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Research article

Sociable behavior is related to later fatigue: moment-to-moment patterns of behavior and tiredness

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ABSTRACT

The popular idea that extraverted behavior is mentally depleting has received support in one previous study. The present research attempted to replicate this finding and rule out some alternative explanations. An experience-sampling study was conducted to this end ($N = 74$, observations $= 1046$). The results showed that extraverted behavior was indeed related to feeling tired 2–3 h later. The results provide empirical evidence of an everyday life pattern between behavior and feelings states.

1. Introduction

The idea of social interaction as depleting or tiring has become a part of everyday life discourse and layman psychology. Books such as "Quiet: The hidden power of Introverts in a world that cannot stop talking" by Cain (2012) and "The Highly-Sensitive Person" by Aron (1996), as well as the accompanying Ted Talks and other popular media coverage have put forth the idea that a substantial minority of people experience intensive social interactions as depleting and need alone time to recuperate. These ideas have resonated with a huge number of people (e.g. Blatchford, 2017; Roy, 2013; Sugandha, 2017). At the same time, however, there is little scientific evidence of the tiring effect of social behavior. In fact, most existing research suggests that sociability is beneficial. This connection holds for cross-sectional studies asking participants to report on their social life and well-being (e.g. Diener and Seligman, 2002; Requena, 1995), for longitudinal studies predicting later well-being and longevity from earlier sociability (Berkman et al., 1993; Rizzuto et al., 2012), and for experience-sampling studies recording momentary sociability along with affective states (e.g. Wilt et al., 2012; Zelenski et al., 2012).

In sum, there is a vast amount of evidence suggesting that behaving socially is beneficial. However, the idea that intensive sociability is tiring is endorsed by many, as discussed above. After all, there is indirect evidence suggesting that the presence of others evokes higher arousal and/or effort. For instance, people tend to engage in some level of self-presentation in the presence of others, even close others (e.g. Roth et al., 2001; Tice et al., 1995). There is also some evidence suggesting that people withdraw from social interactions when they are tired or experience stress (Repetti, 1989; Story and Repetti, 2006). Such results indirectly suggest that social interaction requires effort. Furthermore, affective benefits and mental fatigue are not mutually incompatible – it's possible to be tired and happy.

A potential challenge related to studying the possible relation between extraverted behavior and tiredness is that there is a positive relation between extraverted behavior and virility/alertness; i.e. when people report being sociable, they also report being active, energetic, or less tired, at the same time (e.g. Jacques-Hamilton et al., 2020; Leikas and Ilmarinen, 2017). In addition, extraverted behavior is sometimes measured with items such as "energetic" which are conceptually related to low fatigue (e.g. Fleeson et al., 2002). Thus, the possible relation between sociable behavior and fatigue would be difficult to detect. However, when using experience-sampling methodology, it is possible to look at patterns of behavior and feeling states over time. In essence, it is possible to investigate whether earlier social activity is related to later fatigue.

To address the question of the relation between sociability and fatigue, my colleague and I conducted a small-scale experience sampling study (Leikas and Ilmarinen, 2017) in which we tracked lagged relations between extraverted behavior and mood, stress, and fatigue. The results showed that while extraverted behavior, measured by asking people how sociable and talkative they had been during the last hour, was positively

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related to current mood and lower fatigue, it predicted higher fatigue two to three hours later. This study provided some evidence for the popular claim about sociability as depleting. However, the sample size in our study was small and to my knowledge, at the moment, no other evidence exists for this relation. Thus, I conducted a new experience-sampling study in an attempt to replicate the findings.

2. Method

2.1. Participants and procedure

Power and sample size calculations were conducted in the R environment (v. 3.3.2, R Core Team, 2015) using code created with the program MLPowSim (Browne et al., 2009). Parameters were obtained from the dataset of Leikas and Ilmarinen (2017). A multilevel model (with observations nested within participants) predicting fatigue from earlier fatigue, earlier extraverted behavior, and concurrent extraverted behavior was used to calculate the parameters. In this model, the critical extraverted behavior - > later fatigue beta coefficient was 0.10; this was used as an estimated effect size in the power calculations. The research plan was a four-day ESM procedure with four measurements per day. Allowing a maximum of 50% of missing reports per participant, power calculations were conducted for 8 measurements per participant (i.e. 8 level 1 units per level 2 unit), and for $N = 40$ participants and upwards in steps of 10. Both the standard error method (SE) and the Zero/One method suggested that the power to detect a within-subject effect of the size of 0.10 with a minimum of 8 within-subject units was above 0.80 with 70 participants (.85 [95 % CIs .85; .85] for the SE and .87 [.85; .89] for the Zero/One method). Thus, I aimed to collect a sample of around 80 participants, and the final sample was 74. For the R code for these power calculations, see Appendix.

Participants were 74 students in the University of Helsinki (58 women and 16 men, mean age = 26.8 years, $SD = 6.6$ years). They were recruited via an invitation posted on student e-mail lists. They participated in exchange of a gift card of 20 € to a local department store. Participants received an informed consent form explaining the content of the study and that they would be asked to provide their personal phone numbers to the researcher and that their phone numbers would be permanently deleted from the researchers' files immediately after they had completed the study. They were also informed that they could withdraw their participation at any time with full compensation. Only participants who indicated, by signing a consent form online, that they volunteered to participate and had received adequate amount of information about the study, were enrolled to the study.

This research did not fall under the studies requiring an ethical committee approval per the guidelines of the University of Helsinki Ethical Review Board in the Humanities and Social and Behavioural Sciences. Therefore, an ethical committee approval was not sought.

The data of the present study consists of a baseline experience sampling data of a larger study (the present study data was collected as the first phase of the larger study). Participants responded via their personal smart phones. Four times a day during 4 days, they were sent a text message with a link to an online questionnaire. These messages were sent at fixed times: 11am, 2pm, 5pm and 8pm. The questionnaire was identical across measurements. At each measurement occasions, participants were first asked to rate their current mood, stress, and fatigue and next, their behavior and situations during the last hour.

3. Measures

3.1. Mood, stress, and fatigue

Participants reported how *happy* and *content* they were at the moment on a five-point scale ranging from 1 (*not at all*) to 5 (*very much*); these items were highly correlated within situations ($r = .71$) and were averaged into a positive mood score. Participants further reported how *stressed* and *tired* they were on single items using the same five-point scale.

3.2. Behavior

At each measurement occasion, participants were asked to rate their behavior during the last hour with regards to four behavioral states: extraverted, emotionally stable, agreeable, and conscientious. They were asked to "please evaluate your behavior during the last hour" followed by the behavioral items. Extraverted behavior was measured with single item *sociable*, emotionally stable behavior with single item *insecure* (reversed), agreeable behavior with the items *friendly*, *compassionate*, and *altruistic*, and conscientious behavior with the items *responsible* and *productive*. Items were rated on a scale from 1 (not at all) to 5 (very much). Agreeableness items were highly correlated within situation (*r*s .53-.67), as were conscientiousness items ($r = .64$), and they were averaged into state agreeableness and conscientiousness scores, respectively.

3.3. Situation

Participants rated on 5-point scales (from 1 = *not at all* to 5 = *very much*) whether they had *met other people*, *worked* and *studied* during the last hour.

3.4. Personality

Participants' Big Five traits Extraversion, Emotional Stability, Agreeableness, and Conscientiousness were measured with corresponding scales of the revised NEO-FFI questionnaire (McCrae and Costa, 2004). Reliabilities (Cronbach's alphas) were .81, .86, .73 and .86 for Extraversion, Emotional Stability, Agreeableness, and Conscientiousness, respectively.

4. Results

Missing value analyses showed that participants completed 1046 out of possible 1184 reports (88.3 %). The average number of missing reports per participant was 1.88 and the median was 1. One participant had 9 missing reports and one had 8, all the others had 6 or less missing reports. We retained all participants and all available data.

The analyses were conducted with the lme4 package (Bates et al., 2015) in the R environment (v. 3.3.2, R Core Team, 2015). Multilevel regression analyses, with observations (Level 1) nested within participants (Level 2) were used to investigate the main research question. All ESM-derived independent variables were person-mean centered prior to analyses, and personality traits were grand-mean centered. Likelihood Ratio Testing (LRT) was used to test the significance of the fixed effects, and confidence intervals were obtained via parametric bootstrapping.

Table 1 shows the results of the multilevel models predicting T2 fatigue. First, an unconditional model with no predictors (Model 0) was ran. Autoregressive effect (T1 fatigue) was added to Model 1, lagged behaviors to Model 2, concurrent behaviors to Model 3, and personality traits to Model 4. As shown in Table 1, lagged extraverted behavior positively predicted later fatigue (estimate = .19, $p < .001$). This relation remained equally strong whether or not concurrent behaviors and personality traits were controlled for, and 95 % confidence intervals, obtained via parametric bootstrapping, for the lagged extraverted behavior estimate from Model 3 were .10 and .26. In addition, state emotional stability had a small negative relation with lagged fatigue (estimates = -.08 to -.09 across models, $p < .05$), and state conscientiousness was related to concurrent lower fatigue (estimate = -.23, $p < .001$). Earlier fatigue had a small positive relation (estimates .09-.11 across models, *p*s $< .05$) with later fatigue (i.e., autoregression). Finally, trait Emotional Stability was negatively related to momentary fatigue (estimate = -.29, $p < .001$).

Table 1. Fixed effects estimates (top) and variance estimates (bottom) for Models predicting Momentary fatigue at T2 from earlier (T1) fatigue (Model 1), lagged (T1) behavior (Model 2), concurrent (T2) behavior (Model 3) and personality traits (Model 4), $N = 74$.

Parameter	Model 0	Model 1		Model 2		Model 3		Model 4	
	Fixed effects								
	Estimate (SD)	Estimate (SD)	*p*	Estimate (SD)	*p*	Estimate (SD)	*p*	Estimate (SD)	*p*
Intercept	2.46 (0.07)	2.47 (0.07)		2.46 (.07)		2.45 (0.07)		2.46 (.07)	
Level 1									
Lagged effects									
Fatigue (T1, autoregression)		.09 (.04)	.010	.11 (.04)	.002	.09 (.07)	.008	.09 (.07)	.008
State Extraversion (T1)				.19 (.04)	<.001	19 (.04)	<.001	19 (.04)	<.001
State Emotional Stability (T1)				-.08 (.04)	.046	-.08 (.04)	.033	-.09 (.04)	.031
State Agreeableness (T1)				-.09 (.05)	.106	-.10 (.05)	.072	-.10 (.05)	.072
State Conscientiousness (T1)				07 (.04)	.113	10 (.04)	.013	10 (.04)	.013
Concurrent effect									
State Extraversion (T2)						-.02 (.04)	.610	-.02 (.04)	.597
State Emotional Stability (T2)						-.00 (.04)	.950	-.00 (.04)	.959
State Agreeableness (T2)						-.10 (.05)	.054	-.10 (.05)	.055
State Conscientiousness (T2)						-.23 (.04)	<.001	-.23 (.04)	<.001
Level 2									
Trait Extraversion								.06 (.11)	.595
Trait Emotional Stability								-.29 (.10)	.004
Trait Agreeableness								-.12 (.13)	.379
Trait Conscientiousness								.15 (.10)	.167
Random effects									
Level 2									
Intercept/intercept	0.27	0.27		0.28		0.28		0.24	
Level 1									
Intercept/intercept	0.85	0.84		0.80		0.74		0.74	
-2*loglikelihood	2402.2	2395.6		2356.8		2296.2		2287.0	

Note. Fixed effects estimates are unstandardized regression coefficients from multilevel linear regressions.

It should be noted that the relation between conscientious behavior and later fatigue, found in one earlier study (Leikas and Ilmarinen, 2017) was not reliably detected here – the relation was significant in Models 3 and 4, but not in Model 2.

Next, slope variation in the extraverted behavior – later fatigue relation was tested using LRT and the parametric bootstrap test. No significant slope variation was found either using LRT ($X^2 = .08$, $p = .782$) or parametric bootstrapping (PBtest = .08, $p = .489$; Bartlett = .14, $p = .712$). Thus, no individual differences were found for the relation between extraverted behavior and later fatigue.

I ran several control analyses to ensure that the extraverted behavior – later fatigue -relation did not result from multicollinearity, suppression, or other non-substantial issues. First, a multilevel model predicting fatigue with only the lagged extraverted behavior as predictor was run. For this model, the estimate for lagged extraversion was .15 ($SE = .03$, $p < .001$). Second, a model with lagged extraversion and concurrent extraversion was ran. For this model, the estimate of lagged extraversion was .16 ($SE = .03$, $p < .001$). Third, a model with lagged extraversion, concurrent extraversion, and the autoregressive effect of fatigue were added as predictors. For this model, the estimate for lagged extraversion was .17 ($SE = .03$, $p < .001$). These analyses show that the relation between extraversion and later fatigue is substantial on its own, though multicollinearity with other behaviors and earlier fatigue seems to slightly strengthen the relation.

Participants' diurnal and social patterns could have also affected the results as well. It may be that participants were typically alone in the mornings, and thus could not be social, and that their sociability increased as the day progressed. If their tiredness also grew from morning to evening, which is a reasonable assumption, the coincidence of their social and diurnal cycle could drive the results instead of sociability being tiring. To control for this possibility, both fatigue and extraverted behavior were predicted by a four-level measurement occasion variable in two additional multilevel models. An expected trend for fatigue was found ($F = 12.12$, $p < .001$); participants were more tired at 8pm ($M = 2.75$, $SE = .08$) than they were earlier, and more tired at 5pm ($M = 2.51$, $SE = .08$) than they were at 2pm ($M = 2.32$, $SE = .08$) or 11am ($M = 2.34$, $SE = .08$; fatigue did not differ significantly between the two first occasions)[1]. However, a similar trend was not found for extraverted behavior ($F = 0.81$, $p = .486$). In fact, at the absolute level, extraverted behavior was lowest in the 8pm reports ($Ms = 2.76$, 2.82, 2.86 and 2.72, all $SEs = .09$, for the 11am, 2pm, 5pm and 8pm reports, respectively[1]), suggesting that coinciding diurnal and social patterns cannot explain the results. To further investigate this potential confound, the model with lagged extraversion, concurrent extraversion, and lagged fatigue was ran excluding each day's last measurement and again excluding each day's first measurement. In both analyses, the lagged extraversion – later fatigue relation remained significant (estimates .16 and .18, respectively, $ps < .001$). Thus, the coincidence of diurnal and social patterns does not seem to be driving the results.

Finally, I investigated how situational variables of having met other people and having worked or studied were related to the main result. First, "having met other people" is a relatively objective but crude

[1] Tiredness and extraverted behavior means presented here are estimated means from a linear mixed regression, presented with standard errors. The observed tiredness means (and standard deviations) across all participants were 2.34 (1.04), 2.31 (1.01), 2.52 (1.06) and 2.74 (1.11) for the 11am, 2pm, 5pm and 8pm reports, and the observed extraverted behavior means (and standard deviations) were 2.76 (1.20), 2.80 (1.19), 2.86 (1.15) and 2.74 (1.22) for the 11am, 2pm, 5pm and 8pm reports.

measure of sociability; however, one could meet many people without acting in a particularly extraverted way. Thus, a model was ran predicting momentary fatigue from autoregressive fatigue, lagged extraversion, concurrent extraversion, concurrent "meeting other people", and lagged "meeting other people". In this model, the lagged extraversion remained a significant predictor of fatigue (estimate = .13, SE = .04, p = .001). Concurrently meeting other people was, expectedly, negatively related to fatigue (estimate = -.10, SE = .04, p = .014), but lagged meeting other people was unrelated to fatigue (estimate = .05, SE = .04, p = .211). Thus, extraverted behavior, not meeting other people as such, seems to be driving the effect.

Acting extraverted could also be related to working or studying; therefore, the relation between extraverted behavior and later fatigue could be due to extraverted behavior happening mostly in relation to effortful behavior (e.g. working), which leads to fatigue. Therefore, a model similar to the one described above in which the sociability variables were replaced with corresponding work/study variables was ran. In that analysis, expectedly, concurrent working/studying was negatively related to fatigue (estimate = -.12, SE = .02, p < .001), and lagged working/studying, positively (estimate = .08, SE = .02, p = .001). The relation between lagged extraverted behavior and fatigue remained significant also in this analysis (estimate = .15, SE = .03, p < .001). Thus, a relation between extraverted behavior and effortful behavior does not seem to be causing the results.

The relations between momentary mood and stress with lagged extraverted behavior were then investigated. The results of these analyses are reported in Table 2 (mood) and Table 3(stress). As shown there, there were no reliable relations between behavior and later mood, whereas all behaviors were positively related to concurrent mood. Trait Emotional Stability was positively related to momentary mood (estimate = .35, p < .001). Regarding stress, emotionally stable behavior was slightly negatively related to later stress (estimates -.06--.08), and emotionally stable (estimate = -.31) and agreeable (estimate = -.09) behaviors were negatively related to concurrent stress. Trait Emotional Stability was also negatively related to stress (estimate -.31).

5. Discussion

The results supported the view that extraverted, sociable behavior is tiring (Leikas and Ilmarinen, 2017). Participants reported being more tired 2–3 h after behaving in an extraverted way, as compared to having behaved in an introverted way. No evidence for individual differences in this lagged relation was found. This relation was not reducible to variations in concurrent behavior, earlier fatigue, or participants' personality traits. Similar lagged associations of extraverted behavior on mood and stress were not found.

Moment-to-moment patterns of behavior, goals, mood, and other feeling states have become a central topic in behavioral sciences. A pattern that has been found intuitively compelling by the general public (e.g. Blatchford, 2017; Sugandha, 2017) is one between social/-extraverted behavior and fatigue. However, so far not much scientific evidence has existed in support of this idea. The present research showed that sociable, extraverted behavior is indeed related to higher fatigue 2–3 h later. These results replicate those of Leikas and Ilmarinen (2017).

There are several reasons to expect the relation between sociability and feelings of fatigue observed in the present studies. Perhaps the most general and plausible reason is the self-presentational concerns that almost all social interactions evoke (Roth et al., 2001; Tice et al., 1995). Even in the most desirable company, it is normative to control one's emotional expressions and behaviors to some extent, out of consideration for others. Furthermore, interacting with others, especially in group

Table 2. Fixed effects estimates (top) and variance estimates (bottom) for Models predicting Momentary Mood at T2 from earlier (T1) Mood (Model 1), lagged (T1) behavior (Model 2), concurrent (T2) behavior (Model 3) and personality traits (Model 4).

Parameter	Model 0	Model 1		Model 2		Model 3		Model 4	
	Fixed effects								
	Estimate (SD)	Estimate (SD)	p	Estimate (SD)	p	Estimate (SD)	p	Estimate (SD)	p
Intercept	3.08 (.07)	3.08 (.07)		3.08 (.07)		3.09 (.07)		3.08 (.06)	
Level 1									
Lagged effects									
Mood (T1, autoregression)		.04 (.04)	.241	.00 (.04)	.935	-.02 (.04)	.534	-.02 (.04)	.537
State Extraversion (T1)				-.00 (.03)	.879	-.01 (.02)	.621	-.01 (.02)	.630
State Emotional Stability (T1)				.05 (.03)	.120	.04 (.03)	.158	.04 (.03)	.156
State Agreeableness (T1)				.00 (.04)	.916	.04 (.04)	.221	.04 (.04)	.217
State Conscientiousness (T1)				.08 (.03)	.007	.02 (.03)	.405	.02 (.03)	.410
Concurrent effects									
State Extraversion (T2)						.13 (.03)	<.001	.13 (.03)	<.001
State Emotional Stability (T2)						.20 (.03)	<.001	.20 (.03)	<.001
State Agreeableness						.22 (.03)	<.001	.22 (.03)	<.001
State Conscientiousness						.11 (.03)	<.001	.11 (.03)	<.001
Level 2									
Trait Extraversion								.12 (.11)	.276
Trait Emotional Stability								.35 (.09)	<.001
Trait Agreeableness								.06 (.13)	.621
Trait Conscientiousness								-.05 (.10)	.652
Random effects									
Level 2									
Intercept/intercept	0.35	0.34		0.34		0.35		0.26	
Level 1									
Intercept/intercept	0.43	0.43		0.43		0.31		0.31	
-2*loglikelihood	1883.8	1882.4		1873.2		1624.0		1603.8	

Table 3. Fixed effects estimates (top) and variance estimates (bottom) for Models predicting Momentary stress at T2 from earlier (T1) stress (Model 1), lagged (T1) behavior (Model 2), concurrent (T2) behavior (Model 3) and personality traits (Model 4).

Parameter	Model 0	Model 1		Model 2		Model 3		Model 4	
	Fixed effects								
	Estimate (SD)	Estimate (SD)	*p*	Estimate (SD)	*p*	Estimate (SD)	*p*	Estimate (SD)	*p*
Intercept	2.08 (.09)	2.08 (.09)		2.08 (.09)		2.09 (.09)			
Level 1									
Lagged effects									
Stress (T1, autoregression)		.21 (.03)	<.001	.18 (.04)	<.001	.13 (.04)	<.001	.13 (.04)	<.001
State Extraversion (T1)				.01 (.03)	.854	.01 (.03)	.712	.01 (.03)	.714
State Emotional Stability (T1)				-.08 (.03)	.018	-.06 (.03)	.051	-.06 (.03)	.049
State Agreeableness (T1)				.00 (.04)	.965	-.00 (.04)	.958	-.00 (.04)	.957
State Conscientiousness (T1)				-.03 (.03)	.319	-.02 (.03)	.458	-.02 (.03)	.454
Concurrent effects									
State Extraversion (T2)						-.00 (.02)	.950	-.00 (.03)	.929
State Emotional Stability (T2)						-.31 (.03)	<.001	-.31 (.03)	<.001
State Agreeableness						-.09 (.04)	.020	-.09 (.04)	.022
State Conscientiousness						-.00 (.03)	.863	-.01 (.03)	.843
Level 2									
Trait Extraversion								.01 (.14)	.939
Trait Emotional Stability								-.38 (.12)	.002
Trait Agreeableness								-.11 (.16)	.468
Trait Conscientiousness								.05 (.12)	.675
Random effects									
Level 2									
Intercept/intercept	0.50	0.50		0.50		0.50		0.42	
Level 1									
Intercept/intercept	0.46	0.44		0.43		0.38		0.38	
-2*loglikelihood	1934.6	1898.4		1892.2		1787.2		1775.2	

situations, requires the use of attention and short-term memory which is effortful. Our previous study (Leikas and Ilmarinen, 2017) suggested that the number of people met at a given situation partially mediated the link between extraverted behavior and later fatigue, lending credibility to this explanation. Finally, not all social interactions encountered during everyday life are desired or positive, and difficult interactions may require more impression management and emotion control, as suggested by some earlier studies (Evans and Lepore, 1993; Repetti, 1989; Story and Repetti, 2006).

Although current and previous (Leikas and Ilmarinen, 2017; Repetti, 1989) research suggest that extraverted behavior leads to fatigue, there is ample evidence showing that extraverted behavior is related to positive mood (Fleeson et al., 2002; McNiel et al., 2010; Wilt et al., 2012; Zelenski et al., 2012), as was also shown in the present study. This is entirely in line with the vast literatures on the robust positive relation between trait extraversion and positive affect (e.g. Costa and McCrae, 1980; Larsen and Ketelaar, 1991; Lucas and Baird, 2004; Smillie et al., 2012), and between active social life and well-being (e.g. Berkman et al., 1993; Rizzuto et al., 2012). Thus, while the current studies showed that sociable behavior temporarily increases fatigue, it is clear that sociable behavior has generally desirable psychological correlates.

One intriguing question with regards to the behavior-feeling connections is whether counter-trait behavior (e.g. introverts behaving in an extraverted way) has a different relation to feelings than trait-consistent behavior (e.g. extraverts behaving in an extraverted way). Several studies have found that the affective consequences of extraverted/sociable behavior are similar for extraverts and introverts (Fleeson et al., 2002; Zelenski et al., 2012). The current study and the earlier study on extraverted behavior and fatigue (Leikas and Ilmarinen, 2017) did not have sufficient statistical power to test state × trait interaction effects, but neither our earlier (Leikas and Ilmarinen, 2017) nor current study found significant between-participant differences in the slope between extraverted behavior and later fatigue. Thus, it is currently unclear whether personality moderates this relation. However, even if this turns out to be the case, such a moderation effect is likely to be quite small. Therefore, it seems that sociable behavior is related to temporary fatigue for everyone, not just for introverts, as has been suggested in the popular media (e.g. Blatchford, 2017; Roy, 2013).

6. Limitations

Though adequate for detecting within-person processes, sample size was relatively small in the present study. Because of this, the possible moderation of the main finding by trait Extraversion could not be tested. Furthermore, much more women than men participated. In addition, momentary extraversion was only measured with the single item "sociable", which is a very narrow indicator of extraverted behavior (although arguably a central one) and the result should therefore not be generalized to other aspects of extraverted behavior, such as dominance. Thus, the results should be viewed with some caution.

7. Conclusions

Behaving in extraverted, sociable way was found to be related to feeling tired a few hours later. A plausible reason for this finding is the need for impression management and effortful cognitive processing in the presence of others, as compared to solitude. The finding increases

understanding of momentary patterns of behavior and feelings in everyday life.

Declarations

Author contribution statement

Sointu Leikas: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

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