Cognitive Therapy and Research (2020) 44:645–658
https://doi.org/10.1007/s10608-020-10091-7

ORIGINAL ARTICLE

Daily Worry in Trauma-Exposed Afghan Refugees: Relationship with Affect and Sleep in a Study Using Ecological Momentary Assessment

Theresa Koch[1,2] · Alexandra Liedl[1,2] · Keisuke Takano[1] · Thomas Ehring[1]

Published online: 13 March 2020

Abstract

Background Repetitive negative thinking—and worry as a common variant—have been suggested to be transdiagnostic maintaining factors of psychopathology in refugees. Using an ecological momentary assessment (EMA) approach, this study tested the feasibility of EMA and the hypothesis of a self-reinforcing relationship (a) between worry and affect and (b) between worry and sleep in refugees. Additionally, we examined whether worry interacts with postmigration stress to impact on affect and sleep.

Methods For 1 week, 45 trauma-exposed Afghan refugees received five prompts per day asking them to report on momentary levels of worrying and negative as well as positive affect. In addition, sleep quality was assessed in the morning and the occurrence of postmigration stress at night.

Results Our findings did not indicate a bidirectional relationships (a) between worry and affective experiences and (b) between worry and poor sleep quality. However, worry experienced on a given day predicted increased negative affect on the next day; in turn, positive affect predicted decreased worrying on the next day. Hypotheses on the interaction between worry and stress in predicting affect and sleep were not supported.

Conclusion These preliminary findings suggest unidirectional effects of daily worry on negative affect and positive affect on daily worry. However, the low compliance rate and the small sample size precludes drawing firm conclusions. Implications for further EMA research among refugees are discussed.

Keywords Worry · Sleep · Affect · Postmigration stress · EMA · Refugees

Introduction

In response to the unprecedented numbers of refugees being forcibly displaced as well as consistent evidence for elevated rates of psychological disorders in this group, research on refugee mental health has advanced significantly in recent years (Turrini et al. 2017). However, there has long been a rather narrow focus on posttraumatic stress disorder (PTSD), with considerably less attention paid to other mental health problems in this group (Nickerson 2018). In addition, research has largely focused on the role of pre-migration traumatic events in the development of psychopathology, and much less is known about other risk and maintaining factors of psychopathology in refugees. In order to develop more effective and tailored psychological interventions, there is a need to better understand psychological processes maintaining mental health problems across diagnostic categories. It therefore appears particularly promising to investigate the role of transdiagnostic processes in this population.

Refugees from Afghanistan resettling in western countries are a group facing a particularly high mental health burden which has been linked to pre-migration traumatic events (such as prolonged exposure to war) as well as an unstable postmigration situation (Alemi et al. 2014). Due to a radically decreasing asylum approval rate in Germany,

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s10608-020-10091-7) contains supplementary material, which is available to authorized users.

✉ Theresa Koch
theresa.koch@psy.lmu.de

[1] Division of Clinical Psychology and Psychological Treatment, Department of Psychology, LMU Munich, Leopoldstr. 13, 80802 Munich, Germany

[2] Refugio München, Munich, Germany

many Afghans are currently confronted with an insecure residence status, lack of work permit and separation from their families. In contrast to other refugee populations (e.g., those originating from Syria), Afghan refugees have nevertheless been underrepresented in research on refugee mental health, possibly due to challenges such as relatively low average levels of education, unstable living conditions in exile and multiple, chronic traumatization.

Repetitive Negative Thinking and Worry as Transdiagnostic Processes

Repetitive negative thinking defined as excessive thinking about current concerns, problems, past experiences or worries about the future, has been identified in Western samples as an important transdiagnostic process (Ehring and Watkins 2008). There is evidence from a number of cross-sectional as well as prospective studies showing that repetitive negative thinking plays a crucial role in the development and/or maintenance of psychological disorders (Ehring and Watkins 2008; McEvoy et al. 2013; Spinhoven et al. 2018; Watkins 2008). In the literature on refugee mental health, this process has often been referred to as "thinking a lot" (Hinton et al. 2016). This key idiom of distress is one of the nine entries in the Diagnostic and Statistical Manual-5 glossary of cultural concepts of distress (DSM-5; American Psychiatric Association 2013). It is used in many cultures to express thinking about one or more distress-inducing topics such as current worries or past negative events, and can in turn trigger negative emotional, somatic as well as mental symptoms (Hinton et al. 2016). In a cross-cultural review on idioms of "thinking too much", it was associated with different types of symptom severities such as depression, anxiety, and PTSD, but also with aspects of experience not reducible to psychiatric symptoms or disorders, such as socioeconomic vulnerability (Kaiser et al. 2015).

One common variant of repetitive negative thinking or "thinking a lot" is worry. It is defined as a chain of thoughts and images, negatively affect–laden and relatively uncontrollable which involves mostly future-focused anticipation of negative outcomes (Borkovec et al. 1983). In a study on trauma-exposed Cambodian refugees, worry has been identified as the most common type of dysphoric cognition under the construct of "thinking a lot" (Hinton et al. 2016). Worry is a dysfunctional cognitive coping strategy involved in a large number of different disorders such as generalized anxiety disorder, depression, and PTSD (Bardeen et al. 2013; Ehring and Behar in press). It is conceivable that repetitive negative thinking in the form of worry is highly prevalent in refugees with mental health problems, for several reasons. First, many refugees have experienced premigration trauma events, and excessive worrying is common in trauma survivors (e.g., Michael et al. 2007; Roussis and Wells 2008). In addition, this group is frequently confronted with postmigration problems and situations that are related to an ambiguous and potentially negative outcome, such as socioeconomic disadvantage, unemployment, separation from their families, discrimination, and uncertainty related to the asylum application process (Porter and Haslam 2005). As both premigration trauma load and postmigration life stress make the refugee population vulnerable to extensive worrying, it appears important to better understand the antecedents and consequences of excessive worry in this group. In one of the few studies on this topic to date, worry was investigated in a sample of 201 Cambodian trauma-exposed refugees (Hinton et al. 2011). Results of a path analysis suggested that worry is associated with PTSD and that this relationship is mediated by somatic arousal and trauma recall. However, the study solely focused on PTSD and was limited to a cross-sectional design, which does not allow drawing inferences about causality or directions of the associations.

Ecological Momentary Assessment Among Refugees

To address this shortcoming, the current study used smartphone-based ecological momentary assessment (EMA) to investigate the proximal antecedents and consequences of worry in a sample of trauma-exposed refugee in their natural environments. EMA assessments involved repeated sampling of participants' current worry episodes as well as emotional and mental experiences in response to prompts emitted by a smartphone. EMA maximizes ecological validity and minimizes recall bias when reporting momentary experiences in daily life. Furthermore, it enables us to investigate dynamics changes in worry and other psychological processes across time. The rich and nuanced data collected through EMA designs allows elaborated analyses on microprocesses of worry through refined statistical techniques: for instance hierarchical linear modeling to examine the interplay with other processes such as affect or sleep in a real-world context (Myin-Germeys et al. 2009). Indeed, an EMA study produces multilevel data that can be analyzed at different levels, such as the prompt, day, and person levels. As smartphone technology has been documented to be both appealing and accessible among refugees (smartphone use between 66 and 89%, depending on country of origin; Emmer et al. 2016; UNHCR 2017), we assumed that EMA would be a promising assessment tool for refugees.

Bidirectional Relationships Between Worry, Affect and Sleep

According to the transcultural "thinking a lot" model, cognitions such as worry trigger both mental symptoms, negative affect and somatic symptoms such as headache and poor sleep (Hinton et al. 2016). These symptoms can in turn be

expected to trigger more worrying, leading to a vicious circle. The current study focused on affective experience and sleep as possible antecedents and consequences of worry. Specifically, we aimed to test the self-reinforcing cycle, proposed by the "thinking a lot" model, in which worrying contributes to negative affect and sleep disturbances, resulting in further worrying.

To the best of our knowledge, no study has tested the proposed bidirectional relationships (a) between worry and affective experiences and (b) between worry and poor sleep quality in a refugee population. In the broader literature on Western, non-refugee populations, the existing, limited data does not provide clear evidence either. To date, there are only two EMA studies examining the proposed self-reinforcing cycle within one study design but both focus on worry and sleep; data on affect is still lacking. First, Thielsch et al. (2015) found that pre-sleep worrying among patients with generalized anxiety disorder predicted reduced sleep quality, which in turn resulted in increased levels of worry on the subsequent day. Second, however, another study among high trait worrier indicated that worry experienced on a particular day predicted increased sleep disturbances at the following night, but not vice versa (McGowan et al. 2016). In sum, there is very little evidence on the bidirectional relationship to date, with the effect of worry on sleep appearing more consistent than the reverse one.

As an alternative to bidirectional effects, there might be unidirectional detrimental effects of daily worry on sleep as well as on subsequent levels of positive and negative affect. These unidirectional effects have been investigated more thoroughly and show clearer evidence to date. In a study combining self-reports and long-term sleep monitoring with actigraphy among Japanese students, repetitive thought in the evening predicted longer sleep-onset latency, decreased sleep efficiency, and reduced total sleep time (Takano et al. 2014). A similar study found that daily worry predicted heightened sympathetic and reduced parasympathetic action as well as impaired subjective sleep in a non-clinical sample (Weise et al. 2013). According to psychological models of insomnia, this is due to a physiological arousal and emotional distress being triggered by worry and leading to the perception of sleep problems and genuine sleep deficits (Harvey 2002; Harvey et al. 2005).

In terms of affect, experimentally induced worry and rumination revealed to increase negative affect and decrease positive affect among a community sample in a series of two studies (McLaughlin et al. 2007). However, this unidirectional relationship of worry and affect could not be replicated in a clinical sample (Kircanski et al. 2018). Given the unclear findings and the mere focus on Western samples to date, it remains to be tested whether the relationship between worry and affective experience as well as sleep in refugees is of an unidirectional or a bidirectional nature, as predicted by the transcultural "thinking a lot" model (Hinton et al. 2016).

Interaction Between Worry and Stress

In the group of trauma-exposed refugees, there is accumulating evidence pointing to a key impact of postmigration stress such as discrimination, loneliness, and fear of deportation on mental health (Li et al. 2016). However, it is conceivable that not all refugees respond to these stressors in a similar way, but that their response is moderated by a number of vulnerability and resilience factors. Worry might be a vulnerability factor for psychological symptoms that may exert deleterious effects especially in interaction with postmigration stress which refugees experience in their daily lives. Corroborative evidence for this hypothesis comes from studies conducted in Western populations showing, for example, that the combination of elevated trait repetitive negative thinking (in the form of rumination) and a stressful event is associated with increased negative affect and general distress (Moberly and Watkins 2008; Robinson and Alloy 2003). In addition, not only trait rumination but also the state level of so-called stress-reactive rumination was shown to interact with the experience of life stress to prospectively predict depressive symptoms and negative mood in diary studies (Connolly and Alloy 2017; Genet and Siemer 2012). As rumination and worry are closely related, overlapping constructs, the question arises whether the finding that engaging in stress-reactive rumination leads to higher subsequent negative effects on symptoms or affect when it occurs in interplay with life stress might be transferrable to the process of worry and postmigration stress in refugees. Therefore, the current study not only investigated the main effect of worry on psychological distress (i.e., affective experience, sleep quality), but also the interactive effects of worry and postmigration stress on these outcomes.

Objective

The current study used an EMA paradigm in which Afghan refugees reported their current levels of worry and affect as well as quality of nighttime sleep and postmigration stress for 7 days in their daily life. As past research has not frequently used EMA in refugee populations, we were initially interested in the feasibility (i.e., compliance and reactivity) of an EMA design with this specific sample. Furthermore, the study aimed to investigate Afghan refugees for the self-reinforcing relationships (a) between worry and affect and (b) between worry and sleep. Finally, we aimed to examine the interaction between worry and postmigration stress in predicting affect and sleep. The following hypotheses were tested:

Hypothesis 1 Bidirectional relationship between worry and affect:

Hypothesis 1a Worry significantly predicts increased levels of negative affect and decreased levels of positive affect.

Hypothesis 1b Negative affect significantly predicts increased levels of worrying and positive affect significantly predicts decreased levels of worrying.

Hypothesis 2 Bidirectional relationship between worry and sleep:

Hypothesis 2a Worry significantly predicts decreased sleep quality at the following night.

Hypothesis 2b Sleep quality significantly predicts increased levels of worrying on the next day.

Hypothesis 3 Interaction between worry and stress:

Hypothesis 3a The interaction between postmigration stress and worry significantly predicts an increase in negative affect and decrease in positive affect.

Hypothesis 3b The interaction between postmigration stress and worry significantly predicts a decrease in sleep quality.

Given the nested structure of our data we were able to test our hypotheses not only at a between-subject level, but also at different within-subject levels: Sleep variables, on the one hand, are only specified at the day-level whereas affect, on the other hand, is specified both at the day- and prompt-levels. This multi-level approach allows us to explicitly differentiate between predictions at a trait-like level (between-subject level) as well as between longer-term (day-level) and short-term (prompt-level) predictions.

Method

Participants

We aimed to recruit participants with a range of mental health burden, providing greater power to investigate the role of worry in individuals reporting different levels of distress. This is why we used two different recruitment strategies. First, participants were recruited from a sample of patients taking part in a clinical intervention study at an outpatient unit for victims of torture and war ($n = 21$; Koch et al. 2020). Second, participants were recruited via referrals from teachers and social workers or via community advertisements ($n = 31$). A priori inclusion criteria were as follows: (1) being a refugee or asylum seeker from Afghanistan (2) at least 15 years of age, (3) literacy in Dari or German and (4) exposure to a traumatic event in Afghanistan or on the way into exile. Seven participants were excluded from statistical analyses because of their low compliance with the EMA protocol (i.e., responded to < 20% EMA signals). Reported reasons for the low compliance were technical problems ($n = 2$) and no time and motivation ($n = 5$). When comparing the excluded with the included participants on the baseline variables, we did not find a substantial difference on the GHQ-28; both groups exceeded the cut-off with excluded participants showing only a slightly lower score ($M = 31.67$, $SD = 14.18$) than the included ones ($M = 36.21$, $SD = 15.36$). Similarly, both groups showed the mean PCL-5 scores around the established cut-off of 33 indicative for PTSD, with excluded participants again scoring slightly lower ($M = 29.67$, $SD = 12.01$) than those in the included sample ($M = 34.24$, $SD = 14.74$). Concerning the number of traumatic events, descriptive differences were only minor between the two groups (excluded participants: $M = 10.29$, $SD = 5.50$; included participants: $M = 11.87$, $SD = 4.31$). Thus, the final sample consisted of 45 Afghan refugees and asylum seekers settling in Germany.

The majority of participants were male ($n = 41$; 91%) with ages ranging from 15 to 47 years ($M = 22.91$, $SD = 7.46$). Participants had arrived in Germany on average 2.02 years ago ($SD = 0.80$; range = 1.00 to 4.83) and had spent 8.64 years in education ($SD = 4.69$; range = 1 to 18). Most of the sample currently went to school or attended a German-language course (87%, $n = 39$); 11% of the sample were employed ($n = 5$), and 2% were unemployed without a working permit ($n = 1$). Twelve participants had been granted a residence permit (27%), whereas the remaining 33 participants had an insecure residence status (73%). Ten participants (22%) were taking sleeping medication during the time of the study but were asked to keep the intake stable.

EMA Measures

All measures used in this study were translated into Dari and back-translated into German by experienced translators in accordance with gold standard practices (Bontempo 1993). Minor discrepancies were rectified by the research team and translators with experience in working with mental health material.

Worry

Earlier EMA research has used different items to operationalize worry, for example by asking questions for worry duration, burden, frequency, and intensity (e.g., Thielsch et al.

2015). As EMA can only have a few items per prompt, we decided to focus on worry intensity ("How much do you worry right now?"), which was easy to understand. Participants rated this item on a visual analogue scale, ranging from 0 = *not at all* to 100 = *a lot*). Participants were asked to complete this item 5 times per day.

Negative and Positive Affect

Negative and positive affect were assessed using ten items of emotional adjectives. In consultation with Afghan translators with extensive experience in the mental health sector, four items were selected from the International Positive and Negative Affect Schedule Short-Form ("afraid", "upset", "ashamed", and "active"; I-PANAS-SF; Thompson 2007); and six items were added, which were relevant and applicable within the Afghan language ("helpless", "guilty", "sad", "relaxed,", "happy", and "satisfied"). Participants rated the extent to which they felt each emotion at the current moment on a visual analogue scale, ranging from 0 = *not at all* to 100 = *very much*. We aggregated the rating scores as indicators of negative and positive affect, which appeared to be a reliable measurement within- and between-person (for both scales: $R_{KF} > .99$[1]; $R_C > .75$[2]). Participants were asked to complete this item 5 times a day.

Sleep

Sleep quality was measured with one item ("How well did you sleep last night?"), analogous to Thielsch et al. (2015). It was rated on a visual analogue scale, ranging from 0 = *very bad* to 100 = *very good*. Participants were asked to complete this item at the first prompt of each day. Additional sleep-related items were included in this measurement for a different research question not of relevance for the current analyses.

Postmigration Stress

We used the Postmigration Living Difficulties (PMLD) Checklist (Silove et al. 1997; Steel et al. 1999) and adapted it to the German context and to the daily assessment format. This adapted checklist includes 16 postmigration stressors, and participants were asked to rate the extent to which each of the stressors was of concern to them on a particular day. The checklist was completed every evening during the EMA phase (i.e., at the last prompt of a day). Items are rated on a 5-point scale (0 = *not a problem* to 4 = *a very serious problem*). Items scored at least 3 (a moderately serious problem) are considered positive responses, adding to a total count of daily postmigration stressors. Reliability was estimated to be excellent between persons ($R_{KF} > .99$) and moderate within persons ($R_C = .69$).

Dispositional Questionnaires

Participants completed several self-report questionnaires during the lab appointments.

The *Traumatic Event Checklist* consisted of 23 items adapted from the *Posttraumatic Diagnostic Scale* (PDS; Foa et al. 1997) and the event list of the *Harvard Trauma Questionnaire* (HTQ; Mollica et al. 1992). Participants were asked to rate if they had experienced or witnessed different potentially traumatic events. Overall trauma exposure was represented by a count of the number of types of traumatic events reported.

The *General Health Questionnaire* (GHQ-28; Goldberg et al. 1997) was used to assess general psychological health on the different subscales somatization, anxiety/insomnia, social dysfunction and depression.

The *PTSD Checklist for DSM-5* (PCL-5; Weathers et al. 2013) was used to assess the severity of PTSD symptoms.

Both of these symptom measures have strong psychometric properties and can be used as screening instruments to detect psychological distress (via cut-off of 23/24; Goldberg et al. 1997) or a probable PTSD (via DSM-5 diagnostic algorithm for PTSD; Blevins et al. 2015).

Procedure

The study was approved by the local Research Ethics Committee (project number 2017_76_Koch_b). We used mobile-phone-based EMA to collect data from participants 5 times a day (fixed time-based design: 7:45 am [weekdays] or 10:30 am [weekend], 1:00 pm, 4:00 pm, 7:00 pm, and 9:30 pm) for a period of 7 days. Most participants used their personal smartphone for the assessment. For those with no appropriate device, the research team provided a smartphone for the duration of the assessment. Whereas affect and worry were reported at each of the five daily prompts, participants rated the postmigration stress they experienced over the course of the day only once in the evening (last prompt of the day) and their sleep quality upon awakening once in the morning (first prompt of the day). The EMA items were presented in the following order: Sleep/postmigration stress (where applicable), positive and negative affect, and worry. Each prompt had to be answered within 30 min after receiving the signal. Responses that were not completed within the time limit were not recorded in the system. Before and after the 7 days of EMA, participants attended two appointments in

[1] R_{KF} is a between-subject reliability coefficient, estimating the reliability as an average over k time points for fixed coefficients, and is indicative of the consistency of item responses over time and across people (Shrout and Lane 2012).

[2] R_C is a within-subject reliability coefficient, and is indicative to evaluate sensitivity to within-person change (Cranford et al. 2006).

the lab. During the first meeting, a member of the research group explained the purpose of the study, gave a briefing on the EMA procedure and emphasized that the participation was voluntary, that participants could withdraw from the study at any point and that data would remain anonymous and not used for the asylum process. All participants—and in case of being minor also their guardians—then gave written informed consent. They also completed the trauma list and answered some demographic questions. At the second and last appointment, they completed a pack of questionnaires (GHQ-28, PCL-5). Participants also filled in additional questionnaires that are not of relevance for the current analyses and results of which will be reported elsewhere. At the end of the 1-week course of EMA, participants were compensated for their time. For the EMA-week, participants received €10, but only if they answered 80% of all prompts. The two assessment sessions were compensated with €18. For participants taking part in the treatment study, the assessment was part of the standard assessment; these participants were therefore not compensated for their participation in the assessment sessions.

Statistical Analysis

All the hypotheses were tested with package lme4 of R software, version 3.6.1. (Bates et al. 2015). Because of the nested structure of our data, we used hierarchical linear modeling (HLM) fitted with Restricted Maximum Likelihood. HLM allows testing our hypotheses at different levels (i.e., between-subject level, day-level, and/or prompt-level). The degrees of freedom were obtained by applying the Satterthwaite approximation (Satterthwaite 1946).

Our first model had a two-level structure, with the day-level nested to the person level. As sleep was only reported on a daily basis, worry and affect ratings were also specified at the day-level by aggregating the scores per day. All predictors were person-mean centered prior to all analyses to best capture the effect of within-subject fluctuations during the EMA week. HLM analyses tested whether a day-level variable for Person j on Day d (e.g., NA_{dj}) was predicted by the other variable on Day d -1 (e.g., $Worry_{(d-1)j}$), after controlling for the level of the dependent variable on Day $d-1$ (e.g., $NA_{(d-1)j}$). We also controlled for correlates of compliance to reduce potential bias introduced by missingness. Separate models were estimated for each of the variables as an independent variable with the other variable as a predictor, which allowed us to test the direction of the association between worry and affect as well as worry and sleep. All models assumed random effects for the intercept and slope, which were allowed to vary across participants. Exemplarily for the lagged regression on negative affect (NA, Hypothesis 1a), the model is specified in the following equations:

$$\text{Level 1 (day} - \text{level)}: \quad NA_{dj} = \beta_{0j} + \beta_{1j} Worry_{(d-1)j} + \beta_{2j} NA_{(d-1)j} + r_{dj},$$

$$\text{Level 2 (person} - \text{level)}: \quad \beta_{0j} = \gamma_{00} + \gamma_{01} Worry_{pm,j} + u_{0j},$$
$$\beta_{1j} = \gamma_{10} + u_{1j},$$
$$\beta_{2j} = \gamma_{20} + u_{2j}.$$

In the level-1 model, the level of NA on day d is predicted by worry and NA on the previous day, $d-1$ (with r_{dj} as the residual). The intercept (β_{0j}) is a function of the person-mean (pm) of the predictor for person j across all days (e.g., $Worry_{pm,j}$). Thus, we were able to analyze the relationship between worry and affect also at a between-subject level, which represents more stable, trait-like effects (i.e., people with a greater tendency to worry would report a higher level of negative affect over the EMA course). All level-1 coefficients (β_{0j}, β_{1j}, and β_{2j}) were assumed to vary at level-2 with random effects u_{0j}, u_{1j} and u_{2j}.

A similar two-level model was additionally specified at the prompt- (instead of day-) level for affective experience, because—in contrast to sleep—affect was reported 5 times a day. Therefore, we estimated additional models for the momentary relationship between worry and affective experience, which allows us to differentiate between short-term (prompt-level) as well as longer-term (day-level) predictions.

To test Hypotheses 3 (i.e., the interaction between worry and stress in predicting negative affect and sleep), interaction terms were added to the above described models at the day level. Two types of interactions were considered here: (a) the within-level interaction ($Worry_{(d-1)j}$ X $Stress_{(d-1)j}$) and (b) the cross-level interaction ($Worry_{(d-1)j}$ X $Stress_{pm,j}$) when predicting affect and sleep. The former interaction speaks to a day-level phenomena (i.e., on a day when people experienced higher levels of stress, worry would exhibit a lager effect on affect and sleep), whereas the latter cross-level interaction taps into a person (or trait) level phenomenon (i.e., people who generally experience higher levels of stress tend to show a higher effect of worry on affect and sleep). All predictors were person-mean centered.

Results

Descriptive Statistics and Compliance with EMA

Table 1 shows range, means, and standard deviations for the scales assessed at baseline and via EMA. Around half of the participants ($n = 26$; 58%) met the criteria for a probable PTSD diagnosis according to the DSM-5 diagnostic algorithm, and 73% of all participants ($n = 23$) exceeding the

Table 1 Descriptive statistics for study variables ($N = 45$)

Variable	*M* (*SD*)	Range	EMA compliance: percentage (*SD*)
Dispositional variables			
Number of traumatic events	11.87 (4.31)	4–21	
PCL-5	34.24 (14.74)	7–70	
GHQ-28	36.21 (15.36)	13–73	
EMA variables			
Worry	56.85 (29.94)	0–100	55% (21)
Negative affect	30.41 (23.48)	0–95	55% (21)
Positive affect	46.35 (22.39)	0–97	55% (21)
Postmigration stress	9.98 (4.07)	0–16	60% (24)
Sleep quality	48.24 (25.46)	0–100	51% (28)

Notes: *PCL-5* PTSD Checklist for DSM-5, *GHQ-28* General Health Questionnaire (28 item version), *EMA* Ecological Momentary Assessment

cut-off for psychological distress, as measured by the GHQ-28. Across all participants, the most important stressor was a fear of deportation, which was reported on 80% of daily (evening) prompts, followed by fear for family back home (76%) and separation from family (72%; see Fig. 1 for more details).

After excluding 7 participants with very low compliance rates (< 20%), the final data of 866 responses at the prompt-level and 261 responses at the day-level from 45 participants were submitted to analyses (out of the possible 1575 observations at the prompt-level and 315 observations at the day-level). The mean response rate at the prompt-level was 55% with the range of 21–95% ($SD = 20.75$). Exact compliance rates for the different EMA variables are shown in Table 1. Exploratory correlation and regression analyses were conducted to identify demographic or dispositional factors that were associated with the compliance rate. A higher compliance rate was associated with longer time settled in Germany ($r = .31$; $p = .037$), lower PTSD symptom severity ($r = .40$; $p = .006$), and a secure residence status, $t(43) = 2.28$, $p = .028$). We included these three correlates of compliance in all of the models at Level 2 to reduce potential bias introduced by missingness. We also tested whether there was an increasing or decreasing trend of worry over the course of EMA, because participating in EMA per se may have influenced the levels of worry (i.e., reactivity to EMA). Therefore, an additional HLM analysis was conducted, in which momentary worry was predicted by prompt number (i.e., the number of prompts received so far). Prompt number was not a significant predictor of worry, indicating that worry did not have a linear trend over the course of the assessment, $B = 0.06$, $SE = 0.12$, $t = 0.50$, $p = .622$.

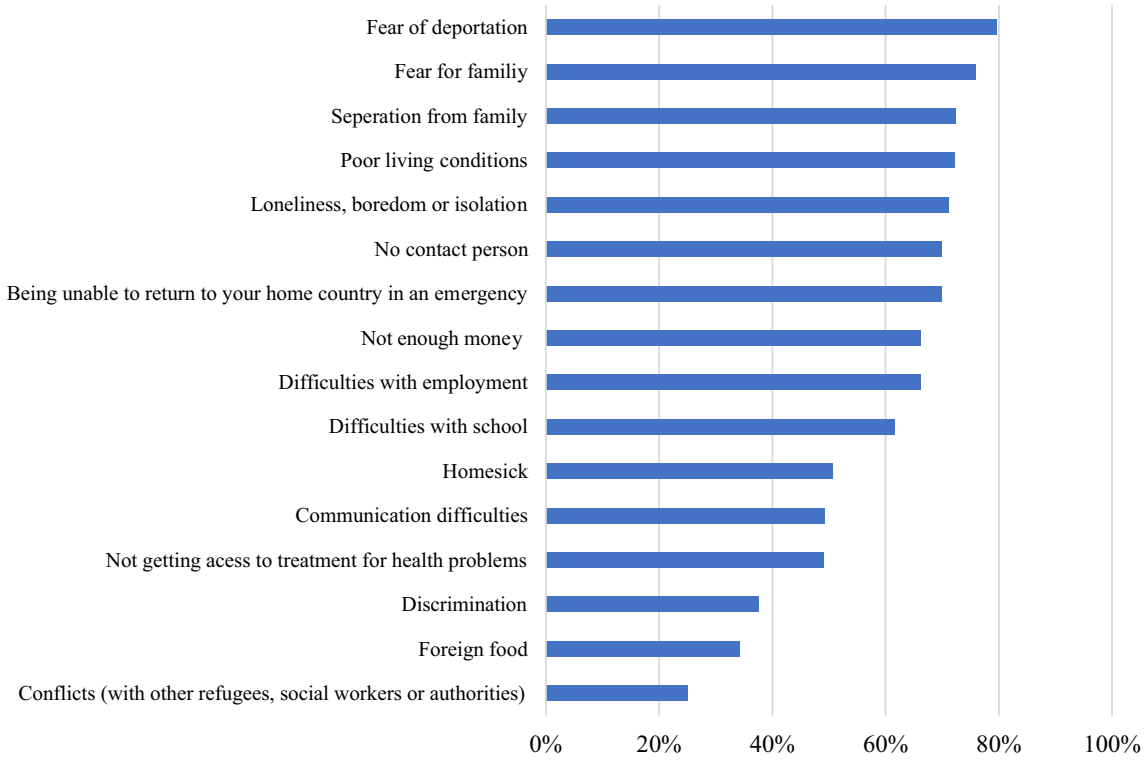

Fig. 1 Mean percentages of days, when the respective postmigration stressor was reported

Intraclass correlations (ICCs) indicated that two third of the variance in negative affect, positive affect and worry at a prompt- as well as at a day-level was explained by individual differences (range: 0.61–0.71), whereas the ICC was smaller for sleep quality (0.31).

Bidirectional Relationship Between Worry and Affect

To test Hypotheses 1, we estimated different HLMs with worry predicting negative or positive affect (Hypothesis 1a) and with negative or positive affect predicting worry (Hypothesis 1b). First, we estimated the models at a day level for longer-term predictions and second zoomed in and estimated the models at a prompt-level for short-term predictions.

For the day-level, results on the analyses of the bidirectional relationship between worry and negative affect as well as positive affect, respectively, are presented in Table 2 (for more details see also Table A in the Supplementary). As hypothesized, worry on the previous day $d-1$ predicted increased levels of negative affect on the subsequent day d. However, this association between worry and negative affect was unidirectional as negative affect did not significantly predict worry on the subsequent day. In both models, we found a significant effect of a between-subject predictor: i.e., the person-mean of worry on negative affect as well as of the person-mean of negative affect on worry. These significant between-subject effects indicate that people with greater tendency of worrying showed higher levels of negative affect, and vice versa. In terms of positive affect, we found similar significant between-subject effects; the person-mean of worry predicted decreased positive affect and the person-mean of positive affect predicted decreased worry. In contrast to our hypothesis, we found no significant within-subject effect of worry on a given day on positive affect on the next day. However, the effect of positive affect on worry was significant; higher levels of positive affect were associated with decreased levels of worry on the subsequent day. It is noteworthy that the autocorrelation of worry was not significant in this model.

For the prompt-level, results on the analyses of the bidirectional relationship between worry and negative affect as well as positive affect respectively, are presented in Table 3 (for more details see also Table B in the Supplementary). Contrary to our hypotheses, neither the effect of worry on affect nor the effect of affect on worry was significant at the prompt-level.

Table 2 HLM parameter estimates for the bidirectional models at a day-level

Fixed effect: β	Estimates (SE)	*t*	*p*
Dependent variable: Negative affect$_d^a$			
Worry$_{d-1}$	0.14 (0.06)	2.29	.026
Worry $_{pm}$	0.43 (0.09)	4.99	< .001
Negative affect$_{d-1}$	0.15 (0.06)	2.40	.017
PTSD severity	0.52 (0.13)	3.88	< .001
Time in Germany	< 0.01 (0.23)	< − 0.01	> .999
Residency	7.39 (4.98)	1.48	.146
Dependent variable: Worry$_d^b$			
Negative affect$_{d-1}$	− 0.04 (0.11)	− 0.31	.758
Negative affect$_{pm}$	1.08 (0.19)	5.56	< .001
Worry$_{d-1}$	0.17 (0.07)	2.27	.024
PTSD severity	− 0.16 (0.22)	− 0.72	.477
Time in Germany	0.32 (0.33)	0.97	.341
Residency	− 7.69 (7.21)	− 1.07	.293
Dependent variable: Positive affect$_d^a$			
Worry$_{d-1}$	− 0.09 (0.06)	− 1.48	.150
Worry$_{pm}$	− 0.38 (0.10)	3.72	< .001
Positive affect$_{d-1}$	0.17 (0.07)	2.58	.011
PTSD severity	− 0.28 (0.16)	− 1.79	.081
Time in Germany	0.12 (0.27)	0.44	.666
Residency	1.33 (5.89)	0.23	.823
Dependent variable: Worry$_d^b$			
Positive affect$_{d-1}$	− 0.17 (0.08)	− 2.12	.036
Positive affect$_{pm}$	− 0.74 (0.20)	− 3.66	< .001
Worry$_{d-1}$	0.08 (0.07)	1.15	.251
PTSD severity	0.21 (0.23)	0.91	.367
Time in Germany	0.36 (0.36)	1.01	.320
Residency	− 0.56 (7.88)	− 0.07	.944
Dependent variable: Sleep quality$_d^c$			
Worry$_{d-1}$	0.10 (0.20)	0.53	.602
Worry$_{pm}$	− 0.38 (0.13)	− 2.95	< .001
Sleep quality$_{d-1}$	− 0.11 (0.12)	− 0.94	.353
PTSD severity	− 0.18 (0.21)	− 0.86	.400
Time in Germany	− 0.47 (0.30)	− 1.57	.127
Residency	− 3.98 (6.39)	− 0.62	.540
Dependent variable: Worry$_d^d$			
Sleep quality$_{d-1}$	− 0.04 (0.08)	− 0.50	.620
Sleep quality$_{pm}$	− 0.80 (0.25)	− 3.21	< .001
Worry$_{d-1}$	0.09 (0.08)	1.09	.288
PTSD severity	0.29 (0.25)	1.13	.265
Time in Germany	0.03 (0.42)	0.08	.937
Residency	0.44 (8.79)	0.05	.960

Notes: *d* day, *pm* person-mean

[a]Number of observations: 245

[b]Number of observations: 243

[c]Number of observations: 91

[d]Number of observations: 146

Bidirectional Relationship Between Worry and Sleep

Two parallel HLM analyses were conducted with worry predicting sleep quality (Hypothesis 2a) and sleep quality predicting worry (Hypothesis 2b) at the day-level. Results are shown in Table 2 (for more details see also Table A in the

Table 3 HLM parameter estimates for the bidirectional models at a prompt-level

Fixed effect: β	Estimates (SE)	*t*	*p*
Dependent variable: Negative affect$_i^a$			
Worry$_{i-1}$	0.05 (0.03)	1.63	.113
Worry$_{pm}$	0.48 (0.08)	5.81	< .001
Negative affect$_{i-1}$	0.18 (0.04)	4.35	< .001
PTSD severity	0.43 (0.13)	3.38	< .001
Time in Germany	− 0.05 (0.22)	− 0.21	.832
Residency	8.19 (4.68)	1.75	.088
Dependent variable: Worry$_i^b$			
Negative affect$_{i-1}$	0.08 (0.12)	0.68	.503
Negative affect$_{pm}$	1.08 (0.18)	5.90	< .001
Worry$_{i-1}$	0.20 (0.04)	5.22	< .001
PTSD severity	− 0.17 (0.22)	− 0.78	.440
Time in Germany	0.31 (0.32)	0.98	.334
Residency	− 6.94 (7.06)	− 0.98	.332
Dependent variable: Positive affect$_i^a$			
Worry$_{i-1}$	− 0.04 (0.05)	− 0.92	.360
Worry$_{pm}$	− 0.41 (0.04)	− 10.41	< .001
Positive affect$_{i-1}$	0.23 (0.06)	3.59	< .001
PTSD severity	− 0.27 (0.06)	− 4.25	< .001
Time in Germany	0.30 (0.09)	3.46	< .001
Residency	0.43 (2.02)	0.21	.831
Dependent variable: Worry$_i^b$			
Positive affect$_{i-1}$	− 0.02 (0.10)	− 2.25	.803
Positive affect$_{pm}$	− 0.68 (0.06)	− 10.58	< .001
Worry$_{i-1}$	0.17 (0.06)	2.80	< .001
PTSD severity	0.29 (0.08)	3.51	< .001
Time in Germany	0.63 (0.11)	5.75	< .001
Residency	2.35 (2.61)	0.90	.367

Notes: *i* prompt number, *pm* person-mean

[a]Number of observations: 582

[b]Number of observations: 576

Supplementary). At the between-subject level, the person-mean of worry significantly predicted decreased sleep quality, whereas the person-mean of sleep quality significantly predicted decreased levels of worrying. This indicates that people with a greater tendency of worrying reported poorer sleep quality and vice versa. Contrary to our hypothesis, however, we found no significant within-subject effect of sleep quality on worry or vice versa.

Interaction Between Worry and Stress

In our last hypotheses, we predicted that postmigration stress (daily and person-mean) would moderate the relationship between the level of worrying on a given day and affective experience on the next day (Hypothesis 3a) or sleep quality at the following night (Hypothesis 3b). In contrast to the hypotheses, none of the interaction effects was significant in the estimated models (see Table C in the Supplementary materials). This finding indicates that postmigration stress did not interact with worry to impact on subsequent affective experience or sleep.

Discussion

In this study, we examined naturally occurring worry at various times of the day among trauma-exposed Afghan refugees in a naturalistic setting by using an EMA paradigm. As this is one of the first studies to use the EMA methodology in a sample of trauma-exposed refugees, we initially aimed to explore the acceptability and feasibility of this technology. Contrary to our hypothesis, our findings did not indicate a bidirectional relationship (a) between worry and affective experiences and (b) between worry and poor sleep quality. However, worry experienced on a given day predicted increased negative affect on the next day; in turn, positive affect predicted decreased worrying on the next day.

Feasibility of EMA and Implications

After having excluded 7 participants because of very low compliance rate (< 20%), the average compliance rate was 55% although it varied largely across participants. This rate is significantly lower than an average compliance of 78% measured in a pooled dataset of 10 EMA studies among 1717 individuals with various mental health conditions (Rintala et al. 2019). In a meta-analysis among adolescents the compliance rate has been shown to range from 51 to 92% (Heron et al. 2017). Given our relatively young sample, our compliance rate is comparable, but clearly at the lower end of the continuum found in adolescents. Consequently, our results need to be considered in the context of a low compliance resulting in limited observations per estimated model. The low compliance might have also contributed to the limited standard deviation, particularly of those variables, which were only assessed once a day (e.g., sleep and postmigration stress).

In sum, the high variance in the compliance rate indicates that EMA is a feasible method in refugees under certain conditions. This is why we strongly recommend the following measures to be taken in future studies in order to reach higher completion rates: For one, a shorter time settled in Germany, an insecure residence status as well as a higher PTSD symptom severity were all associated with a lower compliance rate. This indicates that the more insecure and distressed people are in their daily life, the harder it is to adhere to a burdensome and time-consuming EMA protocol for 7 days. These people might need particularly close support while participating in EMA studies, for example, by effective briefing and communication during the sampling

procedure consistent with guidelines for the use of EMA protocols among clinical populations (Palmier-Claus et al. 2011). And second, future research should provide more incentives for responding to all prompts. One possibility is to give a greater financial compensation. Internal incentives would also be worth considering, such as increasing the motivation for participating: Although we did not conduct a structured assessment on the participants' understandings on the study protocol, the results of our informal interview suggest that a lot of our participants did not understand why it is important to answer each prompt. Thus, it might be helpful to further motivate them by explaining the study's rational and the importance of high involvement and complete participation more precisely. Third, due to the fact that a lot of people from a refugee background lack experience in filling out questionnaires, it is particularly important that the EMA procedure is practiced. Together with a translator, all questions as well as the response scales should be gone over in detail and arising questions should be answered beforehand to ensure each item is understood. Afterwards, participants should complete at least one practice entry under supervision.

Bidirectional Relationship Between Worry and Affect

As suggested by the transcultural "thinking a lot" model (Hinton et al. 2016), we additionally aimed to examine the bidirectional relationships between worry and affect (Hypothesis 1) and between worry and sleep (Hypothesis 2) at different levels (i.e., between-subject level, day level, and/or prompt level). However, in contrast to the "thinking a lot" model's predictions, our data did not support a bidirectional relationship between worry and affect. Instead, we found the relationship seems to be more complex, depending on whether we estimate long-term (day-level) or short-term (prompt-level) prediction models. At the between-subject (i.e., person-mean) level, we found that worry was associated with increased negative affect and decreased positive affect. This means, for example, that people with a greater tendency of worry reported higher levels of negative affect over the course of EMA (and vice versa). Note that these between-subject results do not inform the direction of the associations due to the cross-sectional nature. On the other hand, our day-level analyses indicated specific unidirectional effects: (a) worry on a given day predicted increases in negative affect on the next day, and (b) positive affect on a given day predicted decreases in worry on the next day. However, these prospective effects were not observed in the prompt-level analyses, which suggest that the associations between worry and affect are not visible in this relatively short (several hours) time window.

The null findings at the prompt level are consistent with recent models stressing the role of worry in avoiding affective experiences. For example, the contrast avoidance model suggests that worry serves to sustain, rather than to change, levels of negative and positive affect in the service of avoiding emotional contrast (Llera and Newman 2014; Newman and Llera 2011). The model has been validated repeatedly among nonclinical and clinical participants (Kircanski et al. 2018; Newman et al. 2019).

Our results, however, might indicate that the avoidance function of worry might only be successful in the short-term, but not the longer-term: We found significant effects at the day level, in that the level of worrying during the day predicted increases in negative affect on the next day. For positive affect, only the reverse effect was found in that higher levels of positive affect on a given day predicted decreased levels of worrying on the next day. This is in line with clinical data on the effectiveness of treatment approaches which aim to increase positive affect such as pleasant activity scheduling and behavioral activation in order to decrease repetitive negative thinking: Behavioral activation has not only been confirmed to be an efficient intervention in reducing rumination in addition to symptoms of depression in a meta-analysis (Mazzucchelli et al. 2009), but also in reducing excessive worry among a community population of excessive worriers (Chen et al. 2013).

Another reason for the discrepancy between results at the prompt vs. day level might lie in the time-interval dependency of cross-lagged panel models (Kuiper and Ryan 2018). Depending on the time-interval of observation, cross-lagged panel models can lead to different parameter estimates. In our data, for example, the autoregressive effects which represent the stabilities of the variables appeared to be higher the smaller the time-interval was. This made it more difficult for additional predictors to reach significance beyond these autoregressive effects.

Bidirectional Relationship Between Worry and Sleep

We also tested the bidirectional relationship between worry and sleep. At the between-subject level, we found significant associations between worry and poor sleep quality; people with a greater tendency of worry reported decreased sleep quality (and vice versa). On a day level, however, worry on a given day did not significantly predict decreased sleep quality on the subsequent night nor did sleep quality predict changes in worrying on the next day. Our results are at odds with the predictions derived from the "thinking a lot" model as well as the results of several EMA studies that mostly confirm unidirectional relationships between worry and sleep (McGowan et al. 2016; Thielsch et al. 2015). Of note, several participants gave the same or similar rating score on their sleep quality over the course of EMA, resulting in a small mean of within-person standard deviation across participants [M (SD) = 15.31; range: 0–48.32]. This may have contributed to the lack of

within-subject findings. Additionally, the number of observations used in the models was limited due to many missing values in the sleep variable, which was only assessed once a day in the morning. Whereas the first model predicting sleep used only 91 observations, the second reversed model predicting worry made use of 146 observations. Future research with a higher compliance rate and consequently a higher number of observations as well as a larger standard deviation within person is therefore much needed to draw final conclusions about a bidirectional or unidirectional relationship.

Interaction Between Worry and Stress

To test our third hypothesis, we examined the interactive effect of worrying and postmigration stress. This is the first study assessing postmigration stress repeatedly in the daily life of refugees via EMA in contrast to the usual retrospective assessment with the PMLD Checklist. Our participants reported a high number of postmigration stressors everyday with the fear of deportation being the most relevant one. However, postmigration stress did not exacerbate the psychological distress that follows worrying. There are a number of methodological factors that need to be taken into account when interpreting these findings. First, the low compliance again resulted in the small number of observations ranging between 66 and 166. This limited the statistical power to detect the very small effects of the interactions. Second, another possible reason might lie in the way we operationalized postmigration stress. We used the widely accepted PMLD Checklist and adapted it to the daily assessments. Thus, we had a daily score of how many stressors the participants had experienced throughout the day and were only able to examine the moderating role of postmigration stress at a day level. In previous studies on stress-reactive rumination among non-refugee populations, however, participants recorded stressors on every prompt, reducing retrospective biases and being able to analyze short-term detrimental effect of engaging in rumination in interplay with current life stress (Connolly and Alloy 2017; Moberly and Watkins 2008). The use of the checklist might have also contributed to the very small mean of within-person standard deviation across participants (M ([SD] = 1.56; range: 0–3.69), as some of the predefined stressors assessed such as poor living conditions might be relatively stable.

Limitations

Results from the current study must be considered in the context of limitations. First, the low compliance rate has led to reduced statistical power, and questions the representativeness of the sampling and thus the validity and generalizability of the findings. We cannot preclude systematic noncompliance at a prompt level. Therefore, we need to be cautious in drawing solid conclusions from this data for the cross-lagged associations. Second, our research is limited by not including other source of information such as objective measures of sleep disturbance (e.g., polysomnography, actigraphy) as well as standard self-report questionnaires to measure trait worry at baseline (e.g., Penn State Worry Questionnaire; Meyer et al. 1990). Third, even though our study design allowed to investigate phenomena micro-longitudinally and to elucidate predictive lagged relationships, it is important to note that we cannot infer exact causality from these results. Therefore, experimental studies are needed to investigate the causal effect of worry on affect, sleep, and the maintenance of psychopathology in refugees. Fourth, third factors influencing the variables of interest cannot be ruled out in a naturalistic setting. For example, some assessments were taking place in the month of Ramadan, which might have had an influence on the participants, especially on their sleep quality. Fifth, our study is limited to worry as a common variant of the idiom "thinking a lot" and its relationship with affect and sleep. Although this is defensible as a first step, future studies should also assess the more general construct of "thinking a lot" which has a broader cross-cultural relevance. By additionally integrating other types of mental (e.g., poor concentration) and somatic distress (e.g., headache), the transcultural "thinking a lot" model (Hinton et al. 2016) could be tested more thoroughly.

Conclusion

Due to the cost efficiency and accessibility, smart-device technology can be a useful tool for assessment in minority groups. It is noteworthy that this EMA study focused on a unique and particularly vulnerable population that is currently underrepresented in research. Despite the methodological challenges involved, it appears promising to use EMA for the assessment of transdiagnostic processes maintaining mental health problems in trauma-exposed refugees under certain conditions. As discussed in detail above, some modifications to the setting of EMA research in this group appear warranted.

A number of preliminary conclusions can be derived from the current findings. However, due to several limitations, a replication of these findings in a larger sample and with longer sampling times is clearly necessary before any firm conclusions can be drawn. Even though we did not find evidence for the self-reinforcing cycle between worry and affective experience or sleep, our day-level findings imply that decreased positive affect predicts increased worry, which results in increased negative affect. Moreover, people with a greater tendency of worry reported not only

increased negative affect and decreased positive affect but also decreased sleep quality.

Thus, the findings are in line with the idea that worry appears to be a relevant transdiagnostic factor in trauma-exposed refugees, which needs to be addressed in treatment. If findings can be replicated and extended in future research, a relevant clinical implication in the long run may be to address worry both directly in treatment but also indirectly by teaching strategies aiming to maintain and increase experiences of positive emotions. Our group tried to implement these findings in the development of a culture-sensitive skills-training for refugees, which also targets cognitive processes such as worrying (Koch et al. 2020).

Acknowledgements We would like to thank Dorothee Pöhlchen and Olga Topalidou for their assistance during data collection.

Funding T. Koch was supported by Cusanuswerk.

Compliane with Ethical Standards

Conflicts of interest Theresa Koch, Alexandra Liedl, Keisuke Takano and Thomas Ehring declare that they have no conflicts of interest.

Ethical Standards The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Animal Rights Statements No animal studies were carried out by the authors for this article.

Informed Consent Informed consent was obtained from all individual participants included in the study, and in case of being minor also from their guardians.

References

Alemi, Q., James, S., Cruz, R., Zepeda, V., & Racadio, M. (2014). Psychological distress in Afghan refugees: A mixed-method systematic review. *Journal of Immigrant and Minority Health, 16*(6), 1247–1261. https://doi.org/10.1007/s10903-013-9861-1.

Bardeen, J. R., Fergus, T. A., & Wu, K. D. (2013). The interactive effect of worry and intolerance of uncertainty on posttraumatic stress symptoms. *Cognitive Therapy and Research, 37*(4), 742–751. https://doi.org/10.1007/s10608-012-9512-1.

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software, 67*(1), 48.

Blevins, C. A., Weathers, F. W., Davis, M. T., Witte, T. K., & Domino, J. L. (2015). The posttraumatic stress disorder checklist for DSM-5 (PCL-5): Development and initial psychometric evaluation. *Journal of Traumatic Stress, 28*(6), 489–498. https://doi.org/10.1002/jts.22059.

Bontempo, R. (1993). Translation fidelity of psychological scales: An item response theory analysis of an individualism-collectivism scale. *Journal of Cross-Cultural Psychology, 24*(2), 149–166. https://doi.org/10.1177/0022022193242002.

Borkovec, T. D., Robinson, E., Pruzinsky, T., & DePree, J. A. (1983). Preliminary exploration of worry: Some characteristics and processes. *Behaviour Research and Therapy, 21*(1), 9–16. https://doi.org/10.1016/0005-7967(83)90121-3.

Chen, J., Liu, X., Rapee, R. M., & Pillay, P. (2013). Behavioural activation: A pilot trial of transdiagnostic treatment for excessive worry. *Behaviour Research and Therapy, 51*(9), 533–539. https://doi.org/10.1016/j.brat.2013.05.010.

Connolly, S. L., & Alloy, L. B. (2017). Rumination interacts with life stress to predict depressive symptoms: An ecological momentary assessment study. *Behaviour Research and Therapy, 97,* 86–95. https://doi.org/10.1016/j.brat.2017.07.006.

Cranford, J. A., Shrout, P. E., Iida, M., Rafaeli, E., Yip, T., & Bolger, N. (2006). A procedure for evaluating sensitivity to within-person change: can mood measures in diary studies detect change reliably? *Personality and Social Psychology Bulletin, 32*(7), 917–929. https://doi.org/10.1177/0146167206287721.

Ehring, T., & Behar, E. (in press). Transdiagnostic view on worrying and other negative mental content. In G. A.L. & G. A.T. (Eds.), *Generalized anxiety disorder and worrying: A comprehensive handbook for clinicians and researchers*. Chichester: Wiley-Blackwell.

Ehring, T., & Watkins, E. R. (2008). Repetitive negative thinking as a transdiagnostic process. *International Journal of Cognitive Therapy, 1*(3), 192–205. https://doi.org/10.1680/ijct.2008.1.3.192.

Emmer, M., Richter, C., & Kunst, M. (2016). *Flucht 2.0: Mediennutzung durch Flüchtlinge vor, während und nach der Flucht* [Flight 2.0: Refugee's use of media pre, post and during the flight]. Retrieved March 10, 2020, from http://www.polsoz.fu-berlin.de/kommwiss/arbeitstellen/mediennutzung/forschung/Flucht-2_0/index.html.

Foa, E. B., Cashman, L., Jaycox, L., & Perry, K. (1997). The validation of a self-report measure of posttraumatic stress disorder: The posttraumatic diagnostic scale. *Psychological Assessment, 9*(4), 445–451. https://doi.org/10.1037/1040-3590.9.4.445.

Genet, J. J., & Siemer, M. (2012). Rumination moderates the effects of daily events on negative mood: Results from a diary study. *Emotion, 12*(6), 1329–1339. https://doi.org/10.1037/a0028070.

Goldberg, D. P., Gater, R., Sartorius, N., Ustun, T. B., Piccinelli, M., Gureje, O., et al. (1997). The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychological Medicine, 27*(1), 191–197. https://doi.org/10.1017/S0033291796004242.

Harvey, A. G. (2002). A cognitive model of insomnia. *Behaviour Research and Therapy, 40*(8), 869–893. https://doi.org/10.1016/S0005-7967(01)00061-4.

Harvey, A. G., Tang, N. K. Y., & Browning, L. (2005). Cognitive approaches to insomnia. *Clinical Psychology Review, 25*(5), 593–611. https://doi.org/10.1016/j.cpr.2005.04.005.

Heron, K. E., Everhart, R. S., McHale, S. M., & Smyth, J. M. (2017). Using mobile-technology-based ecological momentary

assessment (EMA) methods with youth: A systematic review and recommendations. *Journal of Pediatric Psychology, 42*(10), 1087–1107. https://doi.org/10.1093/jpepsy/jsx078.

Hinton, D. E., Barlow, D. H., Reis, R., & de Jong, J. (2016). A transcultural model of the centrality of 'thinking a lot' in psychopathologies across the globe and the process of localization: A Cambodian refugee example. *Culture, Medicine, and Psychiatry, 40*(4), 570–619. https://doi.org/10.1007/s11013-016-9489-4.

Hinton, D. E., Nickerson, A., & Bryant, R. A. (2011). Worry, worry attacks, and PTSD among Cambodian refugees: A path analysis investigation. *Social Science and Medicine, 72*(11), 1817–1825. https://doi.org/10.1016/j.socscimed.2011.03.045.

Kaiser, B. N., Haroz, E. E., Kohrt, B. A., Bolton, P. A., Bass, J. K., & Hinton, D. E. (2015). "Thinking too much": A systematic review of a common idiom of distress. *Social Science and Medicine, 147,* 170–183. https://doi.org/10.1016/j.socscimed.2015.10.044.

Kircanski, K., Thompson, R. J., Sorenson, J., Sherdell, L., & Gotlib, I. H. (2018). The everyday dynamics of rumination and worry: Precipitant events and affective consequences. *Cognition and Emotion, 32*(7), 1424–1436. https://doi.org/10.1080/02699931.2017.1278679.

Koch, T., Ehring, T., & Liedl, A. (2020). Efficacy of a transdiagnostic group intervention to enhance emotion regulation in refugees: A pilot randomized controlled study. (**Manuscript submitted for publication**).

Kuiper, R. M., & Ryan, O. (2018). Drawing conclusions from cross-lagged relationships: Re-considering the role of the time-interval. *Structural Equation Modeling, 25*(5), 809–823. https://doi.org/10.1080/10705511.2018.1431046.

Li, S. S. Y., Liddell, B. J., & Nickerson, A. (2016). The relationship between post-migration stress and psychological disorders in refugees and asylum seekers. *Current Psychiatry Reports, 18*(9), 82. https://doi.org/10.1007/s11920-016-0723-0.

Llera, S. J., & Newman, M. G. (2014). Rethinking the role of worry in generalized anxiety disorder: Evidence supporting a model of emotional contrast avoidance. *Behavior Therapy, 45*(3), 283–299. https://doi.org/10.1016/j.beth.2013.12.011.

Mazzucchelli, T., Kane, R., & Rees, C. (2009). Behavioral activation treatments for depression in adults: A meta-analysis and review. *Clinical Psychology, 16*(4), 383–411. https://doi.org/10.1111/j.1468-2850.2009.01178.x.

McEvoy, P. M., Watson, H., Watkins, E. R., & Nathan, P. (2013). The relationship between worry, rumination, and comorbidity: Evidence for repetitive negative thinking as a transdiagnostic construct. *Journal of Affective Disorders, 151*(1), 313–320. https://doi.org/10.1016/j.jad.2013.06.014.

McGowan, S. K., Behar, E., & Luhmann, M. (2016). Examining the relationship between worry and sleep: A daily process approach. *Behavior Therapy, 47*(4), 460–473. https://doi.org/10.1016/j.beth.2015.12.003.

McLaughlin, K. A., Borkovec, T. D., & Sibrava, N. J. (2007). The effects of worry and rumination on affect states and cognitive activity. *Behavior Therapy, 38*(1), 23–38. https://doi.org/10.1016/j.beth.2006.03.003.

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the penn state worry questionnaire. *Behaviour Research and Therapy, 28*(6), 487–495. https://doi.org/10.1016/0005-7967(90)90135-6.

Michael, T., Halligan, S. L., Clark, D. M., & Ehlers, A. (2007). Rumination in posttraumatic stress disorder. *Depression and Anxiety, 24*(5), 307–317. https://doi.org/10.1002/da.20228.

Moberly, N. J., & Watkins, E. R. (2008). Ruminative self-focus, negative life events, and negative affect. *Behavior Research and Therapy, 46*(9), 1034–1039. https://doi.org/10.1016/j.brat.2008.06.004.

Mollica, R. F., Caspi-Yavin, Y., Bollini, P., Truong, T., Tor, S., & Lavelle, J. (1992). The harvard trauma questionnaire: Validating a cross-cultural instrument for measuring torture, trauma, and posttraumatic stress disorder in Indochinese refugees. *Journal of Nervous and Mental Disease, 180*(2), 111–116. https://doi.org/10.1097/00005053-199202000-00008.

Myin-Germeys, I., Oorschot, M., Collip, D., Lataster, J., Delespaul, P., & van Os, J. (2009). Experience sampling research in psychopathology: Opening the black box of daily life. *Psychological Medicine, 39*(9), 1533–1547. https://doi.org/10.1017/S0033291708004947.

Newman, M. G., Jacobson, N. C., Zainal, N. H., Shin, K. E., Szkodny, L. E., & Sliwinski, M. J. (2019). The effects of worry in daily life: An ecological momentary assessment study supporting the tenets of the contrast avoidance model. *Clinical Psychological Science, 7*(4), 794–810. https://doi.org/10.1177/2167702619827019.

Newman, M. G., & Llera, S. J. (2011). A novel theory of experiential avoidance in generalized anxiety disorder: A review and synthesis of research supporting a contrast avoidance model of worry. *Clinical Psychological Review, 31*(3), 371–382. https://doi.org/10.1016/j.cpr.2011.01.008.

Nickerson, A. (2018). Pathways to recovery: psychological mechanisms underlying refugee mental health. In N. Morina & A. Nickerson (Eds.), *Mental health of refugee and conflict-affected populations: Theory, research and clinical practice* (pp. 91–109). Cham: Springer International Publishing.

Palmier-Claus, J. E., Myin-Germeys, I., Barkus, E., Bentley, L., Udachina, A., Delespaul, P. A. E. G., et al. (2011). Experience sampling research in individuals with mental illness: reflections and guidance. *Acta Psychiatrica Scandinavica, 123*(1), 12–20. https://doi.org/10.1111/j.1600-0447.2010.01596.x.

Porter, M., & Haslam, N. (2005). Predisplacement and postdisplacement factors associated with mental health of refugees and internally displaced persons: A meta-analysis. *Journal of the American Medical Association, 294*(5), 602–612. https://doi.org/10.1001/jama.294.5.602.

Rintala, A., Wampers, M., Myin-Germeys, I., & Viechtbauer, W. (2019). Response compliance and predictors thereof in studies using the experience sampling method. *Psychological Assessment, 31*(2), 226–235. https://doi.org/10.1037/pas0000662.

Robinson, M. S., & Alloy, L. B. (2003). Negative cognitive styles and stress-reactive rumination interact to predict depression: A prospective study. *Cognitive Therapy and Research, 27*(3), 275–291. https://doi.org/10.1023/a:1023914416469.

Roussis, P., & Wells, A. (2008). Psychological factors predicting stress symptoms: Metacognition, thought control, and varieties of worry. *Anxiety Stress and Coping, 21*(3), 213–225. https://doi.org/10.1080/10615800801889600.

Satterthwaite, F. E. (1946). An approximate distribution of estimates of variance components. *Biometrics Bulletin, 2*(6), 110–114.

Shrout, P. E., & Lane, S. P. (2012). Psychometrics. In M. R. Mehl & T. S. Conner (Eds.), *Handbook of research methods for studying daily life* (pp. 302–320). New York, NY: The Guilford Press.

Silove, D., Sinnerbrink, I., Field, A., Manicavasagar, V., & Steel, Z. (1997). Anxiety, depression and PTSD in asylum-seekers: Associations with pre-migration trauma and post-migration stressors. *The British Journal of Psychiatry, 170*(4), 351–357. https://doi.org/10.1192/bjp.170.4.351.

Spinhoven, P., van Hemert, A. M., & Penninx, B. W. (2018). Repetitive negative thinking as a predictor of depression and anxiety: A longitudinal cohort study. *Journal of Affective Disorders, 241,* 216–225. https://doi.org/10.1016/j.jad.2018.08.037.

Steel, Z., Silove, D., Bird, K., McGorry, P., & Mohan, P. (1999). Pathways from war trauma to posttraumatic stress symptoms among Tamil asylum seekers, refugees, and immigrants. *Journal of*

Traumatic Stress, 12(3), 421–435. https://doi.org/10.1023/a:1024710902534.

Takano, K., Sakamoto, S., & Tanno, Y. (2014). Repetitive thought impairs sleep quality: An experience sampling study. *Behavior Therapy, 45*(1), 67–82. https://doi.org/10.1016/j.beth.2013.09.004.

Thielsch, C., Andor, T., & Ehring, T. (2015a). Do metacognitions and intolerance of uncertainty predict worry in everyday life? An ecological momentary assessment study. *Behavior Therapy, 46*(4), 532–543. https://doi.org/10.1016/j.beth.2015.05.001.

Thielsch, C., Ehring, T., Nestler, S., Wolters, J., Kopei, I., Rist, F., et al. (2015b). Metacognitions, worry and sleep in everyday life: Studying bidirectional pathways using Ecological Momentary Assessment in GAD patients. *Journal of Anxiety Disorders, 33,* 53–61. https://doi.org/10.1016/j.janxdis.2015.04.007.

Thompson, E. R. (2007). Development and validation of an internationally reliable short-form of the positive and negative affect schedule (PANAS). *Journal of Cross-Cultural Psychology, 38*(2), 227–242. https://doi.org/10.1177/0022022106297301.

Turrini, G., Purgato, M., Ballette, F., Nosè, M., Ostuzzi, G., & Barbui, C. (2017). Common mental disorders in asylum seekers and refugees: Umbrella review of prevalence and intervention studies. *International Journal of Mental Health Systems, 11,* 51. https://doi.org/10.1186/s13033-017-0156-0.

UNHCR. (2017). From a Refugee Perspective: Discourse of Arabic speaking and Afghan refugees and migrants on social media from March to December 2016. Retrieved from https://data2.unhcr.org/en/documents/download/58018.

Watkins, E. R. (2008). Constructive and unconstructive repetitive thought. *Psychological Bulletin, 134*(2), 163–206. https://doi.org/10.1037/0033-2909.134.2.163.

Weathers, F. W., Litz, B. T., Keane, T. M., Palmieri, P. A., Marx, B. P., & Schnurr, P. P. (2013). *The PTSD checklist for DSM-5 (PCL-5)*. Boston: National Center for PTSD.

Weise, S., Ong, J., Tesler, N. A., Kim, S., & Roth, W. T. (2013). Worried sleep: 24-h monitoring in high and low worriers. *Biological Psychology, 94*(1), 61–70. https://doi.org/10.1016/j.biopsycho.2013.04.009.