The current issue and full text archive of this journal is available on Emerald Insight at:
https://www.emerald.com/insight/0268-3946.htm

Strengths use and work-related flow: an experience sampling study on implications for risk taking and attentional behaviors

Wei Liu and Dimitri van der Linden
Center of Excellence for Positive Organizational Psychology, Erasmus Universiteit Rotterdam, Rotterdam, The Netherlands, and
Arnold B. Bakker
Center of Excellence for Positive Organizational Psychology, Erasmus Universiteit Rotterdam, Rotterdam, The Netherlands and Department of Industrial Psychology and People Management, University of Johannesburg, Johannesburg, South Africa

Received 30 July 2020
Revised 18 January 2021
24 April 2021
3 June 2021
Accepted 11 June 2021

Abstract

Purpose – Using positive psychology theories, the authors build a model to test whether episodic fluctuations in strengths use coincide with changes in flow experiences and further predict risk-taking behavior and attentional performance.

Design/methodology/approach – A field study covering five working days was conducted among 164 Chinese employees; twice a day, they were asked to complete questionnaires regarding their strengths use and flow experiences during the previous hour ($N = 938$ observations). Immediately afterward, their risk-taking behaviors and attentional performance were tested using computerized tasks.

Findings – Multilevel analyses showed that when employees used their strengths more often in the previous hour, they also reported an increase in flow. Episodic fluctuations in flow were positively associated with risk taking and negatively related to attentional performance.

Practical implications – Employees should be encouraged to use their strengths more at work, as this might increase their flow experiences. At the same time, they should pay attention to the downsides of flow (i.e. less attention after flow) at an episodic level.

Originality/value – The authors add to previous studies by using a more objective approach, namely employing computerized tasks on risk-taking behavior and attention to capture the behavioral outcomes of work-related flow.

Keywords Work-related flow, Strengths use, Risk-taking behavior, Attentional performance

Paper type Research paper

Introduction

Focusing on wellbeing and circumstances in which people can thrive provides a complementary approach to maintain or restore mental health and correct shortcomings (Peterson and Seligman, 2004). In this regard, one mental state receiving considerable attention in the literature is flow – a state of consciousness in which one is completely

© Wei Liu, Dimitri van der Linden and Arnold B. Bakker. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at http://creativecommons.org/licences/by/4.0/legalcode

This research was supported by the Chinese Scholarship Council (No. 201706220053) and Center of Excellence for Positive Organizational Psychology at the Erasmus University Rotterdam. The authors are thankful for Tingting Han's assistance to collect the data.

Journal of Managerial Psychology
Vol. 37 No. 1, 2022
pp. 47-60
Emerald Publishing Limited
0268-3946
DOI 10.1108/JMP-07-2020-0403

immersed in the task at hand and feels less stress and lower self-consciousness (Bakker, 2008). Flow is also accompanied by a sense of control, a merging of action and awareness and an altered sense of time (Csikszentmihalyi, 1997). People may experience flow during certain work episodes but not in others, depending on their current state and task characteristics (Bakker and Van Woerkom, 2017).

Previous research has already identified task characteristics (e.g. autonomy and feedback) that can facilitate flow (Demerouti *et al.*, 2012). Nevertheless, there are two aspects regarding the antecedents and outcomes of flow that remain largely understudied. First, based on the self-determination model of flow (Bakker and Van Woerkom, 2017), it has been proposed that strengths use (doing the things one is good at) is an important antecedent of flow because people achieve a better skill-challenge balance and perform at their best. An important assumption in this context is that people use their strengths more during some episodes than other episodes (Bakker *et al.*, 2019). Subsequently, during the periods when people use their strengths, they are more likely to experience flow. Also, even though such within-person variability has attracted growing interest among scholars (Bakker *et al.*, 2019; Fullagar and Kelloway, 2009; Van Woerkom *et al.*, 2016), this presumed episodic strengths use-flow link has rarely been empirically examined (Bakker and Van Woerkom, 2017).

Second, in the literature, flow has often been associated with favorable outcomes, including elated mood and better performance (for a review, see Fullagar and Delle Fave, 2017). Yet, based on the conservation of resources theory (COR; Hobfoll *et al.*, 2018), flow may also include detrimental effects as being in flow may consume various resources (Debus *et al.*, 2014). Being overly focused on or driven by work may be associated with unfavorable outcomes, such as the depletion of attentional and energy resources (i.e. vigor), unethical behavior and sub-optimal health (Aleksić, 2016; Schüler and Nakamura, 2013; Schüler and Pfenninger, 2011). Such potentially unfavorable flow effects have seldom been investigated, let alone with objective (behavioral) outcomes.

The present study addresses these two caveats in flow research by making two main contributions. First, we extend self-determination model of flow (Bakker and Van Woerkom, 2017) using a multilevel approach to test whether strengths use can facilitate flow experience at a *within-person* level. In general, strengths use is defined as behavior in which employees are doing what they are relatively good at (Govindji and Linley, 2007). We propose that the level of flow fluctuates episodically, partially depending on strengths use. When engaging in activities aligned with their strengths, employees can be more authentic and tend to perform at their best, enhancing the likelihood of flow. Second, based upon COR theory (Hobfoll, 1989), we include two computerized tasks to assess a range of fundamental behavioral and cognitive aspects that may be associated with flow (Schüler and Nakamura, 2013), namely risk-taking behavior and attentional performance. These two tasks assess behaviors sensitive to affective and cognitive resources/states. As such, we test whether flow is also associated with possible downsides (Aleksić, 2016).

This study used an experience sampling method (ESM; Fullagar and Kelloway, 2009). The experience sampling method enables us to investigate the relationship between episodic fluctuations in variables at a more proximal and micro level. Specifically, we examine how people use their strengths differently across short work episodes and how this relates to concurrent flow experiences, risk taking and attentional performance (see Figure 1). To assess these episodic experiences, we rely on two measurements per day (Morning 10:00–12:00 and Afternoon 3:00–5:00) across consecutive five working days ($N = 938$ observations).

Theoretical background

Work-related flow

Flow at work is conceptualized by three dimensions: work absorption, work enjoyment and intrinsic work motivation (Bakker, 2008). Absorption refers to the concentration and immersion in activities, one of the hallmarks of flow (Demerouti *et al.*, 2012). Positive mood relates to the enjoyment in activities (Csikszentmihalyi, 1997). Intrinsic motivation refers to the willingness to achieve inner goals rather than external rewards. Work-related flow also implies that employees forget time and surroundings, being dedicated into performed tasks.

A vast body of the literature has revealed the antecedents of flow, such as autonomy, feedback and skill-challenge balance (Fullagar and Delle Fave, 2017). Yet, few studies have directly tested strengths use as a predictor of flow, especially at an episodic level. The latter, however, seems particularly relevant, according to Csikszentmihalyi (2014):

> The defining feature of flow is intense experiential involvement in the moment-to-moment activity. Attention is fully invested in the task at hand, and the person functions at his or her fullest capacity (p. 230).

During work episodes when employees use their strengths, they may function better and feel immersed compared to other work episodes. On this notion, flow may "come and go" quickly when people move from one work episode to another work episode depending on personal states and task characteristics (Beal *et al.*, 2005).

Strengths use

Wood *et al.* (2011, p. 15) defined strengths as "the characteristics of a person that allow them to perform well or at their personal best." For example, when attending a routine meeting, employees might use their sense of humor to create a more enjoyable atmosphere. Obviously, strengths are trait-like (Peterson and Seligman, 2004) because they reflect certain skills or abilities that remain relatively stable. Nevertheless, the actual use of one's strengths can fluctuate from situation to situation depending on the context. For example, Bakker and Van Woerkom (2017) stated that during periods when employees use their strengths, they can better cope with challenges, and thereby improve performance.

Strengths use and flow are different because using one's strengths is defined as a *specific set of behaviors* (e.g. using a creative approach to a complex task, or using certain social skills when dealing with others). In contrast, work-related flow is a *subjective experience* comprised of intrinsic motivation, enjoyment and absorption. According to the self-determination model of flow (Bakker and Van Woerkom, 2017), strengths use is theoretically one important antecedent of flow. During work episodes, when people use their strengths, they approach their work such that it brings out the best in them. Accordingly, they can better deal with challenges and are most likely to achieve a balance between challenges and skills. The flow literature has proposed that such a skill-challenge balance is crucial for the experience of flow (Csikszentmihalyi, 2014). Particularly when high challenges are combined with high skills (i.e. strengths), people are pushed to their limits and are absorbed in tasks.

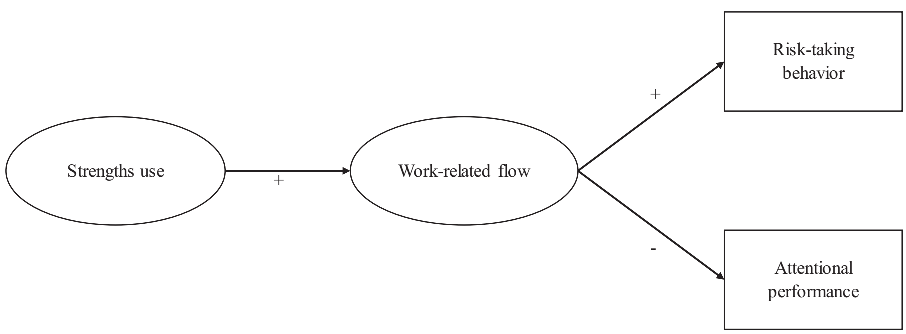

Figure 1.
Proposed model of episodic strengths use and work-related flow

The literature has well documented a positive link between strengths use and flow at a between-person level (Govindji and Linley, 2007; Peterson and Seligman, 2004; Van Woerkom *et al.*, 2016). Previous research has also shown that strengths use might be positively related to flow at a within-person level. For example, in a study among 65 civil engineers, Van Woerkom *et al.* (2016) found that weekly strengths use were positively associated with weekly work engagement. In an experience sampling study, Bakker *et al.* (2019) found that naval cadets were more likely to report higher work engagement on the days when they used their strengths. For example, some cadets might be particularly good at creating new approaches to solve complex work problems. In contrast, others may have more bravery and confidence for climbing high in the mast of the ship.

H1. Episodic strengths use is positively related to episodic work-related flow.

Outcomes of work-related flow

When people experience flow, they consume energetic and cognitive resources (de Sampaio Barros *et al.*, 2018). Based upon COR theory (Hobfoll *et al.*, 2018), certain resources (i.e. energy, attention and positive affect) are valued by people because these resources are essential to keep performance at par and prevent potential losses. Consequently, any possible reduction of resources due to flow might be associated with negative effects. For example, previous studies have established that being cognitively engaged in a task for an extended period may lead to reduced attentional performance on subsequent tasks (Chalder *et al.*, 1993; Newton *et al.*, 2020; Van der Linden *et al.*, 2003).

Also, positive affect/mood is a less obvious pathway through which previous flow may negatively influence subsequent performance. A link between flow or affective states, on the one hand, and risk taking and attentional performance, on the other hand, has been recognized (Phillips *et al.*, 2002). For example, individuals are willing to make decisions congruent with their current mood (Forgas and Eich, 2012). People show various attentional scope due to affective states (Rowe *et al.*, 2007). Overall, having used one's strengths and experiencing flow in the preceding period may impact subsequent risk taking and attentional performance, on which we elaborate below.

Risk-taking behavior. Risk-taking behavior is relevant in an organizational context since employees have to make decisions that involve risks (Fehr-Duda *et al.*, 2011). Employee risk-taking behavior entails a multi-dimensional construct (i.e. risk, uncertainty) which makes its definition and measurement complex (Williams *et al.*, 2003). Neves and Eisenberger (2014, p. 187) defined risk taking as "a willingness to withstand uncertainty when tackling challenging problems without obvious solutions." In the current study, as we measured risk taking using the Balloon Analogue Risk Task (BART), in line with Lejuez *et al.* (2002), we mainly refer to the risk taking as those behaviors that consist of some potential losses but also provide the likelihood to obtain gains or rewards.

The literature has revealed several factors influencing risk taking, such as the perception of risks and positive affect (Fehr-Duda *et al.*, 2011). On the one hand, drawing from COR theory, flow may cause a subsequent reduction of cognitive resources to appraise risks (Schüler and Pfenninger, 2011). Since flow requires intense focus and concentration, people often feel tired and exhausted after flow (Demerouti *et al.*, 2012). Yet, adequate resources (i.e. sleep, recovery) are essential for understanding potential risks and taking appropriate risks (Debus *et al.*, 2014).

On the other hand, flow is a state that activates a positive mood (Csikszentmihalyi, 1997). Such a happier mood might also influence the risks that individuals are willing to take. More risks are to be taken when individuals are in a positive mood because they are more optimistic about the outcomes. People tend to believe "good" things will happen no matter what they choose (Fehr-Duda *et al.*, 2011). During flow, people become more confident, which may also lead to more risky behaviors (Schüler and Nakamura, 2013).

Studies have indicated that flow might be associated with risk-taking behavior. Individuals are generally motivated to maintain the status quo when they are happier, thereby taking fewer risks when the stakes are high. However, they tend to prefer more risks when stakes are low (Fehr-Duda *et al.*, 2011). Schüler and Pfenninger (2011, p. 4) argued that "the loss of self-reflection, the lost control of time, the restricted perception to a limited field of activity can be problematic when performing high-risk sports". They showed that flow indeed impairs kayakers' perception of risks (e.g. underestimation) and is associated with risk-taking behavior. In three studies with kayakers and rock-climbers, Schüler and Nakamura (2013) found that flow leads to higher self-efficacy and, in turn, to risky behavior among inexperienced participants.

H2. The episodic flow experience is positively related to episodic risk-taking behavior.

Attentional performance. Attention is the cognitive and behavioral processes that facilitate the selective focus on specific information while ignoring other task-irrelevant information. Correspondingly, attentional performance involves the efficiency of goal-directed information processing (i.e. accuracy and speed). At work, attention is an essential aspect that relates to job performance (Gardner *et al.*, 2011). When working on various tasks, employees need to direct and transfer their attentional resources from task to task.

Although the COR theory has not been directly applied in the context of flow and attention, the literature indicates that flow might consume attentional resources (de Sampaio Barros *et al.*, 2018). During flow, people tend not to stop thinking persistently and deeply of the tough problems until they have been solved. This process requires substantial and focused attention (Gardner *et al.*, 2011). Because of the intense focus on the performed tasks during flow, employees may have less energy and feel more exhausted after flow episodes when they fail to detach from work (Demerouti *et al.*, 2012).

Studies have indicated that positive mood accompanied by flow is associated with a global attentional focus (Rowe *et al.*, 2007). A broader attentional scope might also lead to decreased performance, because a broader scope enables individuals to process more information, even irrelevant information (i.e. distractors) in attention-related tasks. For example, Phillips *et al.* (2002) showed that, compared to the group with a neutral or negative mood, a positive mood caused longer response times. Similarly, using the Eriksen's flanker task, Rowe *et al.* (2007) found participants in a positive mood responded with a reduced speed because positive mood allowed them to be affected by distractors.

H3. The episodic flow experience is negatively related to episodic attentional performance.

As argued, strengths use is associated with flow, and flow is related to risk taking and attentional performance, it can be expected that strengths use may be indirectly associated with the risk-taking behavior and attentional performance through the mediation of flow experience.

H4. Episodic strengths use is indirectly (positively) related to risk taking and indirectly (negatively) related to attentional performance through the episodic flow experience.

Method

Sample and procedure

We recruited a sample of Chinese employees by posting advertisements on WeChat (a social network platform). For registration, participants need to have a full or part-time job. In total, 164 participants voluntarily signed up for the study (60.1% female). The sample age ranged from 18 to 55 years (mean = 27.88, SD = 6.03). The average tenure was 3.39 years (SD = 5.24), and the mean of weekly work hours was 45.5 (SD = 15.3). Most (89.6%) of the participants have achieved a university/college (or above) level. Participants had various occupational backgrounds, such as agriculture, food and natural resources (5.1%), education and training (22.7%), information technology (10.4%), finance (13.0%), government and public administration (4.5%).

After giving informed consent, participants received the following surveys. They started by filling out a baseline questionnaire (demographics). In the subsequent week, an episodic survey started for 5 days (Monday–Friday) with 2 times per day. Time slots for the episodic inquiry were between 10:00 and 12:00 and between 15:00 and 17:00. Completing the questionnaire outside these time slots was not permitted by setting up time requirements on Qualtrics. The required time slots aimed to capture *episodic* strengths use and flow experience and increases the likelihood of acquiring effective return from participants. Each participant received 5 Chinese Yuan (0.65 Euros) for each episodic survey.

Measures

As we mainly focused on employee behaviors and personal states at the episodic level, all questionnaires were converted to an episodic version by adding "In the last hour" as an introduction to each of the items. Responses were given on a 7–point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Strengths use. Van Woerkom *et al.* (2016) introduced a measurement on within-person strengths use at work. A sample item is "In the last hour, I used my talents at work". Average score based on the four items was computed for strengths use. Cronbach's α at a within-person level was 0.88. Cronbach's α at a between-person level was 0.98, showing good reliability.

Work-related flow. To measure flow experience at work, we adopted a shortened version of the WOrk-reLated Flow Inventory (WOLF; Bakker, 2008). Two representative items for each of the three dimensions were selected. The sample item for work absorption is "In the last hour, I was immersed in my work" (work absorption); "In the last hour, my work gave me a good feeling" (work enjoyment); "In the last hour, I forgot everything else around me while working" (intrinsic work motivation). A composite score based on the three dimensions was computed for flow. Cronbach's α at a within-person level was 0.86. Cronbach's α at a between-person level was 0.94.

Risk-taking behavior. Risk-taking behavior was measured by a mobile version of the Balloon Analogue Risk Task (m-BART; MacLean *et al.*, 2017). The BART was designed to measure risk-taking behavior realistically and showed high reliability and consistency with risk preferences in daily lives (e.g. smoking, alcohol use). In the task, participants can inflate a balloon by clicking on the "Inflate Balloon" button and collect earned game points by clicking on the "Collect" button. Ten rounds were set for the game. During the task, participants were instructed to pump the balloon such that they can earn more game points, but the balloon burst unpredictably and randomly. The person who received the highest game credits would be rewarded with 500 Chinese Yuan (65.25 Euros).

Attentional performance. To test attentional performance, we used the Stroop Color and Word Task (SCWT; Scarpina and Tagini, 2017). Since the authors focused on the employees' overall attentional performance, namely their general attentiveness and response speed, we did not distinguish between congruent versus non-congruent trials. During the task, participants were presented with trials that contained either of the four words, "red," "black," "blue," or "yellow." Moreover, the words were written in red, black, blue, or yellow ink. Participants had to respond as quickly and accurately as possible to the color of the font by clicking one of the buttons (red, black, blue and yellow) at the middle bottom of the screen. There were forty rounds in total. The accuracy performance and speed (response time) in the trials in which they responded correctly were employed to measure attentional performance.

Control variables. Demographics (gender, age, education and working years) were included as control variables. Gender and age have an impact on flow experience (Bryce and Haworth, 2002). Education and working years might influence the level of skills, which is important to determine flow and performance at work (Csikszentmihalyi, 1997). As autonomy is an essential factor influencing flow experiences (Fullagar and Kelloway, 2009), we also controlled for autonomy at a between-person level. A sample item to measure autonomy is "The job allows me to make a lot of decisions on my own". Cronbach's α for autonomy was 0.86. Besides, as fatigue might influence risk taking and attentional performance, fatigue was also assessed with two items (Chalder *et al.*, 1993), including "Do you have difficulty concentrating now?" and "Are you lacking in energy now?". The Spearman–Brown coefficient for fatigue across 10 episodes was 0.72–0.88 (average = 0.82).

Statistical analysis

Considering that the data had a hierarchical structure with working episodes nested within persons, multilevel modeling analysis (MLM) was employed. The normality of data was checked before conducting multilevel analysis, and variables that did not conform to normal distribution were transformed to normal-like distribution at first (Howell, 2007). Specifically, adjusted pumps and response time in the SCWT were transformed by running the logarithm transformation. Pumps were transformed using the square-root formula, and correct times were transformed by taking the reciprocal of (k-x) (Howell, 2007). As we found that there are extreme values from the SCWT and BART, data points beyond three standard deviations from the mean were treated as outliers and excluded from the analyses. Before conducting the multilevel analysis, between-person level variables were centered on grand mean, and within-person level variables were centered on person mean. All analyses were performed using the MLwiN software (version 2.10).

Results

Descriptive analysis

Table 1 showed the means, standard deviations and correlations between the study variables. Intra-class correlation (ICC) analysis showed that between-person variance accounted for the following portions of the total variance, strengths use (59.03%), flow (58.95%), unadjusted

		Mean	SD	1	2	3	4	5	6
1	Strengths use	4.87	1.12	(0.59)	0.70**	0.00	0.02	−0.17	0.04
2	Work-related flow	4.37	1.14	0.83**	(0.59)	0.06*	0.08*	−0.05	0.07*
3	Adjusted pumps (BART)	10.39	3.59	−0.08	−0.11	(0.63)	0.89**	−0.02	0.00
4	Unadjusted pumps (BART)	9.98	2.90	−0.06	−0.08	0.98**	(0.59)	−0.05	0.13**
5	Accuracy performance (SCWT)	40.18	1.38	0.10	0.05	−0.04	−0.03	(0.13)	−0.18**
6	Response time (SCWT)	1.12	0.23	0.21*	0.22*	−0.15	−0.11	0.07	(0.44)

Note(s): Intra-class correlation (ICC) for each variable is shown in parentheses on the diagonal. Correlations above the diagonal are computed based on within-person level (N = 938); below the diagonal are relations on between-person level (N = 164). BART = Balloon Analogue Risk Task. SCWT = Stroop Color and Word Test; $*p < 0.05$, $**p < 0.01$

Table 1. Means, standard deviations and correlations of study variables

pumps (59.40%), adjusted pumps (63.02%), number of accuracies (13.30%) and response time (44.18%). These results confirmed that a multilevel approach was appropriate and applicable.

Multilevel confirmatory factor analysis

Multilevel confirmatory factor analysis using Mplus (version 7; Muthén and Muthén, 2017) was conducted to examine the construct validity of the strengths use and flow. Results showed that a two-factor model fit the data well (χ^2 (68) = 405.44, p = 0.00; root mean square error of approximation (RMSEA) = 0.07; CFI = 0.91; standardized root mean square residual$_{\text{within}}$ (SRMR) = 0.05; standardized root mean square residual$_{\text{between}}$ (SRMR) = 0.05). We also tested an alternative model with only one factor by allowing items of strengths use and work-related flow to load on one overall latent factor. Results showed that the fit of the one-factor model to the data was worse than the fit of the two-factor model (χ^2 (70) = 809.18; RMSEA = 0.10; CFI = 0.80; SRMR$_{\text{within}}$ = 0.07; SRMR$_{\text{between}}$ = 0.08; $\Delta\chi^2$ (2) = 403.73, p < 0.01).

Testing hypotheses

Hypothesis 1 states that episodic strengths use is positively related to episodic work-related flow. Results showed that after controlling for autonomy (b = 0.48, t = 4.92, p < 0.01), strengths use was significantly and positively related to work-related flow at a within-person level (b = 0.68, t = 22.03, p < 0.01; see Table 2). These results confirm Hypothesis 1.

Hypothesis 2 states that flow is positively associated with risk-taking behavior. Results showed that after controlling for fatigue (b = –0.01, t = 2.50, p = 0.01), flow was not positively related to adjusted pumps (b = 0.01, t = 1.20, *ns.*), but positively related to the unadjusted number of pumps (b = 0.03, t = 1.80, p = 0.04). These results partly confirm Hypothesis 2.

Hypothesis 3 states that work-related flow is negatively associated with attentional performance. Results showed that fatigue was negatively related to accuracy performance in the stroop task (b = –0.02, t = 1.78, p = 0.04), and fatigue was positively related to response time (b = 0.01, t = 4.00, p < 0.01). When employees experienced a higher level of flow during a

Table 2.
Unstandardized multilevel regression models predicting episodic work-related flow

	Work-related flow			
	Model 1		Model 2	
Study variable	Estimate	SE	Estimate	SE
Intercept	2.83	0.84	2.94	0.83
Control variable				
Gender	0.14	0.16	0.16	0.16
Age	–0.01	0.03	–0.01	0.02
Education	–0.06	0.12	–0.09	0.11
Tenure	0.01	0.03	0.01	0.03
Autonomy	0.50***	0.10	0.48***	0.10
Predictor variable				
Strengths use			0.68***	0.03
Level-2 variance				
Intercept	0.61	0.09	0.65	0.09
Slope			0.02	0.01
Level-1 variance	0.52	0.03	0.25	0.01
Deviance	2329.53		1778.53	

Note(s): ***p < 0.001. N = 164 individuals, N = 938 occasions work episode, they made more mistakes after flow ($b = -0.03$, $t = 2.20$, $p = 0.01$). In addition, a higher level of flow experience was shown to predict longer response time in the stroop task ($b = 0.01$, $t = 2.75$, $p = 0.00$). These results support Hypothesis 3 (see Table 3).

Finally, Hypothesis 4 states that strengths use is indirectly related to risk-taking behavior and attentional performance through flow. Multilevel mediation analysis (Muthén and Muthé, 2017) results showed that strengths use was significantly indirectly related to risk taking (*indirect effect* = 0.03, SE = 0.01, $t = 2.42$, $p = 0.02$, *confidence interval* = [0.01, 0.04]); and marginally significant between strengths use and attention through flow (*indirect effect* = −0.02, SE = 0.01, $t = -1.92$, $p = 0.06$, *confidence interval* = [−0.04, −0.00]). Thus, Hypothesis 4 is partially supported (see Table 4).

Additional analysis

Since there might be a lagged effect as we measure strengths use, flow and outcomes repetitively across 10 episodes, we also used an autoregressive approach by controlling for the previous episode's flow, risk-taking behavior and attentional performance. Results

	Risk-taking behavior				Attentional performance			
	Adjusted pumps		Unadjusted pumps		Response time		Number of accuracy	
Study variable	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Control variables								
Gender	−0.04*	0.02	−0.10	0.07	−0.00	0.01	0.02	0.03
Age	−0.01*	0.00	−0.02*	0.01	0.00*	0.00	0.00	0.01
Education	0.02	0.02	0.06	0.05	−0.00	0.01	0.02	0.02
Tenure	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Fatigue	−0.01*	0.00	−0.02	0.01	0.01**	0.00	−0.02	0.01
Predictor variable								
Work-related flow	0.01	0.01	0.03*	0.02	0.01**	0.00	−0.03**	0.01
Between-person variance	0.01	0.00	0.11	0.02	0.00	0.00	0.01	0.00
Within-person variance	0.01	0.00	0.08	0.00	0.00	0.00	0.08	0.00
$\Delta\chi^2$	350.22***		82.49***		458.99***		67.85***	

Note(s): *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. $N = 164$ individuals, $N = 871$ occasions (risk-taking behavior); $N = 877$ occasions (attentional performance). $\Delta\chi^2$ was calculated by comparing to a model within only control variables as predictors. Adjusted number of pumps = the average of pumping times during rounds in which the balloon did not burst; unadjusted number of pumps = the average number of pumping times that participants inflated the balloon during both burst and unburst balloons

Table 3. Unstandardized multilevel regression model predicting risk-taking behavior and attentional performance

Dependent variable	Path a (SU–flow)		Path b (flow–outcomes)		Indirect effect		
	Estimate	SE	Estimate	SE	Estimate	SE	90% CI
Risk-taking behavior							
Adjusted pumps	0.71***	0.03	0.01[a]	0.01	0.01[a]	0.00	[0.00, 0.01]
Unadjusted pumps	0.71***	0.03	0.04**	0.01	0.03**	0.01	[0.01, 0.04]
Attentional performance							
Number of accuracies	0.71***	0.03	−0.03[a]	0.01	−0.02[a]	0.01	[−0.04, −0.00]
Response time	0.71***	0.03	0.01	0.00	0.00	0.00	[0.00, 0.01]

Note(s): ***$p < 0.001$, **$p < 0.01$, [a]partially significant ($0.05 < p < 0.10$)

Table 4. Multilevel results on within-person level for Path a, Path b and indirect effect

showed that strengths use was still positively related to flow ($b = 0.70$, SE $= 0.04$, $p < 0.01$) after controlling for previous episodes' flow. The effect of flow on risk taking disappeared ($b = 0.00$, SE $= 0.01$, ns.) after controlling for previous risk taking ($b = 0.11$, SE $= 0.04$, $p = 0.00$). Flow still harmed speed performance ($b = 0.01$, SE $= 0.00$, $p = 0.01$) after controlling for previous attention.

Discussion

The present study's central aim was to examine one specific antecedent of flow, namely strengths use and objective outcomes of flow, including risk taking and attentional performance. Using an experience sampling method, we investigated the behavioral outcomes of flow at an episodic level. We found that employees were more likely to experience flow when using their strengths. However, they also took more risks and showed compromised attentional performance after experiencing a higher level of flow. We elaborate on the theoretical and practical implications below.

Theoretical and practical implications

The present study's first contribution is that we confirmed with multilevel data that employees experience more flow when using their strengths. This suggests that strengths use provides employees with opportunities to meet the challenges at work and thus increase the likelihood to experience flow. This study echoes and adds to Bakker and Van Woerkom (2017)'s self-determination model of flow by providing empirical evidence on the extent to which individuals can use their strong points to *create* flow experience. Although strengths use relates to more flow experience, it is also possible that the same task becomes easier when people use their strengths. Thus, they might need to look for new challenges to maintain flow performance. Since people are likely to perform at their best when doing what they are good at, they will most likely have the confidence and self-efficacy to search for new challenges (Van Woerkom *et al.*, 2016), which facilitates the challenge-skill balance and, in turn, flow experience.

The second contribution is that, based on resource theories such as COR, we point out that there may be unfavorable effects of flow. Our results reveal that people compromise attentional performance after flow, which is consistent with previous arguments about the potential downsides of flow (Aleksić, 2016). Earlier studies indicated that flow was primarily beneficial to job performance. However, the present study used a different approach, at a within-person level and found evidence on the less favorable outcomes of flow within a short period. This might be because, during flow, individuals are likely to consume various resources (e.g. energy, attention), and it is difficult for people to recover within a short period. This might further impair performance on subsequent work-related tasks because of the lack of resources.

In line with this, Csikszentmihalyi (1997) previously reported the downsides of flow. In his study with surgeons, one surgeon reported that operation at work was like "taking narcotics", another surgeon reported that it was like "taking heroin". Similarly, musicians who were immersed in flow experience for a long time suffered from play-related injuries (Guptill, 2012). The unfavorable effects of flow presented in these and our study indicate that even though individuals have more positive affect after flow, they might also be adversely influenced by the too deeply absorbed states or temporarily excessive concentration on the task. Prior research showed that recovery was essential to facilitate flow experience on a daily basis, and it might be essential for people to recover after flow (Debus *et al.*, 2014). Although the majority of studies confirmed that flow was beneficial to performance (Csikszentmihalyi, 1997; Demerouti *et al.*, 2012; Fullagar and Kelloway, 2009), using an episodic level design, our findings reflect the possible negative *after-effects* of flow rather than *during* flow. It is important to distinguish the direct- and after-effects, because previous studies predominantly assessed performance on the task in which people were in flow (i.e. self-reports), but individual levels of energy and other psychological resources may also vary as a function of flow (Fullagar and Delle Fave, 2017; Newton *et al.*, 2020). Our findings contribute to COR theory (Hobfoll, 1989) by revealing that flow may provide energy during a task, but may also be associated with some level of resource depletion after the task. Such depletion may be accompanied with compromised attention and increased risk taking. Taken together, we confirm one of the central tenets of COR that individuals have to obtain, retain and foster valued resources (i.e. energy, attention) to keep performance at par.

In addition to the side-effects of flow, the recent literature has revealed that proactive behaviors may have beneficial as well as detrimental outcomes on wellbeing and performance (Cangiano *et al.*, 2021). The latter authors argued that proactive behaviors could undermine individual wellbeing (i.e. increased stress, role overload and ostracization) by depleting resources (i.e. energy, time, attention) and raise resistance from others. We contribute to the literature on the negative sides of proactive behavior by focusing on strengths use and identified flow as a mechanism through which strengths use may bring more risks and undermine attention in the short-term. This provides one of the potential explanations why proactive behavior is found to be energy- and resources-consuming, at least during a short episode of flow.

Finally, our study shows that after controlling for the previous episode's risk-taking, flow is no longer predictive of risky behaviors. There is a range of studies demonstrating how transient changes in mood (i.e. positive affect) influence risk taking (Fehr-Duda *et al.*, 2011; Schüler and Nakamura, 2013; Schüler and Pfenninger, 2011), but some studies also indicate that risk-taking behavior might be relatively stable and trait-like (Kogan and Wallach, 1964; Schildberg-Hörisch, 2018). In our sample, risk-taking behavior tended to be more trait-like rather than state-like, which is in line with the perspective that emphasizes the stable features of risk taking. In contrast, after controlling for previous levels of attentional performance, flow still accounted for variance in attention. This result confirms that attention has more state-like features and seems more transient in nature (Gardner *et al.*, 2011).

Limitations

Several limitations need to be considered when interpreting the results. First, we were unable to examine performance/behavior when participants are experiencing flow. This is because responding to our survey and carrying out the computerized tasks would interrupt any actual work-related flow experience. Therefore, we used a study design in which the performance test immediately followed a fixed time frame at work in which employees could (or not) have experienced flow-like states. Such a design can provide a simultaneous-like relationship between flow experience and objective performance.

Second, it is worth noting that since strengths use and flow are both measured with self-reports, it raises concerns about common method variance issues. Therefore, we also tested a common method variance by following Eichhorn (2014)'s procedure. Using Mplus, we estimated the common latent factor of 10 items (indicating strengths use and flow), which was equal to 0.53. Common method variance is the square of the common latent factor, namely $0.53^2 = 0.29$. As 0.29 is below the threshold of 50%, this indicates that the common method bias is not a major threat in the current study.

Future research

Since the present study could not assess flow and its outcomes simultaneously, we encourage future research that uses *in vivo* assessments of flow and performance to replicate the current findings, so that the predictors and outcomes are methodologically more aligned. For example, one of the possible approaches in future research is to conduct experiments in the lab to induce flow (i.e. better skill-challenge balance), then assess performance immediately after flow. This approach would establish the link between flow experience and performance in an even more sophisticated way and sheds light on the proximal outcomes of flow.

It would also be useful to include additional covariates when predicting flow and performance, such as workload, recovery and sleep quality (Debus *et al.*, 2014). Prior studies suggest that recovery, personal resources and job resources are beneficial to flow (Demerouti *et al.*, 2012). Therefore, future research should control for the characteristics of different work episodes and the level of recovery in previous episodes when predicting short-term flow experiences.

Conclusions

Overall, the present study supports two main findings. First, strengths use seems to be accompanied by flow at the episodic level. This suggests that employees create flow experience by making use of their strengths. Second, although the positive correlations and effects of flow have been well-established, the present study suggests that flow also has some downsides in terms of stronger preference for risks and compromised attentional performance within a brief period after flow. This indicates that people had better rest and recover after a focused work period.

References

Aleksić, D. (2016), "The negative aspects of flow: examining relationships between flow and unethical behavior", *EDAMBA Journal*, Vol. 15, pp. 45-60.

Bakker, A.B. (2008), "The work-related flow inventory: construction and initial validation of the WOLF", *Journal of Vocational Behavior*, Vol. 72 No. 3, pp. 400-414.

Bakker, A.B. and Van Woerkom, M. (2017), "Flow at work: a self-determination perspective", *Occupational Health Science*, Vol. 1 Nos 1-2, pp. 47-65.

Bakker, A.B., Hetland, J., Olsen, O.K. and Espevik, R. (2019), "Daily strengths use and employee well-being: the moderating role of personality", *Journal of Occupational and Organizational Psychology*, Vol. 92 No. 1, pp. 144-168.

Beal, D.J., Weiss, H.M., Barros, E. and MacDermid, S.M. (2005), "An episodic process model of affective influences on performance", *Journal of Applied Psychology*, Vol. 90 No. 6, pp. 1054-1068.

Bryce, J. and Haworth, J. (2002), "Wellbeing and flow in sample of male and female office workers", *Leisure Studies*, Vol. 21 Nos 3-4, pp. 249-263.

Cangiano, F., Parker, S.K. and Ouyang, K. (2021), "Too proactive to switch off: when taking charge drains resources and impairs detachment", *Journal of Occupational Health Psychology*, Vol. 26 No. 2, pp. 142-154.

Chalder, T., Berelowitz, G. and Pawlikowska, T. (1993), "Development of a fatigue scale", *Journal of Psychosomatic Research*, Vol. 37 No. 2, pp. 147-153.

Csikszentmihalyi, M. (1997), *Finding Flow: The Psychology of Engagement with Everyday Life*, Basic Books, New York.

Csikszentmihalyi, M. (2014), *Flow and the Foundations of Positive Psychology*, Springer, Dordrecht.

de Sampaio Barros, M.F., Araújo-Moreira, F.M., Trevelin, L.C. and Radel, R. (2018), "Flow experience and the mobilization of attentional resources", *Cognitive, Affective and Behavioral Neuroscience*, Vol. 18 No. 4, pp. 810-823.

Debus, M.E., Sonnentag, S., Deutsch, W. and Nussbeck, F.W. (2014), "Making flow happen: the effects of being recovered on work-related flow between and within days", *Journal of Applied Psychology*, Vol. 99 No. 4, pp. 713-722.

Demerouti, E., Bakker, A.B., Sonnentag, S. and Fullagar, C.J. (2012), "Work-related flow and energy at work and at home: a study on the role of daily recovery", *Journal of Organizational Behavior*, Vol. 33 No. 2, pp. 276-295.

Eichhorn, B.R. (2014), *Common Method Variance Techniques*, Cleveland State University, Cleveland, OH, pp. 1-11, SAS Institute.

Fehr-Duda, H., Epper, T., Bruhin, A. and Schubert, R. (2011), "Risk and rationality: the effects of mood and decision rules on probability weighting", *Journal of Economic Behavior and Organization*, Vol. 78 Nos 1-2, pp. 14-24.

Forgas, J.P. and Eich, E. (2012), "Affective influences on cognition: mood congruence, mood dependence, and mood effects on processing strategies", in *Handbook of Psychology*, 2nd ed., Vol. 4, John Wiley & Sons, New York.

Fullagar, C. and Delle Fave, A. (2017), *Flow at Work : Measurement and Implications*, Routledge, Abingdon and New York.

Fullagar, C.J. and Kelloway, E.K. (2009), "'Flow' at work: an experience sampling approach", *Journal of Occupational and Organizational Psychology*, Vol. 82 No. 3, pp. 595-615.

Gardner, D.G., Dunham, R.B., Cummings, L.L. and Pierce, J.L. (2011), "Focus of attention at work: construct definition and empirical validation", *Journal of Occupational and Organizational Psychology*, Vol. 62 No. 1, pp. 61-77.

Govindji, R. and Linley, P.A. (2007), "Strengths use, self-concordance and well-being: implications for strengths coaching and coaching psychologists", *International Coaching Psychology Review*, Vol. 2 No. 2, pp. 143-153.

Guptill, C. (2012), "Injured professional musicians and the complex relationship between occupation and health", *Journal of Occupational Science*, Taylor & Francis Group, Vol. 19 No. 3, pp. 258-270.

Hobfoll, S.E. (1989), "Conservation of resources: a new attempt at conceptualizing stress", *American Psychologist*, Vol. 44 No. 3, pp. 513-524.

Hobfoll, S.E., Halbesleben, J., Neveu, J.P. and Westman, M. (2018), "Conservation of resources in the organizational context: the reality of resources and their consequences", *Annual Review of Organizational Psychology and Organizational Behavior*, Vol. 5, pp. 103-128.

Howell, D.C. (2007), *Statistical Methods for Psychology*, 6th ed., Thomson Wadsworth, Belmont, CA.

Kogan, N. and Wallach, M.A. (1964), *Risk Taking: A Study in Cognition and Personality*, Holt, Rinehart & Winston, New York.

Lejuez, C.W., Richards, J.B., Read, J.P., Kahler, C.W., Ramsey, S.E., Stuart, G.L., Strong, D.R. and Brown, R.A. (2002), "Evaluation of a behavioral measure of risk taking: the balloon analogue risk task (BART)", *Journal of Experimental Psychology: Applied*, Vol. 8 No. 2, pp. 75-84.

MacLean, R.R., Pincus, A.L., Smyth, J.M., Geier, C.F. and Wilson, S.J. (2017), "Extending the balloon analogue risk task to assess naturalistic risk taking via a mobile platform", *Journal of Psychopathology and Behavioral Assessment*, Vol. 40, pp. 107-116.

Muthén, L.K. and Muthén, B.O. (2017), *Mplus User's Guide*, 8th ed., Muthén & Muthén, Los Angeles, CA.

Neves, P. and Eisenberger, R. (2014), "Perceived organizational support and risk taking", *Journal of Managerial Psychology*, Vol. 29 No. 2, pp. 187-205.

Newton, D.W., LePine, J.A., Kim, J.K., Wellman, N. and Bush, J.T. (2020), "Taking engagement to task: the nature and functioning of task engagement across transitions", *Journal of Applied Psychology*, Vol. 105 No. 1, pp. 1-18.

Peterson, C. and Seligman, M.E.P. (2004), *Character Strengths and Virtues: A Handbook and Classification*, Oxford University Press, Washington and New York.

Phillips, L.H., Bull, R., Adams, E. and Fraser, L. (2002), "Positive mood and executive function: evidence from Stroop and fluency tasks", *Emotion*, Vol. 2 No. 1, pp. 12-22.

Rowe, G., Hirsh, J.B. and Anderson, A.K. (2007), "Positive affect increases the breadth of attentional selection", *Proceedings of the National Academy of Sciences*, Vol. 104 No. 1, pp. 383-388.

Scarpina, F. and Tagini, S. (2017), "The stroop color and word test", *Frontiers in Psychology*, Vol. 8, p. 557.

Schildberg-Hörisch, H. (2018), "Are risk preferences stable?", *Journal of Economic Perspectives*, Vol. 32 No. 2, pp. 135-154.

Schüler, J. and Nakamura, J. (2013), "Does flow experience lead to risk? How and for whom", *Applied Psychology: Health and Well-Being*, Vol. 5 No. 3, pp. 311-331.

Schüler, J. and Pfenninger, M. (2011), "Flow impairs risk perception in kayakers", *Sport Psychology*, pp. 237-246.

Van der Linden, D., Frese, M. and Meijman, T.F. (2003), "Mental fatigue and the control of cognitive processes: effects on perseveration and planning", *Acta Psychologica*, Vol. 113 No. 1, pp. 45-65.

Van Woerkom, M., Oerlemans, W. and Bakker, A.B. (2016), "Strengths use and work engagement: a weekly diary study", *European Journal of Work and Organizational Psychology*, Vol. 25 No. 3, pp. 384-397.

Williams, S., Zainuba, M. and Jackson, R. (2003), "Affective influences on risk perceptions and risk intention", *Journal of Managerial Psychology*, Vol. 18 No. 2, pp. 126-137.

Wood, A.M., Linley, P.A., Maltby, J., Kashdan, T.B. and Hurling, R. (2011), "Using personal and psychological strengths leads to increases in well-being over time: a longitudinal study and the development of the strengths use questionnaire", *Personality and Individual Differences*, Vol. 50 No. 1, pp. 15-19.

Corresponding author
Wei Liu can be contacted at: liu@essb.eur.nl

For instructions on how to order reprints of this article, please visit our website:
www.emeraldgrouppublishing.com/licensing/reprints.htm
Or contact us for further details: **permissions@emeraldinsight.com**