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Affective Well-Being, Rumination, and Positive Reappraisal among People Living with HIV: A Measurement-Burst Diary Study

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Background: Changes of affective well-being are usually analysed either as longitudinal processes or as daily fluctuations. We used a three-burst diary study to combine these perspectives. **Method:** The participants were 211 patients with a diagnosis of HIV infection. In three bursts with 6-month intervals, they completed an online diary for five consecutive days, which gives 15 days of measurements. They evaluate affective well-being (positive and negative affect), stress associated with a central hassle, and coping (rumination and positive reappraisal). **Results:** Higher daily stress coupled with higher rumination was related to lower well-being. For positive reappraisal, the picture was more complex. First, its interaction with daily stress had an effect on negative, but not on positive, affect. Second, this effect was significant only at the first burst. **Conclusions:** These results suggest a stable debilitating effect of daily rumination, but a limited and diminishing beneficial effect of daily positive reappraisal among people living with HIV. As such, they do not confirm the view that positive reappraisal sustains affective well-being during chronic health conditions. This may inform stress management interventions for PLWH, which are now increasingly taking the form of mobile applications, adapted to the daily lives of patients in their natural environment.

Keywords: affect, coping, HIV, measurement-burst diary study, stress

INTRODUCTION

While a general agreement exists that *coping* matters in the way people deal with stressful life events, until now no consensus has been reached on how to operationalise, classify, and assess different ways of coping (see for review Cheng

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et al., 2014; Skinner et al., 2003). A large heterogeneous literature on coping with respect to coping measurements, coping outcomes, and especially conclusions is a serious impediment to aggregate results regarding the same stressor or domain (Kato, 2013; Stanton et al., 2007). One of the problems in coping studies is that *coping* is not a distinctive, easy to report behavior, but rather a multidimensional phenomenon referring to diverse cognitive and behavioral efforts displayed by the same individual in various times and contexts. This transactional aspect of coping was elaborated by Lazarus and Folkman (1984) in stress and coping model almost 40 years ago, but until recently it has been poorly captured. The traditional designs have a limited ability to give a comprehensive picture of coping by a given person in their natural environment (Kato, 2013) due to their insufficient ecological validity. Specifically, it has been challenging to examine a process that differs not only between people, but also has its own dynamics within people over time during their daily lives (Hamaker, 2012). A promising methodological solution lies in an intensive longitudinal design (Bolger & Laurenceau, 2013), where the individual nature of these changes can be depicted through multiple measurements in the same person. As coping is a within-person process by definition (Lazarus & Folkman, 1984), the ability to capture this intrapersonal variability can be regarded a milestone in stress and coping research.

In this context, two strategies, that is, positive reappraisal and rumination, deserve special attention because of their well-recognised opposite effects on affective well-being in spite of some similarities (Aldao et al., 2010; Hu et al., 2014). Namely, both these strategies being emotion-focused have a cognitive modality, where the emotional state is to change through a change of appraisal of the situation (Lazarus & Folkman, 1984; Smith & Alloy, 2009). Also, they may be especially relevant and preferred in situations with a low level of available control (Haines et al., 2016; Kamijo & Yukawa, 2018). More specifically, positive reappraisal refers to cognitive attempts to reinterpret stressful life events in a positive way, including attempts to find benefits in such situations, and thus changing their initial meaning (Folkman & Moskowitz, 2000). As a result, the use of this coping strategy is positively associated with various aspects of psychological well-being (Garnefski et al., 2002), including mostly enhancing positive affect in the face of vast categories of aversive life events (Folkman, 2008). Conversely, rumination is defined as thinking about the reasons and consequences of an experienced stressful situation, focusing on the negative contents only (Nolen-Hoeksema, 1991). There are many findings on its positive association with various aspects of psychological distress, including mainly depressive symptoms (see for review Nolen-Hoeksema et al., 2008).

Recent studies using a within-person perspective have confirmed effects obtained in studies with a more traditional design only to a certain degree. For instance, daily positive reappraisal was related to daily positive, but not to daily negative, affect (Brans et al., 2013; Brockman et al., 2017; Pavani et al., 2016).

Additionally, more in-depth analysis showed that for some people lower daily positive reappraisal was associated with lower negative affect, whereas for others with higher daily negative affect (Brockman et al., 2017). Daily rumination results for the same day indicate both an increase in negative affect and a decrease in positive affect (Brockman et al., 2017). Overall, these findings suggest that the role of positive reappraisal and rumination is less symmetrical in terms of affect valence than has been assumed hitherto (Aldao et al., 2010).

However, these studies were based on one set of intensive measurements, which do not allow for assessment of stability of the obtained results within longer periods of time. Also, because they concentrated on affect regulation more than on coping, they did not control for stress source and intensity. Finally, they included healthy participants, from the general population. Surprisingly, research on the link between positive reappraisal and rumination with regard to various aspects of daily psychosocial functioning in clinical populations is still relatively scarce (e.g. Gruszczyńska & Knoll, 2015; Kircanski et al., 2015).

Concerning people living with HIV (PLWH), it should first be underscored that studies on the psychosocial aspects of living with HIV are dominated by a focus on the negative consequences. This stems from some kind of *implicit* assumption that the person's life is preoccupied with HIV-related distress associated with being diagnosed with a life-threatening virus (see for review Bennett et al., 2016; Leserman, 2008; Machtinger et al., 2012). However, due to the substantial progress in antiretroviral treatment, the average life expectancy of PLWH has become similar to the general population (Deeks et al., 2013). Therefore, currently many people experience their HIV infection more as a chronic, manageable health condition rather than a fatal disease, meaning their health status is still an important, but not necessarily predominant, source of their everyday distress (Carricco, 2019). Therefore, in spite of the same source of chronic stress (i.e. HIV infection) the stress level of PLWH may fluctuate day by day, leading to significant individual differences in psychological adaptation (Farmer et al., 2017). According to stress and coping theory, these differences should also be explained by ways of coping with daily stress. However, to complicate matters, the literature on struggling with HIV infection, although massive, is very heterogeneous with respect to coping assessment and conclusions (e.g. Armon & Lichtenstein, 2012; Gray & Hedge, 2010; Rzeszutek et al., 2017; Sikkema et al., 2006). The meta-analysis by Moskowitz et al. (2009) showed that among PLWH positive reappraisal was related to higher positive and lower negative affect, although the first effect was stronger. Interestingly, there were no identified studies at that time that assessed the association between rumination and positive affect among PLWH, thus only its relationship with negative affect was confirmed. Furthermore, newer studies (Nightingale et al., 2010) include rumination rather in the context of posttraumatic growth among PLWH, without analysis of within-person daily processes.

Current Study

Considering the aforementioned research gaps, the aim of our study was to examine stable between-person differences as well as intraindividual changes and daily fluctuations in the relation among affective well-being (positive and negative affect at the end of the day), stress associated with daily hassles, and coping (rumination and positive reappraisal). We used a measurement-burst diary study to identify these effects (Sliwinski et al., 2009), with three diaries separated by 6-month intervals and repeated in the same group of PLWH. Thus, the aim of the study is not only assessing daily fluctuations but also verifying the stability of these processes during a longer period of time (i.e. intraindividual change) (Nesselroade, 1991; Stawski et al., 2015). Thus, with the same sample, we would like to confirm that results obtained in single set of daily diaries are not accidental, but persist over time. We formulated three hypotheses based on the results of previous stress and coping studies carried out in a within-person framework, taking into account the specific context of living with HIV.

> *Hypothesis 1.* There is a relationship between affective well-being and daily stress: lower positive affect and higher negative affect relate to higher daily stress after controlling for weekly and overall stress reported by a person. This effect is stable within time of the study.

With regard to the association of negative and positive affect with daily stress, this hypothesis remains intuitively obvious and well documented in the studies on the general population, including with the within-person model (e.g. Bolger et al., 1989; Dunkley et al., 2017). However, to date, no research with such a methodological design has been conducted among PLWH. Moreover, the burst-diary design allows verification of whether within-person coupling of daily stress and affect changes across follow-up. Sliwinski et al. (2009) conceptualised it as changes in reactivity, that is, how strongly a person reacts emotionally to a given stress level, which could be related to aging or other developmental processes (Röcke & Brose, 2013). However, taking into account the relatively short time covered by our study and the effectiveness of medical treatment of HIV infection, on average we expect a quite stable value of this slope across all the measurement bursts.

> *Hypothesis 2.* There is a relationship between affective well-being and daily coping in terms of rumination and positive reappraisal. Specifically, higher daily rumination is related to lower positive affect and higher negative affect. The opposite relationships are expected for positive reappraisal. These effects are stable within time of the study.

Based on classical stress and coping theory (Lazarus & Folkman, 1984), we assumed that the effects of coping on affective well-being should be observed after controlling for the stress effects described in the previous hypothesis. As

presented in the introduction, within-person relationships between these coping strategies and both affect valences are ambiguous, especially for positive reappraisal, thus they can be sample and context specific. However, in previous studies they regarded daily fluctuations only; now we will also examine their intraindividual stability over time.

Hypothesis 3. There is a significant stress × coping relationship at the daily level, with rumination and positive reappraisal moderating the impact of stress on well-being. This effect is stable within time of the study.

Finally, since coping strategies are undertaken to alleviate stress, daily well-being in the face of stress could be a proxy for coping effectiveness, especially when emotion-focused strategies are considered (Lazarus, 2000). Therefore, we expect that an interaction of daily stress and daily coping should be noted. Specifically, higher stress when accompanied by higher rumination (comparing to lower) would be related to lower affective well-being (Genet & Siemer, 2012), whereas for positive reappraisal the opposite effect would be noted. Also, this daily stress × daily coping relationship is expected to be stable across bursts.

METHOD

Participants and Procedure

This study is a part of a larger project on well-being and quality of life among PLWH undergoing antiretroviral treatment. All the patients had a medically confirmed diagnosis of HIV and were recruited from a specialised outpatient clinic where they received antiretroviral treatment in schemas according to current medical guidelines The additional inclusion criteria encompassed a lack of HIV-related cognitive disorders, no current diagnosis of substance use, as well as access to the internet. Out of 770 eligible patients, 217 agreed to take part in the repeated diary study and provided their email address and phone number. These patients were contacted approximately 1 week before the first diary to confirm their willingness to participate and verify the correctness of their contact data. Their final informed consent was obtained on the first day of the first diary. No one resigned at this stage; however, six people had missing data for all three bursts. Thus, they were excluded from the analyses. For the remaining participants, mean values of missing days was 7.46 (SD = 4.39) with 70 per cent providing more than four measurement days. Thus, the final sample included 211 patients (17% women) and 1,574 measurement points.

Each burst consists of repeated sequences of daily measurements. For five consecutive days (from Monday to Friday), the participants filled out online questionnaires, which were sent via hyperlinks to their email boxes each evening to evaluate their affective well-being (positive and negative affect), followed by

stress associated with a central hassle on a given day and coping strategies (rumination and positive reappraisal) related to this hassle. A single online diary survey took approximately 3 to 5 minutes to complete. The items assessing affective state and coping were shuffled within to avoid habitual answering, and automatic notifications prompted participants to answer every question. Daily access was restricted to a limited time after which the link was deactivated and the survey could not be entered. Thus, the participants had no access to the previous answers for review. The online diaries were accessible from internet-connected PCs, smartphones, and tablets. This procedure constitutes a gold standard in diary studies (Masumi et al., 2012).

In total, the study protocol consists of three bursts of such 5-day diaries, separated by a 6-month interval, which equaled 15 potential measurement days for each person through the 12 months of the study. During completion of the diaries, three trained research assistants, supervised by the authors, were available to the participants via email and phone to provide technical support and to answer their questions. The participants received a diary day automatic reminder 4 hours after the survey link was sent if the survey had not been completed, a thank you message after completing each survey, and a longer message when each burst was finished. Participants did not receive compensation for their participation. The study protocol was accepted by the institutional ethics committee.

Measures

The end-of-day affective well-being was evaluated using 12 items from the PANAS-X by Watson et al. (1988): six items measuring negative affect (e.g. tired, unhappy, and upset) and six items evaluating positive affect (e.g. calm, excited, and satisfied). The participants assessed how they felt at the end of each day and provided their answers on a 5-point scale from 1 = *very slightly or not at all* to 5 = *strongly*. The raw values for a given day were added and averaged separately for each subscale. The multilevel reliability was assessed by omega coefficient (Geldhof et al., 2014). The coefficient values were high at the within- and between-person levels, respectively, for both negative (ω_w = .81; ω_b = .97) and positive affect (ω_w = .82; ω_b = .96).

The stress intensity due to central hassles was assessed using a modification of the operationalisation by Dunkley et al. (2003). The participants chose the most central hassle on a particular day and then described event-related stress intensity, controllability, and importance. In this study, only data on stress intensity were used. Participants answered the question *How stressful was this event or issue to you?* and rated their stress level from 1 = *not at all* to 5 = *very much*.

Coping was assessed with two items taken from Brief COPE (Carver, 1997) for positive reappraisal (*I've been trying to see it in a different light, to make it seem more positive. I've been looking for something good in what is happening*), and two items taken from Response Styles Questionnaire (Treynor et al., 2003)

for rumination (*I've been thinking what I am doing to deserve this. I've been thinking why I have problems other people don't have*). They were rephrased to match daily evaluation. Participants were instructed to provide their answers on a 5-point scale from 1 = *I haven't been doing this at all* to 5 = *I've been doing this a lot*, keeping in mind their coping with a central hassle. The raw values for a given day were added and averaged for each strategy. Thus, two indicators were obtained, with higher values indicating higher intensities of rumination and positive reappraisal, respectively. The reliability of the measurement was satisfactory, with lower values for within-person omega coefficient (ω_w = .59; ω_b = .97 for positive reappraisal; ω_w = .63; ω_b = .98 for rumination).

Data Analysis

In general, we followed the pattern of data analysis proposed by Sliwinski et al. (2009) when estimating fixed effects. We had the same hierarchical data structure, with three levels: days (Level 1), nested in bursts (Level 2), nested in persons (Level 3). After obtaining intraclass correlation coefficients via an unconditional model with random intercepts (Bolger & Laurenceau, 2013), we started with a model in which daily affective well-being was explained by intercept, time-related parameters (i.e. weekdays and bursts, and gender because of possible differences between women and men in reporting their emotional states). Weekdays were coded 0 for Monday and then 1, 2, 3, and 4, respectively, for consecutive days. Analogically, bursts were coded from 0 to 2. For stress and coping three indexes were obtained: raw daily level as described in the measures section, burst level (an average value from all weekdays of a given burst), and person level (an average value from all the measurement days for each person). All these values were grand mean centered to facilitate interpretation in absolute values (Sliwinski et al., 2009). In the second model, stress indicators were added, followed by coping indicators in the next model and interaction daily stress × daily coping in the final one. Simple slopes were obtained using the calculator by Preacher et al. (2006). All analyses were performed separately for negative affect and positive affect as well as for rumination and positive reappraisal. Additionally, in all the models we included random effects across individuals and across bursts as well as autoregressive covariance structure (AR1) at Level 1. All the analyses were performed using IBM SPSS Statistics Version 25.

RESULTS

Descriptive Statistics

Table 1 presents basic descriptive statistics as well as Pearson's correlations for aggregated data in each measurement burst. For negative affect, we noted 53 per

TABLE 1
Descriptive Statistics and Pearson's Correlations for Aggregated Diary Data by Measurement Burst

			Pearson's correlations			
Variables	*M*	*SD*	*1*	*2*	*3*	*4*
First measurement burst						
1. Negative affect	2.08	0.88				
2. Positive affect	2.87	0.90	−.56			
3. Stress	2.87	1.20	.55	−.28		
4. Rumination	1.92	1.10	.41	−.24	.24	
5. Positive Reappraisal	2.95	1.08	−.17	.30	−.02#	.06#
Second measurement burst						
1. Negative affect	2.11	0.92				
2. Positive affect	2.86	0.93	−.60			
3. Stress	2.86	1.22	.63	−.45		
4. Rumination	1.85	1.02	.41	−.27	.25	
5. Positive Reappraisal	2.91	1.07	−.08#	.26	−.07#	.02#
Third measurement burst						
1. Negative affect	2.08	0.88				
2. Positive affect	2.92	0.91	−.54			
3. Stress	2.92	1.22	.60	−.42		
4. Rumination	1.78	1.04	.52	−.32	.35	
5. Positive Reappraisal	2.83	1.19	.05#	.27	.03#	.10#

Note: *M* = mean, *SD* = standard deviation.
All correlations except those marked with # are significant at $p < .05$.

cent of the variance at the daily level, 10 per cent at the burst level, and 37 per cent at the between-person level. These proportions were similar for positive affect: 51 per cent, 9 per cent, and 41 per cent, at daily, burst, and person level, respectively. Thus, with substantial intrapersonal variability and between-person differences in affective well-being, we observed relatively small variance due to intraindividual change.

Preliminary Analysis: Within-Person Changes of Affective Well-Being

Results for examining within-person time effects on affective well-being are presented in Model 1 of Tables 2 and 3. As expected, there is no significant change in well-being during the time of the study. However, a slight improvement occurs across weekdays with the highest values of negative affect ($\beta = -.05$, $p < .001$) and the lowest values of positive affect ($\beta = .05$, $p < .001$) on Mondays. Gender differentiated level of positive affect, with women reporting lower values than men ($\beta = .29$, $p < .05$). Nevertheless, this effect disappeared in models including stress and coping.

TABLE 2
Results of Multilevel Analyses for Stress and Rumination on the End-of-Day Affective Well-Being

	Negative affect					*Positive affect*				
Parameters	*Model 1 Est (SE)*	*Model 2 Est (SE)*	*Model 3 Est (SE)*	*Model 4 Est (SE)*	*Model 5 Est (SE)*	*Model 1 Est (SE)*	*Model 2 Est (SE)*	*Model 3 Est (SE)*	*Model 4 Est (SE)*	*Model 5 Est (SE)*
Fixed effects										
Intercept	2.39 (.12)***	2.17 (.09)***	2.16 (.08)***	2.14 (.08)***	2.15 (.08)***	2.50 (.12)***	2.66 (.11)***	2.68 (.11)***	2.68 (.11)***	2.68 (.11)***
Burst	.02 (.03)	.01 (.02)	.02 (.02)	.02 (.02)	.01 (.02)	.03 (.03)	.02 (.03)	.01 (.03)	.01 (.03)	.01 (.03)
Day	−.05 (.01)***	−.03 (.01)*	−.02 (.01)*	−.02 (.01)*	−.03 (.01)*	.05 (.01)***	.03 (.01)**	.03 (.01)**	.03 (.01)**	.03 (.01)**
Gender	−.19 (.12)	.03 (.09)	.01 (.08)	.02 (.08)	.01 (.08)	.29 (.14)*	.15 (.12)	.14 (.11)	.14 (.11)	.14 (.11)
Stress_day		.35 (.03)***	.33 (.03)***	.33 (.03)***	.33 (.03)***		−.24 (.03)***	−.23 (.03)***	−.23 (.03)***	−.23 (.03)***
Stress_week		.06 (.04)	.04 (.04)	.05 (.04)	.05 (.04)		.03 (.05)	.04 (.05)	.03 (.05)	.03 (.05)
Stress_person		.14 (.07)*	.06 (.07)	.06 (.07)	.06 (.06)		−.07 (.08)	−.01 (.08)	−.01 (.08)	−.01 (.08)
Burst x stress_day		−.01 (.02)	−.02 (.02)	−.01 (.02)	−.01 (.02)		−.03 (.02)	−.02 (.02)	−.03 (.02)	−.03 (.02)
Burst x stress_person		.04 (.04)	.05 (.04)	.04 (.04)	.04 (.04)		−.04 (.04)	−.04 (.04)	−.03 (.04)	−.03 (.04)
Rumination_day			.17 (.03)***	.16 (.03)***	.17 (.03)***			−.08 (.03)**	−.08 (.03)**	−.08 (.03)**
Rumination_week			.04 (.05)	.04 (.05)	.04 (.05)			−.08 (.06)	−.08 (.06)	−.08 (.06)
Rumination_person			.01 (.07)	.01 (.07)	.02 (.07)			−.03 (.09)	−.04 (.08)	−.04 (.09)
Burst x Rumination_day			.02 (.03)	.01 (.03)	−.01 (.03)			.02 (.03)	.02 (.05)	.02 (.03)
Burst x Rumination_person			.01 (.04)	.02 (.04)	.02 (.04)			−.03 (.05)	−.03 (.05)	−.03 (.05)
Stress_day x Rumination_day				.07 (.01)***	.05 (.02)**				−.03 (.01)*	−.03 (.02)
Burst x Stress_day x Rumination_day					.02 (.01)					.00 (.02)
Random effects										
Level 3 (between−person)										
Intercept	.30 (.04)***	.14 (.02) ***	.10 (.02)***	.10 (.02)***	.10 (.02)***	33 (.05)***	.28 (.04)***	.25 (.04)***	.24 (.04)***	.24 (.04)***
Stress_day		.02 (.01)**	.02 (.01)**	.02 (.00)**	.02 (.00)**		.03 (.01)***	.03 (.01)***	.03 (.01)***	.03 (.01)***
Rumination_day			.01 (.01)*	.01 (.01)	.01 (.01)			.01 (.01)	.01 (.01)	.01 (.01)

TABLE 2 *(Continued)*

	Negative affect					*Positive affect*				
Parameters	*Model 1 Est (SE)*	*Model 2 Est (SE)*	*Model 3 Est (SE)*	*Model 4 Est (SE)*	*Model 5 Est (SE)*	*Model 1 Est (SE)*	*Model 2 Est (SE)*	*Model 3 Est (SE)*	*Model 4 Est (SE)*	*Model 5 Est (SE)*
Level 2 (within−person, across bursts)										
Intercept	.01 (.03)	.02 (.02)	.01 (.02)	.01 (.02)	.01 (.02)	.02 (.01)	.04 (.02)*	.03 (.02)	.03 (.02)	.03 (.02)
Repeated measures										
AR1 diagonal	.52 (.03)***	.34 (.02)***	.31 (.02)***	.31 (.02)***	.31 (.02)***	.49 (.02)***	.35 (.02)***	.35 (.02)***	.35 (.02)***	.35 (.02)***
AR1 rho	.28 (.04)***	.21 (.04)***	.20 (.05)***	.20 (.05)***	.20 (.05)***	.25 (.04)***	.13 (.05)**	.13 (.05)**	.13 (.05)**	.13 (.05)**

Note: Est = estimate, *SE* = standard error.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

TABLE 3
Results of Multilevel Analyses for Stress and Positive Reappraisal on the End-of-Day Affective Well-Being

	Negative affect					*Positive affect>*				
Parameters	*Model 1 Est (SE)*	*Model 2 Est (SE)*	*Model 3 Est (SE)*	*Model 4 Est (SE)*	*Model 5 Est (SE)*	*Model 1 Est (SE)*	*Model 2 Est (SE)*	*Model 3 Est (SE)*	*Model 4 Est (SE)*	*Model 5 Est (ss)*
Fixed effects										
Intercept	2.39 (.12)***	2.17 (.09)***	2.16 (.08)***	2.20 (.09)***	2.19 (.09)***	2.50 (.12)***	2.66 (.11)***	2.64 (.10)***	2.64 (.10)***	2.65 (.10)***
Burst	.02 (.03)	.01 (.02)	.00 (.02)	−.01 (.02)	.00 (.02)	.03 (.03)	.02 (.03)	.04 (.02)	.04 (.02)	.04 (.02)
Day	−.05 (.01)***	−.03 (.01)***	−.04 (.01)***	−.04 (.01)**	−.04 (.01)**	.05 (.01)***	.03 (.01)**	.04 (.01)***	.04 (.01)***	.04 (.01)***
Gender	−.19 (.12)	.03 (.09)	.01 (.09)	.02 (.09)	.02 (.09)	.29 (.14)*	.15 (.12)	.15 (.11)	.15 (.11)	.14 (.11)
Stress_day		.35 (.03)***	.33 (.03)***	.33 (.03)***	.33 (.03)***		−.24 (.03)***	−.23 (.03)***	−.23 (.03)***	−.23 (.03)***
Stress_week		.06 (.04)	.06 (.04)	.07 (.04)	.07 (.04)		.03 (.05)	.02 (.04)	.01 (.04)	.01 (.04)
Stress_person		.14 (.07)*	.14 (.06)*	.13 (.06)*	.13 (.06)*		−.07 (.08)	−.08 (.07)	−.07 (.07)	−.07 (.07)
Burst x stress_day		−.01 (.02)	.00 (.02)	−.01 (.02)	.00 (.02)		−.03 (.02)	−.03 (.02)	−.02 (.02)	−.02 (.02)
Burst x stress_person		.04 (.04)	.02 (.04)	.02 (.04)	.02 (.04)		−.04 (.04)	−.02 (.04)	−.03 (.04)	−.02 (.04)
PReappraisal_day			−.11 (.03)***	−.11 (.03)***	−.10 (.03)***			.10 (.03)**	.10 (.03)**	.10 (.03)**
PReappraisal_week			−.11 (.05)*	−.11 (.05)*	−.11 (.05)*			.20 (.05)***	.20 (.05)***	.20 (.05)***
PReappraisal_person			.08 (.07)	.07 (.07)	.06 (.07)			.09 (.07)	.09 (.08)	.09 (.08)
Burst x PReappraisal_day			.04 (.02)	.03 (.02)	.03 (.02)			.00 (.02)	.00 (.03)	.00 (.03)
Burst x PReappraisal_person			.08 (.04)*	.08 (.04)*	.08 (.04)*			−.09 (.04)*	−.09 (.04)*	−.09 (.04)*
Stress_day x PReappraisal_day				−.03 (.01)*	−.05 (.02)**				.01 (.01)	.02 (.02)
Burst x Stress_day x PReappraisal_day					.03 (.01)*					−.01 (.02)
Random effects										
Level 3 (between−person)										
Intercept	.30 (.04)***	.14 (.02) ***	.14 (.02)***	.14 (.02)***	.14 (.02)***	33 (.05)***	.28 (.04)***	.22 (.03)***	.22 (.03)***	.22 (.03)***
Stress_day		.02 (.01)**	.01 (.01)**	.02 (.02)**	.02 (.01)**		.03 (.01)***	.03 (.01)***	.03 (.01)***	.03 (.01)***
PReappraisal_day			.02 (.01)*	.02 (.01)*	.01 (.01)*			.01 (.01)	.01 (.01)	.01 (.01)

TABLE 3 *(Continued)*

	Negative affect					*Positive affect>*				
Parameters	*Model 1 Est (SE)*	*Model 2 Est (SE)*	*Model 3 Est (SE)*	*Model 4 Est (SE)*	*Model 5 Est (SE)*	*Model 1 Est (SE)*	*Model 2 Est (SE)*	*Model 3 Est (SE)*	*Model 4 Est (SE)*	*Model 5 Est (ss)*
Level 2 (within−person, across bursts)										
Intercept	.01 (.03)	.02 (.02)	.01 (.02)	.00 (.01)	.01 (.02)	.02 (.01)	.04 (.02)*	.01 (.02)	.01 (.02)	.01 (.02)
Repeated measures										
AR1 diagonal	.52 (.03)***	.34 (.02)***	.33 (.02)***	.32 (.02)***	.32 (.02)***	.49 (.02)***	.35 (.02)***	.34 (.02)***	.34 (.02)***	.34 (.02)***
AR1 rho	.28 (.04)***	.21 (.04)***	.20 (.05)***	.19 (.05)***	.19 (.05)***	.25 (.04)***	.13 (.05)**	.13 (.05)**	.11 (.05)*	.11 (.05)**

Note: Est = estimate, *SE* = standard error, PReappraisal = positive reappraisal.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Hypothesis 1: Relationship between Affective Well-Being and Stress

The next stage of analysis is presented in Model 2. Results for negative and positive affect are highly similar. Namely, higher negative affect and lower positive affect are related to higher daily stress ($\beta = .35$ and $\beta = -.24$, $p < .001$, respectively) and there is no incremental effect of the week-stress level. Also, a lack of burst effect showed within-person stability of these relationships during the time of the study. Additionally, there is a significant between-person stress effect, noted only for negative affect ($\beta = .14$, $p < .05$), in that participants reporting higher stress in general, also had higher negative affect.

Hypothesis 2: Relationship between Affective Well-Being and Coping after Controlling for Stress

Results for each kind of coping are described separately. For rumination (Model 3 of Table 2), there is a significant positive relationship at the daily level for negative affect ($\beta = .18$, $p < .001$) and a negative relationship for positive affect ($\beta = -.08$, $p < .01$). Thus, on days with higher use of rumination, worse affective well-being is also noted. Also, the within-person slope of the relationship between rumination and daily well-being did not change across bursts, and ruminative coping at the person level did not modify intraindividual change in well-being.

For positive reappraisal (Model 3 of Table 3), although the pattern of results is more complex, similar results are seen for both negative and positive affect. Specifically, there is a significant relationship of affective well-being with daily use of positive reappraisal strategies ($\beta = -.11$, $p < .001$, and $\beta = .10$, $p < .05$) as well as weekly use of these strategies ($\beta = -.11$, $p < .05$, and $\beta = .20$, $p < .001$). No main effect of between-person differences in positive reappraisal was noted; nevertheless, this effect changes longitudinally. Specifically, with each burst, a higher average of positive reappraisal reported by participants is coupled with a decrease of positive affect ($\beta = -.09$, $p < .05$) and an increase of negative affect ($\beta = .08$, $p < .05$), and thus with worsening of affective well-being.

Hypothesis 3: Interaction between Daily Stress and Daily Coping

Finally, an interaction between daily stress and daily coping was added in Model 4 (Tables 2 and 3). It revealed that higher daily stress when accompanied by higher rumination has a stable dampening effect on affective well-being as shown in Figure 1. Namely, for higher daily rumination, the relationship between daily stress and negative affect was twice as strong as for lower daily

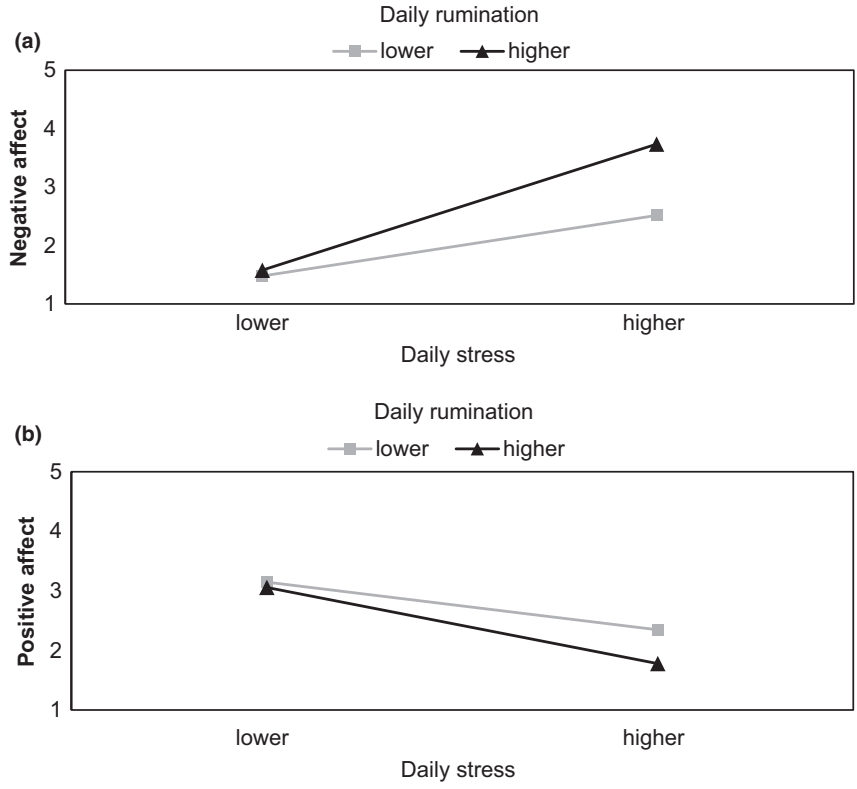

FIGURE 1. Simple slopes for interaction between daily stress and daily rumination on negative (a) and positive affect (b).

rumination (β_{low} = .26, p < .001 vs. β_{high} = .54, p < .001). Region of significance for simple slopes indicates that for all the participants in our sample this slope was positive and significant. Similarly, the negative relationship between positive affect and daily stress was stronger for higher than for lower daily rumination, although this effect was less pronounced (β_{low} = −.20, p < .001 vs. β_{high} = −.32, p < .001). Region of significance for simple slopes indicates that for all the participants in our sample these slopes had the same negative sign and were significant.

For positive reappraisal, there is an opposite effect but only for negative affect: together with higher daily stress, a higher daily level of these strategies was related to lower negative affect (β = −.03, p < .05). However, this effect is burst-related (β = .03, p < .05). Namely, for the first set of diaries it is equal to β = −.06, and significant at p = .001, whereas for the second β = −.003 and for the last β = .01, both insignificant. The simple slopes were thus probed only

for the first burst, for which the positive relationship between daily stress and negative affect is getting weaker with higher use of positive reappraisal (β_{low} = .48., $p < .001$ vs. β_{high} = .20, $p < .001$), turning insignificant at a value of around three standard deviations above the mean. However, it is outside the range of reported daily positive reappraisal in our study; thus although different in magnitude, this slope is significant for all the participants.

Summing up, for rumination the hypothesis was supported, whereas for positive reappraisal the positive effect was noted only for negative affect and disappeared with time.

DISCUSSION

The results of our study were in line with our expectations regarding the time effects for daily affective well-being among our participants. Namely, as expected affective well-being was longitudinally stable but a significant day effect was noted (i.e. participants reported the highest negative affect and the lowest positive affect on Monday with linear improvement across weekdays). Some authors have already observed an adaptation and stability of well-being, especially over the long term, when patients were not newly diagnosed and when HIV is adequately controlled by the treatment (Ironson & Hayward, 2008; Tsevat et al., 2009); notably, both of these circumstances were fulfilled among our participants. It would suggest that living with HIV, at least for some people, might be subject to the same adaptation processes as others described by subjective well-being theory (Lyubomirsky, 2011). Also, day-by-day across week fluctuations were observed, which were noted earlier in nonclinical populations. Taken together, it may suggest a high similarity of processes underlying affective well-being among highly functional PLWH on antiretroviral treatment to those without any diagnosis of chronic illness.

To some extent, this is also illustrated by the verification of the first hypothesis that higher daily stress was related both to negative affect (positively) and positive affect (negatively), but at the same time no effect for week-level stress or burst effect of stress for either positive and negative affect has been found. With regard to the association of affect with daily stress, this result remains intuitively obvious and well documented in the studies on the general population (e.g. Bolger et al., 1989; Dunkley et al., 2017). However, only very few studies with such a methodological design have been conducted, so it may contribute to both the HIV/AIDS and affective well-being literature. The null finding regarding the link between daily stress and affective well-being in a longitudinal perspective may again be a sign that among PLWH short-term affective fluctuations in the aftermath of various stressors do not necessarily translate into long-term changes in how stress disturbs well-being (Rendina et al., 2018; Tsevat et al., 2009). Finally, interestingly, higher reported stress at the person level had an effect only on

negative affect and not on positive affect among our participants. This may support a differential effect of perceived chronic stress on affective well-being with a more reactive negative affect-related system even when dealing with relatively small stressors, such as daily hassles (Larsen & Prizmic, 2008).

When coping was added to the models, we observed some differences between the result patterns for rumination and positive reappraisal. As expected, higher daily rumination was related to worse affective well-being, after controlling for stress effects, and was not modified by burst. Thus, this was stable across time, which can be also interpreted as time-invariant. As such, it supports this relationship more strongly than in the existing studies (Nolen-Hoeksema et al., 2008) and those among PLWH (Kraaij et al., 2008; Nightingale et al., 2010), since it was repeated during the time of the study (i.e. observed at *each set* of diaries). However, we did not find that between-person differences understood as a proxy of coping styles (Parker & Endler, 1992) are related to affective well-being, which is inconsistent with existing results concerning ruminative style (Nolen-Hoeksema, 1991, 2000) and positive reappraising style (Mauss et al., 2007; Memedovic et al., 2010) as well as studies using the diary approach (Gunaydin et al., 2016), although data on the latter are very scarce. Nonetheless, in our study, we confirmed the expected relationship of affective well-being with daily coping strategies and, additionally, failed to observe it for coping styles.

Finally, we also noted a significant interaction of daily stress with daily coping. As expected in Hypothesis 3, higher daily stress when coupled with higher rumination was related to lower affective well-being. In general, however, the picture for positive reappraisal is more complex than for rumination. First, when we analysed positive reappraisal at the person level, we observed *worsening* affective well-being with each burst for those who reported that they generally use this coping more intensively in the time covered by the study. Secondly, at the level of daily coping, we noted that the beneficial effect of positive reappraisal strategies in the face of higher stress in terms of reducing negative affect, present in the first diary data collection, was erased in the second and third. Taken together, we found a *stable debilitating effect* of daily rumination on both valences of affective well-being, but a *disappearing beneficial effect* of daily positive reappraisal, and limited to negative affect only.

The aforementioned findings are relatively difficult to interpret as until now no studies with such a design including coping have been conducted either among PLWH or in other samples. However, they correspond with a large effect for rumination and only a small to medium effect for positive reappraisal in depression and anxiety as illustrated by meta-analyses on emotion-regulation across psychopathology (Aldao et al., 2010). This weaker effect of positive reappraisal could be explained by significant between-person variability; Brockman et al. (2017) found that for some people higher daily reappraisal was related to

lower negative affect, whereas for others it was related to higher negative affect. Thus, in real life outcomes of positive appraisal are not necessarily so unified and beneficial as assumed (McMahon & Naragon-Gainey, 2018), not only at the daily level, but also at the person level. Kuppens et al. (2012) showed a significant cross-sectional as well as a predictive effect of emotional inertia on depression. Interestingly, this deleterious carry-over was noted for both negative and positive emotions, which suggests a crucial role of the flexibility of emotional responses (note that a positive autoregressive correlation was indicated for both positive and negative affect in our study). Therefore, the lack of this flexibility could be reflected in a diminishing beneficial effect of adaptive strategies and an increasing debilitating effect of maladaptive strategies. The former was noted in our study; however, how it translates into escalation of symptomology requires observation of trajectories within longer periods of time (Kuppens et al., 2012; Pavani et al., 2017).

Nonetheless, we still have to keep in mind that in our study on average we observed neither an increase of negative affect nor a decrease of positive affect across bursts, so the aforementioned effects do not have a profound impact on affective well-being. Rather, the findings support the stability of affective well-being and may also explain how it is regulated to maintain this stability. It is also worth noting that person-related stability assumes that interindividual differences in well-being exist as indicated by significant random intercepts and the aforementioned time-related effect of overall use of positive reappraisal. Additionally, their sources other than time, gender, stress, and coping were not accounted for in our study.

Still, this study has several strengths. To the best of our knowledge, it is the first study using three bursts of daily diaries with this particular set of study variables and with a relatively large sample size of participants. The added value of our research lies also in the analysis of long-term usual daily functioning of PLWH when dealing with different hassles, a topic greatly neglected in the HIV/AIDS literature. Nevertheless, some limitations should also be underscored. First, in this study, we did not control for several sociodemographic and clinical variables which may be related to the obtained pattern of findings, particularly as our sample should be regarded as highly functional and with well-controlled medical symptoms. Future studies should concentrate on more heterogeneous samples of PLWH with regard to their socioeconomic status and HIV infection progression. Second, all the variables were assessed by self-description and only one item was used for stress assessment. Thus, future studies in that area could focus on a more comprehensive assessment of stress related to daily hassles. Finally, our study shares shortcomings typical of all diary studies, including a highly demanding protocol for participants, which could influence the results in many ways. In our case, of special importance is sample-selection bias, the percentage of missing data and the potential intervening impact of repeated measures (Bolger &

Laurenceau, 2013). However, no significant intraindividual change was observed (Newcomb et al., 2018), suggesting the limited nature of measurement reactivity (Shrout et al., 2018). Even if the observed time-related interaction effect is suspected to be a result of attenuation, still it would be intriguing to discover why this effect was noted only for positive reappraisal. Verification of this finding requires further research.

Despite these limitations, we revealed a *debilitating effect* of high daily rumination on affective well-being, especially when coupled with high stress, and a *beneficial effect* of daily positive reappraisal, especially when coupled with high stress, but only for negative affect. Additionally, a completely new result is that we found stability of the stress × rumination effect and a fading of the stress × positive reappraisal effect. Thus, we identified possible shortcomings of using a single set of diaries, which is a diary design dominating contemporary research on the daily life of PLWH (e.g. Fazeli et al., 2017; Rendina et al., 2018), and showed the potential of using a burst design. This study illustrates that although we are still quite far from "capturing life as it is lived" (Bolger et al., 2003), we are equipped with tools to make more a reliable approximation of these real-life processes. Hopefully, it would lead to more effective stress management interventions, which are now increasingly taking the form of mobile applications, tailored to the everyday lives of patients with chronic medical conditions in their natural environment (Barroso et al., 2019).

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