother tongues. Afterwards, the adolescents completed a questionnaire. During the interview, adolescents were connected to the portable recording device for the continuous assessment of HR and EDA, from which HRV (Task Force of The European Society of Cardiology and The North American Society of Pacing and Electrophysiology, 1996) and skin conductance level (SCL; Boucsein et al., 2012) were derived, respectively.

The third appointment involved an interaction task between the adolescents and their mothers and, when possible, fathers. At arrival, parent(s) completed the second part of the sociodemographic interview about their health behaviors and afterwards one of them would take part in the interaction, followed by the second caregiver. Interactions were counterbalanced across Adolescent × Parent dyads in terms of who began the interaction first; that is, mother or father. Also during this session, adolescents' HR and EDA were continuously monitored. Salivary cortisol was collected from all participating parents during this session to assess endocrinological, stress-related responses to the family interaction. One interaction between a mother and her child

was conducted in French, since the mother did not feel confident enough to interact in English or German. Two interactions (Mother×Child and Father×Child) took place in English, since both parents used this language in daily interactions with their child. A two-parent family did not take part in the interaction, since they decided to leave the study. Finally, another family was unable to reach the University and the interaction was conducted at home; precautions were taken to ensure that no external interferences could disturb the conflict task. No interruptions occurred.

Finally, an optional meeting was designed to provide families with information about their interviews, questionnaires, and interaction task results. If necessary, contact information of mental health professionals was provided.

Measures

Friends and Family Interview (FFI)

The FFI is a quasi-clinical semistructured interview, based on the concepts of the AAI, designed to assess the attachment representations of adolescents aged between 10 and 17 years (Steele & Steele, 2005a; Steele et al., 2014). The instrument consists of 28 questions and lasts approximately 40 minutes. Interviews are video recorded and later transcribed for coding. During the FFI, participants are asked about themselves, about their relationships with friends, parents, siblings, and how they think they are affected by them. During an initial warm-up, respondents are given general information about the interview. During the following first section of the FFI, participants are asked to describe their family and other significant people around them. Next, they are asked to talk about themselves and about the things they like to do, providing specific examples to better support the narration. Other questions include those about what other people should know about them to know them well, what participants like best and dislike most about themselves, what happens when they are emotionally upset and what they do when they find themselves in a challenging situation. The second section is about school and friends: respondents are firstly asked to talk about their school, their favorite subject and teacher, then their friends and particularly about a best friend. Other questions concern what they like best and dislike most about the relationship with their friends, what they believe they think about them, if they have ever argued or been jealous and how they felt about it. Also in this case, examples about real-life experiences were asked. In section three questions concern their relationship with their parents and siblings, always adding specific examples, what they do together, what they like and dislike, and finally what they think their mothers and fathers think about them. Furthermore, respondents are asked about the first time they were separated from their parents, how they regard the relationship between their parents, and how they feel when their mothers and fathers argue. The last questions are future-oriented: participants are requested to explain how they think the relationship with their parents has changed since they were younger, why they think their parents behave as they do, and how they see the relationship with them in five years (Steele et al., 2014).

The FFI has developmental and pedagogical features, since it allows children to reflect on their significant relationships, thus giving them the possibility for a mental (re)organization of the attachment situation within their families (Kriss, Steele, & Steele, 2013). The FFI was first used during the "London Parent–Child Project", an 11-year longitudinal investigation that observed parents during the prenatal period and followed up

the children during infancy and adolescence (Steele & Steele, 2005a; Steele & Steele, 2005b). The main feature of the FFI is its focus on current significant relationships, while the AAI emphasizes how past childhood experiences affect a person's current state of mind regarding attachment (Kriss et al., 2013). Reports concerning the validity of the AAI with adolescents are mixed (Allen & Miga, 2010; Kiang & Furman, 2007). The strength of the FFI is that "before a final classification is made, transcripts are rated for the presence of security, dismissiveness, preoccupation, and disorganization on Likert-type scales (…). Each dimensional classification code is made independently before a categorical determination is considered. The final attachment classification represents the dominant strategy observed in the transcript" (Kriss et al., 2013, p. 93). Moreover, on the one hand, in a recent article, Pace, Muzi, and Steele (2019) argued that the FFI could be weaker than the AAI to detect disorganization as it does not ask explicitly about traumatic experiences. On the other hand, however, the FFI in contrast to the AAI is recorded on video, a procedure that allows the evaluation of two nonverbal codes that are connected with the disorganized classification: (a) distress and fear, (b) frustration and anger. These nonverbal codes capture specific signs of distress such as freezing behavior, anxiety, stereotypic movements, verbal and nonverbal aggression toward the interviewer, and so on, which are usually considered indexes of disorganization (Steele et al., 2014). All in all, the FFI, although newer than the AAI, has proved to be a promising instrument to assess attachment in adolescence. The FFI has been used in several studies with different samples across different countries, and there is supporting evidence for its validity with adolescents (Kriss et al., 2013; Pace et al., 2019). For instance, it demonstrated good internal consistency, adequate cross-cultural validity (Jewell et al., 2019; Stievenart, Casonato, Muntean & van de Schoot, 2012), and concurrent validity with the maternal attachment classifications obtained from the AAI, as well as longitudinal prediction of coherence when associated with the classifications obtained from the Strange Situation Procedure (SSP; Ainsworth et al., 1978) in infancy (Steele & Steele, 2005a; Steele & Steele, 2005b).

Once transcribed, the interviews are coded (Manual Version 4) using a 4-point scale (1 = no evidence, 2 = mild evidence, 3 = moderate evidence, 4 = marked evidence), which allows for the identification of the different coping and defense strategies (Steele et al., 2014). The most important constructs of the FFI are narrative coherence (Grice, 1975), reflective functioning, and internal working models. Finally, respondents are classified in terms of their attachment representation as secure-autonomous (S), insecure-dismissing (Ds), insecure-preoccupied (P), or disoriented-disorganized (D), according to the dominant strategy that is observed in the transcript (Kriss et al., 2013). Individuals with S attachment representations show a coherent discourse with the ability to discuss and explore their significant relationships in an open and flexible manner; their interviews are also characterized by a sense of balance and ease with oneself, as well as empathy for significant others. Persons classified as Ds will typically portray themselves as strong with a minimal urgency to need others; they tend to minimize negative experiences and show idealization and/or derogation of their parents. Individuals classified as P usually show inflexibility, ambivalence in the evaluation of their parents, anger, and excessive blaming toward the parental figures. Persons classified as D usually derogate themselves, present contradictory or incoherent strategies, lapses in monitoring of reasoning or discourse, fear, and dissociated states

of mind, which shows in speech and or nonverbal behavior (Steele et al., 2014).

All FFIs were coded by the first author (AD). A second expert, who was not a member of the same research group and who was blind to the characteristics of the sample, coded 31 randomly selected interviews (63%). Both coders received training from Dr. Howard Steele and achieved certified reliability. Interrater agreement was 87% (k = .87) for four-way classifications (S, Ds, P, D) and 93% (k = .89) for three-way classifications (S, Ds, P). Disagreements between the coders were resolved by discussion. Internal consistency concerning the subscales of "coherence" was high (Cronbach's α = .91), in line with previous studies (e.g., Pace et al., 2019).

Family Interaction Task (FIT)

The FIT is a revealed-differences task designed to assess autonomy and relatedness patterns of the Parent × Adolescent relationship. Mothers and adolescents and, separately, fathers and adolescents are asked to discuss a disagreement and to try and reach a solution for a problem over a period of 8 minutes. The interaction starts after the dyad listened to a tape that was recorded without the parent, where the adolescent stated his or her opinion and the point of view of the mother or the father. Every interaction is about a topic both parent and adolescent disagreed on, typically regarding money, school, household, friends, or siblings. In the current study, interactions were video recorded and later transcribed for coding according to the Autonomy and Relatedness Coding System (ARCS; Manual Version 2.15), to identify behaviors promoting and inhibiting autonomy and relatedness within the dyad (Allen et al., 2012). In addition to rhetorical indicators, facial expressions and gestures were observed for coding purposes. The ARCS has been successfully culturally adapted and shown to be reliable in predicting adolescents' (attachment-related) functioning (Allen et al., 2003; Becker-Stoll et al., 2008; Beijersbergen et al., 2008). Interactions are coded using a 4-point scale, and the system identifies 10 subscales that are then summed into the following four overall scales: (a) "exhibiting autonomy" (extent and quality of reasoning, level of confidence), (b) "undermining autonomy" (extent and quality of recanting or collapsing, blurring and pressuring), (c) "exhibiting relatedness" (extent and quality of queries, validating, and level of engagement), and (d) "undermining relatedness" (extent and quality of distracting or ignoring, being hostile, or devaluing). In previous research, exhibiting autonomy and exhibiting relatedness have been combined into one scale, but there has been growing evidence that examining them separately is statistically advantageous (Allen et al., 2012; Becker-Stoll et al., 2008). Thus, in this study, the four overall scales were kept separate.

The first author (AD), who had received training by an expert (Casey L. Brown – University of California, Berkeley) trained by Dr. Joseph P. Allen, coded the FITs. He then collaborated with another researcher on a training set of nine pre-coded and annotated interactions to achieve satisfactory inter-rater agreement. This researcher then blindly rated 46 randomly selected interactions (56%). Intraclass correlations between the two coders were r = .85; disagreements between the coders were resolved by discussion. Internal consistency of the four scales used in the analyses was appropriate both for the Adolescent×Mother interactions (exhibiting autonomy α = .93, undermining autonomy α = .74, exhibiting relatedness α = .70, undermining relatedness α = .76) as well as for the Adolescent×Father interactions (exhibiting

autonomy α = .94, undermining autonomy α = .80, exhibiting relatedness α = .70, undermining relatedness α = .63).

Physiological measures

The VarioPort-E® (Becker Meditech, Germany) portable recording device was used to monitor electrocardiogram (ECG) and EDA, from which we derived HR (in terms of IBI in ms) and HRV (in terms of RMSSD), and SCL (expressed in terms of μS) to replicate and extend previous findings (Beijersbergen et al., 2008; Roisman et al., 2004). Three single-use electrodes were attached to the chest of the adolescents according to Einthoven lead II. Two multiuse electrodes filled with conductive isotonic electrode gel were applied to the hypothenar palmar site of the nondominant hand. The sampling rate for HR was 256 Hz, while EDA was sampled at 32 Hz. The quality of the signals was checked online through the VarioGraf® software (Version 4.81; Becker Meditech, Germany). After sensors had been attached, a 5-minutes baseline recording ensued before participants were asked to begin with the interview or with the interaction task. During the baseline period of the FFI and the FITs, participants were instructed to sit still on their chair.

Concerning the FFI, the following questions were selected for use in later physiological analyses (Steele et al., 2014): (Q5.1) When you are upset, what do you do? What happens then? Is there someone you turn to? Can you tell me about a time when you were upset? (Q5.2) When you are about to do something new or very challenging, how do you get yourself ready? Is there someone you would turn to for help? Can you tell me about a time? (Q21) Could you think of the first time you were separated from your parents? How old were you at the time? Do you remember how you felt? How do you think your parents felt at the time? (Q25) Now I'd like to ask you about your parents again, but this time it's not about your relationship with each of them, but rather how do you think they get along with each other? Do they ever argue? How do you feel when they argue? Do you remember a time recently when they were arguing? Can you tell me how it was, what it was about? How did you feel? Could you imagine how you'd feel if you saw them arguing? (Q27.1) Why do you think your mother behaved or behaves the way she does? In other words, why do you think she is the person she is? (Q27.2) Why do you think your father behaved or behaves the way he does? In other words, why do you think he is the person he is? The selection of questions was made after discussion with one of the authors of the interview (H. Steele, personal communication, October 9, 2015), with the aim to differentiate best between secure and insecure adolescents, and between organized and disorganized individuals.

During the FIT, physiological responses were monitored continuously. For analysis, however, only the first 4 minutes starting at the discussion (divided in subperiods of 1 minute each) were selected. This time frame was chosen since some dyads shifted theme and began to talk about issues that did not concern the disagreement, for instance what they were going to have for dinner, and so on.

Raw physiological data were analyzed with WinCPRS® software (Version 1.16; Absolute Aliens Oy, Finland). IBI, RMSSD, and SCL reactivity scores for the FFI were computed by subtracting baseline means from the respective means of the selected questions; the same applied to the FIT (i.e., subtracting the mean of IBI, RMSSD, and SCL during baseline from the means during the 1-minute periods of the interaction).

Family data questionnaire

This sociodemographic interview was administered to both parents, if available. The first part of the interview concerns sociodemographic (i.e., nationality and country of origin) and educational background, and the current working situation of the participating parent(s), according to the International Standard Classification of Education (ISCED) 2011 scales (2012). Other questions concern family composition (e.g., members and age), duration of the parental relationship or marriage, and if applicable, adoptive history (i.e., reasons for adoption, age at adoption, country of origin, time spent in institution or foster family, health condition at adoption, and general adjustment of the child), divorce history (i.e., reasons for divorce, age at separation/divorce), physical and mental health of the child, and schooling and school support. In the second part, parents were asked about their health behaviors since these could affect physiological responses (i.e., medication, weight, sleep attitudes, food, and alcohol intake). They were also asked to rate their level of physical activity during the last seven days, and how much they smoked, on a 5-point Likert scale (1 = *never* to 5 = *often*). Mothers also gave information about their menstrual cycle and use of hormonal contraceptives.

Personal data questionnaire

This short sociodemographic interview was administered to adolescents to collect information on physical activity during the last seven days and their tobacco consumption (i.e., cigarette smoking) on a 5-point scale, since these factors could affect physiological responses. Lastly, they were asked about hand preference, to place the EDA electrodes on the nondominant hand (Dawson et al., 2007).

Data reduction and statistical analysis

All statistical analyses were performed using SPSS v.24.0 (IBM Corp., Armonk, NY, USA). The Kolmogorow–Smirnow and Mauchly's tests were used to test for normality of distribution and sphericity assumptions, respectively. In a first set of preliminary analyses, we carried out a visual inspection to identify possible outliers in the psychophysiological data (> 1.5 interquartile ranges). We included outliers in the analyses since the results remained unchanged both when they were excluded or when they were changed into the next lowest or highest score to reduce their impact (Keppel & Wickens, 2004; Tabachnick & Fidell, 2013). Effect sizes were quantified using Cohen's *d*. Next, we examined the role of sociodemographic factors (age, parental education, physical activity, smoking, sex) on attachment, IBI, RMSSD, and SCL reactivity, as well as autonomy and relatedness. Correlations were not significant (*p* > .05); however, we included age, physical activity, and smoking as covariates in the subsequent main analyses, since they might differentially affect physiological responses (e.g., Beijersbergen et al., 2008). Moreover, using a multivariate analysis of variance (MANOVA) and post hoc Student's *t* tests, we also explored the question whether insecure individuals (Ds, P, D) differed in autonomy and relatedness, as well as in IBI, RMSSD, and SCL reactivity. No differences were found (*p* > .05). *H1* was analyzed employing both three-way (S, Ds, P) and two-way (organized, disorganized) attachment classifications using MANOVA and post hoc Student's *t* tests. Concerning psychophysiological reactivity during the FFI, *H2* was examined using a three-way attachment classification (S, Ds, P) with a linear mixed model with diagonal covariance structure with attachment representation, question (upset, challenge, separation, parents

Table 2. Attachment classification and scores on the scales of the Family Interaction Task (FIT) for adolescents and mothers (score range 1–4)

	Secure (n = 12)* M (SD)	Dismissing (n = 22) M (SD)	Preoccupied (n = 14) M (SD)	Organized (n = 34)* M (SD)	Disorganized (n = 14) M (SD)	Total (N = 48)*
Promoting autonomy	2.54 (0.80)	1.41 (0.68)	1.77 (0.92)	2.02 (0.88)	1.27 (0.72)	1.80 (0.72)
Undermining autonomy	0.97 (0.64)	2.00 (0.59)	1.64 (0.55)	1.59 (0.70)	1.76 (0.77)	1.64 (0.71)
Promoting relatedness	1.90 (0.59)	1.13 (0.47)	1.39 (0.57)	1.55 (0.54)	1.02 (0.62)	1.40 (0.61)
Undermining relatedness	0.90 (0.58)	1.75 (0.69)	1.38 (0.91)	1.32 (0.77)	1.70 (0.85)	1.43 (0.80)

Note. *FIT is missing for one adolescent in this group.

arguing, why behaved mother, why behaved father) and physiological reactivity scores as fixed effects and participants included as random effect. A post hoc analysis of variance (ANOVA) was also run to test for significant differences between adolescents with secure, dismissing, and preoccupied attachment. H3 was also tested with the same linear mixed model using a two-way attachment classification (organized, disorganized), question (upset, challenge, separation, parents arguing, why behaved mother, why behaved father), and physiological reactivity scores as fixed effects and participants included as random effect. With regard to the psychophysiological reactivity during the FIT, H4 was assessed using a three-way attachment classification (S, Ds, P) with two linear mixed models with diagonal covariance structure to separately examine possible differences during the interactions with mothers and fathers to analyze physiological reactivity at specified time intervals (i.e., four 1-minute intervals) during the FITs; attachment representation, time frame (T1, T2, T3, T4) and physiological reactivity scores were included as fixed effects and participants as random effect. H5 was tested using a two-way attachment classification (organized, disorganized) with the same linear mixed models with attachment representation, time frame (T1, T2, T3, T4) and physiological reactivity scores as fixed effects and participants as random effect. Finally, two independent linear mixed models were run with the averaged RMSSD reactivity scores during the FFI (Situation 1) and the FITs (Situation 2) as dependent variables and the two-way attachment classification (organized, disorganized) and situation as independent variables.

Results

Attachment, autonomy, and relatedness

Concerning the attachment distribution in the present sample of 49 adolescents, 13 were classified as secure, 22 as dismissing, and 14 as preoccupied. When considering the disorganized category, the distribution was 13 secure, 14 dismissing, 8 preoccupied, and 14 disorganized.

H1.1, H1.2: Differences between secure, dismissing, preoccupied, and disorganized adolescents

Concerning the interactions with mothers, the overall effect with a three-way attachment classification (S, Ds, P) was significant, $F(8, 84) = 4.28$, $p < .001$. There were significant group differences concerning behaviors promoting autonomy, $F(2, 45) = 8.10$, $p < .001$, behaviors undermining autonomy, $F(2, 45) = 11.67$, $p < .001$, behaviors promoting relatedness, $F(2, 45) = 8.15$, $p < .001$, and behaviors undermining relatedness, $F(2, 45) = 5.25$, $p < .01$. Post hoc t tests showed that secure adolescents displayed significantly more behaviors promoting autonomy than

adolescents classified as dismissing ($p < .001$, $d = 1.53$) and preoccupied ($p < .05$, $d = .90$). Secure adolescents displayed also significantly less frequently and to a lesser extent behaviors undermining autonomy than dismissing ($p < .001$, $d = 1.66$) and preoccupied ($p < .05$, $d = 1.12$) ones. Finally, secure adolescents displayed more behaviors promoting relatedness ($p < .001$, $d = 1.45$) as well as fewer behaviors undermining relatedness ($p < .05$, $d = 1.33$) than adolescents classified as dismissing. There was a trend for secure individuals to show more behaviors promoting relatedness than preoccupied ones ($p = .052$). There was also a significant overall effect using a two-way attachment classification (organized, disorganized), $F(4, 43) = 3.16$, $p < .05$: organized individuals displayed behaviors promoting autonomy, $F(1, 46) = 7.91$, $p < .01$, $d = .94$, and relatedness $F(1, 46) = 8.94$, $p < .01$, $d = .91$, more frequently and at a higher extent than disorganized ones. No differences were found for behaviors undermining autonomy, $F(1, 46) = 0.58$, $p = .45$, and undermining relatedness, $F(1, 46) = 2.29$, $p = .14$. Means and standard deviations for the scales of autonomy and relatedness for the Child×Mother interactions are presented in Table 2.

As for the interactions with the fathers, the overall effect was significant $F(8, 56) = 2.96$, $p < .01$. There were significant differences between groups concerning behaviors promoting autonomy, $F(2, 31) = 8.16$, $p < .001$, behaviors undermining autonomy, $F(2, 31) = 3.33$, $p < .05$, and behaviors promoting relatedness, $F(2, 31) = 9.71$, $p < .001$. No differences were found for behaviors undermining relatedness, $F(2, 31) = 0.68$, $p = .52$. Post hoc t tests showed that secure adolescents displayed significantly more behaviors promoting autonomy than dismissing ($p < .01$, $d = 1.60$) and preoccupied ($p < .01$, $d = 1.50$) adolescents. Secure individuals also showed fewer behaviors undermining autonomy ($p < .01$, $d = 1.00$) and more behaviors promoting relatedness ($p < .01$, $d = 2.04$) than dismissing adolescents. No significant overall effect was found with a two-way attachment classification (organized, disorganized), $F(4, 29) = 0.95$, $p = .45$. Means and standard deviations for the scales of autonomy and relatedness for the Child×Father interactions are presented in Table 3.

Psychophysiological responses during the FFI

Means and standard deviations of the raw physiological data during baseline and during the FFI questions are presented in Table 4. There were no differences in baseline levels of IBI, RMSSD, and SCL between the three groups (S, Ds, P) or between organized and disorganized adolescents ($p > .05$). Moreover, there was neither a main effect for question nor an interaction between attachment representation and question, thus only the attachment main effects are reported.

Table 3. Attachment classification and scores on the scales of the Family Interaction Task (FIT) for adolescents and fathers (score range 1–4)

	Secure (n = 10)[a] M (SD)	Dismissing (n = 16)[b] M (SD)	Preoccupied (n = 8)[c] M (SD)	Organized (n = 34)[d] M (SD)	Disorganized (n = 5)[e] M (SD)	Total (N = 34)[f] M (SD)
Promoting autonomy	2.78 (0.81)	1.42 (0.88)	1.38 (1.04)	1.84 (1.08)	1.65 (1.17)	1.81 (1.08)
Undermining autonomy	0.98 (0.78)	1.67 (0.60)	1.29 (0.65)	1.29 (0.73)	1.87 (0.32)	1.38 (0.71)
Promoting relatedness	2.08 (0.54)	1.00 (0.52)	1.44 (0.82)	1.48 (0.76)	1.05 (0.65)	1.42 (0.75)
Undermining relatedness	0.80 (0.65)	1.11 (0.72)	0.91 (0.64)	0.91 (0.69)	1.30 (0.54)	0.97 (0.68)

Note. [a]FIT is missing for three adolescents in this group; [b]FIT is missing for six adolescents in this group; [c]FIT is missing for six adolescents in this group; [d]FIT is missing for six adolescents in this group; [e]FIT is missing for nine adolescents in this group; [f]FIT is missing for 15 adolescents in this group.

Table 4 Attachment classification and raw physiological values for the Friends and Family Interview (FFI) baseline and questions

Physiological value	Question	Secure (n = 13) M (SD)	Dismissing (n = 14) M (SD)	Preoccupied (n = 8) M (SD)	Disorganized (n = 14) M (SD)
RMSSD	Baseline	51.54 (30.39)	73.93 (39.74)	50.50 (29.92)	72.29 (29.85)
	Upset	49.00 (28.81)	60.29 (33.14)	42.88 (18.92)	55.85 (19.79)
	Challenge	49.85 (26.87)	62.14 (39.03)	44.63 (20.62)	62.07 (23.87)
	Separation	50.92 (26.96)	59.29 (41.53)	46.63 (21.03)	58.14 (21.11)
	Parents arguing	50.85 (35.09)	63.57 (39.08)	47.50 (20.09)	58.64 (26.17)
	Why behaved mother	48.92 (28.81)	65.21 (41.50)	51.75 (33.78)	59.79 (23.40)
	Why behaved father	51.31 (37.96)	59.78 (41.26)	45.25 (21.11)	64.21 (32.82)
IBI	Baseline	800.85 (132.91)	828.29 (133.33)	751.25 (69.73)	829.79 (114.11)
	Upset	742.46 (107.26)	769.07 (106.16)	695.63 (63.49)	766.79 (99.71)
	Challenge	756.08 (115.30)	779.86 (115.31)	700.13 (72.27)	774.86 (104.70)
	Separation	764.85 (101.83)	777.36 (120.99)	723.88 (58.55)	787.43 (125.08)
	Parents arguing	764.38 (123.93)	788.29 (137.48)	717.38 (59.08)	785.57 (125.71)
	Why behaved mother	756.15 (106.89)	799.29 (154.01)	717.38 (85.96)	798.07 (122.96)
	Why behaved father	766.23 (128.20)	781.64 (122.35)	713.25 (57.62)	796.71 (123.24)
SCL	Baseline	7.30 (3.31)	9.11 (6.19)	9.53 (4.56)	8.51 (7.06)
	Upset	10.99 (6.16)	11.62 (6.51)	13.15 (5.62)	11.93 (7.60)
	Challenge	10.98 (6.25)	11.64 (6.54)	13.51 (5.26)	11.80 (7.56)
	Separation	10.96 (6.17)	11.65 (6.63)	12.46 (5.26)	11.75 (6.61)
	Parents arguing	11.15 (5.96)	11.67 (6.33)	12.20 (5.05)	11.94 (6.94)
	Why behaved mother	10.79 (5.03)	11.78 (6.21)	12.91 (5.81)	11.64 (6.78)
	Why behaved father	11.01 (5.62)	11.82 (6.17)	12.93 (5.82)	11.71 (7.32)

Note. RMSSD = root mean of the squared successive differences, IBI = inter-beat interval, SCL = skin conductance level.

H2: Differences between secure, dismissing, and preoccupied adolescents

The results indicated a main effect for group in RMSSD reactivity $F(2, 265) = 13.58$, $p < .001$, suggesting an overall effect of attachment classification on reductions in vagal tone in response to the interview. Post hoc tests showed that dismissing adolescents displayed larger decreases in vagal tone in response to the interview than secure (*M difference* = −11.96, *SE* = 2.36, *df* = 265,

$p < .001$, $d = .79$) and preoccupied individuals (*M difference* = −6.92, *SE* = 2.31, *df* = 265, $p < .01$, $d = .39$). There were no differences between secure and preoccupied adolescents (*M difference* = 5.04, *SE* = 2.63, *df* = 265, $p = .17$) (see Figure 1).

Moreover, there was no main effect for group in IBI reactivity, $F(2, 268) = 1.46$, $p = .24$, but there was a trend for a main effect for attachment classification in SCL reactivity, $F(2, 268) = 2.76$, $p = .065$.

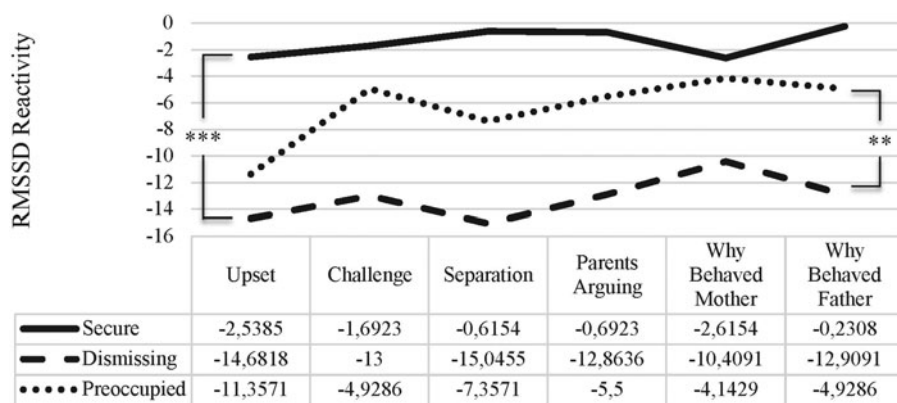|	Upset	Challenge	Separation	Parents Arguing	Why Behaved Mother	Why Behaved Father
Secure	-2,5385	-1,6923	-0,6154	-0,6923	-2,6154	-0,2308
Dismissing	-14,6818	-13	-15,0455	-12,8636	-10,4091	-12,9091
Preoccupied	-11,3571	-4,9286	-7,3571	-5,5	-4,1429	-4,9286

Figure 1. Root mean of squared successive differences (RMSSD) reactivity change scores of secure, dismissing, and preoccupied adolescents during the Friends and Family Interview (FFI). Note. **$p < .01$, ***$p < .001$.

H3: Differences between organized and disorganized adolescents

There was a main effect for group (two-way attachment classification: organized vs. disorganized individuals) in RMSSD reactivity, $F(1, 269) = 8.30$, $p < .01$. The results showed that disorganized adolescents responded with a larger decrease in RMSSD to the interview than organized individuals (M difference $= -6.30$, $SE = 2.18$, $df = 269$, $p < .01$, $d = .38$), suggesting that they experienced the FFI as a more challenging experience (see Figure 2).

Moreover, there was neither a main effect for group in IBI reactivity, $F(1, 273) = 0.18$, $p = .67$, nor in SCL reactivity, $F(1, 274) = 0.04$, $p = .95$.

Psychophysiological responses during the FITs

H4: Differences between secure, dismissing, and preoccupied adolescents

There was not a significant main effect for attachment classification in either the FIT with mothers, $F(2, 173) = 0.84$, $p = .43$, or in the FIT with fathers, $F(2, 117) = 1.32$, $p = .27$. These results suggest that there were no differences in RMSSD reactivity between attachment groups during the interaction task, neither with mothers as interaction partners nor with fathers.

Concerning IBI reactivity, there was neither a main effect for attachment classification in the FIT with mothers, $F(2, 176) = 2.37$, $p = .10$, nor in the FIT with fathers, $F(2, 116) = 0.46$, $p = .63$.

As for SCL reactivity, there was neither a main effect for attachment classification in the FIT with mothers, $F(2, 174) = 2.07$, $p = .13$, nor in the FIT with fathers, $F(2, 117) = 0.69$, $p = .50$.

H5: Differences between organized and disorganized adolescents

Concerning mothers, there was a significant main effect for attachment on RMSSD reactivity, $F(1, 176) = 6.12$, $p < .05$. With regard to fathers, there was also a main effect for organized and disorganized attachment classification on RMSSD reactivity, $F(1, 118) = 10.73$, $p < .001$ (see online supplementary materials: Figure 3 and Figure 4, respectively). The results showed that disorganized adolescents responded with larger decreases in RMSSD, than organized individuals to the task with both mothers (M difference $= -7.79$, $SE = 3.15$, $df = 176$, $p < .05$, $d = .38$) and fathers (M difference $= -12.51$, $SE = 3.82$, $df = 118$, $p < .001$, $d = .77$), suggesting that the interaction tasks with both parents were emotionally challenging for them.

Concerning IBI reactivity, there was neither a main effect for attachment classification in the FIT with mothers, $F(1, 180) = 1.24$, $p = .27$, nor in the FIT with fathers, $F(1, 118) = 1.95$, $p = .17$.

As for SCL reactivity, there was a main effect for attachment classification in the FIT with mothers, $F(1, 178) = 16.89$, $p < .001$ (see Figure 5). The results showed that disorganized adolescents responded with a more marked increase in SCL to the interaction with mothers than organized individuals (M difference $= 0.84$, $SE = .20$, $df = 178$, $p < .001$, $d = .69$), further confirming that they experienced the FIT with mothers as a more challenging experience. In the FIT with fathers instead, there was no significant effect for attachment classification $F(1, 121) = .17$, $p = .68$.

Psychophysiological responses during the FFI and the FITs

There was a main effect for attachment classification in both the task with the mother, $F(1, 86) = 4.13$, $p < .05$, and the father, $F(1, 58) = 4.37$, $p < .05$. The results showed that disorganized adolescents displayed significantly larger decreases in RMSSD; that is, more vagal withdrawal, both during the FFI and during the FIT with both mothers (M difference $= -7.22$, $SE = 3.56$, $df = 86$, $p < .05$, $d = .46$) and fathers (M difference $= -10.19$, $SE = 4.88$, $df = 61$, $p < .05$, $d = .73$) than organized adolescents (see Figure 6).

Discussion

The aim of the present study was to investigate the question whether adolescents with different attachment classifications (a) display specific relational patterns in dyadic conflict interactions with their parents and whether they (b) show differential psychophysiological stress responses during an attachment interview (FFI) and during the interaction with their mothers and fathers (FIT). The results of our study considerably extend previous research on the relation between attachment and autonomy, and on the relation between attachment classification and psychophysiological responses. Moreover, to our knowledge, this is the first study of its kind to include a sample of fathers, a population that has largely been neglected in attachment research until recently (Bretherton, 2010). We also tested whether individuals with disorganized attachment representations show any differences in their physiological reactions, using a narrative approach and its pertinent classification system (Steele et al., 2014).

With regard to autonomy and relatedness, the results suggest that securely attached individuals possess better abilities in

Figure 2. Root mean of squared successive differences (RMSSD) reactivity change scores of adolescents classified as organized and disorganized during the Friends and Family Interview (FFI). Note. **p < .01.
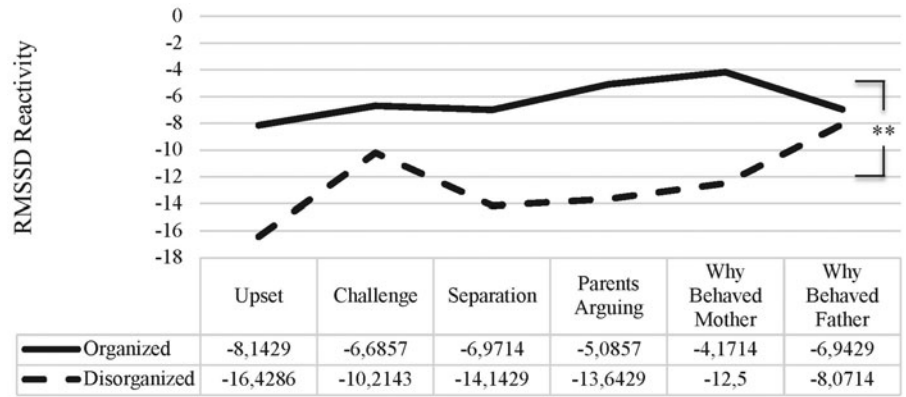
	Upset	Challenge	Separation	Parents Arguing	Why Behaved Mother	Why Behaved Father
Organized	-8,1429	-6,6857	-6,9714	-5,0857	-4,1714	-6,9429
Disorganized	-16,4286	-10,2143	-14,1429	-13,6429	-12,5	-8,0714

Figure 3. (online supplementary material). Root mean of squared successive differences (RMSSD) reactivity change scores of adolescents classified as organized and disorganized during the Family Interaction Task (FIT) with mothers. Note. *p < .05.
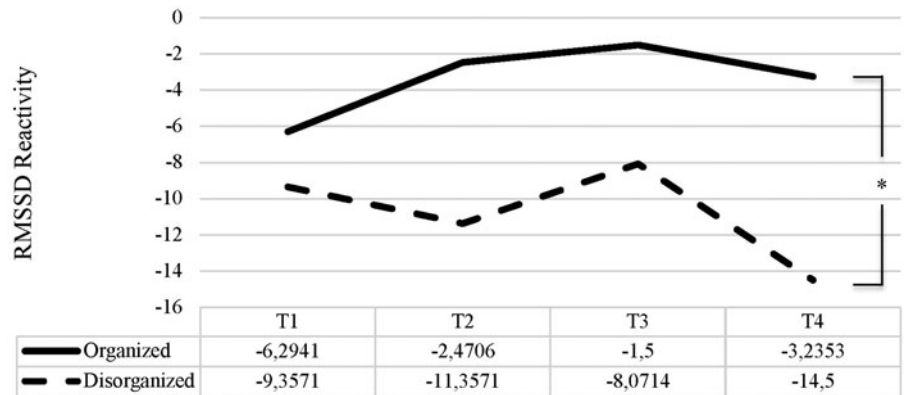
	T1	T2	T3	T4
Organized	-6,2941	-2,4706	-1,5	-3,2353
Disorganized	-9,3571	-11,3571	-8,0714	-14,5

Figure 4. (online supplementary material). Root mean of squared successive differences (RMSSD) reactivity change scores of adolescents classified as organized and disorganized during the Family Interaction Task (FIT) with fathers. Note. ***p < .001.
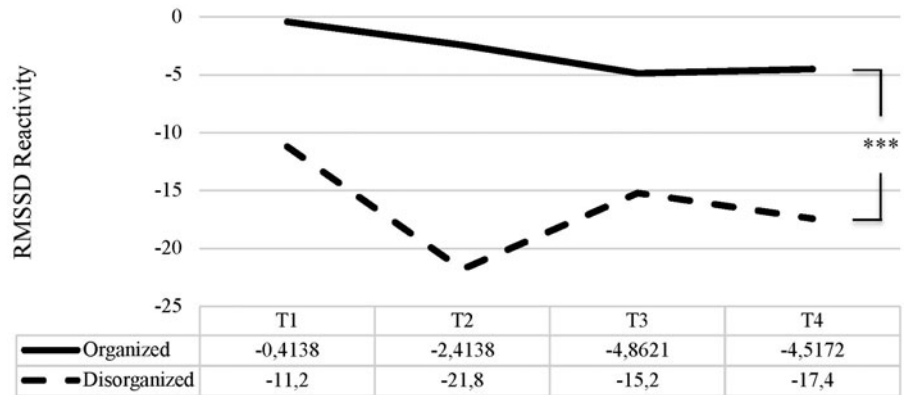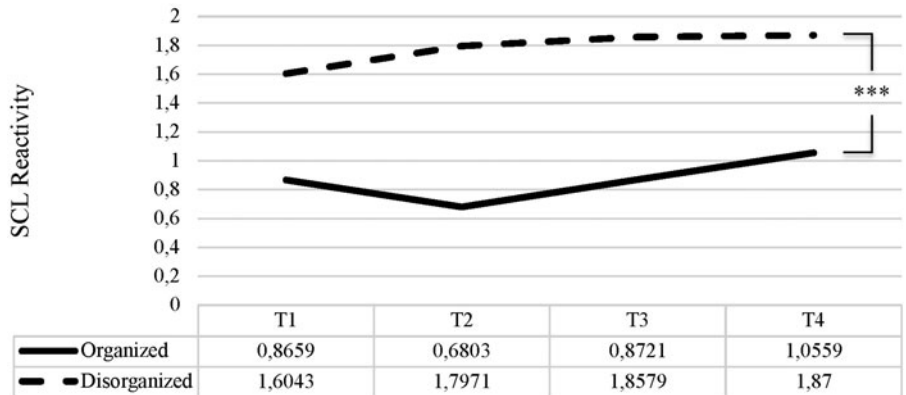
	T1	T2	T3	T4
Organized	-0,4138	-2,4138	-4,8621	-4,5172
Disorganized	-11,2	-21,8	-15,2	-17,4

Figure 5. Skin conductance level (SCL) reactivity change scores in µS of adolescents classified as organized and disorganized during the Family Interaction Task (FIT) with mothers. Note. ***p < .001.

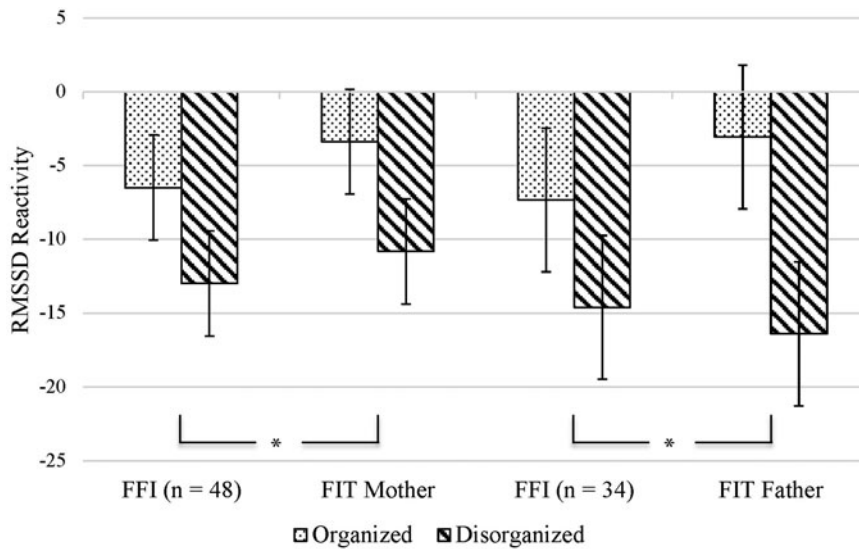|	T1	T2	T3	T4
Organized	0,8659	0,6803	0,8721	1,0559
Disorganized	1,6043	1,7971	1,8579	1,87

Figure 6. Mean root mean of squared successive differences (RMSSD) reduction of adolescents classified as organized and disorganized during the Friends and Family Interview (FFI) and the Family Interaction Tasks (FITs). Note. *p < .05; Error bars indicate one standard error.

expressing their own opinions with confidence while maintaining an engaged and amicable connectedness with both their mothers and fathers. The findings indicate that secure adolescents are more able to have a goal-corrected partnership with their parents in challenging situations; for example, in a disagreement. This balance between different needs has been compared to those expressed during the infant SSP, where the balance between exploration and attachment is assessed by observing behaviors that are exhibited in the effort to maintain the relationship during a challenging moment; that is, separation (Allen et al., 2003). In contrast, dismissing adolescents displayed autonomous relatedness behaviors less frequently and to a lesser extent than secure ones, suggesting difficulties to express autonomy needs and often displaying behaviors undermining autonomy and relatedness, for example recanting their position to find an agreement and withdrawing from the interaction or ignoring the other speaker. This supports the notion that dismissing individuals tend to have a fight or flight strategy (Allen & Tan, 2016; Cassidy, 1994; Hesse, 2016). Preoccupied adolescents, however, did not differ significantly in their behaviors promoting autonomy and relatedness in the interactions with their parents. Nevertheless, they displayed more behaviors undermining autonomy than secure ones, for example blurring or pressuring the caregiver to find an agreement. Individuals with a preoccupied state of mind usually are more open than dismissing ones to talk about and express their emotions, and engage in strategies to maximize their focus on attachment relationships; at the same time, they have difficulties in regulating their emotions and might show more anger toward their attachment figures, thus confirming their ambivalence in the relationship with parents (Borelli et al., 2018; Cassidy, 1994; Hesse, 2016). Finally, disorganized adolescents displayed significantly fewer behaviors exhibiting autonomy and relatedness than organized ones (although only in the interaction with their mothers), but did not show more behaviors undermining autonomy and relatedness. In the present study, disorganized individuals often remained silent during the whole interaction or unsuccessfully tried to assert their position. The low presence of both autonomy and relatedness suggests that these interactions were dominated by fear or by dissociative processes, which resulted in the full withdrawal of the adolescent (e.g., looking down, staring blankly,

showing no affect) (Allen et al., 2012; Duschinsky, 2018). This is especially true for the interactions with mothers, who were displaying significantly higher hostile or threatening behaviors than fathers. Although the ARCS was not designed with this specific aim, it might nevertheless be useful to identify disorganized speech and behaviors that are likely to appear in Parent×Adolescent interactions. Similar features have been observed also in another interaction task that shares some features with the FIT and its ARCS: using the Goal-Corrected Partnership in Adolescence Coding System (Lyons-Ruth, Hennighausen, & Holmes, 2005), Hennighausen, Bureau, David, Holmes, and Lyons-Ruth (2011) could show that disorganized adolescents use controlling-containing strategies to balance parental hostile and humiliating behaviors, by changing subject or making jokes during the interaction; that is, employing a strategy mainly based on distraction. This is similar to what we found in our study, although the behaviors of disorganized individuals were rather characterized by a lack of engagement in the discussion, potentially indicating fearful reactions.

Concerning psychophysiological reactivity during the FFI and the FIT, adolescents showed higher cardiovascular and electrodermal arousal during the interview as compared to a resting condition, which suggests the interview's potential to induce stress. The probably most important results concern the converging evidence that adolescents classified as disorganized showed more vagal withdrawal – that is, more stress reactivity – throughout both tasks; that is, during the attachment interview and during the conflict interaction with their mothers and fathers. Moreover, they also responded with increased SNS activation as indicated by SCL reactivity, but only during the FIT with their mothers.

The six questions we chose to analyze during the FFI seem to have activated the attachment system of disorganized adolescents. Similar results have been found in studies on infant samples: Spangler and Grossmann (1993) showed that disorganized infants during the SSP had higher HR responses than other infants when alone in the room. Similarly, Willemsen-Swinkels, Bakermans-Kranenburg, Buitelaar, van Ijzendoorn, and van Engeland (2000) found that disorganized infants had significantly increased HR during separation from and a decrease during reunion with the caregiver. However, a later study on a group of adopted adolescents using the AAI and the FIT

(Beijersbergen et al., 2008) did not find any differences between resolved and unresolved individuals, but the authors argued that this might have been because they only measured physiological reactivity during questions investigating trauma, loss, and abuse.

The behavioral withdrawal that mainly characterized the FIT with the mothers affected both RMSSD and SCL responses; the same pattern of activation appeared also in the interaction with fathers, although only at a physiological (and just in vagal tone) rather than behavioral level. The explanation for this difference might lie in the fact that, although fathers displayed on average better reflective functioning and less hostile and threatening behaviors than mothers, the adolescents might have internalized a pattern of incoherent strategies (or fearful responses), which is then reflected in the physiological reactivity with both parents. Other studies have investigated and shown the association between unresolved (or disorganized) attachment and physiological reactions in other contexts than the SSP or the AAI. Stanley (2006), using the Adult Attachment Projective Picture System (AAP; George & West, 2012), found that unresolved persons showed significantly higher SCL responses while watching separation and reunion scenes, with the level of arousal increasing during the reunion. Another study that also used the AAP in a sample of depressed patients (De Rubeis et al., 2016) found that individuals with disorganized attachment responded to ostracism with significantly higher increases in HR than depressed patients with organized attachment. Taken together, the present results and previous studies provide converging evidence for the assumption that disorganized attachment seems to be more pervasive than other insecure attachment categories, and suggest that disorganization is associated with increased stress reactivity both during tasks that have been developed to evaluate the quality of attachment and during tasks that activate the attachment system more indirectly.

Concerning the three-way classification system (S, Ds, P), the results concerning RMSSD reactivity suggest that dismissing individuals experienced more stress than secure and preoccupied ones during the attachment interview but not during the interactions with mothers and fathers. We would argue that the FFI was able to activate attachment-related defensive processes (Mikulincer, Shaver, Cassidy, & Berant, 2009) of individuals classified as dismissing, both from a narrative (i.e., using idealization or derogation) as well as from a physiological perspective (i.e., using ineffectively a deactivating strategy). This result confirms previous findings from Dozier and Kobak (1992) and Roisman et al. (2004), who found that adults with a dismissing strategy displayed increased SCL responses during the AAI, suggesting that deactivation is associated with increased stress reactivity. In contrast, Beijersbergen et al. (2008) found that dismissing adolescents had lower HR reactivity than secure ones during the AAI. The authors conclude that dismissing individuals were able to successfully use a deactivating strategy during the attachment interview. We would argue that the contrasting results between the present study and Beijersbergen et al. (2008) can be explained in terms of the tasks used. While the AAI (used by Beijersbergen et al., 2008) is presumed to be a valid instrument when used with adolescents, results are inconsistent (Allen & Miga, 2010; Kiang & Furman, 2007). The FFI, although based on the AAI, differs from it in its focus on the current mental representations of the relationship with the parents. With the acquisition of formal operational thinking, adolescents begin to be able to reflect and represent their attachment relationships (Allen & Miga, 2010). Nevertheless, the ability to view oneself and others in their biographical context by constructing life stories seems to develop during adolescence: this transitional period allows for the integration and interpretation of the memories of a person's past with the present and acts as a developmental bridge between childhood and adulthood. It might then be difficult and not age-appropriate for young individuals to answer questions about the early relationship with their parents, since these memories are not yet well organized and settled in their autobiographical memory (Habermas & Bluck, 2000; Steele & Steele, 2005a). The questions of the FFI may have been more effective in triggering attachment-related physiological responses in dismissing adolescents, whereas thinking about early attachment memories that are not yet well integrated might be one of the reasons that allowed dismissing adolescents in previous studies to use an effective defensive strategy; that is, by excluding these memories (Beijersbergen et al., 2008; Zeijlmans Van Emmichoven, van IJzendoorn, De Ruiter, & Brosschot, 2003).

The FIT does not seem to have had the same effect: the use of recanting or ignoring behaviors toward both parents may have been an effective strategy for dismissing adolescents that allowed them to maintain a lower physiological arousal, practically at the same levels of secure and preoccupied adolescents. An alternative interpretation could be that during adolescence, Parent × Child conflicts can be considered as a normal part of daily family life (Steinberg, 2001). Although the FIT has a coding system that allows behaviors related to autonomy development to be observed, it may not provoke enough physiological arousal to distinguish between different organized attachment categories. This seems to contrast with previous findings of Beijersbergen et al. (2008). It is important to note, however, that their investigation was entirely conducted at families' homes, which may not have allowed for the same level of precision of psychophysiological assessment during the FIT as in a laboratory. We chose the latter because we wanted to take advantage of a neutral and standardized setting for all families to minimize the effects of differences in external environments. Nevertheless, standardization usually goes at the cost of ecological validity, so the FIT and other such interaction tasks conducted in the home environment might provide a more accurate picture of discussions that might occur there on a daily basis (Gardner, 2000). Future studies should investigate differences in physiological stress responses assessed in the home and a laboratory environment in a more systematic fashion. In addition, the sample in Beijersbergen et al. (2008) was only composed of adolescents who had been adopted in infancy, without a control group. Adolescence is a critical period for adoptees since they become more concerned with thinking about who they are, where they come from, and who they will become. Establishing a sense of self can be therefore somewhat challenging because they might experience feelings of guilt toward their adoptive parents when thinking about their biological ones, they might feel confuse or angry for being abandoned, or they might have difficulties in identifying with their adoptive parents because of different physical traits and, therefore, feel that they do not belong to their family (Bimmel, Juffer, van IJzendoorn, & Bakermans-Kranenburg, 2003). These factors might contribute to adoptees starting to question their identity more intensively because they are more aware of the ethnic and cultural differences with their parents, and this might also be reflected in the interactions (or conflicts) with their adoptive parents, which have been shown to be more intense than those that occur in other families (Rueter, Keyes, Iacono, & McGue, 2009). Further studies are needed to disentangle the possible

role that different family situations might also play for physiological stress reactions.

Finally, our results showed an association between disorganized attachment and larger vagal withdrawal (an indicator of PNS activity) during both the FFI and the FITs. An association with the SNS (as measured by EDA) was present only during the interaction with the mothers. For dismissing adolescents, we only found an association with PNS activity during the FFI. The role of vagal tone in the regulation of emotions has gained increasing attention during the last decades, since it offers a way to explore how the vagus nerve regulates heart rate in response to stressful situations (Porges, Doussard-Roosevelt, & Maiti, 1994). Porges' (2011) polyvagal theory focuses on the influence that the nervous system has on the individuals' ability to regulate their behavioral systems (i.e., social, emotional, and behavioral). The PNS protects metabolic resources, and from a behavioral perspective, it is associated with immobilization, as for instance freezing under acute threat. The SNS, on the other hand, increases metabolic output and inhibits the vagal system to promote behavioral mobilization (e.g., fight or flight responses) (Porges, 2011). Individuals who have greater vagal tone regulating capacities are also able to respond in a more flexible manner to stressful environmental stimuli, therefore having better abilities to recover from emotional arousal and have more adaptive strategies in social contexts (Beauchaine, Gatzke-Kopp, & Mead, 2007; Porges et al., 1994; Vögele, Sorg, Studtmann, & Weber, 2010). Empirical findings concerning vagal reactivity during infancy, childhood, and adolescence have shown that the vagal system seems to be the structure that lies at the core of emotion regulation, and that deficient vagal tone modulation appears to reflect emotional dysregulation (Beauchaine et al., 2007).

We would argue that the FFI triggered reactions of the ANS only partially as the stimuli it provided were not strong enough to activate a response of the SNS. Talking about current attachment relationships was stressful for both disorganized and dismissing individuals, but not threatening to activate fight or flight responses. Especially for disorganized adolescents, it is plausible to assume that the presence of an empathetic interviewer, with a nonjudging attitude and genuine interest in their life stories, might have buffered the physiological responses. However, it is also likely that the level of threat disorganized adolescents experienced during the FIT with their mothers prompted both deactivation of PNS and activation of SNS responses, triggering at a physiological level the breakdown in strategy that characterizes the disorganized classification (Hesse & Main, 2000; Liotti, 2004). Dismissing individuals might have developed some self-regulatory abilities that help them to deal physiologically with stressful circumstances (as for instance an interaction). Adolescents with disorganized attachment might fail to have this capacity, because their fear system is continuously activated, leading simultaneously to an excessive deactivation of the vagal system (freezing) and to the activation of the SNS (fight or flight), which does not allow for any response strategies. This process is reminiscent of what has been described in the literature on disorganized attachment as "fright without solution" (Hesse & Main, 1999, p. 484).

Limitations

Limitations of the current study concern the sample size, which was small in statistical terms and which might have led to insufficient statistical power to detect further differences between different attachment representations. Furthermore, there were more significant findings concerning mothers than fathers. This might be due to the lower number of fathers that took part in the study, which resulted in a smaller sample size, and might not have allowed to find further differences in the interaction with different parental figures. Future studies should involve an equal number of mothers and fathers, in order to examine whether the two parental figures might differentially affect adolescents' attachment representations. In addition, the disorganized category was over-represented, compared to previous investigations of nonclinical samples of adolescents (Bakermans-Kranenburg & van IJzendoorn, 2009; Becker-Stoll et al., 2008) suggesting that participant recruitment might have been biased, because those volunteering were probably more motivated for personal reasons (e.g., parents felt that their son or daughter had difficulties). Furthermore, the complexity of data collection, as for instance the inclusion of both parents, the fact of being interviewed and video-recorded, and last but not least the collection of physiological data might have limited participation. Therefore, a larger sample would probably bypass this "selection bias" and would allow for better generalizability of the results.

Conclusions

In summary, disorganization was reflected to a greater extent in physiological measures of the ANS than dismissing attachment, and this might be due to its pervasive negative influence on the psychological, behavioral, and physiological systems (e.g., Miljkovitch, Deborde, Bernier, Corcos, Speranza & Pham-Scottez, 2018). Although dismissing individuals might effectively employ avoidance in some contexts, as in the interaction with others, disorganization does not allow for this, since the fight or flight approach is impaired by fear. From a clinical perspective, it is also important to point out that disorganized attachment has only shown a modest stability over time and this gives room for interventions with children and their parents (Granqvist et al., 2017). This is also true for adolescence, where several attachment-based interventions (e.g., Attachment-Based Family Therapy; Connect Program; Mentalization-Based Treatment for Adolescents) have been developed with the aim of helping (both directly and indirectly) adolescents to better regulate their emotions (overview: Kobak & Kerig, 2015). Supporting adolescents in finding a healthier balance between the different behavioral systems – that is, attachment, exploration, and fear – will ultimately positively impact their wellbeing.

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