*Journal of Pediatric Psychology*, 41(1), 2016, 117–127
doi: 10.1093/jpepsy/jsv016
Advance Access Publication Date: 21 March 2015
Topical Review



# Topical Review: Families Coping With Child Trauma: A Naturalistic Observation Methodology

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Received September 6, 2014; revisions received January 27, 2015; accepted February 4, 2015

## Abstract

**Objective** To introduce a novel, naturalistic observational methodology (the Electronically Activated Recorder; EAR) as an opportunity to better understand the central role of the family environment in children's recovery from trauma. **Methods** Discussion of current research methods and a systematic literature review of EAR studies on health and well-being. **Results** Surveys, experience sampling, and the EAR method each provide different opportunities and challenges for studying family interactions. We identified 17 articles describing relevant EAR studies. These investigated questions of emotional well-being, communicative behaviors, and interpersonal relationships, predominantly in adults. 5 articles reported innovative research in children, triangulating EAR-observed behavioral data (e.g., on child conflict at home) with neuroendocrine assay, sociodemographic information, and parent report. Finally, we discussed psychometric, practical, and ethical considerations for conducting EAR research with children and families. **Conclusions** Naturalistic observation methods such as the EAR have potential for pediatric psychology studies regarding trauma and the family environment.

**Key words**: accidents and injuries; family functioning; posttraumatic stress; research design and methods.

Research into the effects of trauma on children's lives has accumulated substantially in the past two decades. We have a better understanding of exposure to traumatic events in children (Copeland, Keeler, Angold, & Costello, 2007), their recovery trajectories (Le Brocque, Hendrikz, & Kenardy, 2010a), screening tools to identify those at risk of later psychological difficulties (Kramer, Hertli, & Landolt, 2013), predictors of persistent posttraumatic stress (Alisic, Jongmans, Van Wesel, & Kleber, 2011; Cox, Kenardy, & Hendrikz, 2008), and the effects of various interventions (Foa, Keane, Friedman, & Cohen, 2008). Family environment factors are emerging as central in children's recovery (McDonald & Deatrick, 2011). In this article, we discuss the methodologies used to understand family influences and introduce a novel, naturalistic observational methodology as a way to advance knowledge through permitting an unobtrusive, in vivo, observational assessment perspective.

## Recovery From Trauma: The Central Role of the Family

The environment within a family plays a central role in children's mental and physical health (see, e.g., the Risky Families model by Repetti, Taylor, & Seeman, 2002). The roles of parent–child interactions in the development of anxiety disorders (Gar, Hudson, & Rapee, 2005) and mood disorders (Schwartz, Dudgeon, Sheeber, Yap, Simmons, & Allen, 2012) have been well established. Although less common, studies of family environment in children's recovery from trauma also demonstrate the importance of family characteristics and the well-being of family members (see McDonald & Deatrick, 2011 for a review). For example, based on a systems and social ecological model of coping (Kazak, 1989), Boyer, Hitelman, Knolls, and Kafkalas (2003) found that family functioning predicted posttraumatic stress in children and young adults with a spinal cord injury. Family functioning also influenced functional independence through its effect on the severity of posttraumatic stress. In another study on various types of pediatric injury, children in families that showed high levels of expressiveness had less severe posttraumatic stress symptoms than children in families low on expressiveness (Schreier, Ladakakos, Morabito, Chapman, & Knudson, 2005). Family environment factors have also been shown to affect children's psychosocial and functional recovery after complex medical procedures (Jobe-Shields et al., 2009; Phipps, Dunavant, Lensing, & Rai, 2005) and traumatic brain injury (Yeates, Taylor, Walz, Stancin, & Wade, 2010). Of the various family factors studied, the role of parental distress has been particularly prominent. One of the first theoretical models focusing on the relation between parental and child mental health after trauma was the Relational posttraumatic stress disorder model by Scheeringa and Zeanah (2001). Two subsequent meta-analyses have confirmed that parental traumatic stress and parental depressive symptoms were important predictors of child distress after a traumatic event (Alisic et al., 2011; Morris, Gabert-Quillen, & Delahanty, 2012). Finally, qualitative studies also point to the role that parents play in trauma recovery, including providing a sense of connectedness and opportunities to express emotions and process the experience (see Van Wesel, Boeije, Alisic, & Drost, 2011 for a review).

## Strengths and Limitations of Current Methods

Research in this field often relies on global self-report measures completed by parents, such as the Family Environment Scale (Moos & Moos, 1994) and the Parent Support-Control Questionnaire (Lilley, 2003). These measures aim to assess broad constructs to characterize familial and parenting characteristics—for example, parental warmth (Le Brocque, Hendrikz, & Kenardy, 2010b) and family conflict (Liber, List, Van Loey, & Kef, 2006). Such research provides a theoretically and practically valuable perspective on how the family climate is perceived by family members. However, in adopting a first-person, global perspective, these methods can yield only limited information about everyday family interpersonal interactions (Repetti, Reynolds, & Sears, 2015). Families are complex, interactive systems, and the family ecosystem comprises countless reciprocal microinteractions between members. The richness of this system is difficult to fully characterize through self-report measures. Many communicative behaviors are so subtle and habitual that people have difficulty remembering and therefore reporting on them, and one's ability to objectively report on the reciprocal and interdependent communication patterns within one's own family system may be limited (cf. Trull & Ebner-Priemer, 2013).

Some researchers have examined how parents and children process stressful situations such as injuries or Emergency Department visits by eliciting retrospective parent–child discussions about these events (Bauer et al., 2005; Sales, Fivush, & Peterson, 2003). For example, Bauer and colleagues showed that maternal use of emotion language in conversations with their children about a traumatic event predicted children's use of emotion language 6 months later. While this methodology provides rich information about the content and style of parent–child reminiscing, the prompted, retrospective, and laboratory nature of this paradigm does not allow for a fine-grained understanding of whether, when, or how traumatic experiences are discussed within families in daily life. Moreover, the generalizability of both self-report and laboratory findings to everyday life has been questioned because of the variations in parental behaviors related to the context in which they are measured (Repetti et al., 2015; Tobin et al., 2014).

Finally, experience sampling methods, which ask participants to report about their state and experiences in real time (Smyth & Heron, 2014) have facilitated a significant advancement in how we study interaction processes in the real world. For example, Tan and colleagues (2012) used this method to study emotional reactivity and regulation in youth by means of multiple brief phone calls during the day. Youth with anxiety reported similar levels of negative emotions during momentary reports of current emotion compared with those without anxiety. However, youth with anxiety reported higher levels of past-hour peak intensity of these emotions, indicating differences in the retrospective appraisal of their experiences, as well as differences in regulation strategies. While experience sampling mitigates some of the biases introduced by

**Table I.** A Comparison of Three Methods: Survey, Experience Sampling, and the EAR

| Method aspect | Survey | Experience sampling | EAR |
|---|---|---|---|
| Approach | Efficiency oriented | Ecologically oriented | Ecologically oriented |
| Medium | Paper and pencil, electronic | Paper and pencil, electronic | Electronic |
| Mode | Active (data provided through voluntary response) | Active (data provided through voluntary response) | Passive (data collected through automatic recording) |
| Method | Global self-report | Momentary self-report | Behavioral observation |
| Perspective | Self (agent) | Self (agent) | Other (observer) |
| Awareness of assessment | High | High | Low after habituation |
| Burden for participant | Practical (time to participate) | Practical (interruption of daily life) | Psychological (intrusion of privacy) |
| Burden for researcher | Minimal | Preparing participants (instruction and training) | Preparing the sound data (coding and transcribing) |
| Data collection limited by | Retrospection, impression management, self-insight | Response burden, impression management, self-insight | Privacy considerations, self-censoring, laboratory capacity for data coding |
| Optimized for assessment of | Subjective beliefs and personal self-concept | Subjective experiences and perceptions | Objective social environments and interactions |
| Child-friendliness | Challenging for some children, depending on age and abilities | Challenging for some children, depending on age and abilities | Young children and children with cognitive/language limitations can wear the EAR |

retrospective reporting, a drawback is that the monitoring and reporting required create a response burden for families at times of stress. In addition, this method still provides an exclusively first-person assessment perspective, relying on the subjective perceptions of family members, and can potentially influence behavior through the self-monitoring involved in repeatedly answering questions.

## Naturalistic Observations: The Electronically Activated Recorder

A naturalistic observational approach could complement existing global and momentary self-report-based assessment approaches to understanding family functioning and interactions in daily life after a traumatic event. In particular, the Electronically Activated Recorder (EAR; Mehl, Pennebaker, Crow, Dabbs, & Price, 2001) has been developed to facilitate such in vivo observations. The EAR captures segments of acoustic information from participants' daily life over hours, days, or, potentially, weeks. It yields an acoustic log of daily activities and interactions as they naturally unfold and is one of the few ways to collect person-centered behavioral observational data in a natural environment (Campos, Graesch, Repetti, Bradbury, & Ochs, 2009). Unlike experience sampling methods, and important for minimizing reactivity and socially desirable responding, the participant is unaware exactly when the EAR is recording. In addition, the EAR facilitates research with groups for whom self-report methods might be particularly difficult—for example, young children, or children with cognitive and expressive language limitations. Children neither need to understand the method (in the way that they would need to understand the meaning of questions asked using other methods) nor be able to communicate responses verbally or in writing. The method also does not place any cognitive demands on children in terms of attention span. This is especially valuable for children who have been exposed to trauma or a serious illness, as stress symptoms are related to concentration difficulties (Saigh, Mroueh, & Bremner, 1997). An overview of the similarities and differences between surveys, experience sampling, and the EAR is provided in Table I.

The EAR is an iPod touch or iPhone device loaded with a free application called iEAR. The device is worn in a protective case attached to a belt or clothing, and unobtrusively records segments of ambient sound of customizable length at random or periodic intervals (e.g., 30 s every 5 min). It generates large sets of sound files that can be transcribed and coded, and used as input for both quantitative and qualitative analyses. For example, verbatim transcripts of utterances can be readily submitted to automatic text analysis using Linguistic Inquiry and Word Count software (Pennebaker, Booth, & Francis, 2007). This software calculates the frequency with which people use different categories of words, such as words referring to cognition, affect, and social interactions (see below for an example on frequency of swear words and emotional support in women with a serious illness by Robbins et al., 2011). In addition, EAR researchers have developed and adjusted behavioral coding systems for capturing aspects of the participant's

momentary locations, activities, and interactions (Mehl, Robbins, & Deters, 2012). For example, this coding allows researchers to determine the proportion of time that people spend in the company of others, and relate this information to psychosocial outcomes.

## Review of Health and Well-Being Studies Using the EAR

Recent years have seen an increase in the number of EAR studies conducted, in fields as varied as organizational psychology, social and personality psychology, and clinical and health psychology. Through a systematic search in Google Scholar, Medline, and PsychInfo, we identified 17 peer-reviewed articles describing use of the EAR in empirical studies concerning health and well-being. In these articles, the EAR was used to investigate questions of emotional well-being, communicative behaviors, and interpersonal relationships, predominantly in adults. Example studies in each of these domains are described below, while Table II provides a full overview. The samples involved nonclinical and clinical populations, including populations facing physical health challenges. In nonclinical populations, the method has been used to describe patterns in daily life that relate communicative and interpersonal behaviors to *emotional well-being*. For example, Mehl, Vazire, Holleran, and Clark (2010) found that higher well-being in healthy adults was associated with spending less time alone, more time talking with others, engaging in less small talk, and engaging in more substantive conversations. While the well-being measures included self- and informant reports, the interactions where directly observed with the EAR, which ensures that results are not influenced by shared method variance. The authors concluded that "the happy life is social rather than solitary, and conversationally deep rather than superficial" (Mehl et al., 2010, p. 540).

Several studies have also sought to use the EAR to describe the everyday *communicative behaviors* of individuals experiencing mental illness. Tomko and colleagues (2014), for example, found that while expressions of anger were frequently followed by time spent alone in participants with depression, the same was not true for participants with borderline

**Table II.** EAR Studies on Health and Well-Being

| Number | Article(s) Country | Sample description | Data collection | Main findings |
|---|---|---|---|---|
| 1 | Baddeley, Pennebaker, & Beevers (2013) United States | 29 adults with major depressive disorder and 28 adults who never experienced depression | 4 consecutive days of EAR recording (90 s every 12 min); self-report questionnaires (MINI; SCID) | Individuals with and without major depressive disorder spent similar amounts of time talking, laughing, and with another person. Adults with depression spent less time in groups and used more negative emotion words, particularly in reference to the self, and around romantic partners. Findings suggest social interactions differ in quality but not quantity between people with and without depression. |
| 2 | Brown, Tragesser, Tomko, Mehl, & Trull (2014) United States | 20 adults with borderline personality disorder and 11 adults with a depressive disorder | 3 consecutive days of EAR recording (50 s every 18 min); self-report questionnaires (observed and recalled affect) | No difference between groups on recalled levels of positive or negative affect across different types of interpersonal events. Discrepancies between recalled and observed levels of negative and positive affect for participants with borderline personality disorder for all types of interpersonal events. |
| 3 | Hasler, Mehl, Bootzin, & Vazire (2008) United States | 96 undergraduate students; 79 undergraduate students | 3 days of EAR recording (30 s every 12.5 min); self-report questionnaire (BFI). 5 days of EAR recording (30 s every 12.5 min); self-report questionnaire (NEO-PI-R) | Behavior associated with positive affect varied according to rhythms of participants' average wake time; behavior associated with negative affect did not. |

(continued)

**Table II.** Continued

| Number | Article(s) Country | Sample description | Data collection | Main findings |
|---|---|---|---|---|
| 4 | Holtzman, Vazire, & Mehl (2010) United States | 79 undergraduate students | 4 consecutive days of EAR recording (30 s every 12.5 min); self-report measures (NPI; single item self-esteem scale; BFI) | Students with high self-reported narcissism were rated as behaving in more extraverted and less agreeable ways, skipped class more, and used more sexual language. Links between narcissism and unpleasant behavior were strengthened when self-esteem was controlled for. |
| 5 | Imami, Tobin, Kane, Saleh, Lupro, & Slatcher (2015) United States | 53 predominantly low income youth with asthma (10–17 years) and their families | 4 consecutive days of EAR recording (50 s every 9 min); parent-report measures (maternal income; maternal education; CBCL) | Maternal education, but not income, was positively associated with child positive behaviors, positive affect displayed by mothers and children, and increased maternal responsiveness. Maternal positive affect and responsiveness mediated the relationship between maternal education and child positive affect. |
| 6 | Kim (2008) United Kingdom | 89 Korean-English and Spanish-English bilingual undergraduate students | 2 separate days of audio-recordings, 1 month apart (30 s every 12.5 min); 4 consecutive days of expressive writing in native language and/or English; self-report on expressive writing task. | Participants who wrote in both their native language and English participated in more EAR-observed social engagement 1 month later than did those who wrote only in one language, or controls. |
| 7 | Mehl (2006) United States | 96 undergraduate students | 2 days of EAR recording (30 s every 12.5 min); self-report questionnaire (BDI) | Overall, untrained (lay) raters showed little accuracy in determining participants' levels of depressive symptoms from listening to recordings. They were somewhat more accurate at identifying participants who were moderately or severely depressed compared with those with a mild depression. |
| 8 | Mehl & Pennebaker (2003) United States | 11 undergraduate students or recent graduates | EAR recording, before September 11 (1 or 2 days of recording) and for 10 consecutive days after (30 s every 12 min); self-report questionnaires (BFI; TMMS; IES) | There was no difference in the amount of social interaction before or after the event; however, there was a gradual shift from group to dyadic interactions in the days following. A relative increase in dyadic interactions was marginally related to better psychological adjustment after 2 weeks. |
| 9 | Mehl et al. (2010) United States | 79 undergraduate students | 4 days of EAR recording (30 s every 12.5 min); self-report questionnaires (SWLS; BFI) | Higher well-being was associated with spending less time alone, more time talking with others, engaging in less small talk, and in more substantive conversations. |
| 10 | Robbins, Focella, Kasle, López, Weihs, & Mehl (2011) United States | 13 women with rheumatoid arthritis; | 2 weekends of EAR recording (baseline; 1-month follow-up; 50 s every 18 min); self-report questionnaires (COPE; CES-D) | Swearing in the presence of others was related to increases in depressive symptoms, and decreases in reported emotional support over the study period. |
| | | 21 women with breast cancer | 1 weekend of EAR recording (50 s every 9 min); | Decreases in emotional support mediated the effect of swearing |

(continued)

**Table II.** Continued

| Number | Article(s) Country | Sample description | Data collection | Main findings |
|---|---|---|---|---|
| | | | self-report questionnaires (COPE; CES-D) | on disease-severity-adjusted changes in depressive statements. |
| 11 | Robbins, López, Weihs, & Mehl (2014) United States | 56 women with breast cancer and their spouses | 1 weekend of EAR recording (50 s every 9 min); self-report questionnaires (IES; CES-D) | Cancer was a topic of about 5% of the conversations between couples. Cancer conversations were more often informational than emotional/supportive. The more cancer conversations partners had with their spouses (emotional or informational), the better the patients' adjustment was at follow-up. |
| 12 | Robbins, Mehl, Holleran, & Kasle (2011) United States | 13 women with rheumatoid arthritis | 2 weekends of EAR recording (50 s every 18 min); self-report questionnaires (CES-D; BDI; Pain) | Sighing was positively related to patients' levels of depression, but not to physical symptoms. |
| 13 | Slatcher & Robles (2012) United States | Two parent families of 44 children aged 3–5 years | 1 day of audio recording (150 randomly selected 30 s snippets), parent-report questionnaires (CBCL; parent report of conflict events), salivary cortisol (6 × per day for 2 days) | Greater EAR-assessed child conflict at home was associated with lower waking cortisol and a flatter diurnal cortisol slope, including when controlling for child age, sex, wake-up time, and parent reported externalizing behavior. |
| 14 | Slatcher & Trentacosta (2011) United States | 35 two-parent families with 3–5-year-old children | 2 separate days of audio recording (baseline; 1-year follow-up; 150 randomly selected 30 s snippets); self-and parent-report questionnaires (BDI; CES-D; CBCL) | Direct positive associations found between parental depressive symptoms and child behaviors (concurrent: crying, acting mad, and television watching; prospective: negative emotion word use). |
| 15 | Slatcher & Trentacosta (2012) United States | 35 two-parent families with 3–5-year-old children | 2 separate days of audio recording (baseline; 1-year follow-up; 150 randomly selected 30 s snippets); self- and parent-report questionnaires (BFI; CBQ; SEFQ) | Parents' negative emotionality predicted child problem behaviors and negative emotion word use. Relationships between parent negative emotionality and problem behaviors were moderated by paternal-reported child negative emotionality and mothers' positive and negative expressiveness. |
| 16 | Tobin, Kane, Saleh, Naar-King, Poowuttikul, Secord, Pierantoni, Simon, & Slatcher (2014) United States | 54 youth with asthma (10–17 years) and their caregivers | 4 consecutive days of EAR recording (50 s every 9 min); self- and parent-report questionnaires (PEQ; daily diaries; self-reported asthma symptoms and medications) | Strong associations were found between EAR observed conflict and self-reported asthma symptoms as well as EAR observed wheezing. |
| 17 | Tomko, Brown, Tragesser, Wood, Mehl, & Trull (2014) United States | 25 adults with borderline personality disorder and 13 adults with a depressive disorder | 3 consecutive days of EAR recording (50 s every 18 min); structured clinical interviews | Anger at a previous time interval predicted spending time alone in the subsequent time interval for the group with depression, but not for the group with borderline personality disorder. |

MINI = Mini-International Neuropsychiatric Interview; SCID = Structured Clinical Interview for DSM Disorders; BFI = Big Five Inventory; NEO-PI-R = NEO Personality Inventory Revised; NPI = Narcissistic Personality Inventory; CBCL = Child Behavior Checklist; TMMS = Trait Meta-Mood Scale; IES = Impact of Event Scale; SWLS = Satisfaction With Life Scale; CES-D = Center for Epidemiologic Studies Depression Scale; SEFQ = Self-Expressiveness in the Family Questionnaire.

personality disorder (BPD). Possible interpretations included that, for those with BPD, the likelihood of experiencing anger was not contingent on social stimuli, but that they were more likely to continue with or seek out social interaction after an aversive experience. This interpretation resonates with the fear of abandonment and intolerance of being alone reported as core symptoms of BPD and stands in contrast with the social withdrawal associated with aversive social experiences in depression, and as enacted by the participants in this study.

In the same sample, Brown, Tragesser, Tomko, Mehl, and Trull (2014) found that participants with BPD recalled more intense *interpersonal experiences* of positive and negative affect than the levels objectively rated based on the audio data from the same interpersonal events. This echoed previous findings that individuals with BPD experience difficulties labeling their own emotional experiences (Suvak et al., 2011) and was interpreted as supporting Linehan's theories of emotional invalidation in the etiology of BPD (see Linehan & Koerner, 1993). Together, these studies demonstrate the potential of the EAR method for investigating day-to-day behavioral features associated with some well-accepted psychological constructs in the study of mental health, and the potential for EAR data in triangulating and comparing information from multiple sources (e.g., the comparison of retrospective self-report data about interpersonal events with information recorded at the actual moment of those events).

The EAR method has also been used to understand psychological well-being and behavior in the context of *physical health challenges*. In particular, these studies focus on the ways in which communicative behaviors in those affected by health issues may relate to their well-being, the well-being of those around them, and the level of support that they receive. Robbins, Mehl, Holleran, and Kasle (2011) found that sighing was an observable indicator of elevated depressive symptoms in women with rheumatoid arthritis. In a combined sample of the same women with rheumatoid arthritis and women with breast cancer, Robbins and colleagues (2011) reported that swearing by patients was associated with a decrease in emotional support and increase in depressive symptoms over the 2–4-month study period. Furthermore, only swearing in the presence of others predicted these declines, suggesting a direct interpersonal cost of this behavior. In a sample of women with breast cancer, Robbins, López, Weihs, and Mehl (2014) found that most cancer-related conversations between these women and their partners were informational in content. They also noted that partners spoke about cancer to others much less frequently than did patients, and made fewer emotional disclosures during cancer-related conversation with patients, taking on a more supportive role. Overall, having more frequent conversations about cancer was related to decreases in avoidance/intrusive thoughts for patients, and informational conversations were associated with reduction in patients' depressive symptoms. Unexpectedly, the frequency of conversations conveying emotional, rather than informational, support was largely unrelated to psychological well-being. This demonstrates how the EAR method can highlight ways in which day-to-day, naturally occurring, and seemingly mundane behaviors are associated with participants' well-being.

Finally, an area with potential for expansion is the application of the EAR method with *children*. So far only two EAR studies in children have been reported, yielding five articles. Slatcher and Trentacosta (2011, 2012) used the EAR to assess whether parental negative emotionality and depressive symptomatology were associated with observable aspects of young children's behavior. Negative emotionality in parents was associated with increased negative behaviors in children, including arguing and fighting, and the use of negative emotion words (Slatcher and Trentacosta, 2012). Direct positive associations were found between parental depressive symptoms/negative emotionality and child behaviors in daily life, including negative word use, crying, acting mad, and television watching by children (Slatcher and Trentacosta, 2011). In a related sample, Slatcher and Robles (2012) found that child conflict at home was associated with lower waking cortisol and a flatter diurnal cortisol slope—considered indicative of less healthy cortisol patterns. Interestingly, maternal questionnaire reports of daily parent–child conflict were not associated with the cortisol patterns, suggesting that EAR observations may be more strongly related to various health outcomes than traditional self-report.

Researchers have also used the EAR methodology to investigate influences on emotional well-being and physical health in a sample of youth (10–17 years) with asthma. Tobin and colleagues (2014) found strong associations between EAR-observed family conflict and asthma symptoms including EAR-observed wheezing, while Imami and colleagues (2015) found that higher maternal education was associated with positive behaviors in these youth, positive affect displayed by mothers and children, and increased maternal responsiveness. Maternal positive affect and responsiveness mediated the relationship between maternal education and child positive affect. These studies illustrate how the EAR method can be used to gather rich data from children, including those who are too young to self-report, and be triangulated with other data such as neuroendocrine assay, sociodemographic information, and parent-report while avoiding parent-report biases that may be influenced by the predictive factors (e.g., parental depressive symptoms) that we seek to understand.

## Psychometric, Practical, and Ethical Considerations

Recording sounds of daily life raises various methodological and ethical questions. Here, we discuss the considerations regarding informed consent, data collection, data preparation, and data analysis that are most important for research of the family environment after pediatric trauma. An extensive description of psychometric properties and ethical considerations in adult EAR studies can be found in Mehl et al. (2012). In addition, detailed manuals and protocols for adult and child EAR studies are available through the authors.

### Informed Consent

Perhaps the most prominent ethical issue in EAR studies regards informed consent. Although parents and children undertaking the study will provide consent or assent, EAR studies have the potential to record bystanders without their knowledge. While in many countries, it is legal to record people in public settings, this is more ambiguous in private settings (e.g., in the United States, many, but not all, states allow recording as long as one of the parties has consented). There are several strategies to ensure that the recordings are made in the most transparent way possible. Participants can be asked to inform people with whom they interact that there is a possibility of being recorded. The EAR can be worn with a visible sign warning about the potential of being recorded. Any identifying information such as names and phone numbers is deleted from the recordings (an aspect of the procedures that can be labor intensive and that needs to be considered in the planning stages of a study). Newer versions of iEAR also have a privacy button, guaranteeing participants a prespecified time of no-recording on pressing the button. In addition, in some studies, researchers have given participants the opportunity to listen to their recordings, and delete any as they choose, before the data are processed, giving them control over what is heard by researchers. This procedure is more complex with adolescents, as it can be unclear who should listen to the recordings first—the parents or the adolescent (Margolin et al., 2005). In adult studies, however, typically few sound files (<0.1%) are deleted, indicating the acceptability of the method for participants (Mehl et al., 2012).

### Data Collection

Following a brief (<2 hr) period of habituation, the device tends to be well tolerated and participants report forgetting about it for stretches of time (Mehl & Holleran, 2007). Previous studies have used between one and ten consecutive days of recording, with a maximum of 4 days for children. In one child-focused study, the researchers opted for 1-day recordings only to limit family inconvenience (Slatcher & Trentacosta, 2012). When recording >1 day, it is important that families are instructed about recharging the EAR overnight. In addition, careful attention needs to be paid to correct programming and functioning of the EAR, as well as retrieval of the devices (Tobin et al., 2014). In an ongoing study, the current authors have found that instructing families to conscientiously fill out a basic diary facilitates transcription and coding (Alisic et al., 2015).

### Data Preparation

To ensure quality of the transcriptions, at least two trained research assistants are involved in the transcription, with one being the primary transcriber and the second reviewing and correcting the transcription. The sound files are subsequently coded for the participant's location (e.g., at school, at home), activity (e.g., having a meal, gaming), interaction status (e.g., alone, talking with someone, on the phone), and emotional expression (e.g., laughing, crying) according to a tailored coding scheme. An example of a potential coding scheme for parent–child interactions after a serious injury is given in Figure 1. Ideally, all sound files are independently coded by two research assistants, after which intercoder reliability can be calculated from the double codings using intraclass correlations. It is also possible to assess reliability based on training sets of sound files that are coded by the full group of coders (Imami et al., 2015). Previous EAR studies have reported overall good reliability after coder training, especially for variables that have a clear and specific behavioral referent. For example, in the study by Robbins et al. (2014), intraclass correlations for all coding categories ranged from .76 to .92. Data preparation is probably the most costly aspect of EAR research. In particular, the development of a comprehensive coding system, the extensive training period for research assistants, and the required time for transcription, coding, and de-identification need to be taken into account when planning for an EAR study.

### Data Analysis

As the sound files represent natural units of analysis that do not require further selection of data, the sets of independent coding can be readily averaged across coders and summed per participant (e.g., to obtain the frequency of certain behaviors within a day). Because EAR data and questionnaire data are often combined, an important characteristic of many EAR studies is the avoidance of shared method variance. The analyses can vary from simple descriptive statistics such as frequency distributions to high-end inferential statistical techniques such as actor-partner interdependence models (Robbins et al., 2014), depending on the research questions asked.

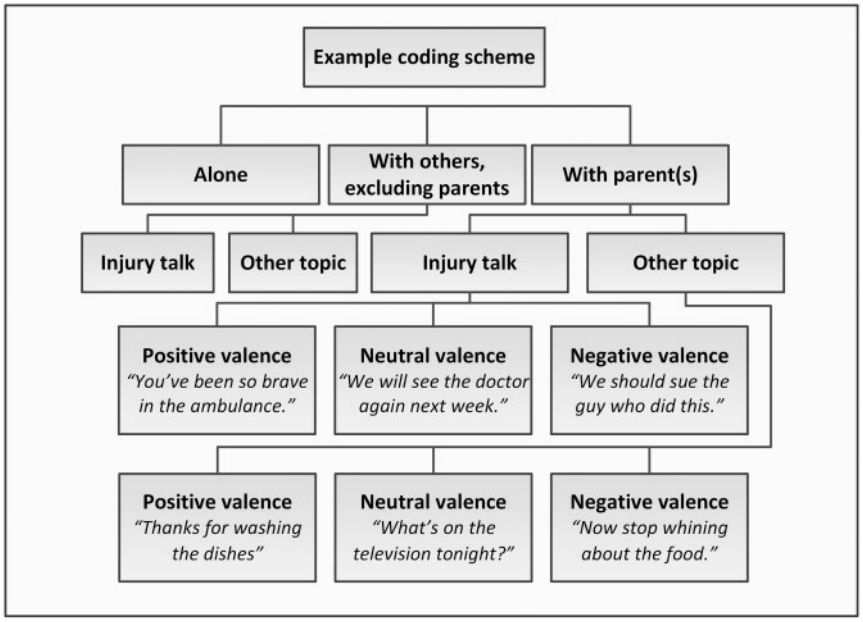


**Figure 1.** Example of a scheme to code sound files for parent–child interactions after a serious injury.

## Conclusion

The EAR methodology allows researchers to gather real-time, in vivo observational data. Such data can further our understanding of the role that social behaviors play when families deal with childhood injury and with other forms of medical trauma. For example, Jobe-Shields and colleagues (2009) called for observational research to explore aspects of the family environment associated with childhood cancer experiences, including coping with long hospital stays and intrusive procedures, and conversations related to treatment and associated experiences. The EAR has particular value for children in pediatric settings because it allows data collection despite any cognitive or expressive language limitations caused by an injury, a serious illness, or mental health difficulties; a child can wear the EAR even if he/she cannot speak or concentrate well. Given the methodological issues associated with studying family environments in the aftermath of trauma, EAR data provide an exciting opportunity to supplement existing first-person self-report measures and lab-based observational measures with naturalistic observation data describing participants in the spontaneous pursuit of their everyday lives. Triangulation of these methods bears the potential to critically advance our understanding of, and thereby improve our ability to provide, support for children and their families.

## Funding

E.A. is supported by the Netherlands Organization for Scientific Research (grant 446-11-021). The preparation of this manuscript was also supported by NIH grant R21HD078778.

*Conflicts of interest*: None declared.

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