The Incremental Validity of Average States:**A Replication and Extension of Finnigan and Vazire (2018)**

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We embrace the values of openness and transparency in science. We therefore follow the 21-word solution (Simmons et al., 2012), or refer to complete project documentations in the OSF. There, we also publish all raw data necessary to reproduce reported results and provide scripts for all data analyses reported in this manuscript (osf.io/h6z2w). The analyses were preregistered (osf.io/53wrg). This research was supported by grants from the German Research Foundation (DFG): BA 3731/6-1 to Mitja D. Back, Steffen Nestler, and Boris Egloff, WA 3509/3-1 to Jenny Wagner, and WR 160/1-1 to Cornelia Wrzus. We are grateful to the many people who enabled us to conduct the experience-sampling studies. We thank Katie Finnigan and Simine Vazire for their cooperation and feedback concerning this replication.

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Abstract

States refer to our momentary thoughts, feelings, and behaviors. Average states (aggregates across multiple time points) are discussed as a more accurate and objective measure of personality compared to global self-reports since they do not only rely on people's general beliefs about themselves. Specifically, Finnigan and Vazire (2018) argued that, if average states better capture what a person is actually like, this should be reflected in their unique association with informant-reports of personality, and tested this idea based on two experience-sampling studies. Their results showed, however, that average self-reported states did not predict global informant-reported personality above and beyond global self-reports. In this research, we aimed at replicating and extending these results. We used data of five studies (total $N = 806$) that involved global self- and informant-reports and employed a variety of different experience-sampling methods (time-based with different sampling schedules, event-based). Across all studies, the original results (i.e., no incremental effects of average self-reported states) were replicated. Furthermore, as an extension to the original study, we found that average other-reported states (provided by peers, results based on one study) did indeed predict global informant-reports above and beyond global self-reports. These findings highlight the importance of differentiating between method effects (global reports vs. average states) from source of information effects (self vs. other). We discuss these results, focusing on the suitability of using informant-reports as a criterion variable and conceptual differences between assessment methods.

Keywords: personality, behavior, states, traits, experience-sampling

The Incremental Validity of Average States:

A Replication and Extension of Finnigan and Vazire (2018)

Personality (who we are) is typically assessed using global self-report questionnaires (e.g., agreeableness: “how considerate are you in general?”). In recent years, however, the use of self-reported states (e.g., “how considerate were you in the last hour?”), aggregated over multiple measurement points, has been discussed as an alternative way to measure personality. To validate such average states as indicators of personality, Finnigan and Vazire (2018) examined whether they are incrementally valid in predicting informant-reported personality (e.g., “how considerate is Tina?”) above and beyond global self-reports. In this study, we aimed at replicating and extending their results.

The utilization of average states (typically assessed via experience-sampling methods) as measures of personality is backed up by Whole Trait Theory (Fleeson & Jayawickreme, 2015), which posits that states are momentary manifestations of traits. Aggregated states might be more objective and more accurate measures of personality (Fleeson, 2009; Furr, 2009) since they purportedly attenuate disadvantages of global measures (i.e., global self-reports), such as retrospective biases or an overreliance on self-schemas (Beal, 2015). Research concerning the reliability and validity of average states shows that they are stable over time (Baird et al., 2006; Epstein, 1983; Fleeson, 2001, 2007) and correlate with global self-reports ($r = .20$ to $r = .60$; Augustine & Larsen, 2012; Fleeson, 2001, 2009; Rauthmann et al., 2019; Sherman et al., 2015). Furthermore, their nomological associations with other measures (e.g., situational perceptions; life satisfaction) are relatively similar in size compared to the associations of global self-reports with such measures (Augustine & Larsen, 2012; Rauthmann et al., 2019). Up until the study by

Finnigan and Vazire (2018), however, there has not been any formal investigation of how average states fare in predicting non-self-reported outcomes.

Finnigan and Vazire (2018) argued that, if average states capture what a person is actually like (i.e., how they act, think, and feel), this should be reflected in their association with informant-reports of personality. Also, if they were more objective (i.e., less influenced by biases and self-schemas) compared to self-reports, they should show incremental validity in predicting informant-reports of personality. According to the authors, informant-reports serve as a ‘relatively sound’ criterion because they have shown to be accurate measures of personality, predicting objective behavior and life outcomes at least as well as, and independent of, self-reports. In two experience-sampling studies ($N = 105$; $N = 387$; both samples of college students), they tested these assumptions. They hereby assessed global self- and informant-reported (e.g., friend, sibling, romantic partner) personality (i.e., Big Five). Furthermore, in both studies, participants took part in an experience-sampling procedure in which participants repeatedly reported on their (Big Five) states within the past hour (6 times a day for 6 days in Study 1; 4 times a day for 15 days in Study 2). For more information concerning the original study (i.e., number of informants, used measures) see Table 1. Overall, they found consistent evidence that average self-reported states were related to global informant-reports. However, the relationship was weaker than the relationship between global self- and informant-reports. Moreover, by means of structural equation modeling (SEM), Finnigan and Vazire demonstrated that average state self-reports were not incrementally valid over global self-reports in predicting global informant-reports (consistent across all Big Five traits). Based on their results, the authors concluded that average state self-reports might not contain valid information for the prediction of

informant-reported trait personality beyond what is captured by global self-reports and moreover, might be prone to self-biases (e.g., viewing oneself in an overly favorable manner).

So far, the study of Finnigan and Vazire (2018) is the only study that systematically compared experience-sampled self-reported states, global self-reports, and global informant-reports. As experience-sampling methods are heavily growing in popularity, more robust insights into these relationships are needed. This especially concerns two questions: First, do results hold for different kinds of state measures? That is, Finnigan and Vazire (2018) only used two items to assess each state. It could well be possible that more items are needed to capture an entire trait on a state level. Also, as there are so far no best practices for the development of state measures (Horstmann & Ziegler, 2020), the way Big Five items are selected and phrased on a state level might influence the potential increment validity of average states. Second, do results hold for different kinds of sampling schedules? Finnigan and Vazire (2018) only used a specific type of experience-sampling method (i.e., time-based experience-sampling with regard to the last hour). However, the incremental validity of states might depend on the level of abstraction on which these states are assessed (e.g., assessment of states expressed within the last week vs. expressed within the last hour vs. expressed within the last interaction; see Bolger et al., 2003 for an overview of different designs).

Furthermore, to more comprehensively understand the relation between average states and global traits, it is necessary to disentangle method effects (i.e., whether personality was assessed via global reports or aggregated state reports) from source of information effects (i.e., whether information was obtained from the self or others). That is, it is possible that average states do indeed provide information about global informant-reports beyond what is captured by global self-reports. However, this might be masked by the utilization of *self-reported* states that

share the same source of information with *self-reported* global traits. Thus, moving to a source of information in the assessment of states that is independent of self-reports (e.g., other-reports of behavior, see for example Breil et al., 2019; Fleeson & Law, 2015) would allow for more differentiated conclusions.

The Present Research

The purpose of the current research was twofold. First, we aimed at *replicating* the results of Finnigan and Vazire (2018). As in the original study, we used global informant-reported personality as a criterion variable and considered the relationship with global self-reports and average self-reported states. To provide more robust and insights into these relationships we assessed data across five different studies that used a variety of different experience-sampling methods and states measures. Second, we aimed at *extending* the results of Finnigan and Vazire (2018). For this purpose, we also considered average other- (i.e., peer-) reported states in addition to global self-reported personality and average self-reported states to predict global informant-reported personality (within one study).

Replication – Method

For the replication, we used data from five different experience-sampling studies. The five studies are explained briefly within this main text and in more detail in the online supplement (see osf.io/h6z2w). Overall, the study designs, procedures, and questionnaires were similar to the original studies. For a comparison between the five studies and the original studies concerning number of participants, relevant measures, and experience-sampling procedures see Table 1. This replication based on Study 1 was preregistered (see osf.io/53wrg). Please note that the data had already been collected but no analyses directly related to these research questions

138 had been conducted.¹ After analyzing the results of Study 1, we decided to include additional
139 studies for more robust insights into the investigated relationships. For Studies 2 to 5, all
140 decisions (e.g., exclusion of observations) and analysis steps were performed exactly as
141 preregistered for Study 1 if not stated otherwise.
142

¹ The researcher (i.e., Paula Schweppe) who drafted the preregistration was not given access to the data before completion of the preregistration and was hence unaware of any statistical patterns in the data. However, some decisions (e.g., general suitability of this dataset, exclusion criteria for diary assessment) were made in consultation with the other authors. Thus, it cannot be ruled out that some decisions were influenced based on knowledge of Study 1.

143 **Table 1**144 *Comparison of Original Studies and Studies Included in this Replication*

	Finnigan & Vazire: Study 1	Finnigan & Vazire: Study 2	Study 1A	Study 1B	Study 2	Study 3	Study 4	Study 5
Number of participants	89-105	340-387	113-120	116-120	233	159	135	159
Number of informants	214	918	244	244	419	268	325	328
Number of state self-reports	2,301	11,460	693	6,626	10,125	6,770	6,523	4,282
Global self- and informant-reports	TIPI	BFI-44	BFI-S (17 Item version)	BFI-S (17 Item version)	BFI-44 (42 Item version)	BFI-44	BFI-44	BFI-2
State Measures	10 rephrased TIPI items	8 rephrased BFI items (no openness)	6 behavioral/affect items	7 behavioral/affect items	5 behavioral/affect items	22 Goldberg's trait adjectives	31 rephrased BFI items	5 behavioral/affect items
Sampling schedule	6 times a day for 6 days	4 times a day for 15 days	7 bi-weekly diaries	5 weeks of event-based experience-sampling	50 daily diaries (5 waves of 10 days)	5 times a day for 14 days	5 times a day for 14 days	5 times a day for 7 days
Time reference	Last hour	Last hour	Last week	Last interaction	Most memorable experience of the day	Last 30 minutes	Last 30 minutes	Time since last questionnaire

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Participants

Across the five studies, the final sample included 806 participants (Study 1: 120, Study 2: 233, Study 3: 159, Study 4: 135, Study 5: 159). Age ranged from 15 to 42 ($M = 20.33$, $SD = 3.09$) and 77% of participants were female. In Study 2 and Study 5, there were also subsamples of older participants available (age > 50), which were excluded to make the studies more comparable. We furthermore employed two additional inclusion criteria. First, participants were excluded who did not provide global self-reported *and* informant-reported personality (i.e., at least one informant-report). Second, participants were excluded who did not provide enough state reports (i.e., less than two for daily / bi-weekly diary studies (Study 1A, Study 2); less than five for studies in which multiple reports per day were possible (Study 1B, Study 3, Study 4, Study 5)).

Within all studies, participants received course credit or monetary compensation in exchange for their participation. Furthermore, the procedures of each study were approved by the respective (university's) Institutional review boards. At the individual study level, the replication studies were similar in sample size to the original studies (original Study 1: $N = 89-105$; original Study 2: $N = 340-387$, replication studies: $N = 113 - 233$). Through the meta-analytic integration, however, the overall replication sample size was almost twice as large compared to the original studies.

Procedure

Global self- and informant-reports

Within all studies, participants started by completing a battery of personality trait measures. In addition to completing the global self-reports, participants recruited multiple informants (i.e., mainly peers or family members) who completed a rephrased version of the questionnaire (e.g., "participant x is someone who ..."). Across all studies, a total number of

1,584 informants were recruited resulting in an average of 1.97 informant-reports per participant ($Mdn = 2$).

Average States

Average states were assessed via different procedures across the studies. This included bi-weekly diaries (Study 1A), daily diaries (Study 2), repeated time-based assessment per day (Study 3, Study 4, Study 5), or event-based assessments (Study 1B). All procedures had in common that participants did not report on their general thoughts, feelings, and behaviors but were prompted to consider a specific time-frame (e.g., last 30 minutes: Study 3 and 4). Please note that in Study 1 two different approaches were used (i.e., time-based diaries and event-based assessments). Overall, 35,019 state reports (on average 43.45 per participants) were assessed across the five studies.

Measures

Trait Measures: Big Five

For the self- and informant-reported personality, different versions of the Big Five Inventory (BFI, Danner et al., 2016; Gerlitz & Schupp, 2005; John & Srivastava, 1999; Soto & John, 2017) were used within the included studies. Here, the number of included items per trait varied from 3 (BFI-S, Study 1) to 12 (BFI-2, Study 5). An overview of Cronbach's alpha reliabilities (both for self-reports, and aggregated informant-reports) as well as one-way intra-class correlations (ICCs) between informants are displayed in Table 2.

Table 2*Cronbach's Alpha Reliabilities and Intra-Class Correlations Across Studies*

	Study 1	Study 2	Study 3	Study 4	Study 5
Alpha self-report					
Neuroticism	.77	.88	.86	.84	.89
Extraversion	.85	.90	.91	.84	.86
Openness	.72	.87	.79	.79	.82
Agreeableness	.56	.71	.77	.76	.80
Conscientiousness	.70	.79	.81	.78	.85
Alpha informant-report					
Neuroticism	.73	.86	.87	.88	.91
Extraversion	.80	.91	.90	.84	.87
Openness	.67	.87	.84	.84	.87
Agreeableness	.71	.82	.88	.86	.87
Conscientiousness	.76	.87	.87	.88	.90
ICC across informants					
Neuroticism	.57	.46	.53	.57	.67
Extraversion	.57	.62	.70	.70	.67
Openness	.27	.58	.46	.49	.66
Agreeableness	.24	.47	.50	.63	.52
Conscientiousness	.37	.58	.38	.61	.73

Note. Alpha = Cronbach's alpha reliability. ICC = One-way intra-class correlation. ICCs were based on the median number of informants per participant. This was two for Studies 1, 2, 3, and 5 ICC[1,2] and three for Study 4 ICC[1,3].

State Measures: Big Five

The states were assessed via a varying number of items per study and Big Five dimension, ranging from one to seven items per Big Five dimension. For Study 1, the allocation of items to Big Five dimension was done by the authors of this study as specified in the preregistration.² For Study 2, 3, and 4, we used the allocation applied in previous studies that relied on these datasets (Magee et al., 2018; Magee & Biesanz, 2019; Quintus et al., 2021). For Study 5, we relied on the five items that directly targeted each of the Big Five states. For an overview of all items per study and Big Five dimension see Table 3.

Following Finnigan and Vazire's (2018) analyses, we identified the amount of variability in states that is within person. For this purpose, we computed intra-class coefficients for each of the Big Five dimensions per study. We did this by dividing the variance within person by the total variance in a multi-level model (one model per Big Five dimension). Results are displayed in Table 4.

² Please note that, as specified in the preregistration, we used the item “self-revealing – reserved” to assess state openness in Study 1B. At the time, we decided to use this item as a marker for state openness, as it assessed how openly individuals revealed personal information during the interaction. However, it should be noted that this conceptualization differs from the openness items used in the other studies (which focus more on intellectual and interest aspects) and “self-revealing – reserved” might also be related to extraversion. Thus, the results for openness in Study 1B should be interpreted with this in mind.

Table 3
State Measures Across Studies

	Study 1A	Study 1B	Study 2	Study 3	Study 4	Study 5
N	“anxious, easy to upset – relaxed, emotionally stable” ^R	“nervous – relaxed” ^R	“insecure – secure” ^R	“relaxed” ^R “nervous” “anxious” “tense”	“remains calm in tense situations” ^R “is depressed, blue” “is relaxed, handles stress well” ^R “can be tense” “is emotionally stable, not easily upset” ^R “worries a lot”	“nervous, easy to upset – balanced, relaxed” ^R
E	“extraverted, enthusiastic – reserved, quiet” ^R	“sociable – reclusive” ^R	“shy – outgoing”	“talkative” “energetic” “shy” ^R “reserved” ^R	“is full of energy” “generates a lot of enthusiasm” “tends to be quiet” ^R “has an assertive personality” “is sometimes shy, inhibited” ^R “is outgoing, sociable” “is reserved” ^R	“reserved, quiet – enthusiastic, sociable”
O	“widely interested, profound – conventional, uncreative” ^R	“self-revealing – reserved” ^R	“narrow-minded – open”	“creative” “imaginative” “intellectual” “unsophisticated” ^R	“is intelligent” “is original, comes up with new ideas” “is ingenious, a deep thinker” “is bright”	“conventional, uncreative – widely interested, profound”
A	“critical, combative – understanding, warmhearted” “affectionate, trustworthy – cold-hearted, manipulative” ^R	“friendly – unfriendly” ^R “arrogant – modest” “exploiting – cooperative”	“rejecting – empathic”	“considerate” “sympathetic” “kind” “cooperative”	“tends to find fault with others” ^R “is helpful and unselfish with others” “starts quarrels with others” ^R “has a forgiving nature” “is considerate and kind to almost everyone” “can be cold and aloof” ^R “likes to cooperate with others”	“critical, combative – cooperative, warmhearted”
C	“reliable, self-disciplined – unorganized, careless” ^R	“reliable – unreliable” ^R	“careless” ^R – thoughtful	“organized” “careless” ^R “sloppy” ^R “efficient” “reliable” “responsible”	“makes plans and follows through with them” “does a thorough job” “can be somewhat careless” ^R “receives very good grades” “is a reliable worker” “tends to be lazy” ^R “is easily distracted” ^R	“lazy, careless – reliable, conscientious”

Note. N = neuroticism, E = extraversion, O = openness, A = agreeableness, C = conscientiousness.

^R reverse coded items.

210 **Table 4**211 *Proportion of Total Variance in State Measures That is Within-Person*

	F&V Study 1	F&V Study 2	Study 1A	Study 1B	Study 2	Study 3	Study 4	Study 5
N	61%	64%	24%	63%	85%	63%	48%	72%
E	74%	76%	33%	70%	86%	74%	59%	76%
O	65%	-	39%	69%	87%	63%	40%	74%
A	62%	58%	27%	43%	86%	64%	43%	64%
C	64%	63%	22%	47%	79%	64%	42%	65%

212 *Note.* N = neuroticism, E = extraversion, O = openness, A = agreeableness, C =

213 conscientiousness. F&V refers to the original study (Finnigan & Vazire, 2018).

Analytic Strategy

To ensure the highest possible degree of similarity to Finnigan and Vazire (2018), we followed their statistical analyses as closely as feasible (see Finnigan and Vazire's R code on osf.io/y22qc), adapting them for our data set and our extended research questions. All statistical analyses were performed in R (for data and code, separated for the five studies, see osf.io/h6z2w).

Bivariate correlations

In a first step, we calculated bivariate correlations among global informant-reports on the one hand and the two other personality indicators (i.e., global self-reports, and average states) on the other hand. Second, we compared the strengths of these relationships. To do so, we used the William modification of Hotelling's *t*-test for differences between dependent correlations (Kenny, 1987), which we calculated separately for each Big Five dimension using the *psych* package in R (Revelle, 2016).

Structural Equation Modeling

To test the incremental validity of average states over global self-reports, we conducted structural equation models for each Big Five dimension, using the *lavaan* package in R (Rosseel, 2012). Our models involved the global informant-report latent variable as criterion, predicted by the global self-report latent variable and the *average self-reported state* latent variable. This is a direct replication of Finnigan and Vazire (2018). As in the original study, the variances of the latent factors were constrained to 1.

The estimation of the global self-report latent variables depended on the study. For Study 1 (that employed three items per trait, five for agreeableness) we used these items as indicators to estimate the variables (as in the original Study 1 by Finnigan and Vazire, 2018). For Study 2 to 5

(that employed at least seven items per trait), we created three parcels as indicators to estimate the variables (as in the original Study 2 by Finnigan and Vazire, 2018). For this purpose, we relied on the balance approach (i.e., allocating items on the basis of their factor loadings on the respective trait in the order 1, 2, 3, 3, 2, 1, [...]; see Little et al., 2002). For the global informant-report latent variables, we followed an identical approach but, as a first step, aggregated items across informants.

To construct the average self-reported state latent variables, we adopted Finnigan and Vazire's (2018) procedure of item parceling.³ Here, we first aggregated across different items belonging to one trait dimension per measurement point. That is, depending on the study, up to seven state items per Big Five were aggregated per measurement point. We then ordered the (aggregated) states by measurement points and sequentially assigned each participant's ratings onto three different parcels (i.e., Parcel 1: measurement points 1, 4, 7, [...]; Parcel 2: measurement points 2, 5, 8, [...], Parcel 3: measurement points 3, 6, 9, [...]). For example, if a participant submitted a total of 30 state ratings over the course of a week, these states would be ordered according to the chronological series in which that person completed the respective questionnaires. These ratings would then be allocated alternately to three parcels, resulting in 10 state ratings contributing to each parcel.

The a priori defined exclusion criteria led to missing data in some cases for Study 1 (e.g., some participants only provided enough reports concerning the event-based observations but not for the time-based observations). Furthermore, for the time-based reports (Study 1), there were

³ In the preregistration of this study, we originally planned on conducting a single-indicator approach for the latent state variables. However, in the course of this replication, we decided to use parcels to keep the degree of similarity to the original study (Finnigan and Vazire (2018)) as high as possible. Please note that this decision (i.e., whether using parcels or a single-indicator approach) did not change any relevant results and conclusions across all five studies (see R codes on osf.io/h6z2w).

participants who only provided two measurement points and thus had only two instead of three parcels. In all these cases, and similar to Finnigan and Vazire (2018), we used full information maximum likelihood to deal with missing data. There were no missing cases in Study 2 to 5.

Replication – Results

The descriptive results (i.e., means, standard deviations, intercorrelations) for all variables as well as additional information (e.g., p -values for Hotelling's t -test, fit indices for SEMs) are displayed in the online supplement for the individual studies: osf.io/h6z2w.

Correlations

Table 5 contains the correlations between global informant-reports and global self-reports as well as average states separately for all Big Five traits and across all studies. As in the original study, we found general strong associations between global self-reports and global informant-reports ($r_{\text{mean}} = .55$), ranging from $r = .32$ (agreeableness, Study 1) to $r = .73$ (extraversion, Study 5). All 25 relations (i.e., 5 Studies x 5 Big Five traits) were significant. In most cases, there were moderate correlations among global informant-reports and average states ($r_{\text{mean}} = .27$), ranging from $r = -.08$ (openness Study 1B & Study 2) to $r = .55$ (openness Study 1A). Overall, most relations were significant (22 out of 30 possible correlations). Notable exceptions were average states assessed via the event-based experience-sampling (Study 1B, only significant for conscientiousness) and average states concerning the most memorable experience of the day (Study 2, only significant for neuroticism and extraversion). Similar to the results of the original study, the relations between global self-reports and global informant-reports were (across all cases) stronger than the relationship between global informant-reports and average states. The results for William's modification of Hotelling's t -test indicated that most of these differences were significant (i.e., 25 out of 30 comparisons).

Table 5

Correlations of Global Informant-Reports With Global Self-Reports and Average Self-Reported States

Predictors	F&V	F&V	Study	Study	Study	Study	Study	Study
	Study 1	Study 2	1A	1B	2	3	4	5
N	Global self-report	.28	.53	.60	.52	.52	.49	.66
	Average states	.03	.22	.46	.16	.18	.30	.47
E	Global self-report	.47	.65	.56	.62	.73	.59	.73
	Average states	.19	.41	.45	.16	.37	.32	.47
O	Global self-report	.31	-	.58	.59	.57	.53	.63
	Average states	.07	-	.55	-.08	-.08	.20	.26
A	Global self-report	.28	.44	.32	.44	.39	.33	.43
	Average states	.27	.15	.12	.02	.10	.27	.31
C	Global self-report	.42	.50	.57	.45	.54	.51	.56
	Average states	.31	.25	.43	.35	-.02	.36	.36

Note. All cell values refer to relationships between one predictor (i.e., global self-reports or average self-reported states) and the outcome (i.e., global informant-reports). Significant correlations ($p < .05$) in bold. F&V refers to the original study (Finnigan & Vazire, 2018). Here, information concerning significance was not provided. N = neuroticism, E = extraversion, O = openness, A = agreeableness, C = conscientiousness.

288 **Structural Equation Modeling**

289 To test the potential incremental validity of average self-reported states over global self-
290 reports, we ran different SEM models per Big Five dimension for each study. In line with
291 Finnigan and Vazire (2018), we found that self-reported average states did not predict global
292 informant-reports over global self-reports. These results were consistent across all five studies
293 and across all Big Five dimensions (see Table 6). For example, this means that, when controlling
294 for self-reported global extraversion, individuals with higher average self-reported state
295 extraversion (whether assessed via bi-weekly diaries, daily diaries, repeated time-based
296 assessment, event-based assessment) did not receive higher informant-reported global
297 extraversion scores. Global self-reports, in contrast, significantly predicted global informant-
298 reports for all dimensions.⁴

⁴ Across all SEMs, there were two cases in which the estimated standardized coefficient for the path between global self-report and global informant-report was near or above one (i.e., neuroticism and conscientiousness in Study 1A). To check for the robustness of the presented results, we reran all models from Study 1 as multiple regression models (using mean values instead of parcels, see online supplement for results, osf.io/h6z2w). Overall, the results were very similar to the results of the SEMs (without too high standardized regression coefficients) and all weights that significantly differed from zero in the SEMs were also significantly different from zero in the multiple regression models. However, in one case (i.e., self-reported average states openness within Study 1A) a variable was significant in the multiple regression models but not in the SEMs. Nevertheless, these results should be interpreted with caution as the analyses were post-hoc and not preregistered. Thus, we will only discuss the SEM results within the main text.

Table 6

SEM Models With Global Self-Reports and Average Self-Reported States Predicting Global Informant-Reports.

Predictors		F&V	F&V	Study	Study	Study	Study	Study	Study
		Study 1	Study 2	1A	1B	2	3	4	5
N	Global self-report	.49	.59	.97	.85	.63	.56	.45	.72
	Average states	-.24	-.01	-.19	-.10	-.11	.06	.13	-.02
E	Global self-report	.59	.64	.66	.69	.64	.84	.62	.84
	Average states	.01	.11	-.02	-.11	.09	-.08	.13	-.04
O	Global self-report	.28	-	.58	.73	.68	.64	.64	.67
	Average states	-.02	-	.24	-.16	-.11	.00	-.03	-.01
A	Global self-report	.63	.67	.78	.68	.76	.39	.28	.44
	Average states	-.12	-.26	-.30	-.20	-.33	.14	.15	.08
C	Global self-report	.65	.52	1.05	.64	.56	.68	.72	.63
	Average states	-.04	.00	-.44	.07	-.14	-.04	-.13	-.01

Note. All cell values refer to relationships between one predictor (i.e., global self-reports or average self-reported states) and the outcome (i.e., global informant-reports) while controlling for the other predictor. Results refer to structural equation models in which predictors are latent variables and were estimated using full information maximum likelihood. Here, standardized betas are reported, but significance tests refer to unstandardized coefficients. Significant path coefficients are printed in bold ($p < .05$). F&V refers to the original study (Finnigan & Vazire, 2018). N = neuroticism, E = extraversion, O = openness, A = agreeableness, C = conscientiousness.

Meta-Analytical Integration

For more comprehensive and robust results, we further meta-analyzed the discovered effects across the five new studies as well as the two original studies. We hereby focused on the correlation between global informant-report and average states (Table 5) as well as the incremental validity of average states calculated via SEMs (Table 6). Again, we followed the steps taken by Finnigan and Vazire (2018) for their mini meta-analysis. That is, we first Fisher-z-transformed correlations and standardized latent betas. Study weights and confidence intervals per study were based on the sample size. All confidence intervals were calculated based on the z-transformed values and were then converted back into the correlation / standardized beta metric. Effect sizes were integrated across studies using a random effects meta-analysis that uses a maximum likelihood estimator. Results for the correlations are displayed in Figure 1, whereas results for the standardized betas are displayed in Figure 2. As visualized in the figures one can summarize that (1) average self-reported states are related to global informant-reports but (2) they are not incrementally valid in predicting global informant-reports beyond global self-reports.

325 **Figure 1**326 *Forest Plots of Meta-Analytical Results: Correlations Between Average Self-Reported States and*327 *Informant-Reported Personality*

328 **Figure 2**329 *Forest Plots of Meta-Analytical Results: Incremental Validity of Average Self-Reported States in*330 *Predicting Informant-Reports Beyond Self-Reports*

331

Summary

Within this research we aimed at replicating the results of Finnigan and Vazire (2018). We therefore assessed data across five different studies that used a variety of different experience-sampling methods, sampling schedules, and states measures. Across all studies and in a meta-analytic integration, the original results were replicated, showing that average self-reported states are not incrementally valid in predicting global informant-reports beyond global self-reports.

Extension – Method

With the aim to extend these findings, we further investigated whether these results hold when considering average *other-reported* states. For this purpose, we only used data obtained from Study 1, which included state peer-reports. Again, all analyses steps were preregistered (see osf.io/h6z2w) and followed the same analytic strategy as the replication part. Here, we now describe the participants, the procedure, and measures of Study 1 in more detail to provide all necessary information to follow the methods of this extension.

Participants

Study 1 aimed at accompanying a full cohort of psychology freshmen across their undergraduate studies. Initially, 131 of 138 potential students agreed to participate in this study. Five participants dropped out during the study and six participants did not provide global informant-reported personality (the dependent variable in our analyses). This resulted in a final sample of 120 (81% female) participants with a mean age of 21.33 years ($SD = 3.95$; range: 18 to 42 years). Please note that this is the identical sample as used for the Study 1 replication part of this research.

Procedure

Global self- and informant-reports

During the first week of the study, participants completed an online questionnaire and were asked to forward the same but rephrased questionnaire to (at least) two informants. Informants were family members or well-acquainted friends they met before attending university. A total number of 244 informants (70% female; $M_{age} = 28.51$, $SD_{age} = 13.52$; range: 15 to 63 years) completed ratings of participants' personalities, resulting in an average number of 2.03 global informant-reports ($Mdn = 2$) per participant.

Average Peer-Reported States

Study 1 used two different experience-sampling formats (time-based diaries and event-based assessments) and in both formats average peer-reported states were collected. All participants within this study were at the same time the peers of the other participants in this study. The peers who provided these state ratings did not overlap with the informants who provided the personality trait ratings, as the participants were unacquainted with each other before the study started. Furthermore, the participants of the study were a relative exclusive group, as almost the whole cohort of psychology students participated in this study. That is, most interactions within the university context were with other participants. Overall, participants received ratings from 123 peers. This number of peers is slightly higher than the number of participants because some individuals were excluded from this study as participants (i.e., because informant-reported personality was not available) but the peer-ratings they provided were still used.

Time-based assessment. Starting one week after the beginning of the study (i.e., the beginning of the semester), participants received individualized links to 7 bi-weekly online diaries (please note that there was a 5-week break for Christmas between the fifth and sixth diary). At each of the seven time points, participants were asked to complete state self- and peer-

reports regarding their social interactions within the previous week. When completing peer-reports, participants were shown pictures and first names of the other participants (i.e., fellow students) and, if they knew a person and had interacted with them in the previous week, they were asked questions about this person's states. Across the seven time points of the time-based assessment, a total number of 8,873 peer-reports ($M = 73.94$ received per participant, $SD = 32.56$, $Mdn = 74$, range 15 to 165) were completed. Thus, per diary, participants were evaluated by an average of 10.56 peers.

Event-based assessment. Within the event-based state assessment that took place across three phases in participants' first semester (weeks 1 to 3; week 6, week 16), participants were asked to report on every social interaction they had with other participants of the study. Beforehand, an interaction had been defined as an "encounter with one or more people that lasts at least five minutes, and in which one responds to the behavior of the other persons". Event-based peer-reported states were collected using a smartphone-based questionnaire. When reporting on their latest interaction, participants were asked to choose their interaction partner(s) in a scroll-down menu of pictures and first names and to rate their own and their interaction partner's/partners' states (i.e., behaviors during the interaction). In total, participants received a number of 10,665 peer-reports ($M = 88.88$ per participant, $SD = 38.93$, $Mdn = 90$, range 10 to 178). These reports took place across 9,009 unique interactions. That is, participants were evaluated by an average of 1.18 peers per interaction.

Measures

Trait Measures: Big Five

For self- and informant-reported personality traits, we employed the 15-item Big Five Inventory-SOEP (BFI-S; Gerlitz & Schupp, 2005). As the reliability of brief agreeableness scales

is usually low (Hahn et al., 2012; Lang et al., 2011), two supplemental agreeableness items were added (“I am a person who easily trusts others and believes other people are good”, and reverse scored: “I am a person who tends to criticize others). This resulted in a total number of 17 items that were answered on 7-point Likert scales ranging from 1 (*does not apply at all*) to 7 (*applies perfectly*). Cronbach’s alphas and ICCs are displayed in Table 2.

State Measures

Time-based states were rated on six 11-point adjective items whereas event-based states were rated on six 7-point bipolar adjective items. For the exact wordings see Table 3. The adjective pair corresponding to neuroticism (nervousness) was not assessed in the event-based peer-report. Just as for the average self-reported states we identified the amount of variability in personality that is within person for the peer-reported time-based states (N: 47%, E: 25%, O: 57%, A: 52%, C: 55%) as well as for the peer-reported event-based states (E: 89%, O: 95%, A: 89%, C: 92%). Here, the peer-reports were aggregated across peers (per diary / per interaction) before calculations.

Extension – Results

The descriptive results (i.e., means, standard deviations, intercorrelations) for all variables as well as additional information (e.g., *p*-values for Hotelling’s *t*-test, fit indices for SEMs) are displayed in the online supplement for Study 1: osf.io/h6z2w.

Correlations

Table 7 contains the correlations between global informant-reports and average peer-reported states. Furthermore, for comparison purposes, the relations between global informant-reports and global self-reports as well as self-reported states are also displayed (same results as in Table 5). Nearly all peer-reported states were significantly related to informant-reported

424 personality and correlations ranged from $r = .09$ (event-based openness) to $r = .48$ (time-based
425 extraversion). The relations between global self-reports and global informant-reports were
426 (across all cases) stronger than the relationship between global informant-reports and average
427 peer-reported states. The results for William's modification of Hotelling's t -test indicated that
428 about half of these differences were significant.

Table 7*Correlations of Global Informant-Reports With Global Self-Reports and Average States*

Predictors	Study 1A	Study 1B	Study 1A	Study 1B
	time-based	event-based	time-based	event-based
Self-reported states		Peer-reported states		
N	Global self-report		.60	
	Average states	.46	.16	.25
E	Global self-report		.56	
	Average states	.45	.16	.48
O	Global self-report		.58	
	Average states	.55	-.08	.35
A	Global self-report		.32	
	Average states	.12	.02	.23
C	Global self-report		.57	
	Average states	.43	.35	.44

Note. All cell values refer to relationships between one predictor (i.e., global self-reports or different kinds of average states) and the outcome (i.e., global informant-reports). Significant correlations ($p < .05$) in bold. N = neuroticism, E = extraversion, O = openness, A = agreeableness, C = conscientiousness.

Structural Equation Modeling

We investigated whether average peer-reported states predicted global informant-reports above and beyond global self-reports (see Table 8 for results). Here, we found significant effects for time-based as well as event-based peer-reported extraversion (time-based: $\beta = .24, p = .021$, bootstrap 95% CI = [.01, .50]; event-based: $\beta = .23, p = .024$, bootstrap 95% CI = [.04, .43]). That is, when controlling for self-reported global extraversion, individuals who received higher average state extraversion peer-reports also received higher extraversion global informant-reports. Furthermore, there were significant effects for event-based peer-reported agreeableness ($\beta = .22, p = .036$, bootstrap 95% CI = [.02, .46]) and conscientiousness ($\beta = .22, p = .022$, bootstrap 95% CI = [-.04, .44]).⁵

In a last set of models, we tested whether these results hold when using global self-reports, average peer-reported states, *and* average self-reported states as predictors (see online supplement on osf.io/h6z2w for results). Results showed that peer-reported state extraversion, agreeableness (only event-based assessment), and conscientiousness (only event-based assessment) predicted global informant-reports not only above and beyond global self-reports but also above and beyond average self-reported states.

⁵ Please note that this confidence interval (based on 200,000 bootstrapped samples) does include zero and thus, results concerning the incremental effect of peer-reported conscientiousness should be interpreted with caution.

Table 8*SEM Models With Global Self-Reports and Average States Predicting Global Informant-Reports.*

Predictors		Study 1A	Study 1B	Study 1A	Study 1B
		time-based	event-based	time-based	event-based
		Self-reported states		Peer-reported states	
N	Global self-report	.97	.85	.80	-
	Average states	-.19	-.10	.04	-
E	Global self-report	.66	.69	.52	.55
	Average states	-.02	-.11	.24	.23
O	Global self-report	.58	.73	.85	.76
	Average states	.24	-.16	.04	.09
A	Global self-report	.78	.68	.56	.55
	Average states	-.30	-.20	.15	.22
C	Global self-report	1.05	.64	.65	.64
	Average states	-.44	.07	.09	.22

Note. All cell values refer to relationships between one predictor (i.e., global self-reports or different kinds of average states) and the outcome (i.e., global informant-reports) while controlling for the other predictor. Results refer to structural equation models in which predictors are latent variables and were estimated using full information maximum likelihood. Here, standardized betas are reported, but significance tests refer to unstandardized coefficients. Significant path coefficients are printed in bold ($p < .05$). N = neuroticism, E = extraversion, O = openness, A = agreeableness, C = conscientiousness.

Additional Analyses

The extension part of this research was based on one study with a relatively small sample size (i.e., 120). Thus, to check the robustness of the presented results, we performed some additional analyses. All following analyses should be interpreted with caution, however, as they were post-hoc and not preregistered (see online supplement for Study 1 on osf.io/h6z2w for more specific results concerning the additional analyses).

First, the number of peer-reports received varied strongly between participants (i.e., time-based $SD = 33$; event-based $SD = 39$). For this reason, we investigated the relationship between the number of received peer-ratings and the different personality indicators. Results showed (see online supplement Tables 6 and 7) that individuals who received more peer-reports scored significantly higher on nearly all extraversion measures (e.g., global informant-report, global self-report, average self-reported states). Furthermore, individuals who received more peer-reports were also generally evaluated more positively within the time-based and event-based peer-reports (i.e., less neurotic, more extraverted, more open, more agreeable, and more conscientious). Controlling for the number of received peer-reports did, however, not influence the incremental validity of average peer-reported states (see online supplement Table 11).

Second, average state peer-reports were based on more observations compared to average state self-reports. This was due to peer-reports being aggregated across multiple peers per time point. This should have a positive influence on the reliability of these ratings (e.g., Jackson et al., 2015) compared to self-reports. To examine potential influences on incremental validity we reran all analyses but only used ratings of one peer per time point. That is, for each participant and time point (i.e., per diary for the time-based assessment, per interaction for the event-based assessment), we randomly selected one peer and only included this single rating in further

analyses. Results showed that this procedure did not change any relevant results (see online supplement Table 11). Thus, the fact that average peer-reported states were aggregated across multiple peers had no impact on conclusions regarding their incremental validity.

Third, we reran all models as multiple regression models (using mean values instead of parcels, see also Footnote 4 and online supplement Tables 12 and 13). Overall, the results were very similar to the results of the SEMs and all weights that significantly differed from zero in the SEMs were also significantly different from zero in the multiple regression models. However, in three cases (i.e., time-based peer-reported openness, time-based peer-reported agreeableness, and time-based peer-reported conscientiousness) variables were significant predictors in the multiple regression models but not in the SEMs. As such, these exploratory results point even more strongly to the incremental validity of average peer-reported states and to the SEMs being the more conservative test compared to multiple regression analyses.

Fourth, average peer-reported states may not only be used as an alternative predictor (instead of self-reported states) but also as an alternative outcome (instead of global informant-reports). That is, the predictive validity of global self-reports vs. average self-reported states could be further investigated by changing the outcome to peer-reported states. We did this across both time- and event-based sampled average states: Here, results showed that global self-reports were incrementally valid for time-based openness and event-based extraversion. Average states were incrementally valid for time-based extraversion. In all other cases, neither global self-reports nor average self-reported states were incrementally valid (see online supplement Table 14).

Fifth, another way to examine whether average states are incrementally valid is to compare how average peer-reported states and global informant-reports fare in predicting global

self-reports. Similar to the original research question (predicting global informant-reports by average self-reported states and global self-reports), this approach allows the comparison of two predictors, which do not share the source of information with the outcome. Results showed that, across all traits, global informant-reports predicted global self-reports above and beyond average peer-reported states. Conversely, average peer-reported states were incrementally valid in two cases (time-based extraversion and time-based conscientiousness; see online supplement Table 15).

Discussion

In the present research, we aimed at investigating the relation between average states and global self- and informant-reports of personality. We hereby, first, replicated Finnigan and Vazire's (2018) studies, using a variety of different experience-sampling methods and state measures. Second, we extended their studies (based on one sample) by not only using self-reported states but also peer-reported states as predictors.

Replication of Finnigan and Vazire (2018)

In line with Finnigan and Vazire (2018), we showed that average self-reported states were related to global informant-reports. That is, together with the results of the original study, our findings provide robust evidence for the general validity of average experience-sampled states. However, the sizes of relations with global informant-reports were relatively diverse across studies (see Table 5). That is, we found the strongest correlations for the classic time-based assessments (Study 1A, Study 3 to 5, e.g., “how considerate were you in the last 30 minutes”) but generally smaller correlations for the event-based assessment (Study 1B, e.g., “how considerate were you in the last interaction?”) or the daily diary concerning the most memorable experience of the day (Study 2). One explanation for these findings could be that both the “last interaction” and the “most memorable experience of the day” refer to relative specific situations, whereas the time-based assessments are mentally aggregated across different situations, making these measures more ‘trait-like’ and similar to global measures (Robinson & Clore, 2002).

Concerning potential incremental validity, average self-reported states did not provide additional information concerning informant-reported personality beyond what is already captured in global self-reports. These results were consistent across the original and all additional studies and did not depend on the type of state assessment (e.g., the proximity to behavioral

expression) or the number of items assessing each state. That is, when it comes to predicting informant-reported personality traits, average self-reported states are indeed at a disadvantage to the much easier assessable global self-reports. As the original authors note, one possible explanation for this finding could be that average self-reported states are prone to similar biases in perception as global self-reports. It should be acknowledged, however, that biases were not examined in the context of this research.

Extension of Finnigan and Vazire (2018)

The conclusion that average states are not well suited to predict informant-reported personality (above and beyond global self-reports) is only warranted when considering *self*-reported states. The present research shows that average *other*- (i.e., peer-) reported states do indeed provide valid information that is not captured by global self-reports. This was especially true for peer-reported states assessed via event-based assessments (i.e., directly after social interactions). Here, three of the four investigated states (i.e., extraversion, agreeableness, and conscientiousness) showed incremental validity in predicting informant-reported personality. This highlights the importance of considering the source of information (i.e., self vs. others) when examining the validity of average states.

The differences between self- and peer-reported states in the present research might be explained by the asymmetry in self- and other-perception. Motivational and informational differences between the self and others are the two main reasons why self- and other-perceptions diverge (Vazire, 2010). While motivational differences emerge from self-serving biases (e.g., desire to maintain a positive self-concept; Sedikides & Gregg, 2008 or the ego-relevance of the judgement; Andersen et al., 1998), informational differences mainly result from a different access to thoughts, feelings, and behaviors of the self and others (e.g., Brandt et al., 2021). Thus,

it is most likely the case that both types of informants (e.g., family or close friends who provided global ratings) and peers (e.g., fellow students who provided state ratings) have access to parts of a target's personality that are not captured via self-views. Our results were especially clear for extraversion, which might be explained by its high visibility. That is, extraversion can typically be accurately assessed based on very little information (e.g., Breil et al., 2021; Connelly & Ones, 2010).

Limitations and Future Directions

Whereas we addressed some of the limitations of the original research (e.g., only one type of experience sampling, low number of state items, reliance on self-reported states), there are still prevailing limitations. First, all studies were based on student samples (high school or university). In this regard, we would, however, expect that our results generalize to other populations (i.e., non-student samples) and settings (e.g., work settings). Thus, a direct replication of our study would involve assessing similar experience-sampled states across different settings. We have no reason to believe that the results depend on other characteristics of the participants, materials, or context (see Simons et al., 2017).

Second, although we had a high between-person sample size for the replication part, the extension part of this research was based on one study only (with a relatively small sample size). That is, future research should build on the extension part of this research and further test the validity of average other-reported states.

Third, in the current replication and extension, we followed Finnigan and Vazire's (2018) approach and aimed at validating average states as a measure of between-person differences in personality by investigating the relation with global informant-reports. That way, the original authors and us treated global informant-reports as some sort of 'gold standard' against which the

other measures were evaluated. This decision seems sensible, since most of life is lived interpersonally, and what our peers think of us has important consequences (e.g., who will be our friend, life partner, or boss). However, this procedure is also not without its drawbacks, as the informant-reports themselves may be biased. For example, they might be driven by superficial characteristics, theories about how traits are expressed, specific stereotypes, or by specific situations that people are part or not part of (see Brandt et al., 2021). Furthermore, and depending on the informants included, they may be positively biased when informants are close to and like the participants (e.g., Leising et al., 2010; Wessels et al., 2020). Given this, it could be the case that global self-reports better predict global informant-reports because they share more positivity bias. Consequently, the presented results are valid for global informant-reported personality as outcome criteria but do not necessarily translate to alternative criteria that could be addressed in future research. For example, exploratory results within the current research (i.e., Study 1) showed that (in many cases) neither global self-reports nor average self-reported states were incrementally valid in predicting peer-reported average states. Other potential outcome measures for future research could, for example, include personality being assessed through observer ratings based on videos (in a laboratory context) or sound files (in a field context; Mehl et al., 2001). In addition, if one wants to compare different assessment methods with regard to their predictive validity, one could also assess (non-self-reported) life outcomes that are theoretically related to personality (e.g., supervisor-rated job performance, number of friends, partner-rated relationship satisfaction; Barrick & Mount, 1991; Harris & Vazire, 2016; Schaffhuser et al., 2014). Generally, the use of multiple and different outcome criteria would allow for more comprehensive conclusions.

Fourth, if we aim to further understand individual differences and the nature of personality, a sole focus on the potential dimension-wise *accuracy*, *objectiveness*, or *bias* of specific assessment methods is not sufficient because different assessment methods likely tap into different aspects of personality. For example, global traits include evaluations across a long period of time, across diverse settings, and incorporate broader self-concept aspects such as motivation or desires. The average of states, in contrast, mainly focusses on specific behavioral expressions related to a predefined time-frame (a few weeks of behavior in a specific setting, see Fleeson & Gallagher, 2009). That is, the limited incremental validity of average self-reported states in predicting informant-reports does not mean that they are not generally suited to capture what a person is actually like, but rather that they assess a conceptually different part of personality. Taking a more dynamic approach to personality that considers relationships (i.e., contingencies) between a variety of behaviors, thoughts, and feelings (potentially assessed via different assessment methods and sources) would allow for a more fine-grained and comprehensive understanding of the self- and informant-perspective on personality (see Back, 2021).

Conclusion

The present study contributed to the validation of average states as a measure of between-person differences. Across five intensive, time- and event-based experience-sampling studies, we replicated Finnigan and Vazires' (2018) original results showing that average self-reported states *do not* predict global informant-reports above global self-reports and further extended them in considering average peer-reported states. Importantly, we demonstrated that average peer-reported states (in the case of extraversion, agreeableness, and conscientiousness) *do* predict global informant-reports above global self-reports. These findings highlight the importance of

628 considering the method (global trait reports, time-based and event-based state reports) and the
629 source of information (self vs. informant/other) when deciding for and evaluating different
630 approaches of assessing personality.

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