

Thoughts falling apart: disorganized schizotypy specifically predicts both psychotic- and stress-reactivity in daily life

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Supplementary Materials

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Supplementary Methods

Participants

Quality control at the baseline assessment

In order to exclude participants demonstrating low-effort and/or invalid responding, we screened responses in the baseline assessment based on relative completion speed. We calculated the relative speed index according to Leiner (2019), i.e., the median speed of the sample (16 min) divided by the individual's speed. Then, we excluded observations with a relative speed index greater than 2. As a result, the cutoff speed was set at 8 minutes (med[speed] after screening = 16.24 min).

Demographic characteristics of participants included vs. with insufficient data

Table S1

Demographic characteristics and comparison of study samples.

	Initial sample	Participants not included	Final sample	Comparison (not included vs. final)
Size	221	95	126	
Age				$U = 4999$ $p = 0.04$ $r = 0.14^*$
Mean	40.44	37.73	42.49	
Median	38	35	44	
SD	14.24	12.03	15.43	
Range	18 – 78	18 – 66	18 – 78	
Sex				$\chi^2 (1) = 1.21$, $p = 0.27$
Female % (N)	73.76 % (163)	69.47 % (66)	77 % (97)	
Male % (N)	26.24 % (58)	30.53 % (29)	23 % (29)	
Education				$\chi^2 (5) = 8.75$ $p = 0.09$
Primary school or lower % (N)	0.90 % (3)	1.05 % (1)	0.79% (1)	
Vocational school without high school diploma % (N)	1.81 % (4)	4.21 % (4)	0 % (0)	
High school diploma or equivalent % (N)	23.5 % (52)	22.11% (21)	24.6 % (31)	
Bachelor's or Master's degree % (N)	67.87 % (150)	67.37 % (64)	68.25 % (86)	
Doctorate (PhD) % (N)	4.07 % (9)	2.11 % (2)	5.56 % (7)	
Other % (N)	1.81 % (4)	3.16 % (3)	0.79% (1)	

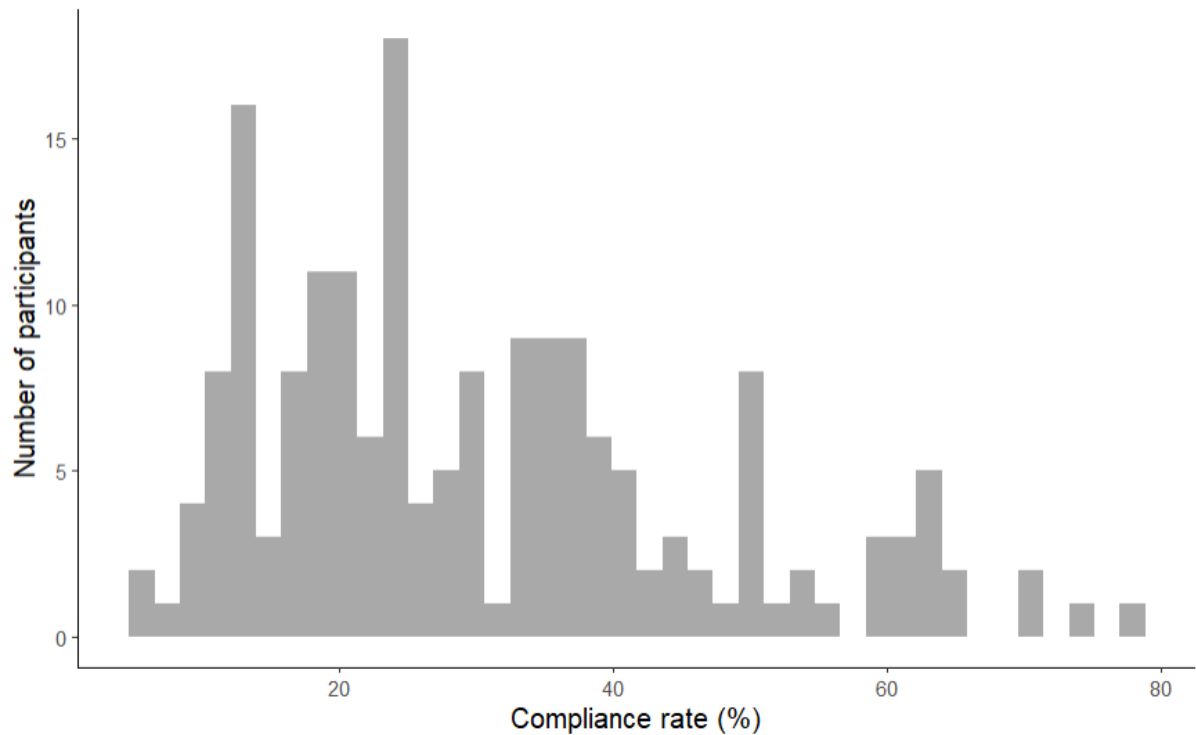
*Final sample had significantly higher age compared to the excluded sample with negligible effect size

Compliance rates

The median compliance rate for the short two-hour daily surveys in the final sample of 126 participants was 26.8%, (Mean = 30.5%, Min = 6.25%, Max = 78.6%, SD = 16%, see Figure S1). The median compliance on the three-day surveys was 77.7% (Mean = 74.6%, Min = 11.1%, Max = 100%, SD = 22.9%, see Figure S2).

Figure S1

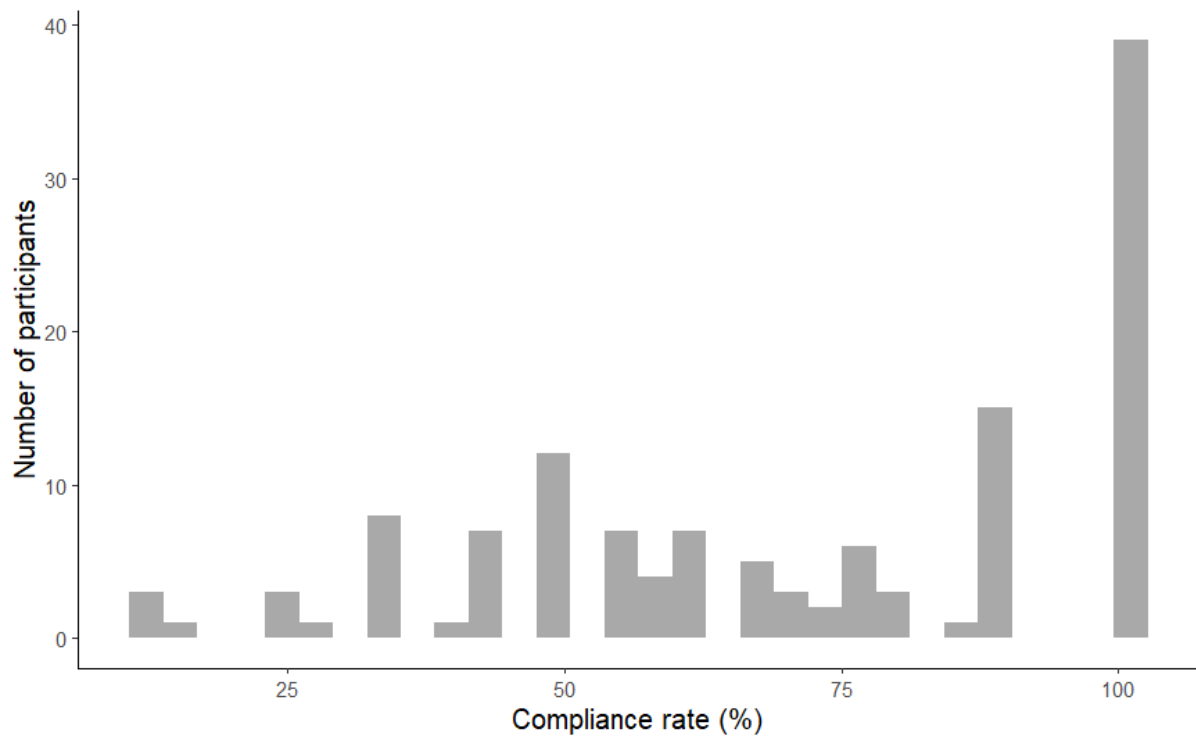
The distribution of participants' compliance rates for short two-hour daily surveys during the study.



Note. Each participant's compliance rate on the short two-hour daily surveys was calculated against the number of days they spent in the study. For example, if a participant enrolled in the study for 20 days, they received 8 emails for 20 days, totaling 160 surveys for the entire study. So, in this case, the number of completed surveys is divided by 160.

Figure S2

The distribution of participants' compliance rates for three-day surveys during the study.



Note. Each participant's compliance rate on the three-day surveys was calculated against the total number of three-day surveys they received during their participation. For example, if a participant enrolled in the study for 20 days, they received 6 three-day surveys in total. So, in this case, the number of completed surveys is divided by 6.

Instruments and design

Extracting latent variables for schizotypy with confirmatory factor analysis

Table S2

Factor loadings of MSS-B items based on confirmatory factor analysis.

	MSS-B item	Positive schizotypy	Negative schizotypy	Disorganized schizotypy
35	<i>I often worry that someone or something is controlling my behavior.</i>	0.802		
26	<i>I often worry that other people are out to get me.</i>	0.746		
32	<i>I believe that there are secret signs in the world if you just know how to look for them.</i>	0.689		
14	<i>I sometimes wonder if there is a small group of people who can control everyone else's behavior.</i>	0.661		
17	<i>I have had the momentary feeling that someone's place has been taken by a look-alike.</i>	0.601		
20	<i>There are times when it feels like someone is touching me when no one is actually there.</i>	0.520		
23	<i>I have had experiences with seeing the future, ESP or a sixth sense.</i>	0.467		
11	<i>I believe that dreams have magical properties.</i>	0.451		
29	<i>Some people can make me aware of them just by thinking about me.</i>	0.432		
8	<i>I have felt that there were messages for me in the way things were arranged, like furniture in a room.</i>	0.353		
38	<i>At times I have wondered if my body was really my own.</i>	0.180		
2	<i>I have sometimes felt that strangers were reading my mind.</i>	0.175		
28	<i>There are just not many things that I have ever really enjoyed doing.</i>		0.922	
13	<i>Throughout my life, very few things have been exciting or interesting to me.</i>		0.860	
16	<i>Having close friends is not as important as people say.</i>		0.740	
31	<i>I generally am not interested in being emotionally close with others.</i>		0.740	
34	<i>My emotions have almost always seemed flat regardless of what is going on around me.</i>		0.707	
4*	<i>In general, it is important for me to have close relationships with other people.</i>		0.693	
7	<i>I have always preferred to be disconnected from the world.</i>		0.670	
37*	<i>Spending time with close friends and family is important to me.</i>		0.620	
19	<i>Generally I do not have many thoughts or emotions.</i>		0.508	
22	<i>Throughout my life, I have had little interest in dating or being in a romantic relationship.</i>		0.488	
1	<i>Throughout my life I have noticed that I rarely feel strong positive or negative emotions.</i>		0.472	
25*	<i>Most of the time I feel a desire to be connected with other people.</i>		0.399	
21	<i>No matter how hard I try, I can't organize my thoughts.</i>			0.953
15	<i>My thoughts are so hazy and unclear that I wish that I could just reach up and put them into place.</i>			0.906
24	<i>I find that I am very often confused about what is going on around me.</i>			0.906
36	<i>I have trouble following conversations with others.</i>			0.896
12	<i>I often feel so mixed up that I have difficulty functioning.</i>			0.895
30	<i>My thoughts are almost always hard to follow.</i>			0.872
27	<i>People find my conversations to be confusing or hard to follow.</i>			0.864
6	<i>Most of the time I find it is very difficult to get my thoughts in order.</i>			0.839
18	<i>My thoughts and behaviors feel random and unfocused.</i>			0.839
9	<i>I often have difficulty following what someone is saying to me.</i>			0.801
33	<i>I often have difficulty organizing what I am supposed to be doing.</i>			0.705

**reversed items*

Table S3

Correlations between MSS-B schizotypy dimensions.

	Positive schizotypy	Negative schizotypy	Disorganized schizotypy
Positive schizotypy	–	0.125	0.544***
Negative schizotypy	0.125	–	0.340***
Disorganized schizotypy	0.544***	0.340***	–

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Extracting a between- and within-person latent variable for psychotic-like experiences with multilevel confirmatory factor analysis

Table S4

Multilevel factor loadings of psychotic-like experiences based on multilevel confirmatory factor analysis.

ESM survey item	Between-person factor loading	Within-person factor loading
<i>I feel like I am losing control.</i>	0.769	0.740
<i>I have difficulty controlling my thoughts.</i>	0.713	0.684
<i>My thoughts are strange or unusual.</i>	0.896	0.573
<i>I am suspicious.</i>	0.811	0.560
<i>I feel like I have been mistreated.</i>	0.639	0.460
<i>My sight or hearing seems strange or unusual.</i>	0.799	0.274
<i>I feel like someone or something is controlling my thoughts or actions.</i>	0.637	0.453
<i>Familiar things seem strange or unusual.</i>	0.804	0.413

Measurement of stressor exposure

Fifteen items described situations to be evaluated on a 5-point Likert scale, 1 meaning that the situation in question significantly worsened in the past 3 days, while 5 meant that the situation improved significantly. Scores of 1–5 were transformed to -2–2, ranging from high support (-2) to high exposure (2). Three items had 'yes'/'no' answers, support scoring -2 and exposure 2. The last two items were open questions where participants could describe a source of distress/support that was not mentioned in the survey. Answers to these were manually screened since some descriptions were redundant and could be sorted into the categories of the structured part of the survey. To avoid duplication, these were scored 0. Other sources of support/stress were given scores of -2 and 2, respectively. Finally, scores were summarized, resulting in higher scores meaning higher stressor exposure.

Items in Hungarian and English:

Kérjük jelölje be, ha az elmúlt három napban az alábbi események valamelyike megtörtént Önnel!
Kérjük, csak azokat jelölje be, amelyek az elmúlt 3 napban történtek meg! Ha valamelyik kérdés nem vonatkozik Önre, nem tudja eldönteni, vagy nem szeretne válaszolni, akkor azt hagyja figyelmen kívül.

English: Please indicate if the following events happened to you in the past three days. Please only mark those that occurred in the last 3 days. If a question does not apply to you, you cannot or do not want to answer, please, ignore that.

Elvesztettem a munkámat / bevételeim eddigi forrását.

I lost my job / source of income.

Új munkát / bevételi forrást szereztem.

I got a new job / source of income.

Jövedelmem: / My income:

1. jelentős mértékben csökkent. / *significantly decreased.*
2. valamennyire csökkent. / *slightly decreased.*
3. nem változott. / *did not change.*
4. valamennyire növekedett. / *slightly increased.*
5. jelentősen növekedett. / *significantly increased.*

Számomra fontos személy(ek) egészségi állapota a megszokotthoz képest / The health condition of someone/people important to me, as compared to usual,

1. jelentősen romlott. / *significantly worsened.*
2. romlott. / *worsened.*
3. nem változott. / *did not change.*
4. javult. / *improved.*
5. jelentősen javult. / *significantly improved.*

Saját egészségi állapotom a megszokotthoz képest / My health condition, as compared to usual,:

1. jelentősen romlott. / *significantly worsened.*
2. romlott. / *worsened.*
3. nem változott. / *did not change.*
4. javult. / *improved.*
5. jelentősen javult. / *significantly improved.*

Számomra fontos személyekkel való kapcsolatom (munkahelyen kívül) a megszokotthoz képest / *My relationship with people who are important to me (outside of work), as compared to usual,:*

1. jelentősen romlott. / *significantly worsened.*
2. romlott. / *worsened.*
3. nem változott. / *did not change.*
4. javult. / *improved.*
5. jelentősen javult. / *significantly improved.*

Számomra fontos személyekkel való kapcsolatom a munkahelyen a megszokotthoz képest / *My relationship with people who are important to at work, as compared to usual,:*

1. jelentősen romlott. / *significantly worsened.*
2. romlott. / *worsened.*
3. nem változott. / *did not change.*
4. javult. / *improved.*
5. jelentősen javult. / *significantly improved.*

Lakhatási körülményeim / *My housing conditions:*

1. jelentősen romlott. / *significantly worsened.*
2. romlott. / *worsened.*
3. nem változott. / *did not change.*
4. javult. / *improved.*
5. jelentősen javult. / *significantly improved.*

Munkahelyemmel / tanulmányaimmal / egyéb kötelezettségeimmel együtt járó terhelés / *The burden associated with my job / studies / other obligations:*

1. jelentős mértékben csökkent. / *significantly decreased.*
2. valamennyire csökkent. / *slightly decreased.*
3. nem változott / *did not change.*
4. valamennyire növekedett. / *slightly increased.*
5. jelentősen növekedett. / *significantly increased.*

Pihenéssel töltött időm: / *The time I spent with rest and relaxation:*

1. jelentős mértékben csökkent. / *significantly decreased.*
2. valamennyire csökkent. / *slightly decreased.*
3. nem változott / *did not change.*
4. valamennyire növekedett. / *slightly increased.*
5. jelentősen növekedett. / *significantly increased.*

Önmagamra fordított idő, amikor bármit csinálhatok, ami örömet okoz, feltölt, vagy a fejlődésemet szolgálja: / *The time that I could dedicate to myself, doing anything that brings joy, rejuvenates, or serves my personal development:*

1. jelentős mértékben csökkent. / *significantly decreased.*
2. valamennyire csökkent. / *slightly decreased.*
3. nem változott / *did not change.*
4. valamennyire növekedett. / *slightly increased.*
5. jelentősen növekedett. / *significantly increased.*

Együtt töltött idő számomra fontos személyekkel (olyanokkal, akikkel nem élek együtt) / *The time spent with people who are important to me (who I do not live with):*

1. jelentős mértékben csökkent. / *significantly decreased.*
2. valamennyire csökkent. / *slightly decreased.*
3. nem változott / *did not change.*
4. valamennyire növekedett. / *slightly increased.*
5. jelentősen növekedett. / *significantly increased.*

Kapcsolattartás mértéke számomra fontos személyekkel (olyanokkal, akikkel nem élek együtt, pl. telefonon, online, stb.): / *The extent of communication with people who are important to me (who I do not live with, and I stay in touch e.g., over the phone, online, etc.):*

1. jelentős mértékben csökkent. / *significantly decreased.*
2. valamennyire csökkent. / *slightly decreased.*
3. nem változott / *did not change.*
4. valamennyire növekedett. / *slightly increased.*
5. jelentősen növekedett. / *significantly increased.*

Anyagi támogatás (családtól, barátoktól, állami támogatás) a megszokotthoz képest: / *Financial support (from family, friends, government assistance), as compared to usual:*

1. jelentős mértékben csökkent. / *significantly decreased.*
2. valamennyire csökkent. / *slightly decreased.*
3. nem változott / *did not change.*
4. valamennyire növekedett. / *slightly increased.*
5. jelentősen növekedett. / *significantly increased.*

Munkáimmal / tanulmányaimmal kapcsolatos teendőkkel / egyéb fontos feladataimmal, összességében, mindent egybevéve: / *With the tasks related to my work / studies / other important responsibilities, overall, all things considered:*

1. jelentősen lemaradtam. / *I fell significantly behind.*
2. valamennyire lemaradtam. / *I fell slightly behind.*
3. nincs változás. / *There has been no change.*
4. valamennyire előreléptem (pl. kisebb munka befejezése). / *I made some progress (e.g., completion of a small task).*
5. jelentősen előreléptem (pl. fontos munka befejezése, mérföldkő). / *I made significant progress (e.g., completion of an important task, milestone).*

Terveim a tanulással / munkával / egyéb számomra fontos elvégzendő feladattal kapcsolatban: / *My plans regarding my studies / work / other important tasks to be completed:*

1. jelentős mértékben felborultak / *were significantly disrupted.*
2. részben felborultak / *were partially disrupted.*
3. nem változtak / *have not really changed.*
4. valamivel átláthatóbbak lettek / *became somewhat clearer.*
5. jelentősen átláthatóbbak lettek / *became significantly clearer.*

A számomra vagy a családom számára szükséges dolgok közül (pl. élelmiszer, számlák, lakbér, gyógyszerek, útiköltség, üzemanyag vagy egy váratlan kiadás: pl. javítani kellett az autót vagy szerelőt kellett hívni) a megszokotthoz képest: / *Among the things necessary for me or my family (e.g., food, bills, rent, medication, travel expenses, unexpected expenses: e.g., having the car repaired, calling a plumber), as compared to usual:*

1. semmit nem tudtam kifizetni / *I could not afford anything.*
2. egy részét nem tudtam kifizetni / *I could not afford some of the necessary things.*
3. a szükséges dolgokat ki tudtam fizetni / *I could afford the necessary things.*
4. a szükségesnél kicsit többet is ki tudtam fizetni / *I could afford slightly more than necessary.*
5. a szükségesnél jóval többet ki tudtam fizetni / *I could afford significantly more than necessary.*

Lekéstem egy fontos találkozóról, eseményről (pl. tárgyalás, orvos). / *I was late from an important meeting or event (e.g., negotiation, doctor's appointment).*

Egyéb jelentős pozitív esemény, változás / *Other significant positive event, change:*

Kérjük, írja le röviden, mi volt az: / *Please describe briefly what it was:*

Egyéb jelentős negatív esemény, változás. / *Other significant negative event, change:*

Kérjük, írja le röviden, mi volt az: / *Please describe briefly what it was:*

Design

On entering the study, participants completed a battery of trait questionnaires and provided demographic information. At the end of this section, participants could decide to enroll in the longitudinal phase of the study, which started the next morning. Prompts were sent out via email 8 times a day, every two hours between 8:00 AM and 10:00 PM. These short surveys included items on psychotic-like experiences and perceived distress in the preceding two hours, besides other items not analyzed here (e.g., sleep quality and quantity). After the survey, participants completed two short cognitive tasks, approximately 1.5 minutes each, in randomized order. These tasks are not included in the present analysis.

Every third day, participants completed a 5-minute survey assessing depressive symptoms, support, and stressor exposure in the past 3 days (only the latter was analyzed here). This survey was sent at 6:00 PM and could be completed until 10:00 PM. On these days participants received no further prompts, the next email was sent at 8:00 the following morning.

Participants could stay in the study for up to 28 but could quit at any point. After participating for a minimum of 7 days, they could opt for feedback containing figures about the daily fluctuation of their negative and positive affective states, and their sleep quality and quantity.

Post-hoc power analysis

The 'PowerAnalysisIL' R package (Lafit et al., 2021; v0.1.0) was used for the post-hoc power calculation of the parameters of the final PLE-reactivity model ($N[\text{part.}] = 126$, $N[\text{obs.}] = 4611$). None of the the available model schemes fully captured the complexity of our model (three-level hierarchical data structure: *momentary PLEs* - [measured eight times a day, within-individual level] ~ *stressor-exposure* [measured once every three days, within-individual level] * *schizotypal traits* [measured at baseline, between-individual level]). Therefore, we approximated statistical power using Model 7 that had the closest resemblance to the models we fitted: it includes a random slope and an intercept, and a cross-level interaction effect (for more details, see Lafit et al., 2021) The simulation was run with 200 Monte Carlo replicates. The number of replicates was largely determined by the performance of the computers we used for the computation.

The results (see Table S5) show that statistical power was maximally sufficient to detect effects relevant to our hypotheses (*PLEs ~ disorganization* and *PLEs ~ disorganization * stressor-exposure*, both with 100% power). In the case of the effect of stressor-exposure, the statistical power turned out to be low, which is likely attributable to the fact that the model scheme available in the R package handled the outcome variable (PLEs) and the predictor (stressor-exposure) as variables varying at the same level (while they were measured at a different resolution at the within-individual level, see above).

Note that the interpretation of the results is shaded by the fact that a perfectly fitting scheme for the models we fitted was not available, and the relatively low number of replicates also increases the uncertainty of the estimated parameters.

Table S5*Results of Monte Carlo power calculation for the final PLE-reactivity model*

Parameter (effect of predictor)	True value	Mean	Std.error	Bias	(1-alpha)% Coverage	Power
Fixed intercept	-0.0548	-0.0512	0.0078	0.0037	0.97	15%
*** Effect of the level-2 continuous variable on the intercept (<i>disorganization</i>)	0.4391	0.4510	0.0073	0.0119	0.97	100%
Fixed slope (<i>stressor-exposure</i>)	0.3745	0.3294	0.0231	-0.0451	0.93	38%
*** Effect of the level-2 continuous variable on the slope (<i>disorganization * stressor-exposure</i>)	1.8491	1.8373	0.0202	-0.0118	0.96	100%

*** *effects of interest*

Supplementary Results

Schizotypy scores of participants included vs. with insufficient data

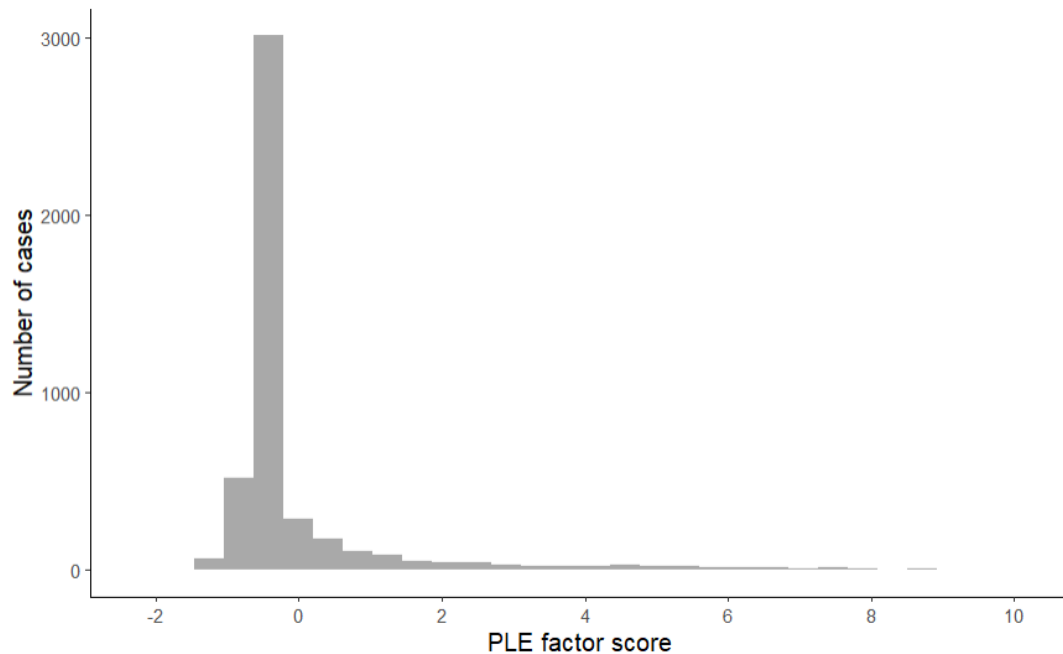
Table S5

Comparison of MSS-B subscale scores between observations included and not included in the final sample.

	Initial sample	Observations not included	Final sample	Comparison (not included vs. final)
Size	221	95	126	
Disorganized				$U = 5655$ $p = 0.43$
Mean	1.63	1.44	1.74	
Median	0	0	0	
SD	2.80	2.69	2.86	
Range	0 – 12	0 – 12	0 – 12	
Positive				$U = 6148.5$ $p = 0.72$
Mean	1.59	1.62	1.54	
Median	1	1	1	
SD	1.87	1.94	1.82	
Range	0 – 10	0 – 10	0 – 7	
Negative				$U = 5749$ $p = 0.61$
Mean	2.62	2.47	2.71	
Median	2	2	2	
SD	2.43	2.32	2.52	
Range	0 – 12	0 – 12	0 – 11	

Figure S3

The distribution of PLE factor scores in the sample.



Note. Each case of PLE factor score corresponds to a single data point (i.e., an ESM survey). Factor scores are based on a multilevel factor analysis of the reported intensity of momentary PLEs.

Supplementary References

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