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Title

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Permalink

<https://escholarship.org/uc/item/996368m6>

Journal

Emotion, 19(5)

ISSN

1528-3542

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Publication Date

2019-08-01

DOI

10.1037/emo0000483

Peer reviewed

Emotion

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Online First Publication, August 13, 2018. <http://dx.doi.org/10.1037/emo0000483>

CITATION

Main, A., Lougheed, J. P., Disla, J., & Kashi, S. (2018, August 13). Timing of Adolescent Emotional Disclosures: The Role of Maternal Emotions and Adolescent Age. *Emotion*. Advance online publication. <http://dx.doi.org/10.1037/emo0000483>

Timing of Adolescent Emotional Disclosures: The Role of Maternal Emotions and Adolescent Age

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Adolescent disclosure is a positive feature of parent–adolescent relationships, though disclosure to parents typically declines across adolescence. However, little is known about parental emotions that facilitate or inhibit real-time adolescent disclosures about their emotions and how parents respond to such disclosures during parent–adolescent interactions. The present study tested (1) whether maternal emotions were associated with the time to adolescents' spontaneous emotional disclosures and (2) whether these associations varied as a function of adolescent age. Adolescents ($N = 49$, $M_{age} = 14.84$ years) and their mothers participated in a 10-min conflict discussion. Adolescent emotional disclosures and maternal emotions were coded moment-to-moment. Results from survival analysis demonstrated that older adolescents whose mothers expressed high levels of negative affect or high levels of validation were more likely to make emotional disclosures earlier in the discussion than were older adolescents whose mothers expressed low negative affect or low validation. There were no differences in associations between maternal emotions and the timing of emotional disclosures for younger adolescents. Findings suggest that a range of maternal emotions (validation and negative affect) might be features of high-quality mother–adolescent relationships in older adolescence, when parent–adolescent relationships are more egalitarian and negative emotions may be more readily expressed. Implications for applying observational methodologies and dynamic statistical techniques to the adolescent disclosure literature are discussed.

Keywords: disclosure, validation, interest, parent–adolescent interactions, survival analysis

Adolescent disclosure to parents about their activities, whereabouts, thoughts, and feelings is associated with fewer behavioral (e.g., Frijns, Keijsers, Branje, & Meeus, 2010; Hamza & Willoughby, 2011) and psychological adjustment problems (e.g., Laird & Marrero, 2010). Features of the parent–adolescent relationship, including parental acceptance and approval (Keijsers,

Frijns, Branje, & Meeus, 2009; Smetana, Metzger, Gettman, & Campione-Barr, 2006; Tilton-Weaver et al., 2010), behavioral control (Soenens, Vansteenkiste, Luyckx, & Goossens, 2006), parental solicitation and monitoring (Hamza & Willoughby, 2011), and relationship closeness (Tasopoulos-Chan, Smetana, & Yau, 2009) have been linked to greater adolescent disclosure to parents. Though several longitudinal studies have found developmental changes in disclosures to parents as adolescents get older (see Keijsers et al., 2016) and prospective links between parent–adolescent relationship quality and adolescents' reported tendency to disclose (Kearney & Bussey, 2015), little research has examined associations between parental emotions and adolescent disclosures in real-time interactions. Imagine, for example, that your teenage son or daughter has just come home from school and runs into the kitchen, where you are preparing dinner, to grab a snack before heading to soccer practice. What can you do to get your adolescent to disclose something meaningful during this brief interaction? And if your adolescent does disclose something to you, what can you do to encourage future disclosures and a positive relationship going forward? A deeper understanding of the parental emotions that facilitate or inhibit spontaneous adolescent disclosures, and how parents respond to such disclosures during real-time parent–adolescent interactions, holds important implications for interventions for improving the quality of parent–adolescent relationships. In the present study, we examined the associations between pa-

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This research was supported by grants awarded to Alexandra Main from the Jacob K. Javits Foundation; the University of California, Berkeley Institute of Human Development; the Greater Good Science Center; and the Psi Chi National Honors Society. This research was also supported by a Banting Postdoctoral Fellowship from the Social Sciences and Humanities Research Council of Canada awarded to Jessica P. Lougheed. We thank Michelle Russell and Emma Netland for assisting in data coding and Drs. Joseph J. Campos, Jodi Halpern, and Qing Zhou for their guidance in developing this study. We are also grateful to the families that participated in or contributed to the study.

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rental emotions and the timing of adolescent emotional disclosures (i.e., how quickly adolescents disclosed about emotional events) during mother–adolescent interactions.

Parental Behaviors, Parent–Adolescent Relationships, and Adolescent Disclosure

Several studies using primarily adolescent and parent reports have examined concurrent and prospective associations among parental behaviors and features of the parent–adolescent relationship that are associated with adolescent disclosure. Adolescents are more likely to report disclosing to parents about their whereabouts and activities (i.e., routine self-disclosure; see Tilton-Weaver, Marshall, & Darling, 2014) in the context of high-quality, accepting relationships (Keijsers et al., 2009; Kerr & Stattin, 2000; Smetana et al., 2006). This is likely because they are confident that their relationship with the parent will not be threatened and they will not be punished if they tell the parent something he or she may have difficulty hearing. Conversely, adolescents who expect their parent(s) to react with criticism or to invalidate their emotions when disclosing are less likely to choose to disclose (Solís, Smetana, & Comer, 2015; Tilton-Weaver & Marshall, 2008). Indeed, adolescent reports of parental trust and acceptance are linked with greater disclosure (Keijsers, Branje, VanderValk, & Meeus, 2010), and positive parental reactions to disclosures are associated with greater adolescent feelings of connectedness with parents, which in turn predicts greater disclosure over time (Tilton-Weaver et al., 2010).

Parental solicitation of information (e.g., direct questioning) about adolescents' whereabouts and activities as well as adolescents' tendency to voluntarily disclose generally predict greater disclosure over the course of adolescence, both of which are more likely to occur in the context of high-quality relationships (Frijns et al., 2010; Stattin & Kerr, 2000). Another important feature of positive parent–adolescent relationships is parental validation (i.e., communication of understanding and appreciation, though not necessarily agreement) of adolescents' thoughts and feelings. Parents who validate their children's emotions send the message that they encourage their child to express and label emotions. Such validation provides an opportunity for successful emotion coaching, which facilitates effective regulation (Gottman, Katz, & Hooven, 1996). This process becomes particularly important during adolescence as many adolescents experience difficulty with regulating their emotions as a result of puberty and social changes occurring during this period (see Morris, Criss, Silk, & Houlberg, 2017). Parental validation may facilitate adolescent disclosure by communicating that adolescents' feelings are important and justified. Indeed, adolescents' self-reports suggest an increased likelihood of future disclosure when the parent has validated previous disclosures (Tilton-Weaver et al., 2010), and adolescents' perceptions of parental validation are associated with more substantive disclosures about their emotions during parent–adolescent interactions (Martin, Kim, & Freyd, 2018).

Conversely, parental negative affect or lack of supportiveness in response to their children's negative affect can promote coercive cycles of interaction (Lougheed, Hollenstein, Lichtwarck-Aschoff, & Granic, 2015; Patterson, 1982), thereby inhibiting future disclosures about emotions. Indeed, Tilton-Weaver and colleagues (2010) found that when adolescents perceive negative parental

responses to their disclosures, adolescents are more likely to feel controlled and less connected to parents, leading to less disclosure and more secrecy over time. Taken together, research suggests that adolescents' perceptions of positive (e.g., validating) or negative (e.g., invalidating) parental responses to their disclosures play a role in predicting adolescent disclosure over time. However, this research mainly captures adolescents' perceptions of parental behaviors, and not observed behaviors during parent–adolescent interactions.

Adolescent Emotional Disclosure

Most research on adolescent disclosure to date has focused on routine disclosures about adolescents' activities and whereabouts, likely because information management strategies (e.g., disclosure and secrecy) are a key aspect of autonomy development during adolescence (Tilton-Weaver et al., 2014). However, less research has focused on adolescents' disclosures about emotional experiences (i.e., self-disclosure; see Jourard, 1959). Emotional disclosure serves important functions including soliciting social support (Pentina & Zhang, 2017) and regulating negative emotions (Lepore, Greenberg, Bruno, & Smyth, 2002). There has been little research on emotional disclosures in adolescents (see Martin et al., 2018; Hare, Marston, & Allen, 2011; Papini, Farmer, Clark, Micka, & Barnett, 1990, for exceptions). Adolescence is an important developmental period in which to examine emotional disclosures, as emotional distress often increases in adolescence (Flaherty et al., 2013). Adolescents are more likely to disclose distressing experiences to peers than to parents (Hershkowitz, Lanes, & Lamb, 2007), but disclosure to parents is associated with fewer psychological problems (Feiring, Taska, & Lewis, 1998). The only study to our knowledge that has examined observed adolescent emotional disclosures found that adolescent-reported parental acceptance was associated with greater emotional disclosures (Hare et al., 2011), suggesting that features of the parent–adolescent relationship are important predictors of adolescent disclosure during daily conversations with parents.

To our knowledge, no studies have examined observed parental behaviors and observed adolescent emotional disclosures in a single study. Furthermore, other observational studies of adolescent emotional disclosures have not examined the timing of such disclosures. Given that parent–adolescent interactions are often brief in the home environment, adolescent disclosures likely need to occur quickly for the benefits of adolescent disclosures to be garnered. Adolescents may be more forthcoming with emotional disclosures if their interactions with parents are generally characterized by high levels of positive (e.g., validation, interest) and low levels of negative (e.g., criticism) parental behaviors. Emotions during social interactions are coordinated in an interpersonal system (Butler, 2011; Granic, 2005; Lougheed, Koval, & Hollenstein, 2016; Main, Paxton, & Dale, 2016). According to dynamic systems perspectives, interpersonal emotion exchanges in the context of close relationships reflect the history of interaction patterns between the individuals comprising that relationship (see Granic, 2005). Therefore, it is likely that adolescent disclosure to parents about personally significant (i.e., emotional) events during everyday interactions is partly related to the emotions parents express or can be expected to express during parent–adolescent interactions. Although most research on adolescent disclosures uses self-report,

or aggregates the amount of disclosure across interactions, an approach examining the temporal dynamics of the parent–adolescent interactions allows for the opportunity to investigate specific, fine-grained patterns of interpersonal dynamics that may become representative of a relationship over time (Bardack, Herbers, & Obradović, 2017; Butler, 2011; Granic, 2005). Such dynamic, transactional models have been applied to studies using self-reported adolescent disclosure, suggesting that adolescents develop expectations about the way their parents will respond if they disclose something, especially if that experience is upsetting (Marshall, Tilton-Weaver, & Bosdet, 2005; Tilton-Weaver & Marshall, 2008). However, it remains unclear whether these interpersonal patterns extend beyond routine informational disclosures to emotional disclosures.

The present study builds on this research by examining whether parental emotions predict adolescent observed spontaneous emotional disclosures; specifically, whether these emotions are associated with the timing of adolescent emotional disclosures (i.e., how much time passed in a conversation before adolescents disclosed about emotional experiences). Moreover, and unique to the present study, we examined associations between parental emotions and adolescent emotional disclosures in real time dyadic interactions.

Developmental Changes in Adolescent Disclosure

Prior research has shown that younger adolescents are more likely to disclose to parents than are older adolescents (Finkenauer, Frijns, Engels, & Kerkhof, 2005; Papini et al., 1990; Smetana, Villalobos, Tasopoulos-Chan, Gettman, & Campione-Barr, 2009), possibly because older adolescents judge parents to have less jurisdiction over information that falls within the personal domain (Rote & Smetana, 2016). Given that one of the central goals of adolescence is establishing autonomy (Fuligni, 1998), this might explain why adolescents' beliefs about the legitimacy of parental control decline across adolescence (Keijsers et al., 2016; Smetana et al., 2006). Older adolescents may disclose less than younger adolescents due to greater concerns about parental disapproval, especially about prudential issues (Nucci, Smetana, Araki, Nakae, & Comer, 2014; Smetana et al., 2009), perhaps because these issues likely involve illicit or risky activities (e.g., smoking). However, less is known about the development of adolescents' tendency to disclose specifically about emotional experiences to parents. A deeper understanding of developmental changes in tendencies to disclose about emotional experiences is important because disclosure of emotional experiences is associated with better mental health in adolescence (Feiring et al., 1998).

The Present Study

The present study examined (a) whether maternal emotions were associated with the time to adolescents' spontaneous emotional disclosures during observed mother–adolescent conversations and (b) how these associations varied by adolescent age. Given prior research demonstrating that adolescents are more likely to disclose if they expect their parent to react supportively (Tilton-Weaver et al., 2010), we hypothesized that greater amounts of maternal validation (i.e., expressions of understanding of the adolescent's point of view) and interest (i.e., curiosity about the

adolescent's point of view) would be associated with a shorter time to adolescents' first emotional disclosures (i.e., adolescents would disclose to their mothers about emotional events more quickly). Conversely, on the basis of prior research showing that adolescents are less likely to disclose when parents react negatively to their disclosures (Tilton-Weaver et al., 2010), we hypothesized that maternal negative affect would predict a longer time to adolescents' first emotional disclosures. Additionally, given previous research demonstrating a developmental decline in routine disclosures across adolescence (e.g., Keijsers et al., 2016), we hypothesized that the time to first emotional disclosure would be greater in older adolescents than younger adolescents. Moreover, given that parent–child relationships undergo a great deal of realignment in adolescence (Collins & Laursen, 2004), we expected that associations between maternal emotions and the timing of adolescent emotional disclosures would vary across adolescent age. Given the lack of research in this area using observational methods and the exploratory nature of this aim, we did not have specific hypotheses about the direction of such associations.

Method

Participants

Participants were 50 adolescents (30 female; $M_{age} = 14.84$ years, $SD = 1.99$) and their mothers who participated in an exploratory research study on mother–adolescent communication (see Main et al., 2016). Adolescents were recruited at ages 13 years to 14 years ($N = 29$) and 17 years to 18 years ($N = 21$) to examine age differences in emotional communication and disclosure. This sample size determination was made to be consistent with previous studies using moment-to-moment observational coding of parent–adolescent emotions (e.g., Hollenstein & Lewis, 2006), interpersonal emotional arousal (Lougheed et al., 2016), and parental responses to adolescent disclosures (Martin et al., 2018). Only adolescents currently living at least 5 days per week with the participating mother were eligible to participate. One dyad from the younger age group was excluded from the analyses because of an error in researcher instruction, resulting in analysis of 49 dyads. The racial/ethnic composition of the sample is as follows: 62% non-Hispanic White, 16% non-Hispanic Black, 10% Asian/Pacific Islander, 4% Hispanic, and 8% other. Maternal education ranged from a high school degree to an advanced graduate degree, with the median highest degree obtained being a bachelor's degree (36.0%). Families' annual income ranged from less than \$25,000 per year to more than \$150,000 per year, with the average family income being \$81,000 to \$100,000.

Procedure

The research was approved by the Institutional Review Board at the University of California, Berkeley. Mothers and adolescents were recruited from local schools and communities in the San Francisco Bay Area using a variety of methods, including through schools, teen afterschool programs, parenting groups, and parent/teen newsletters. Each dyad participated in a 1.5-hr laboratory visit. Mothers and adolescents independently identified two topics that they felt caused the most disagreement in their relationship using the modified version of the Issues Checklist (Prinz, Foster,

Kent, & O’Leary, 1979) and subsequently discussed these topics for 10 min each without a researcher present. Two video cameras (one facing each participant) captured the participants’ facial expressions, vocalizations, gestures, and posture. A researcher knocked on the door to indicate that it was time to switch to the second topic. Mothers were given a \$20 check and adolescents were given a \$20 gift card for participating.

Measures

Adolescent emotional disclosure. Mother–adolescent conflict discussions were coded for adolescent emotional disclosures using modified versions of the Couples Interaction Coding System (Marsh, Busch, Cowan, & Cowan, 2002) and the Supportive Behavior Coding System (Allen et al., 2001). Emotional disclosures were coded as statements that revealed something about how the adolescent felt about his- or herself, the mother, or the relationship (Marsh et al., 2002). Though adolescents could express negative emotions (e.g., anger) while disclosing, coders were trained to observe whether adolescents were acting defensively (i.e., deflecting responsibility or blame) while disclosing or using disclosure to manipulate the parent or gain special privileges; these instances were not coded as disclosure.

Each conversation was first segmented into adolescent and mother conversation turns. Coders were instructed to watch the video once all the way through without assigning any codes to get a general sense of the discussion. Codes were assigned on the second viewing of the discussion. The onset and offset time of each emotional disclosure was recorded to capture the timing and duration of individual disclosures. Each instance of emotional disclosure was subsequently rated on a scale of 0.5 (*low*) to 3 (*high*) to indicate the intensity/depth of each emotional disclosure. A given disclosure was rated highly in intensity if the adolescent clearly stated that she was experiencing intense feelings (e.g., angry, sad, hurt, happy, excited) about something or someone and elaborated on the reasons behind her feelings (e.g., “It makes me feel upset when you act like you don’t trust me”). Disclosures were coded lower in intensity if the adolescent’s statement implied that he was experiencing an emotion, and some inference was required to determine his emotional state (e.g., “I’m gonna fail this Spanish test”; see Marsh et al., 2002). Intensity of emotional disclosures was calculated by averaging the intensity scores across all emotional disclosures during the discussion. Frequency of emotional disclosures was determined by tallying the number of times that the adolescent disclosed across the entire conversation. Given slight variations in discussion lengths, duration of emotional disclosures was calculated as the proportion of the conversation adolescents spent disclosing about something emotional. For testing research questions about the timing of adolescents’ first emotional disclosures during the discussion, the time at which this first emotional disclosure occurred was used as the dependent variable in the analysis (see Analysis Plan for details).

Codes were recorded using Mangold INTERACT (Mangold International, GmbH; Mangold, 2017). A graduate student trained an undergraduate research assistant to reach 75% agreement on training videos prior to the start of coding. Coders were trained over a 3-month period and weekly calibration checks were held to discuss any disagreements and minimize coder drift. Reliability was checked across 30% of the videos. Interrater reliability was

calculated for the agreement on the presence or absence of each emotional disclosure as well as for the intensity ratings assigned. The graduate student served as the “gold standard” to which the other observer’s codes were compared; thus, the graduate student’s codes were included in the final analyses for videos that were coded by both observers. Coders had very high agreement on the presence or absence of emotional disclosures (99.69%). The correlation coefficient for the intensity ratings of emotional disclosure between coders was .85.

Maternal emotions. Maternal emotions were coded continuously during the discussions with the 16-code version of the Specific Affect Coding System (SPAFF; Coan & Gottman, 2007) using Mangold INTERACT (Mangold International, GmbH; Mangold, 2017). The SPAFF is divided into positive, negative, and neutral codes, with specific emotions within each dimension. Codes were assigned in a mutually exclusive and exhaustive manner, meaning that only one code was applied at each time point. The lead author trained two undergraduate research assistants to reach 75% agreement prior to the start of coding.

Reliability was based on second-by-second concordance between observers’ ratings across the interaction. All interactions were coded by one of two undergraduate research assistants. The lead author coded approximately 30% of the videos and served as the “gold standard” to which the other observers’ codes were compared, as recommended by Coan and Gottman (2007). Codes from the undergraduate observers were used in the final analyses. Because of the categorical nature of the data, Cohen’s kappa was used to calculate interrater reliability, with a minimum of .70 kappa required for data to be included in final analyses; videos were recoded until this reliability criterion was met. Weekly calibration checks and discussions were conducted to minimize coder drift. The average kappa across all codes was .77 (range = .62 to .88). To test the main study hypotheses, codes were collapsed into three categories: negative, interest, and validation. Negative emotions included contempt, criticism, defensiveness, stonewalling, domineering, anger, sadness, whining, disgust, and tension. These codes were collapsed into a single negative emotion score. Interest was coded as behaviors that demonstrated genuine interest in and curiosity about the adolescent’s point of view or feelings (e.g., open-ended questions, positive nonverbal attention). Validation was coded as behaviors that communicated sincere understanding of the adolescent’s point of view or feelings (e.g., direct expressions of understanding, paraphrasing, back channeling; see Coan & Gottman, 2007 for a detailed description of the coding scheme). Positive emotions (e.g., humor, affection) were also coded but were not included in the present analyses because they were not central to the main study hypotheses. Proportional durations of maternal emotions were derived for analyses by dividing the total duration of each maternal emotion category by the length of the discussion.

Analysis Plan

First, as this is the first study to examine observed adolescent emotional disclosures in younger and older adolescents, we tested age differences in adolescent emotional disclosures. Specifically, we used *t* tests to examine differences across adolescent age in frequency, duration, and intensity of adolescent emotional disclosures and proportional durations of maternal emotions during the

conversations. We then used survival analysis to test our research questions about the associations between adolescent age and maternal emotions and the timing of adolescents' first emotional disclosures during the conflict discussion. Survival analysis is a statistical approach for estimating the timing of events (Singer & Willett, 2003). Events are conceptualized as qualitative changes from one state to another. In the current study, *events* refer to adolescents' transition from not disclosing emotional information to making their first emotional disclosure during the discussion. We used survival analysis to estimate the hazard (the conditional probability of event occurrence within a given time interval; Mills, 2011) of adolescents' first emotional disclosure. We included adolescent age and maternal emotions (validation, interest, and negative affect) as predictors to examine whether the hazard of adolescents' first emotional disclosure was related to these variables. We followed the recommendations for conducting survival analysis with observational data provided in Loughheed, Benson, Cole, and Ram (2018).

Results

Preliminary Analyses

Descriptive statistics for adolescent emotional disclosures (frequency, duration, and intensity) and proportional durations of maternal emotions for the overall sample and across adolescent age are presented in Table 1. Older adolescents had marginally longer proportional durations of emotional disclosures across the conversation compared with younger adolescents, $t(47) = 1.90$, $p = .07$. There were no age differences in the frequency or intensity of emotional disclosures. Mothers of older adolescents spent a longer proportional duration of the conversation validating their adolescents than mothers of younger adolescents, $t(47) = 2.73$, $p = .03$. There were no age differences in maternal interest or negative affect.

We also examined correlations among adolescent emotional disclosures and maternal emotions (see Table 2). The emotional disclosure variables (frequency, duration, and intensity) were generally positively correlated with each other. Mothers who spent a greater proportion of the discussion displaying negative affect were less likely to engage in validation and interest, and maternal

Table 2

Zero-Order Correlations Among Adolescent Emotional Disclosures and Proportional Durations of Maternal Emotions

Variable	1	2	3	4	5	6
1. E Disc Freq	—					
2. E Disc Dur	.62***	—				
3. E Disc Int	.15	.35*	—			
4. M Val	.07	.30*	.22	—		
5. M Int	.01	.18	.29*	.33*	—	
6. M Neg	.13	-.10	-.08	-.61***	-.49***	—

Note. E Disc Freq = adolescent emotional disclosure frequency; E Disc Dur = proportional duration of adolescent emotional disclosure; E Disc Int = average adolescent emotional disclosure intensity; M Val = maternal proportional duration of validation; M Int = maternal proportional duration of interest; M Neg = maternal proportional duration of negative affect.
* $p < .05$. *** $p < .001$.

interest and validation were positively correlated. Mothers who engaged in more validation had adolescents who spent a greater proportion of the discussion disclosing, and adolescents disclosed at higher intensity levels when mothers displayed more interest.

Survival Analysis: Predicting Time to First Adolescent Disclosure From Maternal Emotions and Adolescent Age

Preliminary considerations. Several characteristics of the data were examined prior to conducting the survival analysis. First, we examined the data for censoring. Censoring is a characterizing of time-to-event data and indicates that event timing cannot be known for certain cases (Mills, 2011). Left-censored cases are those for whom the observation period began while the event was occurring, that is, adolescents who disclosed at the beginning of the observation period. In our sample, one case was left censored. Left censoring is problematic in survival analysis, and rather than using list-wise deletion for this one case, we defined the start time for all dyads as the first second of the conversation during which adolescents were not making an emotional disclosure (Singer & Willett, 2003). Right-censored cases are those who did not experience the event at all during the observation—it is possible they

Table 1

Descriptive Statistics for Adolescent Emotional Disclosures and Proportional Durations of Maternal Emotions Across Adolescent Age

Variable	Overall sample			Younger adolescents			Older adolescents		
	Min	Max	<i>M</i> (<i>SD</i>)	Min	Max	<i>M</i> (<i>SD</i>)	Min	Max	<i>M</i> (<i>SD</i>)
Adolescent emotional disclosures									
Emotional disclosure frequency	0	23.00	3.90 (4.23)	0	23.00	3.79 (5.01)	0	9.00	4.05 (3.01)
Emotional disclosure duration	0	.53	.09 (.11)	0	.25	.06 (.08)	0	.53	.13 (.14)
Emotional disclosure intensity	0	3.00	1.12 (.68)	0	3.00	1.17 (.73)	0	2.07	1.05 (.61)
Maternal emotions									
Validation	0	.42	.11 (.10)	0	.34	.08 (.08)	0	.42	.15 (.11)
Interest	0	.39	.10 (.09)	0	.39	.11 (.09)	0	.25	.08 (.08)
Negative	0	.88	.28 (.22)	0	.69	.30 (.19)	0	.88	.25 (.25)
Survival time									
First emotional disclosure (in s)	Min	Max	Median	Min	Max	Median	Min	Max	Median
	2.00	622.00	121.00	6.00	603.00	99.50	2.00	622.00	123.00

Note. $N = 49$. Disclosure duration refers to the proportion of time during discussion adolescent spent disclosing, adjusting for overall discussion length. Min = minimum; Max = maximum.

did after the observation period ended, but it is unknown, as in the case of adolescents who did not make any emotional disclosures during the conversation. Right censoring is not considered problematic for survival analysis. In our sample, four adolescents did not make an emotional disclosure and were right censored.

We also examined the distribution of survival times. Figure 1a shows the survival times along the x -axis, indicated by the length of the gray bars, with bars stacked vertically along the y -axis in order of adolescents' survival time. Red (light gray) points at the right end of each bar indicate the time at which each adolescent first made an emotional disclosure, and black plot points indicate right censoring. Predictor variables were examined for normality of distributions and outliers. No deviations from normality or outliers were identified. Descriptive statistics for all variables used in the survival analysis are presented in Table 1.

Model fitting and results. We fit a single-episode Cox regression model to examine the associations between adolescent age and maternal emotions and the hazard of adolescents' first emotional disclosure during the discussion. The equation for this model is as follows:

$$h_{ik} = h_{0k} \{ \exp(\beta_1 \text{age}_i + \beta_2 \text{Validation}_i + \beta_3 \text{Interest}_i + \beta_4 \text{Negative}_i + \beta_5 \text{Age} \times \text{Validation}_i + \beta_6 \text{Age} \times \text{Interest}_i + \beta_7 \text{Age} \times \text{Negative}_i) \} \quad (1)$$

where h_{ik} , the hazard of first emotional disclosure for adolescent i at time k , is modeled as a function of the baseline hazard function, h_{0k} , and the linear combination of the predictor main effects and interaction terms (β coefficients). As a first step, we fit the equation with main effects only, and in a second step we added in interaction terms to test the full model expressed in Equation 1.

We used the *coxph()* function of the survival package (Therneau, 2015) in R (R Core Team, 2016) for survival analysis. First, we fit a null (baseline hazard) model to the data to examine the survival function. Figure 1b shows the estimated survival function for the null model, which is the proportion of adolescents who had not yet made their first emotional disclosure at each second of the

discussion. The survival function is quite steep at earlier time points and then becomes less steep over time, indicating that first emotional disclosures tended to occur relatively early during the discussion.

Next, we added predictors to the model to estimate the hazard of adolescents' first emotional disclosure from adolescent age (younger vs. older) and the proportional durations (mean centered) of maternal observed emotions (validation, interest, and negative affect). To test the proportional hazards assumption for each predictor in the model, we examined the Schoenfeld residuals using the *cox.zph()* function from the survival package (Therneau, 2015). Significant deviation of observed values from expected values of the predictors indicates that the hazards are not proportional (Mills, 2011). The results of this test indicated that the associations between event times and all predictors (main effects and interactions) were adequately captured under the proportional hazards assumption (all $ps > .10$). Regarding goodness of model fit, the likelihood ratio test was significant, $\chi^2(4) = 11.47$, $p = .02$, indicating that the predictors significantly improved the fit of model compared to the null model. We also plotted model residuals to see whether any individual cases exerted undue influence on the model results (Mills, 2011) and did not identify any such cases. Taken together, we concluded that the model fit the data well and did not violate model assumptions.

Results for the model are reported in Table 3. Hazard ratios are the primary statistic for interpretation in survival analysis and can be interpreted similarly to odds ratios (Mills, 2011). Hazard ratios equal to 1 indicate no association between the predictor and the hazard, values greater than 1 indicate an increased likelihood of the outcome at higher predictor values, and values less than 1 indicate a decreased likelihood of the outcome and higher levels of the predictor. Hazard ratios can also be interpreted in terms of the percentage change in hazard by subtracting 1 from the hazard ratio and multiplying the result by 100 (Mills, 2011). Contrary to expectations, the main effects of adolescent age (β_1), maternal

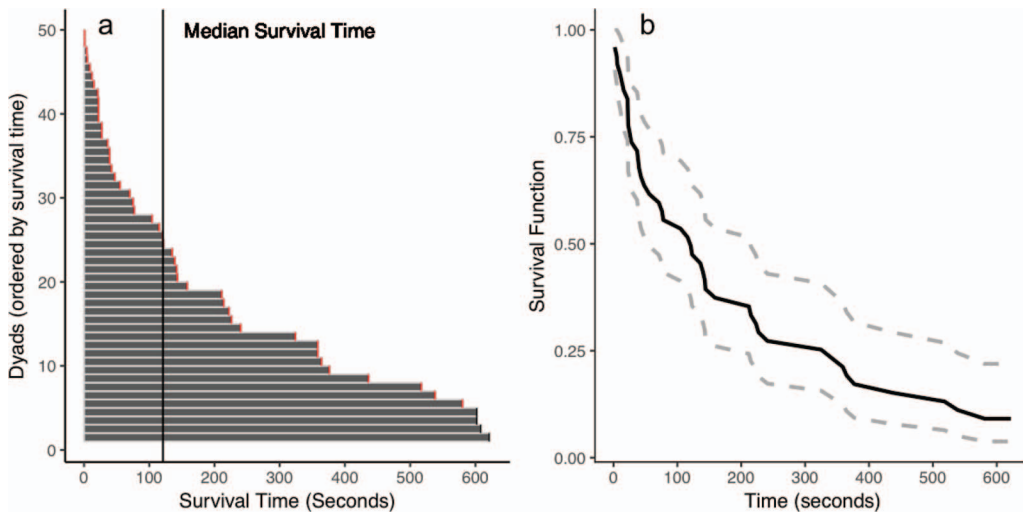


Figure 1. Panel a: Survival times for each adolescent. Panel b: Survival function for the baseline hazard model. Dashed lines indicate 95% confidence intervals. See the online article for the color version of this figure.

Table 3
Results for Survival Analysis Model Predicting Time Until Adolescents' First Emotional Disclosure

Predictor	Estimate	SE	<i>p</i>	Hazard ratio	95% confidence interval of hazard ratio
Step 1 (main effects only)					
β_1 age	-.20	.35	.57	1.22	[.42, 1.62]
β_2 maternal validation	.03	.02	.07	1.04	[1.00, 1.08]
β_3 maternal interest	.04	.02	.11	1.03	[.99, 1.09]
β_4 maternal negative affect	.01	.01	.27	1.01	[.99, 1.03]
Step 2 (full model)					
β_1 age	-.11	.35	.75	.89	[.45, 1.77]
β_2 maternal validation	-.03	.04	.37	.97	[.90, 1.04]
β_3 maternal interest	.07	.03	.02	1.07	[1.01, 1.13]
β_4 maternal negative affect	-.01	.01	.41	1.01	[.97, 1.01]
β_5 Age \times Maternal Validation	.13	.05	.01	1.14	[1.04, 1.25]
β_6 Age \times Maternal Interest	.01	.05	.81	1.01	[.93, 1.10]
β_7 Age \times Maternal Negative Affect	.06	.02	.01	1.06	[1.02, 1.11]

Note. Age: 0 = younger, 1 = older.

validation (β_2), maternal interest (β_3), and maternal negative affect (β_4) were not significant (see Step 1 in Table 3).

Regarding interactions between maternal emotions and adolescent age, the interaction between adolescent age and maternal interest (β_6) was not significant. There were significant interactions between adolescent age and maternal validation (β_5); see Figure 2a for the estimated survival functions with separate lines for each age and different levels of maternal validation. This interaction was followed up with separate Cox regressions for each age group (Kleinbaum & Klein, 2012) to determine which estimated slopes were significantly different from one another. Older

adolescents whose mothers expressed high validation were more likely to disclose earlier (see Figure 2a, solid blue [light gray] line) in the discussion than older adolescents whose mothers expressed low validation (solid black line; $p = .01$), whereas the timing of younger adolescents' first disclosure did not vary by maternal validation ($p = .26$). The interaction between adolescent age and maternal negative affect (β_7) was also significant; see Figure 2b for the estimated survival functions with separate lines for each age and different levels of maternal negative affect. Older adolescents whose mothers expressed high negative affect were more likely to disclose earlier (solid red [light gray] line) in the discus-

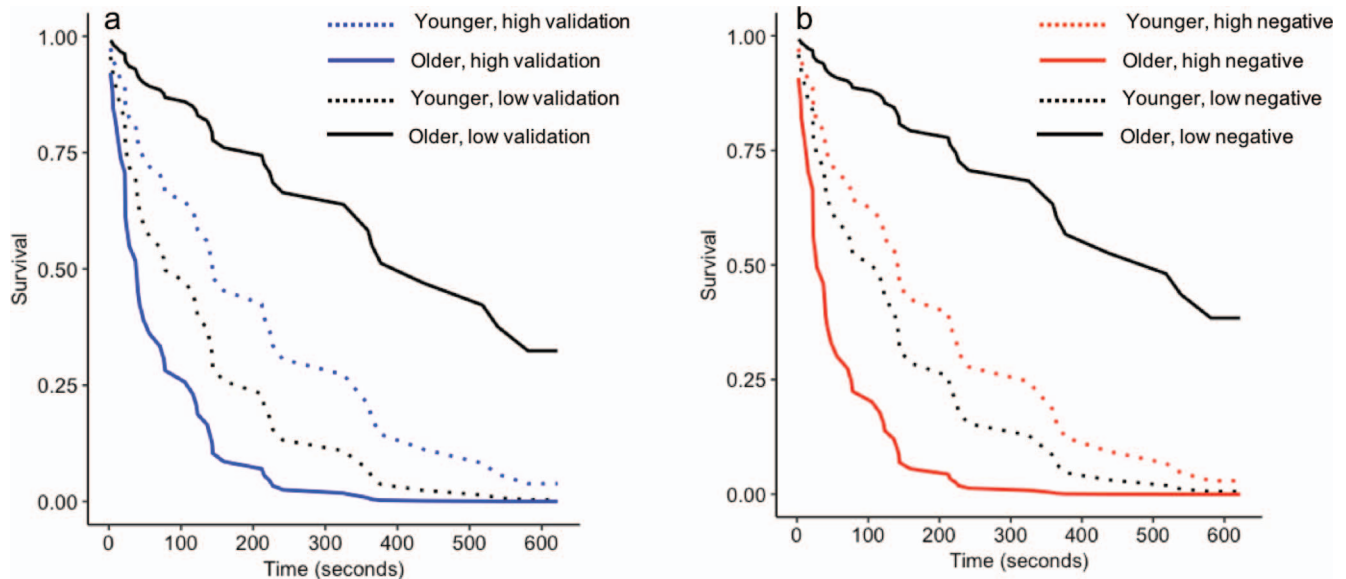


Figure 2. Estimated survival functions for (a) the interaction between adolescent age and maternal validation, and (b) the interaction between adolescent age and maternal negative affect. In Panel a, maternal interest and negative affect are held constant at their means, and high and low levels of maternal validation are represented by ± 1 standard deviation from the sample mean. In Panel b, maternal interest and validation are held constant at their means, and high and low levels of maternal negative affect are represented by ± 1 standard deviation from the sample mean. See the online article for the color version of this figure.

sion than were older adolescents whose mothers expressed low negative affect (solid black line; $p = .01$). The timing of younger adolescents' first emotional disclosure did not vary by maternal negative affect ($p = .30$).

Taken together, only older adolescents disclosed more quickly about emotional events in the context of high maternal negative affect or high validation. In contrast, the timing of younger adolescents' emotional disclosures did not vary by maternal emotion type. Somewhat contrary to expectations, this suggests that not only validation, but also negative affect, may be features of high-quality mother-adolescent relationships in older adolescence, when parent-adolescent relationships are more egalitarian (Steinberg, 1990) and negative emotions may be more readily expressed.

Discussion

The present study is the first to our knowledge to examine associations between observed parental emotions and the timing of observed adolescent emotional disclosures in the context of parent-adolescent interactions. Mothers of older adolescents spent a greater proportion of the discussions validating their adolescents. Though there were no age differences in frequency, duration, or intensity of emotional disclosures across the discussions, there were interactions between maternal validation and negative affect and adolescent age in predicting the timing of adolescents' emotional disclosures. In the following sections we discuss these findings in more detail and address implications of this study for applying observational methodologies and dynamic statistical techniques to research on adolescent disclosure and parent-adolescent relationships.

Adolescent Age Differences in Maternal Emotions and Adolescent Emotional Disclosures

Mothers of older adolescents spent a greater proportion of time during the discussions validating their adolescents. Given that perspective taking and other cognitive abilities improve (Eisenberg, Cumberland, Guthrie, Murphy, & Shepard, 2005; Van der Graaff et al., 2014) and attempts to establish autonomy are perceived by parents as appropriate in late adolescence compared with early adolescence (Feldman & Quatman, 1988), it is possible that mothers perceived older adolescents' thoughts and feelings as clearer and more justified compared with younger adolescents. Indeed, rapid changes in cognitive development from early to late adolescence allow adolescents to be more effective at stating their point of view and advocating for their position during disagreements (Kuhn & Udell, 2007).

Contrary to research that is based primarily on self-report showing that routine disclosures decrease across adolescence (e.g., Smetana et al., 2009), there were no age differences in the observed frequency, duration, or intensity of emotional disclosures. This suggests that there may be a self-presentation bias such that younger adolescents overreport disclosure to parents or older adolescents underreport how much they disclose to their parents. These age differences in reported disclosures may reflect developmental changes in adolescents' perceptions of appropriateness of disclosure to parents and in the domains of topics deemed necessary to disclose to parents given increasing time spent outside the home (Rote & Smetana, 2016). However, it is important to note

that most of the existing research on developmental changes in adolescent disclosure to parents is based on routine disclosures (i.e., what adolescents tell their parents about their whereabouts and activities, see Tilton-Weaver et al., 2014 for an excellent review on distinct types of disclosure). Thus, there may be a decline in adolescent disclosure to parents about their whereabouts and activities because parents are perceived to have less jurisdiction over these domains in late adolescence compared with early adolescence (Laird, Pettit, Dodge, & Bates, 2003; Rote & Smetana, 2016). In contrast, emotional disclosure may not show these changes because parents continue to remain an important source of emotional support across adolescence (Smetana et al., 2006). Furthermore, adolescents' disclosure of information is influenced by factors beyond emotional communication, including adolescents' perceptions of the appropriateness of parental authority over the issue at hand (Smetana et al., 2006), obligations to disclose about a particular topic (Cumsille, Darling, & Martínez, 2010) and the domain under which the issue falls (e.g., Rote & Smetana, 2016). Therefore, our findings should be interpreted in the context of emotional self-disclosure and may not apply to routine disclosures. However, given the relative lack of research on emotional disclosures in adolescence and the importance of emotional development during this period (see Morris et al., 2017), we believe the current study makes important contributions to the literature on emotional self-disclosure in parent-adolescent relationships.

Predicting Timing of Adolescent Emotional Disclosures From Maternal Emotions and Adolescent Age

Though there were no main effects of adolescent age or maternal emotions on the timing of adolescent emotional disclosures, the associations between maternal validation and negative affect and the timing of adolescent emotional disclosures varied by adolescent age. Specifically, older adolescents whose mothers expressed high levels of validation or high levels of negative affect were more likely to disclose about emotional events earlier in the discussion than older adolescents whose mothers expressed less validation or negative affect. These interactions were present adjusting for main effects of adolescent age and all maternal emotions, suggesting that these patterns were unique to these specific maternal emotions in later adolescence.

Although we did not hypothesize that negative affect would be predictive of shorter time to disclosure, our findings shed light on possible developmental differences across adolescence in the functions of negative affect in the context of adolescent disclosure to mothers. Parent-adolescent relationships become more egalitarian in late adolescence (Collins & Laursen, 2004; Steinberg, 1990; Youniss & Smollar, 1985). Thus, negative affect may be more readily expressed by mothers of older adolescents in conflict contexts because mothers may feel that their adolescents are more capable of listening and responding appropriately to their concerns. Indeed, though we did not examine adolescent emotions in the current study, older adolescents and mothers were more likely to engage in patterns of mutual validation during these discussions (Main et al., 2016). Additionally, emotion regulation abilities typically improve across adolescence (see Steinberg, 2005). Such development may have allowed mothers of older adolescents to feel more

comfortable expressing negative emotions in the context of conflict discussions because they may have had more confidence that their adolescents are able to cope with their expressed negativity. An important future direction would be to examine whether observed affective patterns between parents and adolescents facilitated parent disclosure in addition to adolescent disclosure (see Chaparro & Grusec, 2015).

These findings add to a growing body of literature that negative affect is not always bad. This is consistent with a functionalist framework (see Campos, Mumme, Kermoian, & Campos, 1994) in which negative emotions serve particular purposes in specific contexts. In the present study, mothers and adolescents were asked to resolve a conflict. Successful conflict resolution involves validation and curiosity about the other's perspective (Halpern, 2007), but open communication to the partner about one's negative emotions related to the conflict may also be a feature of successful resolution (Dailey, 2006). Thus, mothers' open expressions of negative affect about the conflict topic at hand may have communicated to the adolescent that the topic was significant and that the mother viewed the adolescent as an equal. Thus, negative affect as well as validation among mothers of older adolescents expressed during everyday conversations might facilitate quicker emotional disclosures in dyads characterized by these affective patterns; indicators of high-quality relationships during this specific developmental period.

Though maternal emotions may have facilitated quicker disclosures in dyads with older adolescents, it is also possible that adolescent emotional disclosures early in the conversation resulted in greater maternal validation in some dyads, whereas other mothers responded negatively to such disclosures. This bidirectional interpretation is consistent with research demonstrating that adolescent disclosure facilitates relationship development over time and that associations between adolescent disclosure and parental behaviors are transactional in nature across larger timescales (Laird, Marrero, Melching, & Kuhn, 2013; Tilton-Weaver et al., 2010). Important future directions include testing whether the type of parental response to adolescent disclosures impacts the likelihood of subsequent disclosures within real-time parent-adolescent interactions and whether these observed parental responses impact the quality of the relationship over time.

Taken together, these findings raise some interesting questions about the nature of the relationship between maternal emotions and adolescent emotional disclosures during real-time interactions. Most research on adolescent disclosure to date has largely relied on adolescent self-reports of how often, when, and in the context of what parental behaviors emotions adolescents are likely to disclose. This research thus largely reflects adolescents' perceptions of parental behaviors that facilitate or inhibit their tendency to disclose to parents. Although these perceptions are important, there is often shared method variance (e.g., self-report) across measurement of adolescent disclosures and perceptions of parental behaviors that may artificially inflate associations between these variables. In contrast, our approach measured disclosures and maternal emotions via observations from two different coding teams (i.e., different observers coded for maternal emotions and disclosures), reducing the risk of bias. Most importantly, the use of a statistical method that estimates the timing of events complements the more common approach of self-report measures by

allowing an examination of disclosures as they unfold in situ during parent-adolescent interactions.

Limitations and Future Directions

Some limitations in the present study warrant mentioning. First, though these affective patterns may reflect general features of the parent-adolescent relationship (see Granic, 2005), the present study did not assess mother and adolescent perceptions of relationship quality. Assessment of overall relationship quality would shed light on whether the observed dynamics reflect consistent patterns within the relationship, facilitating quicker disclosures, or whether these emotions were in direct response to adolescent emotional disclosures during the conversations.

Second, the present study included only mothers. Future research with fathers and other caregivers (e.g., stepparents, adoptive parents, grandparents), as well as contexts in which both parents are present, would further our understanding of influences on the timing of adolescent disclosure. Furthermore, given the important emotion regulatory influence of peers in adolescence (Lougheed et al., 2016) and increasing emotional disclosures to peers during the period, future studies could examine temporal relationships between peer emotions and adolescent disclosures.

Third, though the present study is unique in that it captured observed adolescent emotional disclosures and maternal emotions, it will be important in future research to test whether there is convergence between adolescents' observed disclosures and their self-reports of disclosure. Adolescents and parents often have divergent expectations about what constitutes as routine disclosure versus voluntary self-disclosure of private information (Hawk, Hale, Raaijmakers, & Meeus, 2008; Tilton-Weaver et al., 2014), suggesting that adolescents' perceptions of what constitutes as disclosure to parents is important. Furthermore, the present study focused on the timing until first emotional disclosure using categorical methods, but it would also be informative to examine dynamic associations between maternal emotions and the depth (i.e., intensity) of such disclosures (see Martin et al., 2018).

Fourth, the sample size in the present study is relatively small and the findings should be interpreted with caution. The confidence intervals for the effect sizes (i.e., hazard ratios) observed in our study were quite small (ranging from 1.06 to 1.14, with 1.00 indicating a null value), suggesting that the effects are small but present. Power analyses in survival analysis require an estimate of the effect size (i.e., hazard ratio) that researchers expect to find. Because this is the first study to our knowledge to examine the timing of adolescent disclosures, we could not make these a priori estimates. On the basis of a post hoc power analysis (which we acknowledge must not be interpreted as the statistical power of the current study because it reflects the power to detect effects that were found; see Hoenig & Heisey, 2001), a sample with 45 observed events would have 89% power to detect a hazard ratio of 1.14 (Kleinbaum & Klein, 2012). Our hope is that the results of our study will enable researchers to conduct informed power analyses for their own studies of observed disclosures that will enable greater confidence in this nascent area of work.

Despite these limitations, this is the first study to our knowledge to assess these associations on a moment-to-moment timescale. Future research examining such contingencies using multiple methods (e.g., observed and self-reported) and across multiple

timescales (e.g., how dynamics within conversations develop over weeks, months, and years) is needed to better understand how these processes change across adolescence.

Conclusion and Implications

The observational methodology in the present study sheds light on parental emotion-related behaviors that are associated with adolescent disclosure in everyday parent–adolescent interactions. Though not explicitly instructed to do so, most adolescents across both age groups spontaneously disclosed about emotional experiences during a conflict discussion in the lab. The only study to our knowledge that has used observational measures of adolescent emotional disclosures did so during a task that encouraged adolescents to talk with their parents about a topic for which they wanted support (Hare et al., 2011). Previous research shows that parents primarily obtain information about their adolescents across different contexts through spontaneous adolescent disclosure (e.g., Stattin & Kerr, 2000; Tucker, Wiebe, Main, Lee, & White, 2018). Thus, measurement of adolescents' observed spontaneous disclosure in contexts in which they are not explicitly instructed to disclose makes an important contribution to our understanding of adolescent disclosure to parents in everyday situations.

Because adolescents increasingly spend more time outside the home, the positive effects of disclosure on adolescent adjustment will likely be gleaned only if parents can engage in behaviors that facilitate disclosure to happen somewhat quickly during conversations and respond to such disclosures with validation. Thus, the present study holds implications for interventions with parents and adolescents struggling with a lack of disclosure or high levels of secrecy in their relationship. Specifically, parents should not necessarily be discouraged from expressing negative affect with older adolescents, as it may help to create the context for a productive discussion. Furthermore, open communication and validating adolescents' perspectives should be promoted. Observational methods combined with statistical techniques that capture temporal aspects of emotions in real time are crucial to informing more targeted interventions with families during this important developmental period.

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Received October 10, 2017

Revision received May 29, 2018

Accepted June 4, 2018 ■