Studies in Second Language Learning and Teaching
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SSLLT 15 (4). 2025. 885-907. Published online: 03.09.2025
https://doi.org/10.14746/sslltt.47115
http://pressto.amu.edu.pl/index.php/sslltt

Research across contexts and timescales with the experience sampling method: Applications in the study of language anxiety

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Abstract

Language anxiety (LA) is among the most researched emotions in language learning research. Mirroring the recent dynamic turn in the broader field, LA researchers are increasingly interested in the situation-specific and dynamic nature of anxiety (Elahi Shirvan & Taherian, 2021; MacIntyre, 2017). In practice, this must be accompanied by a movement towards methodologies sensitive to potential dynamic changes in LA within and across various contexts. The idiodynamic method constitutes one such approach, which allows researchers to investigate moment-to-moment changes in situated LA (e.g., MacIntyre & Gregersen, 2022; Macintyre & Legatto, 2011), whereas general self-report questionnaires implemented longitudinally typically capture changes at the level of weeks and months. However, quantitative studies on the intermediate timescales, at the level of hours and days, as well as those comparing LA across different contexts, remain comparatively rare. In this paper, we explore the potential of the experience sampling method (ESM; Csikszentmihalyi & Larson, 1987) as an approach to conducting longitudinal studies of LA in a variety of contexts

at this timescale, within and beyond the language classroom. Drawing connections to recent theoretical and methodological developments, we reflect on how the ESM complements existing measures and provide practical guidance for researchers interested in integrating the method into their own studies.

Keywords: language anxiety; experience sampling method; intensive longitudinal methods; informal learning

1. Introduction

Anxiety related to using a second or foreign language (*language anxiety* or LA) has garnered consistent research attention for more than fifty years, leading MacIntyre (2017) to proclaim it "the most widely studied emotion in second language acquisition" (p. 11). LA is commonly defined as "the feeling of tension and apprehension specifically associated with second language contexts, including speaking, listening, and learning" (MacIntyre & Gardner, 1994, p. 284), although how this feeling has been conceptualized in research has vastly changed since its introduction. Earlier research primarily investigated LA as a relatively stable learner characteristic (trait LA), whereas researchers are now more interested in its *situated and dynamic* nature, that is, how LA varies across different timescales (state LA) in interplay with a host of other psychological, social, and contextual factors relevant to language acquisition (Dewaele, 2007). The primary methodological developments that have accompanied this focal shift have been the introduction of various questionnaires measuring LA in increasingly specific contexts, as well as the idiodynamic method (IDM; MacIntyre, 2012; Macintyre & Legatto, 2011) for the investigation of moment-to-moment changes in language-related emotions.

In this paper, we highlight the experience sampling method (ESM; Csikszentmihalyi & Larson, 1987) as another valuable tool for researchers interested in LA and other learner emotions. Complementing existing methodologies, the ESM enables capturing dynamic changes in LA across longer timescales than the IDM (e.g., hours and days) and across a range of contexts, within the classroom and beyond. After a brief review of key theoretical and methodological developments in the LA literature, we provide a general introduction to the ESM and its roots in psychology research. Next, we discuss specific applications of the ESM in investigating current themes and research questions in the case of LA, including relevant prior studies that have applied this method. We conclude with practical advice regarding challenges associated with implementing the ESM that we view as most important in the specific context of LA research.

2. Key theoretical and methodological developments

In his seminal review, MacIntyre (2017) identified three main approaches or developmental phases in LA research: (a) the *confounded phase*, in which researchers investigated LA by borrowing non-language specific concepts and instruments from neighboring disciplines, such as psychology and education; (b) the *specialized phase*, which saw the development of field-specific definitions and measurements of LA; and (c) the *dynamic phase*, which shifted the focus towards investigating variations in LA across time. Botes, Greiff, and Dewaele (introduction to this special issue) identify a fourth *contextual phase*, characterized by examinations of LA in increasingly varied yet narrow contexts and how it relates to various psychological and environmental factors. Below, we look at how the shifts in focus associated with the specialized, dynamic, and contextual phases have been reflected in major methodological developments, focusing on quantitative and mixed methods approaches.

2.1. Specialized language anxiety

Early research on language-specific anxiety primarily treated it as trait-like, meaning a relatively stable individual characteristic that affects behavior across various situations. This focus is clearly reflected in the research instruments that were developed to investigate anxiety in the language context, such as the *Foreign Language Classroom Anxiety Scale* (FLCAS; Horwitz et al., 1986), by far the most widely used questionnaire to this day. The FLCAS contains 33 statements such as "I always feel that the other students speak the foreign language better than I do," which prompt learners to reflect on LA as a general experience or inclination. The items were developed from group discussions with students about their experiences in language classes, exemplifying how qualitative methods can be leveraged to gain insight into the subjective nature of emotions. More recently, a short-form scale (S-FLCAS) was developed and validated, which includes only eight items and is now also in regular use (Botes et al., 2022). These types of LA questionnaires are usually employed in cross-sectional designs, which investigate group-level relationships between trait-like LA and other factors, such as personality traits, motivation or language proficiency (see MacIntyre & Wang, 2022, for a review).

Early research focused primarily on formal language learning and teaching, as exemplified in Horwitz et al.'s (1986) influential definition of LA as "a distinct complex construct of self-perceptions, beliefs, feelings, and behaviors related to classroom language learning, arising from the uniqueness of the language

learning process" (p. 128). Although there is still a relative lack of studies in informal settings to this day (see Schimpff & Botes, 2024, for an exception), researchers began to distinguish more context-specific forms of LA, emphasizing the functional differences between various settings and types of interactions. This resulted in the development of questionnaires to measure, for example, LA in medical settings (Guntzviller et al., 2011) and workplaces (Gargalianou et al., 2016; Guntzviller et al., 2016), and in relation to specific language skills (e.g., writing: Cheng, 2004; reading: Zoghi & Alivandivafa, 2014) or stages of cognitive processing (Onwuegbuzie et al., 2000). Furthermore, although language learners remain the most frequently studied population, specialized instruments (e.g., *Teacher Foreign Language Anxiety Scale*; Horwitz, 2008) have been used to demonstrate that teachers across different contexts can share similar experiences of LA (Liu & Wu, 2021; Machida, 2016). In practice, being increasingly particular about the context in which they study LA has, over time, led researchers to place more emphasis on the situationally embedded, variable nature of anxiety, thus setting the stage for the dynamic and contextual approaches.

2.2. Dynamic and contextual language anxiety

In addition to investigating increasingly specific contexts for LA, researchers have also become more interested in how LA changes over time. This shift in research focus partly mirrors trends in the broader second language acquisition (SLA) literature, where complex dynamic systems theory (Larsen-Freeman, 2007) has become an increasingly popular theoretical framework. At the same time, the dynamic approach harks back to LA researchers' early discussions about whether increasing language use and proficiency would, in time, lead to increases or decreases in anxiety (growing anxiety: MacIntyre & Gardner, 1989; growing confidence: Spitzberg, 2000).

In trying to clarify these relationships, researchers have employed both cross-sectional (e.g., Dewaele & Dewaele, 2017; Guntzviller et al., 2016) and, to a lesser extent, longitudinal approaches (e.g., Elahi Shirvan & Taherian, 2021; Pan & Zhang, 2023). While such studies have successfully identified group-level trends in LA development, they have often produced conflicting results that point towards the existence of both group and individual differences. For example, in a cross-sectional study, Guntzviller et al. (2016) found that the curvilinear relationships between anxiety and foreign language use over time differed between US American and Indian populations (U-shaped versus inverse U-shaped). Meanwhile, Elahi Shirvan and Taherian (2021), in a longitudinal study of LA among university-level Iranian learners of English, discovered significant group-level decreases in LA (and corresponding increases in foreign language enjoyment, FLE) over time, but also

substantial differences in individual learners' LA and FLE trajectories, exemplifying the dynamicity of language-related emotions. The authors suggest that these variations result from interactions between a complex network of individual and situational factors related to LA and FLE.

Indeed, hand-in-hand with rising interest in dynamic LA, research also began to explore in greater detail how the contexts in which learners are embedded contribute to the emergence of LA. Drawing on Bronfenbrenner's (1993; adapted for SLA by van Lier, 2004) nested ecosystems model of human development, studies from this contextual phase have investigated how the emergence of LA interacts with factors at various levels, ranging from learner-internal and immediate situational variables to aspects of the broader instructional and socio-cultural context (e.g., Gkonou, 2017; Kasbi & Elahi Shirvan, 2017). Primarily employing qualitative methods (interviews, learner diaries, and observations), this research has shown the importance of considering interactions between various environmental factors in shaping experiences of LA. In addition to the immediate classroom environment (e.g., atmosphere, group dynamics, task characteristics) and individual learner differences (cognitive, linguistic, and affective variables), it was found that settings beyond the immediate classroom (past learning experiences, standards in curriculum and examination, and broader society and culture) also affected individual experiences of LA. While these studies have been invaluable in highlighting the vast range of factors that may interact with LA in specific contexts, more systematic cross-contextual investigations of how individual and group differences in LA develop over time, alongside other individual and environmental variables, are still largely missing from the literature.

2.3. The idiodynamic method

Nowadays, research tends to conceptualize LA as an "emergent and potentially rapidly changing experience [and] a constantly fluctuating product of interactions among many factors" (MacIntyre & Wang, 2022, p. 176). Thus, in addition to investigating individual tendencies to experience LA in specific contexts (trait view), research during the dynamic and contextual phases explored how LA fluctuates over time (state view), in interplay with numerous learner-internal and external factors (e.g., cognitive load, self-esteem, fear of negative evaluation vs. task complexity, teacher and peer behaviors, and classroom atmosphere; Gregersen et al., 2017). The most important methodological innovation associated with this focal shift has been the introduction of the idiodynamic method (MacIntyre, 2012; Macintyre & Legatto, 2011). Originally developed to capture situational changes in willingness to communicate (WTC) in language classrooms, the IDM has

been utilized to study micro-level dynamic developments in LA. In idiodynamic studies, researchers first record participants performing a language task, such as giving a presentation. Participants then watch these videos and provide moment-to-moment ratings of the target variable (e.g., language anxiety). Finally, both videos and ratings are used in stimulated recall interviews, in which participants explain variations in their ratings.

IDM studies have shown that learners experience moment-to-moment fluctuations in LA that are easily missed by questionnaires like the FLCAS, such that even those who generally report low levels of trait-like anxiety can have acute momentary experiences of state-like LA (e.g., Gregersen et al., 2014, 2017; Saghafi & Elahi Shirvan, 2020). IDM data has also been triangulated with, for example, other physiological (Gregersen et al., 2014) and emotional measures (FLE: Boudreau et al., 2018; Elahi Shirvan & Talebzadeh, 2018; WTC: MacIntyre & Gregersen, 2022) to examine the causes and effects of moment-to-moment changes in LA at the nexus between various dynamic systems.

3. What is missing?

As indicated above, views on LA have undergone major changes over time. After being investigated chiefly as a relatively stable learner characteristic, the focus shifted to the ways in which LA fluctuates over time and the individual and environmental factors which influence these changes. Nowadays, as Dewaele (2007) observed, LA is viewed as something "situated half-way between trait, situation-specific anxiety and state, more sensitive to environmental factors than personality traits and yet more stable than states since it remains relatively stable across languages" (pp. 405-406). In other words, while individuals may have certain predispositions or tendencies regarding LA, this is complemented by a dynamic and contextual perspective which recognizes that LA may be experienced differently across various timescales (moments, days, weeks, months, etc.), varying in interplay with countless other psychological and contextual factors. This underscores the importance of researchers aligning their conceptualization of LA with specific research questions, which may have a stronger focus on either trait or state aspects. This perspective mirrors Spielberger and colleagues' (1983) seminal stance that anxiety should be understood as both a trait and a state, but, under different conditions that inform the respective definitions and choice of research methods. Just as different measurement approaches in psychology research on general anxiety and other emotions are expected to yield varying results depending on whether they tap into trait or state dimensions (Endler & Kocovski, 2001; Spielberger et al., 1983), the same holds true for measurements of specific language anxiety in SLA.

From this point of view, when choosing appropriate research methods, it is important for LA researchers to consider over which period they expect significant changes to occur (the *developmental timescale*, Henry et al., 2024). The two most common quantitative methods currently in use are suitable for investigating LA at two different timescales. Questionnaires such as the FLCAS capture general tendencies, which, although not completely stable, may be slower to change. By themselves, these instruments provide little insight into the dynamic nature of LA. However, when incorporated into longitudinal studies, they can be used to investigate longer-term changes over several weeks and months, that is, the level at which LA could be expected to relate to other relatively slower-changing factors such as language proficiency (Botes et al., 2020). By contrast, the IDM involves collecting moment-to-moment ratings of LA, thus enabling researchers to trace variability at the scale of seconds and minutes in interplay with other highly variable constructs (e.g., willingness to communicate or WTC; MacIntyre & Gregersen, 2022). Meanwhile, what we will here call the *intermediate timescale* (changes across several hours and days) remains relatively unexplored, in part due to a lack of suitable methods for investigating dynamic changes at this level.

Similarly, the research methods currently in use in this field do not enable direct comparisons between experiences of LA in various settings, which is essential to better understanding how contextual factors relate to dynamic changes in language-related emotions. As previously mentioned, questionnaires have been designed to target LA in several specific contexts, though focusing on general trends instead of specific, individual experiences. Conversely, the IDM focuses exclusively on experiences within a single language task, providing insight into how momentary LA relates to subtle changes in task conditions or learner-internal states. However, IDM studies typically do not provide a broader perspective on how the same learners experience LA across different tasks or contexts. Furthermore, due to the necessity of video-recording tasks to elicit retrospective ratings and stimulated recall, it remains difficult to apply the IDM in less controlled, *real-world* environments, although some studies have involved authentic classroom interactions (e.g., Bielak & Mystkowska-Wiertelak, 2024; Gregersen et al., 2014). Drawing direct comparisons between specific individual experiences of language use could be key to unlocking a better understanding of the contextually embedded, dynamic nature of LA and its broader implications for language acquisition.

In summary, there is a need for flexible methods that can capture dynamic changes in LA at the intermediate timescale and across multiple and varied contexts, both within and beyond the classroom. In the following, we introduce the ESM, which, in addressing these needs, has the potential to significantly strengthen the study of dynamic and contextual LA, particularly at the intermediate timescale and in real-world contexts.

4. The experience sampling method

The ESM, also called ecological momentary assessment (Shiffman et al., 2008) and diary methods (Bolger et al., 2003), is an intensive longitudinal research method involving the repeated collection of information from the same individuals, in real time, over the course of several hours, days, or weeks. It was developed by Csikszentmihalyi and Larson (1987) for measuring the frequency and patterns of mental processes in everyday life. Early ESM studies focused on subjective well-being and the conditions under which people experience flow, a state of deep engagement and satisfaction in activities (Csikszentmihalyi, 1990).

There are three main ESM variants, distinguished by whether data are collected at (a) fixed or (b) randomized time points (signal-based sampling), or (c) every time a certain trigger occurs (event-based sampling). Typical ESM studies last between one and two weeks, with two to twelve data collections per day (Wrzus & Neubauer, 2023). The main data sources are usually brief self-report surveys with questions about various aspects of respondents' current or recent experiences, such as their activities, thoughts, emotions, or features of their physical and social environment. In early ESM studies, pagers and programmable watches were used to prompt participants to complete pen-and-paper questionnaires, whereas nowadays specialized smartphone applications have integrated mobile signaling and data collection (e.g., Lang-Track-App, Arndt et al., 2023). Technological advances have also allowed researchers to include a variety of other data sources in ESM studies, such as physiological measurements (Alpers, 2009), geolocation data (MacKerron & Mourato, 2013), photographs (Chen et al., 2017), and ambient sound recordings (Craig et al., 2017).

There is a great variety of both qualitative and quantitative approaches to analyzing ESM data. They range from simpler methods such as visually examining plotted changes or searching for patterns in contextual information to gain qualitative insights into possible causes and effects, to advanced statistical methods for analyzing complex and dynamic networks of variables. Although ESM data naturally lend themselves to longitudinal analyses (change-point analysis, cross-lagged modelling, and latent growth curve analysis, among others), they are also often aggregated by, for example, calculating averages that represent each respondents' typical behavior or levels of emotion over the study period. This assumes that many randomly sampled data points will together provide a representative picture of an individual's average experience, which can be compared between participants. ESM researchers have sometimes argued that these aggregated measures are more ecologically valid and reliable than retrospective questionnaire data because they are collected *in situ*, thus minimizing biases associated with recall methods (Hektner et al., 2007). Nevertheless, discussions about

the extent to which aggregated state measures compare to trait-like indices are still ongoing (e.g., Ellison et al., 2020; Rauthmann et al., 2019). As an alternative to aggregating data (which effectively erases within-person variance; see Schuurman, 2023), we can use mixed-effects or multilevel statistical models, which allow for the simultaneous investigation of relationships at the between- and within-person levels. These models also deal with the problem that intensive longitudinal approaches, as repeated data collection methods, violate the assumption of independence of traditional regression-based statistical methods (such as *t* tests and linear regression). For more in-depth guidance on how to select and implement quantitative and qualitative methods for analyzing ESM data, we refer interested readers to the numerous available specialized research manuals (see e.g., Carter & Emsley, 2019; Hektner et al., 2007; Myin-Germeys & Kuppens, 2021; Walls et al., 2006).

5. Applications of ESM in language anxiety research

Over time, the ESM has been utilized to investigate a wide range of topics in psychology, sociology, and medicine. Given its roots in studies on everyday emotions, it is easy to see the potential benefits this method holds for LA research. The ESM fills a gap in current dynamic perspectives of LA, which for the most part focus on either shorter or longer timescales: seconds and minutes in the case of the IDM, and weeks and months in repeated measures survey studies. This potential has been recognized in a number of studies that have used fixed-schedule variants of the ESM to provide insight into dynamic changes in a variety of motivational-affective variables within language lessons (e.g., motivation: Pawlak, 2012; WTC: Pawlak et al., 2016; boredom: Pawlak et al., 2022). In the following, we highlight two recent studies that are of particular relevance to our current discussion, one in which the ESM was used to investigate LA specifically, among other variables (Khajavy et al., 2021), and one that directly contrasts dynamic development in FLE at three different timescales, as measured via the IDM, ESM, and language learner diaries and interviews (Elahi Shirvan et al., 2020).

Khajavy et al. (2021) collected language learner ratings of LA, enjoyment, and WTC at ten-minute intervals (fixed-schedule sampling) during six weekly classroom sessions. Moving correlation analysis was then used to investigate the relationships between these three affective factors over time. The researchers found that changes in WTC corresponded more closely to changes in FLE than LA, which most participants experienced only at lower levels. It is possible that this is due to the timescale at which data were collected, meaning that participants may have experienced very brief moments of LA that did not have a significant

enough impact on their overall experiences during the ten-minute ESM sampling intervals as to become salient in the measurements. Khajavy et al. (2021) reference findings from IDM studies, reasoning that while "anxiety can be an immediate, fairly intense emotional reaction that might flare up for a learner at any moment, . . . positive emotions such as enjoyment can possibly 'undo' the negative effects . . . and equip learners with resources to recover from sudden or unexpected anxiety" (pp. 186-187). Altogether, the findings of this study support the conceptualization of enjoyment and anxiety as separate and only sometimes related learner emotions, instead of two ends of one emotional spectrum (Dewaele & MacIntyre, 2014), and illustrate the importance of considering various timeframes when studying affective factors in language acquisition.

Elahi Shirvan et al. (2020) similarly set out to compare how language learner emotions change across different timescales. They used the IDM, ESM, diaries, and interviews to investigate changes in FLE at the level of seconds, minutes, weeks, and months, respectively in two participants. They concluded that unique experiences at each level "contribute[d] differently to the emergence of enjoyment patterns for each individual," while also noting that both participants displayed similar patterns of enjoyment "under the influence of the same ecological factors" (Elahi Shirvan et al., 2020, p. 13). This suggests that the ESM can be an equally valuable new tool for researchers interested in how LA (as a counterpart to enjoyment) operates across different timescales, and the contextual factors that contribute to recognizable patterns.

This leads us to the second major benefit we see for the ESM in LA research, namely, that it can facilitate investigations from a contextual perspective about how anxiety (and other language-related emotions) relates to features of the individual learner's physical and social environment, as well as various learner-internal states. It has previously been demonstrated that the ESM can be used to collect rich data about everyday language use in real time from different populations (e.g., migrants and students on study abroad; Arndt et al., 2024), including where they were, what they were doing, and who they were interacting with, as well as their current levels of enjoyment and cognitive engagement. Thus, it is easy to see how the method could also provide detailed insight into the conditions under which learners may experience LA throughout various parts of their lives.

While each time a participant completes an ESM survey they report only on one specific current or recent event, all reports across the entire ESM study period together can provide a detailed picture of a wide variety of situations in which learners may experience LA. In this way, the ESM stands in contrast to specialized questionnaires such as the *Foreign Language Anxiety in a Medical Office Scale* (Guntzviller et al., 2011), which are designed for capturing general tendencies in LA that learners experience in only one setting. Similarly, although

the IDM could arguably provide an even more detailed view of situationally embedded LA than the ESM, this method is time-intensive for both participants and researchers, so that idiodynamic data are not usually collected from the same individual in multiple contexts. By comparison, it is relatively easy to collect a great number of ESM survey responses over several days or weeks, which cover many different situations encountered by the participants. Likewise, the ESM is not limited to classroom or lab settings in the same way as the IDM, but was explicitly developed for studying *real-world* experiences, making it possible to investigate LA across a wide variety of authentic contexts, inside the classroom and beyond.

Table 1 Examples of pertinent research themes and questions that can be addressed using the ESM

Dynamic LA
• What variations in LA do individuals experience across hours, days, or weeks? o How strongly are past levels of LA (e.g., an hour, a few hours, a day ago) associated with current anxiety? o How do different aspects of LA (e.g., physical anxiety, fear of making mistakes, feelings of incompetence, Horwitz et al., 1986) interact dynamically at these timescales? • When/how do targeted interventions (Toyama & Yamazaki, 2021) affect learners' daily experiences of LA?
Contextual LA
• What is the interplay between LA and other critical ID variables in language learning, such as enjoyment and boredom (Dewaele et al., 2023), willingness to communicate (MacIntyre & Gregersen, 2022), or frequency of language use (Lee & Lee, 2020), etc? • How are momentary experiences of LA influenced by different situational, social, and psychological variables (Dewaele, 2007)? o For example, activities (e.g., conversing in the second or foreign language [L2], processing input, code-switching), context (in class, at the doctor's office, in the grocery store), interlocutors (type of relationship, level of L2 proficiency), and experiences (enjoyment, boredom, communicative success or breakdown) o How similar/different are learners in their experience of LA in similar situations (Elahi Shirvan et al., 2020)?
Methods validation, triangulating perspectives of LA
• How do learners' general tendencies regarding LA relate to task-specific or momentary experiences of anxiety (An & Li, 2024)? • What is the degree of correspondence between physiological indicators of arousal (e.g., heart rate, blood-oxygen levels) and learners' self-reported levels of momentary LA (Sevinç, 2018)? • What are the relative relationships of aggregated state vs. trait measures of LA with other higher-level learner characteristics such as language learning motivation (Liu & Huang, 2011), personality traits (Šafranj & Zivlak, 2019), and language aptitude (Leaković, 2024)? • How do *in situ* ratings of LA (ESM data) compare to retrospective ratings (idiodynamic measures) (Elahi Shirvan et al., 2020)?

Altogether, the ESM appears to be ideally suited to researching LA from both the dynamic and contextual perspective, enabling not just investigation of longitudinal shifts in anxiety at the intermediate timescale (across hours and

days), but also the relationships between LA and different situational, social, and psychological factors across different contexts. Depending on whether ESM data are analyzed longitudinally or aggregated, the method supports both the study of typical patterns and differences between persons and within individuals over time (inter- and intra-personal change), and the links between LA and other factors at both individual- and group-levels. To give a few concrete examples, Table 1 shows an overview of pertinent research themes and questions of interest to current LA research that could be addressed using the ESM.

6. Implementing the ESM: Challenges and strategies

Of course, like any research method, implementing the ESM is not without challenges. Here, we will limit our discussion to a few issues that we view as most important in the specific context of LA research and further refer interested readers to the many excellent general guides that provide practical advice for planning and carrying out ESM research (e.g., Fritz et al., 2024; Hektner et al., 2007; Myin-Germeys & Kuppens, 2021).

First and foremost, LA researchers must carefully consider which ESM variant is best suited for their specific research goals. Pertinent studies that previously employed ESM (Elahi Shirvan et al., 2020; Khajavy et al., 2021; Pawlak, 2012; Pawlak et al., 2016, 2022) all used fixed sampling schedules, since their primary aim was to investigate dynamic changes in language-related emotions *during language classes*. While such well-delineated time periods lend themselves to this design, researchers interested in the role that LA plays more generally in people's lives, across a variety of contexts, may instead want to elicit ESM reports at randomized time points throughout the day, to get a representative sample of participants' typical experiences. However, this raises the possibility that some individuals may rarely or never have relevant experiences (i.e., do not use their L2 or do not experience any anxiety) when they are prompted to complete the ESM questionnaire. This could result in the collection of largely irrelevant data, depending on the research question. One possible strategy, then, would be to conduct the ESM study during a period when participants are likely to have many relevant experiences (e.g., a study abroad sojourn). Another option could be to design the ESM survey to target the *most recent relevant experience* (e.g., think back to the last time they felt anxious about using language), instead of asking what respondents were doing right before being signaled. This needs to be weighed against employing an event-based design, whereby participants complete an ESM survey *every time* they experience, for example, notable language-related anxiety. Both options bring with them the

challenge of clearly defining and communicating which episodes should be reported, so that there is consistency across participants. Event-based sampling also places more burden on those who experience anxiety more frequently, as they may be required to submit a greater number of reports. This could result in sampling biases, as more anxious participants could be more likely to skip reports, drop out of the study, or not participate in the first place.

In general, the possible presence of self-selection and response biases, meaning who is likely to participate in the research and what experiences they are likely to report or omit, are important issues in ESM research. Literature reviews have shown that ESM study participants complete an average of 70-80% of surveys (Wrzus & Neubauer, 2023). However, certain groups – such as women and individuals who are more organized, diligent, and conscientious – have been found to be more likely to participate in ESM studies and complete a larger proportion of assessments (Rintala et al., 2019). While this issue is not unique to ESM studies, designs should include strategies for improving participation (especially among underrepresented groups) and maintaining motivation across the duration of the study (see e.g., Arndt & Rose, 2023; Eisele et al., 2022; Hsieh et al., 2008). Furthermore, researchers should report missing data patterns and suitably address them at the analytical stage (e.g., through exclusion or statistical imputation, where appropriate).

Along with the possibility that individuals with higher levels of anxiety may be more likely to drop out of ESM studies or complete fewer reports, another important question is whether completing in-the-moment emotional assessments could exacerbate negative feelings in already-anxious participants. This is not only an important ethical consideration but also has implications for the validity of anxiety measures. Fortunately, medical psychologists have successfully conducted many previous ESM studies on sensitive subjects, including anxiety disorders, and research findings generally triangulate well with other data sources, such as questionnaires and psychological interviews (Walz et al., 2014). Such studies have also found that issues of reactivity (i.e., changes in behavior or experiences due to participating in research) usually subside within a few days as participants habituate to the study procedure.

Finally, an important methodological issue for our field is the development and validation of LA scales that are suitable for ESM studies. One major consideration in designing ESM questionnaires is minimizing the burden on participants, who are expected to repeatedly interrupt their daily activities to complete the surveys. Typically, ESM questionnaires should therefore be easy to complete within no more than one to two minutes. Certainly, extant short-form instruments such as the S-FLCAS (Botes et al., 2022) could provide a starting point, though they would need to be heavily adapted to change the focus of the

questions from general tendencies to recent experiences and make them applicable to all daily contexts, not just the language classroom (e.g., "I felt nervous and confused when I last spoke in my FL" instead of "I get nervous and confused when I have to speak without preparation in FL class"). Given its focus on language use in informal contexts, another good candidate for adaptation would be the scale for measuring LA beyond the classroom currently being developed and validated by Schimpff and Botes (2024). However, to minimize participant burden, this 20-item instrument (five items each for measuring anxiety while listening, speaking, reading, and writing in a foreign language) would need to be shortened significantly and revalidated for implementation in ESM studies.

In general, thoroughly psychometrically validated ESM questionnaires are rare (Fritz et al., 2024), although there have been pushes to increase the transparency and validity of ESM instruments and develop gold-standard criteria grounded in methodological research. This has led to initiatives such as the development of checklists for designing and reporting replicable ESM studies (e.g., Liao et al., 2016); the establishment of the open-science ESM Item Repository (https://www.esmitemrepository.com; Biesemans et al., 2018); and the ManyMoments project, which focuses on collaborative evaluation of ESM study designs, instruments, and analytical methods (https://bit.ly/ManyMoments; The ManyMoments Consortium, 2021).

If language researchers were to take full advantage of the possibility for ESM to provide insight into the dynamic and contextual nature of LA, their surveys would also need to include questions about, for example, what activity the respondents were engaged in, who they were with, other concurrent emotions, and more (see Arndt et al., 2024). Since the questions that could be asked about situational, social, and psychological factors are potentially endless, it is important that the design is guided by carefully delimited research goals. Many ESM researchers have also found co-creation with members of the target population (e.g., focus groups or think-aloud procedures) to be helpful when formulating and choosing relevant content and selecting an appropriate number of questions and response items (Fritz et al., 2024).

7. Conclusion

In this paper, we have argued that the ESM constitutes a valuable addition to the toolbox of researchers interested in language anxiety and other language-related emotions. After reviewing key theoretical and methodological developments, it is clear that the *dynamic and contextual* nature of LA has become primary research foci in this field. In other words, researchers are increasingly concerned with studying not just group-level patterns, but also within-person variability in

LA along various timescales (moments, days, weeks, or months) and their interplay with the specific social, psychological, and environmental contexts in which language use and learning take place. To date, the primary methodological developments that have accompanied these shifts have been the introduction of various questionnaires for measuring general levels of LA in increasingly specific contexts and types of interactions, as well as the adaptation of the idiodynamic method for the investigation of moment-to-moment changes in LA.

Against this background, we have identified two main areas in which the ESM can complement these methodologies. First, this method can be used to study changes in individual LA at the currently under-explored *intermediate timescale*, that is, across hours/days instead of the seconds/minutes or weeks/months targeted by the IDM and repeated questionnaire designs. Prior studies that used the ESM (e.g., Elahi Shirvan et al., 2020; Khajavy et al., 2021) have shown that by considering various timescales, we can better understand the ways in which emotional factors interact with other aspects of the language learning process. Second, the ESM presents a relatively easy-to-implement approach to collecting rich, ecologically valid data about LA from large participant groups across many different contexts, within the classroom and beyond. Currently, cross-situational comparisons cannot be drawn with general self-report questionnaires, which tend to target anxiety in one specific context (e.g., the classroom, at work, in medical settings), while idiodynamic studies (being time-intensive to implement) also do not usually investigate learner emotions in more than one setting at a time. In allowing researchers to capture a wide range of specific experiences of language use from the same individuals across different situations, the ESM could therefore play an important role in unlocking a better understanding of language anxiety as a dynamic and contextual phenomenon.

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