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Daily emotional dynamics and changes in posttraumatic growth and posttraumatic depreciation among people living with HIV

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ABSTRACT

Objective: Posttraumatic growth (PTG), and its negative reflection, posttraumatic depreciation (PTD), are two aspects of response to trauma. This study explores whether daily emotional dynamics (inertia and innovation) can translate into positive versus negative changes among people living with HIV (PLWH) in the form of long-term changes in PTG or PTD.

Methods: The study combined a classical longitudinal approach with two assessments of PTG and PTD within one year and a measurement burst diary design with three weekly electronic diaries. In total, 249 PLWH participated in this study, filling out an expanded version of the Posttraumatic Growth and Depreciation Inventory (PTGDI-X) and a survey of sociodemographic and clinical data. In addition, they assessed their positive affect (PA) and negative affect (NA) at the end of each day in online diaries using a shortened version of the PANAS-X.

Results: Although we observed stable significant inertia and innovation of PA and NA across all bursts, these parameters of daily emotional dynamics were unrelated to the longitudinal changes in PTG and PTD. The same null results were also noted for the average levels of NA and PA.

Conclusions: The results indicated the relative stability of emotion regulation in PLWH over the course of one year and contributed to understanding its dynamic mechanisms in terms of trait-like characteristics. The null result of the relationship between the PTG and PTD change might suggest a weak role of emotion regulation in shaping these trajectories as well as a lack of validity of the PTG/PTD measures.

1. Introduction

The posttraumatic growth (PTG) construct was introduced in the advent of the positive psychology field of study. It inspired a plethora of research on the paradoxical positive changes experienced by people in the aftermath of trauma (e.g., [22,30,36,47,63,64]). Initially, PTG was described by Tedeschi and Callhoun [63,64] as a positive transformational change in response to challenging life circumstances, which translated into versatile gains in social relationships, personal strength, appreciation of life, openness to new life opportunities, and enhanced spirituality. Although a significant body of empirical evidence has been gathered on the prevalence of PTG in various trauma survivors, the theoretical status and PTG measurement are subjects of ongoing scientific discussions and controversies (e.g., [29,49]). One of the key unresolved controversies is the mutual relationship between PTG and the psychological well-being of people after traumatic events [44]. In other words, the question of whether and how PTG translates into trauma survivors' well-being remains unanswered [30,72]. More specifically, contemporary studies found positive (e.g., [39,42]), negative [65], null (e.g., [12,58]), or even curvilinear associations between PTG and psychological well-being indicators in various study samples with experiences of traumatic events [35,66]. The aforementioned inconclusive findings are usually attributed to versatile psychological well-being operationalizations across PTG studies [8,22], as well as a dominating cross-sectional study design, which prevents causal interpretations [10,43]. In addition, the vast majority of authors investigating growth after trauma use retrospective PTG scales focusing on positive changes after trauma only, which may pose a risk of positive

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response bias [4]. To date, only a few authors have explored the parallel negative reflection of PTG in the form of posttraumatic depreciation (PTD; [3,11,50]). More recently, some authors have underscored the independence of PTG and PTD, which may share different predictors and be related differently to well-being after trauma [32]. This may be particularly true for trauma associated with life-threatening illness, which is multifaceted and affects the past as well as the present and future (e.g., awareness of constant threat to life, associated social stigma, [15]). Finally, even fewer authors have tried to capture the daily manifestations of PTG and its associated well-being outcomes by utilizing an intensive longitudinal study design [6].

In our study, we focused on daily emotional dynamics with regard to long-term PTG vs. PTD among people living with HIV (PLWH). As the classic theory of Tedeschi and Calhoun [63,64] presents PTG as a form of positive personality change, it is particularly interesting to examine how it translates into the everyday behaviours that may constitute this change, namely more adaptive daily emotional functioning [29]. The complex and dynamic nature of emotions makes them particularly difficult to measure [18,19]. This poses a fundamental obstacle to determining how emotions shape individual well-being over time ([17]; Lyubomirsky et al., 2005; [69]), particularly its affective component, which is usually characterized by the intensity of both negative and positive affect [14]. Recently, an increasing number of authors have countered the traditional views on emotions as stable individual traits or uniform states that can be easily induced in a laboratory (for a meta-analysis, see [24]). To capture a more realistic image of emotional states of mind, recent studies have defined emotions as emergent processes that should be measured in the natural environment and within a temporal perspective (e.g., [57,60,68]). In other words, it has been found that short-term affect dynamics can be related to some mental disorders [68]. One such phenomenon of emotional dynamics is *emotional inertia*, which was introduced by Suls et al. [61] to define a process in which actual emotional states are derived from the ones that appear previously and may cause poor emotional flexibility [33,34]. Although the construct of emotional inertia has been examined broadly within a negative, psychopathological context (e.g., depression; [24]), little is known about how inertia in affect can be associated with positive well-being outcomes [31]. Furthermore, even less is known about opposite emotional phenomena, namely, *emotional innovation* [21], which indicates a change in daily emotional state that is unrelated to previous observations and therefore unpredictable on that basis (see also [52]). Although both emotional inertia and emotional innovation have never been studied in the context of growth after trauma, the classic PTG models underscore that effective emotion regulation, i.e., maintaining a high level of positive affect (PA), is an important factor supporting cognitive processes that stimulate PTG to appear [64]. Specifically, PA, and not negative affect (NA), was found to be a significant predictor of PTG in a longitudinal study of PLWH [51].

Appropriate emotion regulation, i.e., maintaining a high positive affect, has been linked with versatile health benefits among PLWH, such as enhancing viral suppression [70], slower HIV progression [28], or even decreasing AIDS mortality [40]. However, the aforementioned studies examined the emotional states of these patients in a static, retrospective way and found that knowledge of the daily emotional life of PLWH is still relatively low (e.g., [48,52,55]). One of the variables that can be associated with poor psychological adjustment on a daily basis is HIV/AIDS stigma, which has been found to be related to emotional dysregulation among PLWH [48]. Problems with regulating one's emotional state are also a component of emotional inertia [34]. It seems that both dysregulation and inertia in affect may lead to difficulties in accessing the internal resources that were described as effective in coping with HIV-related distress [48]. What is particularly interesting is examining whether daily emotional dynamics (inertia or innovation) can translate into positive versus negative transformative changes among PLWH in the form of either long-term PTG or PTD.

1.1. Current study

Research on PTG so far has not considered the aforementioned recent advancements in empirically capturing emotional variability and its connection to adapting to chronically demanding conditions. Therefore, our major research question was whether emotion dynamics over short periods of time were associated with changes in PTG and PTD over the longer term. Previous research has suggested that emotional inertia, whether in positive or negative emotions, is a predictor of psychopathological symptoms [34]. However, these findings are inconclusive and refer to emotional inertia extracted from measurements covering an arbitrary time period [24]. This represents only one burst among many others over time, each with potentially different dynamics. Thus, although based solely on the assessments during one burst, inertia is treated as a characteristic of the individual, serving as a proxy indicator of their emotional reactivity and the effectiveness of emotion regulation or, more broadly, regulatory weakness [21]. In this light, however, it remains reasonable to question the extent to which these findings can be generalized, as the stability of emotional inertia over time has yet to be confirmed.

Our study addresses this research gap by including triplicate estimates of both emotional inertia and innovation in the same individuals. We also aimed to examine whether PTG vs. PTD measured in a 1-year longitudinal study are associated with day-by-day emotion dynamics in the form of emotional inertia and innovation. We used a measurement-burst diary study to evaluate the stability of these parameters, with three 5-day electronic daily diaries repeated in the same group of people living with HIV in two follow-ups within 6-month intervals [59]. The measurement model is presented in Fig. 1. We formulated the following hypotheses:

Hypothesis 1. The values of both emotional inertia and innovation for positive and negative affect, respectively, are stable across all three bursts.

Hypothesis 2. Regardless of valence (PA vs. NA), emotional inertia is, respectively, negatively vs. positively related to PTG vs. PTD after adjusting for baseline PTG and PTD levels and mean values of emotions across bursts.

Hypothesis 3. Regardless of valence (PA vs. NA), emotional innovation is, respectively, positively vs. negatively associated with PTG vs. PTD after adjusting for baseline PTG and PTD levels and mean values of emotions across bursts.

2. Methods

2.1. Participants and procedure

This study is part of a larger project on posttraumatic growth among people living with HIV that was held between January 2021 and January 2022. All participants had a medically confirmed diagnosis of HIV and were recruited from an outpatient clinic, where they received antiretroviral treatment. Of the 509 patients who took part in the first assessment, 249 provided their contact details and agreed to take part in further stages of the project. An analysis of the differences between those who agreed to continue and those who did not showed that the former group had more participants with higher education ($\chi 2(3) = 10.26$; $p = .02$), who were single ($\chi 2(1) = 6.213$; $p = .01$), and who reported a history of substance abuse ($\chi 2\ (1) = 10.511$; $p = .001$). Table 1 presents the demographic and clinical characteristics of the study sample.

The design of the study combines two approaches. The first approach included three classical longitudinal measurements, i.e. assessments of self-reported PTG and PTD with paper and pencil questionnaires at 6-month intervals. For the analysis presented in this paper, only two measurements of PTG and PTD, separated by one year, were considered. The second approach was the measurement-burst design. This consists of

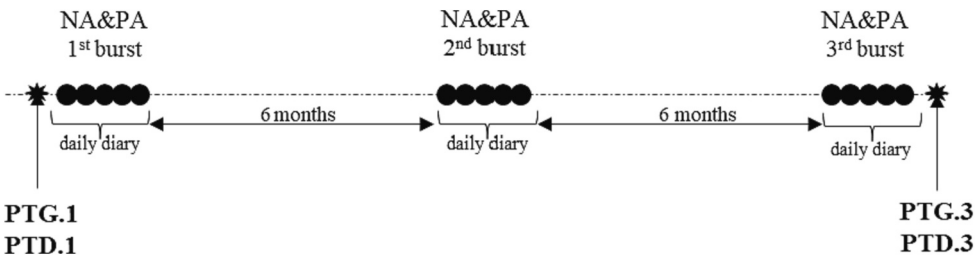

Fig. 1. A three-burst measurement model of daily negative (NA) and positive (PA) affect along with longitudinal measurement of posttraumatic growth (PTG) and posttraumatic depreciation (PTD).

Table 1
Demographic and clinical characteristics of the sample (N = 249).

Variable	N (%)
Gender	
Male	213 (85.5%)
Female	36 (14.5%)
Age in years (M ± SD)	39.7 ± 10.6
Stable relationship	
Yes	122 (49.0%)
No	127 (51.0%)
Education	
No university degree	124 (49.8%)
University degree	125 (50.2%)
Substance abuse	79 (15.5%)
Diagnosed with AIDS	41 (16.5%)
Duration since diagnosis (years) (M ± SD)	11.3 ± 8.0
Duration of antiretroviral treatment (years) (M ± SD)	6.6 ± 5.4
CD4 level (number of CD4 T-cells; cells/mm^3) (M ± SD)	607.8 ± 222.5
Detectable viremia	23 (9.2%)

Note: M = Mean, SD = standard deviation.

three series (i.e. bursts) of weekly online diaries, taken six months apart. The time sequence of all measurements is shown in Fig. 1.

In the case of electronic diaries, the participants filled out online questionnaires on their affective well-being, which were sent via hyperlinks to their e-mail boxes each evening from Monday to Friday. A single online diary survey lasted about 3 to 5 min to complete. Daily access was restricted to a limited time, after which the link was no longer active. The participants also had no access to their previous answers. Online diaries could be accessed via PCs, smartphones, and tablets. This procedure is the gold standard in diary studies [26].

Involvement in the study was voluntary, and no remuneration was provided. Informed consent was obtained twice: before the first measurement of PTG and PTD and before the first burst of the online diary.

2.2. Measures

2.2.1. Expanded version of posttraumatic growth and depreciation inventory (PTGDI-X)

PTG and PTD levels were assessed using the 50-item PTGDI-X [62] questionnaire in a Polish adaptation. PTGDI-X comprises items evaluating domains in a positive direction of PTG (five subscales: relating to others, new possibilities, personal strength, spiritual change, and appreciation of life; for example, *I am more willing to express my emotions*) accompanied by the same items formulated in a negative way to assess PTD (e.g., I *am less willing to express my emotions*). Participants responded on a 6-point scale ranging from 0 (*I did not experience this change*) to 5 (*I experienced this change to a great degree*). Higher scores indicate more intense PTG or PTD levels. We followed the global PTG and PTD scores based on the recommendations of Taku et al. [62]. The participants were instructed to focus on positive or negative changes in their lives after receiving their HIV diagnosis. The Cronbach's α coefficient at the two measurement points for the PTG and PTD was high and ranged from 0.86 to 0.97.

2.2.2. The shortened version of the PANAS-X

The PANAS-X [67] version used in the study was a list of 12 feelings and emotions: six for PA (e.g., *satisfied, energetic*) and six for NA (e.g., *angry*, *worried*). Participants rated the affective states they experienced during each day of the study using an accompanying Likert scale, with values ranging from 1 (*not at all)* to 5 (*strongly)*.

2.3. Statistical analysis

The most popular approach to parameterization of inertia, innovation, and individual differences in the average level of emotions is a two-level autoregressive model [38]. However, the data structure in our study had a three-level hierarchy: days nested in bursts and bursts nested in people, leading to potentially 3735 (5 days × 3 bursts × 249 participants) measuring points. As a three-level dynamic structural equation modeling (DSEM) model is not yet available in Mplus [2], we implemented a special case of a two-level model with daily data modeled for each burst at the within-person level and a latent intercept factor consisting of the three bursts as indicators, with loadings fixed to 1 at the between-person level (see [1]). We also tested for a linear slope term *across* bursts to examine the possible growth of emotions over time. Additionally, daily data *within* each burst were tested for a linear time trend to control for possible systematic changes in the mean of emotions from Monday to Friday. As none of these weekday trends were significant, they were omitted from the results description.

Establishing such a model allowed for joint analysis of emotional dynamics within and across bursts. Thus, at the between-person level of this model, there was a mean intercept and slope representing individual differences in the average trajectory of emotions reported during the diary study. Next, within each burst, there was a mean autoregressive slope representing inertia (i.e., in day-to-day autocorrelation of emotions), a mean log of residual variation [21] representing innovation, and variances of all these parameters representing individual differences [38].

Next, in a series of models, we tested for equality of inertias across bursts, then equality of innovations, and finally equality of mean intercepts. These analyses were aimed at verifying Hypothesis 1 and were done separately for PA and NA.

In the last step, aimed at verifying Hypotheses 2 and 3, linear regressions were added to the final models, with PTG and PTD as the outcome variables, respectively. More specifically, PTG.3 (or PTD.3) values from the third measurement were regressed on emotional inertia, innovation, and trajectories after adjusting for PTG.1 (or PTD.1) from the first measurement and selected sociodemographic and clinical variables. These variables were tested in preliminary regression analysis, and only those significant for the final measures of PTG (or PTD) were included. The PTG and PTD values from the first measurement were grand-mean centered, and the same centering was applied to continuous sociodemographic variables. Categorical variables were dummy coded. All the analyses were performed using Mplus version 8.7 [41] and IBM SPSS version 27 [25].

3. Results

3.1. Descriptive statistics and preliminary analyses

Table 2 presents descriptive statistics for the main variables in the study, together with information on the daily diaries completed in each burst. The mean number of dairy days is around three, with 17% of the participants providing a full set of diary data. With Bayesian estimation, and under the assumption of a missing at random pattern, full information from all observations was used.

Preliminary regression analysis with sociodemographic and clinical variables showed that for PTG.3, the only significant variable was education ($\beta = 0.32, p = .04$, participants with a university degree reported higher PTG), and no significant relationships were identified for PTD.3.

3.1.1. Hypothesis 1

As predicted, Wald tests found that inertias $\chi^2(2) = 0.51, p = .76$ for negative affect; $\chi^2(2) = 0.02, p = .99$ for positive affect], and innovations [$\chi^2(2) = 1.32, p = .52$ for negative affect; $\chi^2(2) = 3.51, p = .17$ for positive affect] did not differ across bursts. The means did not change over time for positive affect [$\chi^2(2) = 2.71, p = .26$], but it did change over time for negative affect [$\chi^2(2) = 17.25, p < .001$]. Consequently, our final models had inertias and innovations constrained to be equal across bursts, a random intercept for positive affect, and a random intercept and slope for negative affect. The inertias, innovations, and growth parameters from the final models are reported in Table 3.

3.1.2. Hypotheses 2 and 3

Regression analyses included as explaining variables the previously described parameters obtained in DSEM and the baseline values of the explained variable, i.e., PTG, or PTD, respectively. The results are presented in Table 4. The only significant predictors of PTG and PTD were their values a year earlier. Emotional inertia and innovation, regardless of their valence, after adjusting for these baseline values, were not related to changes in PTG or PTD. Thus, *Hypotheses 2* and *3* were not supported by our data. Additionally, the same insignificant result was noted for longitudinal NA and PA changes across bursts (intercepts and slopes).

4. Discussion

In the current study, we examined whether the daily emotional dynamics of NA and PA predicted changes in PTG and PTD over one year among individuals living with HIV. The findings of this study are important and advance empirical research in two distinct areas. First, previous research on emotional dynamics has been limited by reliance on measuring daily emotions over a single period of time [23,24], and this study builds on design using repeated measurement of daily emotions within individuals in a burst framework [56,59]. Second, this study empirically examines the role of emotion regulation specified in existing theoretical models of PTG. According to this model [64], PTG is the result of the struggle from adversity, and whether it occurs or not depends on the cognitive-emotional processing undertaken by the individual after the adverse experience. Emotional regulation and management of distress are theorized to be critical for PTG to occur [64]. Alternatively, an inability to regulate distress and other daily negative emotions may result in PTD rather than PTG. Our research extends the understanding of these processes by predicting changes in PTG and PTD with emotional inertia and innovation established in three bursts of daily diaries.

Consistent with Hypothesis 1, and integral to our subsequent hypotheses, we observed evidence for stable levels of both inertia and innovation in all bursts, even despite an overall increase in NA during the study period. As shown in Table 3 specifically, for inertia, we found that higher levels of NA (or PA) the day before predicted higher NA (or PA) the next day. Specifically, we found that there is no (precisely:

Table 2
Univariate higher-order moment descriptive statistics.

Variables	Mean	SD	Minimum	Maximum	Skewness	Kurtosis
NA1	1.99	0.92	1.00	5.00	1.31	1.31
NA2	2.01	0.87	1.00	4.50	0.77	−0.36
NA3	2.33	0.96	1.00	5.00	0.60	−0.33
PA1	2.90	0.86	1.00	4.83	−0.13	−0.38
PA2	2.95	0.95	1.00	5.00	−0.14	−0.75
PA3	2.60	0.96	1.00	5.00	0.26	−0.56
PTG.1	52.20	33.49	0.00	123.00	0.00	−1.12
PTG.3	47.17	31.39	0.00	112.00	0.16	−1.22
PTD.1	22.20	23.85	0.00	115.00	1.25	1.00
PTD.3	27.24	25.33	0.00	104.00	0.99	0.36
DIARY DAYS	2.92	1.39	1.00	5.00	0.07	−1.26

Note. NA – negative affect; PA – positive affect; with numbers 1, 2, and 3 denoting bursts taking place at the beginning of the study (1), after 6 months (2) and after 12 months (3); PTG – posttraumatic growth; PTD – posttraumatic depreciation; with numbers 1 (baseline) and 3 (final) denoting first and third measurement points, i.e. at the beginning and at the end of the study; values for first measurement before centering; DIARY DAYS – completed number of diaries within each burst. SD = standard deviation.

Table 3
Final parameter estimates from three-level dynamic structural equation models.

Parameters	Estimate	SD	95% CI
Positive affect			
Inertia	0.25*	0.07	(0.11, 0.38)
Innovation	−1.33*	0.10	(−1.50, −1.11)
Intercept	2.80*	0.09	(2.63, 2.97)
Slope	−0.05	0.08	(−0.19; 0.12)
Negative affect			
Inertia	0.20*	0.07	(0.07, 0.33)
Innovation	−1.35*	0.11	(−1.57, −1.14)
Intercept	1.85*	0.10	(1.67, 2.04)
Slope	0.28*	0.07	(0.14, 0.42)

* one-tailed $p < .001$.

Table 4
Results of regression analysis.

Variable	PTG3		PTD3	
	Est.	95% CI	Est.	95% CI
Positive affect				
Baseline (PTG1 or PTD1)	0.55*	(0.37;0.74)	0.50*	(0.29; 0.70)
Intercept PA	−5.65	(−105.17; 49.03)	−15.92	(−84.95; 347.76)
Slope PA	73.09	(−335.70; 601.09)	−30.20	(−1894.09; 459.78)
Inertia PA	−21.41	(−67.65; 30.42)	1.60	(−98.40; 43.60)
Innovation PA	−7.95	(−41.37; 19.00)	−0.89	(−21.17; 20.59)
Negative affect				
Baseline (PTG1 or PTD1)	0.54*	(0.35; 0.72)	0.49*	(0.30; 0.68)
Intercept NA	4.38	(−98.70; 122.53)	26.62	(−256.69; 612.74)
Slope NA	−72.54	(−1016.59; 959.08)	36.87	(−1532.66; 1153.24)
Inertia NA	−8.63	(−79.58; 69.10)	12.92	(−29.24; 55.52)
Innovation NA	0.80	(−9.50; 10.38)	−1.34	(−8.26; 6.34)

Note. Est. – estimate; 95% CI – Bayesian 95 credible interval; NA – negative affect; PA – positive affect; PTG – posttraumatic growth; PTD – posttraumatic depreciation; with numbers 1 and 3 denoting the first and third measurement points, i.e. baseline and final levels at the beginning and at the end of the study;
* One-tailed $p <$. 001.

linear) change in positive affect, but there is a linear increase in negative affect. On the other hand, a significant innovation indicated that daily emotions were not only determined autoregressively but were also responsive to changeable situational factors. Finally, the stability of the obtained values of inertia and innovation at the 6-month intervals may suggest that they approximate trait-like parameters of emotion regulation. These findings have interesting clinical and theoretical implications. Namely, to the best of our knowledge, this is the first study to show significant inter-individual affective dynamics in the form of inertia and innovation replicated within the same persons three times over one year. In a clinical setting, these results may serve for a better understanding of temporal fluctuations in the affective well-being of PLWH, as they suggest stable functional characteristics regarding emotional reactivity and emotion regulation [31,33,34]. Thus, these aspects of emotional functioning, not only typical levels of NA and PA, should be examined and targeted in an intervention. Particularly, other studies among PLWH have shown that they can get stuck in a potentially dysfunctional pattern of the situation–emotion–coping relationship [48,52]. From a theoretical perspective, our results add to an ongoing debate on how emotion regulation influences the time course of particular affective states [19], especially those assessed with the aid of dynamic affect measures [24], and provide some evidence that, as expected, underlying mechanisms may represent intraindividual stability.

However, contrary to Hypotheses 2 and 3, the fluctuations in daily NA or PA in the form of emotional inertia or innovation did not predict changes in PTG or PTD over the year. Additionally, an averaged affect across all three study bursts, as well as its changes, was unrelated to PTG and PTD after adjusting for baselines. However, despite these null results, our findings still provide important implications for PTG research that could prove useful for indicating a possible direction of future research. Namely, our two last hypotheses were derived from theoretical models of PTG [64] that have proposed PTG to be a dynamic construct that changes over time in response to factors such as emotional regulation. However, recent research has called into question the ubiquity of the central premise of PTG theory [27]; that is, individuals change positively after adversity. In fact, longitudinal data on PTG suggest that individuals show trajectories of stability, rather than positive change, after a broad and diverse range of adverse life events [5]. This latter phenomenon is usually attributed to well-known problems with PTG measurement, which has been a subject of significant controversy, with the main criticism. For example, one should underscore the overreliance on retrospective assessments of PTG, which require individuals to estimate the degree of positive change that has occurred for each questionnaire item that is uniquely caused by the adverse experience [29,37]. Essentially, retrospective measures of PTG assess individuals' perceptions of how they believe have changed, rather than how they have actually changed from pre-to post-event. Furthermore, research indicates that individuals' perceptions of change often do not accurately mirror how they have changed over time [7,16]. The reason this is significant is that while the theory indicates that people can and do change for better or worse over time after adversity [62], the assessment tools we have, including the one we used in this study, might be inadequate to capture longitudinal trajectories in how people change in this construct and how it may be related to their daily emotional dynamics [20].

On the other hand, the lack of confirmation of our main research question linking emotional dynamics with PTG and PTD can also stem from the limits of complex affect dynamics measures, whose significance for understanding well-being has recently been questioned [13]. Specifically, it was shown that these measures were able to capture only a limited amount of variance in explaining well-being constructs over and above the mean levels of affect. According to the cited authors, this may stem from two reasons: either affect dynamics are of minor importance for studying and understanding well-being terms, or the current operationalization and measurement of affect dynamics precludes adequate capturing of the processes that underlie it. Rather, it seems that this second option is more valid, and we are still far from good research practices to uncover such dynamics [23]. Very recently, Wirth et al. [71] proposed a theory-driven model of intraindividual variability in affect (MIVA). The MIVA model rests on the classic assumption that affective changes illustrate transactions between an organism and its close environment (e.g., [19]). It is inspired by previous studies on affect dynamics [33] but concentrates mainly on the systematic effects of processing external events. Still, for the MIVA-based conceptualizations of the parameters of affect dynamics, relatively low incremental validity was obtained in predicting well-being after adjusting for mean levels of affect.

In this light, probably the most surprising result in our study is a lack of relationship between an average level of NA and PA and changes in PTG and PTD. This indicates that not only the dynamics of daily affect but also the way a person feels "on average" did not translate into the trajectory of PTG and PTD. Thus, the parallel emotional experience appears to be disconnected from reported positive or negative changes in functioning over time. This adds to existing doubts about how accurately the classical PTG/PTD operationalization captures the processes that it is intended to measure and that should be reflected in the everyday functioning of individuals who report experiencing PTG/PTD.

4.1. Strengths and limitations

This study has several strengths, including predominantly the measurement-burst diary study of a relatively large clinical sample of PLWH. However, one should also mention a few limitations. First, following the standard procedure for the administration of the PTG questionnaires, we asked participants to rate the positive and negative changes experienced since receiving their HIV diagnosis. Although the participants rated PTG and PTD over a year, the instructions and reference points for the HIV diagnosis remained the same for each measurement. It is possible to obtain different results if we ask the participants to rate their standing over a shorter and more recent timeframe [6]. Current standing measurements might have been more akin to the daily dynamics of emotion.

Second, the participants in this sample were not newly diagnosed with HIV; rather, they had been receiving treatment for it for a while. It is therefore possible that we were instead capturing participants' responses to other external and internal demands that are already unrelated to major changes caused in their lives by HIV infection. Additionally, as with any diary study, there may be biases associated with intensive repeated measurements [9], which can induce changes due to study participation itself and undermine ecological validity.

In general, the time frame of the study presents potential limitations for interpreting the results. These include a one-year period for PTG and PTD measurements, the number of days of diary measurements, and the interval between the series. In particular, in the daily diaries, average PA remained stable across all bursts, but NA increased significantly, which may be specific to this group and the temporal design of the study.

Finally, the participants who agreed to participate in the diary part of the study had higher education, reported a history of substance abuse, and were overrepresented in the group. Both of these characteristics may be related to the well-being of PLWH and may affect the results [46,54].

5. Conclusion

The main aim of this study was to explore the mechanisms of PTG and PTD changes among PLWH in the context of daily emotional dynamics. In particular, we wanted to check whether emotional inertia and innovation in NA and PA were stable and related to changes in PTG and PTD over one year. Although we observed an assumed stability for both inertia and innovation across the three bursts, we failed to find that these parameters were significantly linked to PTG and PTD changes. Additionally, these changes were unrelated to the average levels of NA

and PA.

Thus, the results indicate the relative stability of emotion regulation in PLWH and contribute to understanding its dynamic mechanisms in terms of trait-like characteristics. This research topic has never been investigated in such an advanced manner in this specific sample [45,53,70]. The null results regarding emotional dynamics, average emotion level, and PTG/PTD call for further research on the intrapsychic mechanisms that underlie growth after trauma occurs. On the one hand, if an individual's emotional functioning is unrelated to long-term PTG, the question emerges regarding the true nature of PTG. Given that the subjective experience of PTG does not appear to manifest in an individual's everyday functioning, it could potentially be deemed an illusion [32]. Consequently, PTG scores may simply be artefacts of retrospective self-reporting, susceptible to various cognitive biases [20]. On the other hand, a conceptualization of emotional dynamics measures is also not free from doubts about their validity [13]. Resolving these operationalization problems is a necessary condition for a meaningful study of the interplay between affect and well-being over time, including posttraumatic growth [6].

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Note. SD – posterior standard deviation; 95% CI – Bayesian 95 credible interval.

Declaration of Competing Interest

All authors declare no conflict of interest.

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