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Feasibility and validity of ecological momentary assessment in adolescents with high-functioning autism and Asperger's disorder



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Ecological Momentary Assessment (EMA) may increase accuracy of data compared with retrospective questionnaires by assessing behaviours as they occur, hence decreasing recall biases and increasing ecological validity. This study examined the feasibility and concurrent validity of an EMA tool for adolescents with High-Functioning Autism Spectrum Disorders (HFASD). Thirty-one adolescents with HFASD completed a mobile phone EMA application that assessed stressors and coping for two weeks. Parents and adolescents also completed retrospective measures of the adolescent's coping/stressors. Moderate compliance with the EMA tool was achieved and some concurrent validity was established with the retrospective measure of coping. Concordance was found between the types of stressors reported by parents and adolescents but not the quantity. The results suggest adolescents with HFASD are capable of reporting on their stressors and coping via EMA. EMA has the potential to be a valuable research tool in this population.

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Ecological momentary assessment (EMA), a measurement method involving repeated assessment of behaviours in real time, in situ (Stone & Shiffman, 1994), may confer many advantages over traditional questionnaires. First, by decreasing the recall period, EMA reduces episodic memory decay and recall biases (Coyne & Gottlieb, 1996), such as mood during recall (Bower, 1981). Second, EMA increases ecological validity compared to retrospective measures as participants report behaviours within the context of their daily life, rather than the laboratory setting (Myin-Germeys et al., 2009; Shiffman, Stone, & Hufford, 2008). Assessing experiences and behaviours in context is important because experiences are thought to be influenced by situational factors (Stone & Shiffman, 2002). Third, EMA permits a fine-grained analysis of the dynamics of behaviour through repeated sampling, potentially uncovering relationships that may not be discovered with retrospective questionnaires, which tend to produce a static "photograph" of behaviour at one time point rather than the "film" of behaviour afforded by EMA techniques (Myin-Germeys et al., 2009; Shiffman et al., 2008).

Recently, the *mobiletype* program, a mobile phone based EMA application, has been used to capture accurate, meaningful data on the mood, stressors and coping of young people (Reid et al., 2009, 2011). Reid and colleagues found that most

Abbreviations: SCQ, social communication questionnaire; RSQ, responses to stress questionnaire; WAIS-IV, Wechsler adult intelligence scale – fourth edition; WISC-IV, Wechsler intelligence scale for children – fourth edition; HFASD, high-functioning autism spectrum disorders; EMA, ecological momentary assessment.

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participants (83%) rated the program's ease of use as good to excellent and believed it accurately captured their thoughts, feelings, and situation (94%). Furthermore, participants engaged well with the tool, responding to 76% of the four-daily prompts to complete the program, which they completed for one week. Mobile phones thus appear to be a convenient and youth friendly EMA tool.

Despite being used with various populations, only one published study has used EMA with individuals with high-functioning autism spectrum disorders (HFASD). Individuals with HFASD are characterised by a restricted range of activities and interests, and difficulties with social interaction and the pragmatic aspects of language (American Psychiatric Association, 2000). The lack of EMA research with individuals with HFASD may be partly due to concerns regarding their ability to self-report, given their difficulties understanding and expressing emotions (Dennis, Lockyer, & Lazenby, 2000; Marans, Rubin, & Laurent, 2005) and identifying and interpreting internal and external emotional states (Hobson, 2005; Lindner & Rosen, 2006). Although some researchers have found individuals with HFASD have a limited ability to provide accurate self-report data (Mazefsky, Kao, & Oswald, 2011; White, Schry, & Maddox, 2012), others have reported more positive results (Hill, Berthoz, & Frith, 2004; Jepsen, Gray, & Taffe, 2012; Meyer, Mundy, van Hecke, & Durocher, 2006) and have suggested multiple informants be used when possible (Achenbach, McConaughy, & Howell, 1987; Jepsen et al., 2012).

The only published EMA-based study involving individuals with HFASD investigated the thoughts of three adults with Asperger's syndrome (Hurlburt, Happe, & Frith, 1994). The adults, who had passed several theory of mind tasks, suggesting some ability to introspect, wore a beeper for approximately five days and recorded their inner experiences each time it sounded. Participants also discussed their diary entries daily with the researchers. The participants reported enjoying discussing their inner experiences, which generally took the form of images, and their ability to do so improved after only a few days. Two of the three participants were able to report on their thoughts using EMA.

Thus EMA may facilitate reporting on inner experiences such as coping in individuals with HFASD, an area that would seem particularly important given the high rates of mental health disorders in young people with HFASD (Ghaziuddin, Ghaziuddin, & Greden, 2002; White, Oswald, Ollendick, & Scahill, 2009). To date, coping research in non-clinical populations has raised concerns regarding the reliability of self-report data when collected retrospectively via traditional questionnaires (Coyne & Gottlieb, 1996; Stone et al., 1998). Test-retest reliability of coping measures used with young people has varied widely (Ayers, Sandler, & Twohey, 1998; Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001) and inter-rater reliability between self- and other informants is generally low (Compas et al., 2001). Accordingly, the field of adult coping has embraced EMA methodologies (Shiffman et al., 2008) and although few studies have utilised this methodology to investigate coping in young people, initial studies appear promising (Ptacek, Smith, Espe, & Raffety, 1994; Reid et al., 2009, 2011).

EMA via mobile phones may be especially suited for adolescents with HFASD considering this population's strengths in using technology over face-to-face communication (Klin, McPartland, & Volkmar, 2005) and preference for electronic screens and games over other leisure activities (Shane & Albert, 2008). EMA's potential to increase ecological validity may be particularly important in investigating stress in this population given their propensity to experience stress as an almost vertical explosion of emotion (Attwood, 2006), the intensity of which may be subjectively forgotten afterwards.

Adolescence is likely to be a particularly stressful time for individuals with HFASD due to the numerous physical, psychological and social changes (Steinberg & Morris, 2001), and may be a critical period for acquiring coping knowledge. Indeed, coping behaviours learnt in adolescence are thought to have a significant impact on coping behaviours employed in adulthood (Patterson & McCubbin, 1987), with a self-perpetuating cycle of stress and psychopathology set into motion if effective methods are not learnt (Seiffge-Krenke, 2000).

Given the lack of EMA research involving individuals with HFASD, it would seem important to establish the feasibility and convergent validity of these techniques to determine their potential in this population. As a major advantage of EMA is its ability to decrease the impact of recall biases by reducing the behaviour-reporting time lapse, it is crucial that participants respond to signals and complete EMA promptly and regularly (Shiffman et al., 2008). Many studies with other populations have achieved compliance rates exceeding 90% (Hufford & Shields, 2002). Nevertheless, there is substantial inter- and intra-study variability in compliance, with a recent review of studies that have used electronic EMA reporting a range of 50%–99% (Hufford & Shields, 2002), frequently dependent upon the presence and level of incentive offered for completing reports.

The validity of EMA is often assessed by correlating EMA data with traditional retrospective questionnaires. Given the expected effects of recall biases on retrospective questionnaires, direct correspondence is not anticipated. Unfortunately, there is no concrete way to measure many psychological constructs, so the issue of validity is not easily solvable. Nevertheless, there should be some degree of concordance between measures of the same behaviour. Findings from previous studies investigating convergent validity have varied widely and appear to be sample-, setting- and even task- specific (Shiffman et al., 2008). Ptacek and colleagues (Ptacek et al., 1994) reported modest correlations between a daily diary measure of coping completed by undergraduate students for seven days prior to an exam and a retrospective measure completed five days following the exam of between $r = 0.47$ to $r = 0.58$. Conversely, Stone and colleagues (Stone et al., 1998) found low correspondence between short-term retrospective (48 h) and momentary reports of coping. For example, about 30% of participants did not retrospectively endorse the same coping strategies they had reported via an electronic diary.

The present study aims to examine the utility of an EMA technique (the *mobiletype* program) to examine the stressors and coping of adolescents with HFASD. It is hypothesised that compliance with the *mobiletype* program will be acceptable but

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