

**How to Promote Flow Experiences at Work:
The Impact of a Mindfulness-Based Intervention and the
Role of Trait Mindfulness**

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Abstract

Flow describes a pleasant state in which people are optimally challenged resulting in them being fully absorbed in a task. The present study investigated whether the use of a mindfulness-based intervention is associated with improvements in work-related flow. Additionally the importance of baseline trait mindfulness in participants was studied. The methodology employed involved a randomised field experiment utilising self-training and a wait-list control group combined with experience sampling methodology. Seventy-nine employees (50 females, 29 males) provided data on flow involving measurements taken twice per week over five working weeks. Multilevel analyses revealed no effect of the study intervention on flow and a missing treatment-by-baseline effect. However, the effect of state mindfulness on flow was found to be highly significant. Future studies could further investigate whether a mindfulness intervention which is readily available on an electronic device can be developed to be easily used regularly by the working population, as well as identify the factors that influence greater compliance with self-taught mindfulness practices.

Keywords: flow, mindfulness intervention, experience sampling method

How to Promote Flow Experiences at Work: The Impact of a Mindfulness-Based Intervention and the Role of Trait Mindfulness

Have you ever experienced a state of total concentration at work when time flew by and you forgot everything around you? Being totally absorbed by a task like this is a state that most of us have probably experienced at one time or another. Csikszentmihalyi (1999) was the first to describe this phenomenon and labelled it flow. Flow describes a pleasant state in which people are optimally challenged resulting in them being fully absorbed in a task (Csikszentmihalyi, 1999). Scholars have shown experiencing flow is an important antecedent to heightened subjective well-being (Moneta, 2004; Fritz & Avsec, 2007; Payne, Jackson, Noh & Stine-Morrow, 2011). This is of relevance when considering factors that may improve workplace productivity. Additionally, Martins (2004) multi-level broaden and build approach demonstrates that work-related flow is an important component (among others) in enhancing satisfaction, motivation, and productivity in the workplace. Furthermore, flow experiences at work have been linked to positive outcomes for organisations, such as enhanced in-role and extra-role behaviour for employees high in conscientiousness (Demerouti, 2006), greater organisational and personal resources (Salanova, Bakker, & Llorens, 2006), and superior inter-individual relations (Bakker, 2005). Flow seems to positively impact on an individual as well as having beneficial effects for organisations yet little is known about how to stimulate flow. Therefore this study aims to investigate how flow can be promoted at work.

Previous research has focused on the self-regulation of attention as an important facet of an individuals' mental capability to experience flow (Gardner & Moore, 2006). In a study by Tang and colleagues (2007) it was shown that meditation training can improve attentional processes. Another study tested the impact of self-regulated attention control on the amount of time spent in flow (Clark, 2002). Thus, the self-regulation of attention is a crucial component in the ability to experience flow. An important component in the field of mindfulness involves the self-regulation of attention, which describes the ability to manipulate ones attentional processes such as remaining focused over a particular period of time (Bishop et al., 2004). One could argue that mindfulness-based interventions may facilitate an individuals' capability to experience flow. Mindfulness is a state-like phenomenon, which entails that people respond to a current event in a non-judgmental and accepting manner (Bishop et al., 2004; Glomb et al. 2011). It has been found to be a promising treatment method in the field of positive psychological interventions aiming to elevate positive feelings, behaviours, and cognitions to foster well-being in clinical as well as in non-clinical samples (Sin & Lyubomirsky, 2009). Interventions such as the Mindfulness-

Based Stress Reduction (MBSR: Kabat-Zinn, 1982) programme and Mindfulness-Based Cognitive Therapy (MBCT: Segal, Williams, & Teasdale, 2002) first introduced mindfulness to treat various emotional and behavioural disorders. While mindfulness has been successfully introduced within the clinical setting, it is still in its infancy in the field of industrial and organisational (IO) psychology. Initial studies have shown that mindfulness has beneficial effects within the context of work. For example, Dane and Brummel (2014) demonstrated that mindfulness is positively associated with job performance, Hülshager, Alberts, Feinholdt and Lang (2013) found that mindfulness promotes job satisfaction, and Allen and Kiburz (2012) revealed that trait mindfulness relates positively to work-life balance.

Previous studies have shown that people can experience flow during computer gaming (Chou & Ting, 2003), musical performance (Fritz & Avsec), and sports (Kee & Wang, 2008). This study aims to expand on previous research findings on flow in the workplace by first investigating the effectiveness of a mindfulness intervention on work-related flow. Secondly, this study will examine the moderating effect of trait mindfulness on the relationship between the intervention and flow. Mindfulness interventions have been shown to improve mean scores of trait mindfulness therefore demonstrating that improvement is possible with training (Carmody, Reed, Kristeller, & Merriam, 2008). Considering trait mindfulness as a moderator will be of particular importance, as research is not only interested in whether mindfulness interventions have an effect, but also for whom they work most efficiently (Shapiro, Brown, Thoresen, & Plante, 2011).

No research to date has investigated the extent to which a mindfulness intervention impacts on an individuals' flow experience at work. This topic is of particular value, because flow has been found to be a considerable source of well-being (Myers & Diener, 1995) which in turn is positively related to work performance (Bakker, Schaufeli, Leiter, & Taris, 2008). Furthermore, introducing trait mindfulness as a moderator will give further clarification on this relationship, as it helps organisations to identify those people most in need of receiving a mindfulness intervention. This is particularly useful as interventions can consequently be focused and tailored to employees' needs. This in turn assists organisations in deciding how to most effectively allocate financial resources and in whom to invest the most time.

As such, this study will contribute to a better understanding of how to facilitate flow at work, thereby contributing to the literature in several ways. First, previous research has focused on the self-regulation of attention as an important component of an individuals' mental capability to experience flow. This study applies the same principle in that it tests a

mindfulness intervention as a potential way to facilitate flow. By combining research on flow with the literature on mindfulness, this study may be able to explain fluctuations in flow due to mindfulness-based practices. This will provide insight for both employees and employers about the extent by which flow experiences can be fostered through mindfulness, beyond the core job characteristics identified by Hackman and Oldham (1975) that have been empirically related to flow.

Flow (at Work)

Compared with the more traditional approach of organisational health psychology, a new trend towards a “positive psychology” has emerged. Positive psychologists focus on human’s strengths and virtues, and on how these can be promoted, rather than on humans’ maladaptive behaviour (Schaufeli, 2004). One area of interest within this field, which has received increasing attention over the past years, is the concept of flow. Flow, first termed by Csikszentmihalyi (1990), describes a pleasant state in which people are optimally challenged resulting in them being fully absorbed in a task (Csikszentmihalyi, 1999) and incorporates eight elements: (a) clear goals, (b) a sense of control, (c) a loss of self-consciousness, (d) clear and immediate feedback on performance, (e) time transformation, (f) a merging of action and awareness, (g) a high level of concentration, and (h) a sense of intrinsic value. In addition to the eight elements, Csikszentmihalyi (1990) proposed that flow is best achieved when an individual’s skill level is approximately in balance with the approached level of challenge, supporting the notion of the need for an optimal level of arousal (Yerkes & Dodson, 1908). Furthermore, entering flow not only depends on task characteristics but also on the extent of dynamic resources a person possesses (Nakamura & Csikszentmihalyi, 2002). That is, an emerging flow experience is shaped by both the environment and the individual. Despite the fact that flow is a pleasurable state, researchers have also shown that it depletes resources and hence requires energy (Nakamura & Csikszentmihalyi, 2002).

Csikszentmihalyi and Csikszentmihalyi (1988) proposed a model in which they describe the processes that are required in order to enter flow. According to the model, the information people are confronted with in day-to-day life is only consciously perceived and enters awareness once attended to. Consequently, attention plays a key element in the ability to access flow, as attentional processes determine which information is processed in consciousness. However, the self-regulation of attention is limited (Schneider & Shiffrin, 1977), therefore less resources are made available to process information that can be consciously perceived. Thus, attention plays a crucial role in whether an individual is capable of experiencing flow.

How can attention be enhanced to extend flow experiences and hence make them more accessible to the working population? Several studies have previously demonstrated (e.g.: Jha, Krompinger & Bame, 2007; Moore & Malinowski, 2009; Cahn & Polich, 2013) that an essential component of meditation is mental training of attention (Slagter, 2007). Mindfulness meditation practices may therefore enhance the ability to sustain attention and consequently facilitate flow states, an issue which will be considered next.

Mindfulness and Mindfulness Intervention

Mindfulness is defined as an “awareness that emerges through paying attention on purpose in the present moment, non-judgmentally to the unfolding of experience moment by moment” (Kabat-Zinn, 2003, p.145). That is, being aware and attentive to the present moment helps recognising that one’s thoughts and emotions are amenable to change (Dreyfus, 2011). This allows practitioners to discriminate between real experiences in time and one’s interpretation of them (Kabat-Zinn, 2003). Mindfulness has grown in popularity within the clinical field (Bishop, 2002), particularly as a result of successfully administered interventions (e.g. Rosenzweig et al., 2010). As mindfulness-based treatments have shown to be effective in clinical samples, the role of mindfulness has been of growing interest in recent years within the context of work (Dane, 2011; Glomb et al. 2011).

Traditional mindfulness interventions, such as the MBSR (Kabat-Zinn, 1982) programme and MBCT (Segal, Williams, & Teasdale, 2002) are time consuming. Consequently, it has become a challenge to introduce mindfulness to the working population, in particular to those with tight work schedules (Sears, Kraus, Carlough, & Treat, 2011). Therefore, researchers put a great deal of effort into reducing the time required (e.g. Malarkey, Jarjoura, & Klat, 2013). The intervention used in this study is a self-taught programme readily available on a smart-phone, tablet or computer, which spans five working weeks involving daily mindfulness practices lasting approximately ten minutes.

To explain how mindfulness meditation practices may lead to greater flow experiences at work, the present study will build upon Bishops et al.’s two-component model of mindfulness (2004). Their model is based on various studies within clinical settings and describes mindfulness as a state. The first component involves the self-regulation of attention, which describes the ability to manipulate ones attentional processes such as remaining focused over a particular period of time and to initiate momentarily awareness. The second component involves orientation towards one’s experience in an open and non-judgmental way. During mindfulness training practitioners are focused on bodily sensations such as their breathing while trying to preserve a relaxed state of mind. Meditators are taught to accept

disruptive thoughts that are arising and subsequently return their attention back to breathing (Wallace, 2006). In this respect, mindfulness based practices improve the preservation of attention by detaching irrelevant information from cognitive evaluations. Following this, mindfulness is developed as a skill that can be practised, and therefore has the ability to enhance attentional processes.

There has been interest in whether mindfulness training can influence attentional performance. A study by Chan and Woollacott (2007) showed that experienced meditators display reduced interference on the Stroop task. Further investigating whether mindfulness training alters or enhances particular aspects of attention, Jha, Krompinger and Baime (2007) found that mindfulness practices improve attention-related behavioural responses. Moreover, attentional performance and cognitive flexibility have been shown to be positively related to meditation training (Moore & Malinowski, 2009). Van den Hurk (2010) demonstrated that mindfulness meditators display a greater focus of attention than a control group. Finally, by reviewing various neuroelectric and imaging studies, Cahn and Polich (2013) concluded that meditation practices increase attentional resources. The afore-mentioned findings provide strong evidence that a mindfulness intervention may enhance the self-regulation of attention and may thus impact on an individual's flow experience at work. The increased capacity for self-regulation obtained by mindfulness practices includes the ability to retain focused attention and may therefore facilitate this relationship. Hence, a first hypothesis can be drawn from previous work:

Hypothesis 1: A mindfulness intervention is positively associated with work-related flow.

Mindfulness Intervention, Flow, and The Role of Trait Mindfulness

Mindfulness by definition is a state-like phenomenon. However, a number of self-report measures have shown that people vary in their natural ability to be mindful. As such, mindfulness at the trait level refers to relatively stable individual differences in the disposition of being mindful across situations (Glomb et al., 2011). Trait mindfulness may evolve over time by repeatedly engaging in states of mindfulness (Garland, 2013). Despite the degree to which people vary in their natural disposition to be mindful, this can be improved with training. Thus, people engaging in mindfulness-based practices are amenable to change (Carmody & Baer, 2008). In general, people who display high traits of mindfulness have been found to be better in self-regulating their behaviour, possess greater well-being, and perform better (Glomb et al., 2011). Other studies showed trait mindfulness to be negatively related to psychological distress (Carmody, Reed, Kristeller, & Merriam, 2008), and rumination

(Chambers, Lo, & Allen, 2008), and positively associated with body satisfaction (Dekeyser, Raes, Leijssen, Leysen, & Dewulf, 2008).

Shapiro and colleagues (2011) have suggested a need to investigate for whom mindfulness interventions work most efficiently. That is why the present study will examine variations between people displaying high mindfulness traits versus people with low traits. Therefore, treatment-by-baseline interactions will be analysed, a method which assesses systematic differences between individuals with differing baseline levels resulting from intervention (Khoo, 2001). In general, it could be hypothesised that interventions applied within the clinical and work-related-settings may have a greater impact on individuals with low baseline levels as opposed to individuals with high baseline levels on a particular trait (Shapiro et al., 2011). This could be explained by the fact that people with low mindfulness traits may have more psychological benefit to gain from the intervention. In contrast, people who display higher traits of mindfulness may show ceiling effects, making it more difficult to attain significant improvements. Baer and colleagues (2006) provide some support for this reasoning by showing that people higher in their natural disposition to be mindful exhibit greater well-being without training. Consequently, researchers have suggested that people with low baseline levels may benefit more from an intervention (Shapiro et al., 2011). This will be further investigated in this study:

Hypothesis 2: Trait mindfulness moderates the relationship between the mindfulness intervention and flow at work such that flow experiences due to the intervention are stronger for participants with low baseline levels in trait mindfulness

The Present Study

A randomised field experiment combined with experience sampling methodology (ESM) will be conducted to test the afore-mentioned hypotheses. In this study participants with different occupations were randomly assigned to a group receiving the intervention or a wait-list control group. Both groups took part in a diary study spanning five working weeks, involving measurements taken twice per week (at the end of work). The set-up of the present study has several advantages. First, the study makes use of a wait-list control group to demonstrate that inferences about the intervention are more effective than time alone. Second, irrelevant of the changes the study might bring, positive psychology interventions are designed to build positive qualities within participants (Meyers, van Woerkom, & Bakker, 2013). Third, by randomly sampling peoples' everyday experiences over a period of five weeks, the present study intends to study subjective experiences in a naturally occurring

environment (Moneta, 2012). Therefore, the experience sampling method is often used in studies assessing flow (Csikszentmihalyi & Figurski, 1982).

Method

Procedure

Employees ($N = 262$) from various German companies were recruited to participate in this study using a variety of recruitment methods. First, the recruitment team contacted working adults from their personal network, either in person or via telephone. Second, the snowballing technique was applied by asking those from the personal network to involve other people they knew in the study. Snowballing is a common and valuable recruitment method adopted in organisational research (e.g. Grandey, Fisk & Steiner, 2005; Groth, Henning-Thurau & Walsh, 2009). Some individuals not previously known to the recruitment team were contacted and recruited via email. Lastly, human resources departments from well-known companies ($N = 5$) were contacted and asked to forward the study to their employees.

Participants were informed that the study would test the effectiveness of a mindfulness intervention within the context of work and by participating they would have the opportunity to use a costly mindfulness-app free of charge over a period of five weeks. The latter served as an incentive to participate in the study. To further encourage participation, people were offered feedback on study results once data collection was completed. Participants received several online questionnaires, including an introductory survey, diary surveys, and a final questionnaire, over a four-week period. After completing the introductory survey, participants were randomly allocated to either the self-training intervention or the wait-list control group.

The self-training intervention was integrated with the diary for participants assigned to the intervention group. Participants within the control group solely filled out the diary surveys and received the self-training intervention once they completed the study. The diary surveys were distributed among participants twice a week (Tuesday and Wednesday) and required to be filled out at the end of the workday on that specific day. Participants that did not finish a survey within the indicated time frame were not able to complete it retrospectively. During the first week participants were also asked to fill out a diary survey on the Monday, resulting in a total of 11 diary surveys taken over a five-week period.

A total of 213 online questionnaires were distributed to employees from a variety of occupations who signed up to participate in the study. Overall, 119 valid questionnaires were returned, resulting in a response rate of 55.9 % (61 intervention group, 57 control group). It is important to note that online questionnaires were in German, whereas the self-training intervention was in English.

Self-training intervention. The self-training intervention involved a meditation app, developed by Puddicombe and Pierson (2010), that provides guided audio meditation training online. It can be accessed via various electronic devices such as a mobile phone, computer, or tablet. This offered a wide range of ways to access the training and integrate it into a busy working day. Before getting started with a meditation audio-session, participants received general information about mindfulness meditation as well as instructions on how and when to perform the exercises via the app. The self-training intervention started with a ten-day programme, where participants first learned the basics of meditation, lasting ten minutes per day. Specifically, participants are confronted with calming meditation practices, which involve the concentration on a particular object, such as one's breathing. This exercise helps to calm one's body and clear one's mind, resulting in improved concentration. After having completed the ten-day programme, participants had access to a broad range of mindfulness audio sessions, which were to be completed in sequential order.

Participants

For the present study 119 employees (71 females, 48 males) from a broad range of organisations in Germany were recruited, mainly from North-Rhine Westphalia. Participants ranged in age from 20 to 65 ($M = 42.65$, $SD = 12.72$) and participated voluntarily. Preliminary analysis revealed that five participants only filled in the introductory survey so were excluded from further analyses. Data was then inspected for missing values on daily flow measures (dependent variable) in week two, three and four. 30 participants were found to have missing values on two weeks and were therefore excluded from the main analysis. Finally, participants were asked to indicate how often (meditation frequency) they had engaged in their meditation exercises before filling out the diary questionnaires. Further, at the end of the study participants had to indicate which exercise level they arrived at. Based on this, ten participants assigned to the intervention group but who failed to meditate with the app were dropped from further analysis. Therefore, the final sample consists of 79 participants (50 females, 29 males; 48 control group, 31 intervention group), ranging in age from 22 to 62 ($M = 43.28$, $SD = 12.34$). Participants worked on average 40 hours per week and the sample population covered a broad range of professions. A total of 15.2 % worked in sales, 8.9% as pedagogues, 7.6 % as teachers, 6.3 % as managers or working in marketing, 5.1% as consultants, 3.8% were lawyers, therapists, researchers, engineers, or working in medical services, respectively; 2.5 % were bank clerks or architects, whereas the rest held other kind of jobs. There was no significant difference in baseline trait mindfulness between participants in the intervention and control group.

Measures

Participants completed several online questionnaires, including an introductory survey, diary surveys, and a final questionnaire, over a five-week period. The introductory survey assessed demographic information (age, gender, occupation, daily work hours) and baseline measures (e.g. trait mindfulness). All other variables were measured on a daily basis. The domains covered within the questionnaires that are relevant to this study (independent, dependent, moderator, and control variables) are listed and described below.

Trait mindfulness. A person's overall level of trait mindfulness was assessed using the German version (Michalak, Heidenreich, Ströhle, & Nachtigall, 2008) of the 15-item Mindfulness Attention and Awareness Scale (MAAS; Brown & Ryan, 2003). This measure is commonly applied to the general population in samples that have no formal experiences in meditation. A sample item of the scale is "I find myself doing things without paying attention" (reverse coded). Items were scored such that high values indicate high values of mindfulness. Participants indicated their responses on a five-point Likert scale ranging from 1 (almost never) to 5 (almost always).

Flow. Daily flow measures were assessed using five items from the Flow Short Scale (Rheinberg, Vollmeyer, & Engeser, 2003; for the English version, see Rheinberg, 2008). Sample items are: "I did not recognize time going by", "I had no difficulty concentrating", "I was totally absorbed in what I was doing". Participants reported their flow experiences on a five-point Likert scale.

Control variables. To rule out alternative explanations, a number of control variables were assessed. It will be controlled for job demands, as entering flow partly depends on task characteristics (Nakamura & Csikszentmihalyi, 2002). The demands of a job were characterised and quantified on a scale developed by Bakker, Demerouti, Taris, Schaufeli and Schreurs (2003) and included eleven items, which were rated on a 4-point Likert scale, ranging from 1 (never) to 4 (always). An example is "My work requires working very hard". Further it will be controlled for baseline flow and daily state mindfulness.

Data Analysis

As the obtained measures of the same individual are not independent, the current data has a hierarchical structure with measures nested within persons. Multilevel analysis is the most appropriate method when dealing with dependency between measurements (Snijders & Bosker, 2012). The intra-class correlation coefficient (ICC) indicated that between-group variance was 51 % for flow, supporting the use of multilevel analysis. Therefore, multilevel modelling was used to test the above-mentioned hypotheses. First, baseline measurements of

flow were taken from week 1 to 3 and considered separately from daily flow measures (taken from week 3 to 5). Baseline measures are those where no effect of the intervention of flow is expected yet, thus they would be expected to stay constant. Daily measures cover those measures that may be expected to change over the course of the study due to the intervention. Daily measures on flow were calculated from flow measures that were taken in week three to five and then averaged. Similarly, baseline measures of flow were calculated from measures on flow taken in week one to three and then averaged. Thus, only the mean score of daily flow measures will serve as the outcome variable “flow”. All other variables measured on a daily basis that are relevant to the present study will be treated in the same way. Second, negatively worded items were reverse coded such that a high value indicates the same type of response on every item. Third, internal consistencies were measured to determine reliability of scales. Additionally, predictor variables were grand-mean centered by subtracting the sample mean from each case’s score on the variable. Centered scores were used to obtain unbiased estimates of the hypothesised relationships (Hofmann & Gavin, 1998). The analysis of multilevel hypotheses started with a null model only including the intercept. Then effects were added and the fit of the model was estimated by means of a likelihood ratio test.

Results

Cronbach’s alpha (α), means, standard deviations and inter-correlations between study variables are displayed in Table 1. Cronbach’s alphas (α) between .82 and .89 were reported, which indicates a good level of internal consistency (Kline, 2005). Contrary to what was expected, group (intervention vs. control) was not significantly correlated with flow. As the intervention was expected to enhance state mindfulness, which in turn was expected to increase work-related flow, a manipulation check was conducted. A multilevel analysis was conducted in order to test whether the intervention had an effect on state mindfulness, which was found to be non-significant, $F(1, 79) = 2.23 = p = .14$ (Table 2). Important to note however is that daily state mindfulness measures as well as trait mindfulness were highly correlated with flow. Flow at the baseline was also found to be highly correlating with flow.

Table 1. *Descriptive Statistics (Means (M), Standard Deviations (SD)), and Intercorrelations among Variables)*

	Cronb. α	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. Age	-	43.23	12.38									
2. Gender	-	-	-	.02								
3. WorkH	-	39.84	11.63	-.20	.37**							
4. Flow BL	.86	3.36	.79	.20	-.15	-.12						
5. State M	.89	4.01	.74	.28*	.05	-.01	.51**					
6. J Demands	.82	2.21	.39	.00	.05	.31**	-.26*	-.30**				
7. Group	-	-	-	.00	-.15	-.08	.04	.17	.02			
8. Trait M	.85	3.48	.63	.28*	.07	-.08	.44**	.64**	-.41**	.07		
9. Flow	.89	3.30	.81	.22	.01	-.03	.77**	.61**	-.21	.05	.45**	

Note. WorkH = Working hours/week; Flow BL = Flow baseline; State M = State mindfulness; J Demands = Job demands; Trait M = Trait mindfulness. *N* = 79. Gender: 2 = male, 1 = female. Group: 1 = intervention, 0 = control. Cronbachs Alphas were calculated individually for every day and then averaged. * $p < .05$. ** $p < .01$ (two-tailed).

Table 2. *Manipulation check for group on state mindfulness*

	Estimate	SE	t
Group	.25	.17	1.49

Note. Group was coded 1 = intervention, 0 = control.

Effect of Group (Intervention vs. Control) on Work Related Flow

To test whether a mindfulness intervention is positively associated with work-related flow (Hypothesis 1), a multilevel analysis was conducted. First, a null model was tested including only the random intercept. The main effect for the condition (intervention vs. control) was added in Model 1. This effect was found to be non-significant, $F(1, 69.30) = 0.65, p = .42$. Therefore, it cannot be concluded that the intervention led to a significant improvement in flow. In addition, it was statistically controlled for the effect of flow at the baseline, state mindfulness, and job demands on flow. The likelihood-ratio test showed a model fit improvement over the null model (Difference $-2 \times \log = 89.40, p < .01$) due to the predictive power of the control variables.

Moderating Effect of Trait Mindfulness on the Group-Flow Relationship

To analyse the potential moderating effect of trait mindfulness on the relationship between group and flow, the main effect for trait mindfulness as well as the interaction between both main effects were added in Model 2. Control variables included in Model 1 were retained. The addition of these predictors resulted in an improved model fit (Difference $-2 \times \log = 43.22, p < .01$). The multilevel models predicting flow from group and trait mindfulness are displayed in Table 3. It can be seen that the interaction of group and trait mindfulness was not significant. Thus, slopes for group relating to flow do not seem to differ due to high or low scores of trait mindfulness.

Table 3. *Multilevel models predicting daily flow from group and trait mindfulness*

Parameters	Null Model			Model 1			Model 2		
	Estimate	SE	t	Estimate	SE	t	Estimate	SE	t
Fixed Effects									
Intercept	3.31**	.09	36.52	3.33**	.07	50.61	3.32**	.07	49.09
Group				-.08	.10	-.81	-.05	.11	-.47
TM							.00	.13	.01
Group*TM							.02	.18	.12
Flow BL				.66**	.07	8.76	.64**	.08	8.24
State M				.36**	.08	4.26	.36**	.10	3.62
I Demands				.18	.14	1.28	.15	.15	1.02
Random Effects									
Residual	.50	.04		.51	.04		.52	.05	
Intercept	.52	.10		.08	.03		.08	.04	
-2*LL	882.399			792.997			749.778		
Diff -2*LL(df)				89.40**			43.22**		

Note. Models are random intercept models. Group was coded 1 = intervention, 0 = control. * $p < .05$. ** $p < .01$.

Discussion

Flow has been shown to be an important antecedent to heightened subjective well-being (e.g. Payne, Jackson, Noh & Stine-Morrow). It has also been linked to positive outcomes for organisations, such as greater organisational and personal resources (Salanova, Bakker, & Llorens, 2006), and superior inter-individual relations (Bakker, 2005). Despite flow having been shown to have a positive impact on individuals as well as on organisations little is known about how to stimulate flow. Consequently, the main aim of this study was to examine how flow could be promoted at work. The self-regulation of attention is a crucial component of an individuals' mental capability to experience flow (Gardner & Moore, 2006) which some researchers feel is also an important element of mindfulness. Based on previous research, two hypotheses were derived. First, that a mindfulness intervention may improve work-related flow. Second, that baseline trait mindfulness affects the relationship between the mindfulness intervention and flow at work such that flow experiences due to the intervention are stronger for participants with low baseline levels in trait mindfulness.

Perhaps surprisingly, this study data does not show there to be a positive effect of using the mindfulness intervention on flow (Hypothesis 1). This may be partly due to poor levels of participation within the intervention group. In general, participants reported only having used the app to meditate on average five times within three weeks. Thus, the mindfulness intervention may not have been used frequently enough to have any effect. This poses the question why participants did not use the app more frequently? It may be the case that the recruitment method in itself was part of the problem. The recruitment team primarily

contacted working adults from their personal network. People may have felt obliged to take part but were not truly interested in or motivated to use the mindfulness intervention. It may have been a better strategy to advertise the study more widely to try to attract participants who were genuinely interested and engaged. This might have led participants to engage more in meditation exercises, however selecting only highly motivated individuals would not translate to the general workforce population and would therefore give rise to other biases. Another possible explanation as to why no effect of the mindfulness intervention on flow was seen might be that finding time to use the app in a busy working week (participants of the present study worked on average 40 hours per week) in addition to having to answer online questionnaires posed a greater challenge than expected. It was initially felt that the app as opposed to more traditional mindfulness interventions (e.g. MBSR, MBCT) could be integrated into a busy working week more easily as it was quicker and more easily accessible on a smart phone, tablet, or computer. However, it may be that the sample group did not want to spend more time on their computer out with work. Another explanation as to why people did not frequently use the app may lie in the idea that goals or intentions are needed to fully engage in a task. It has been shown that behavioural intentions regulate the choice of behaviour (Locke, 1968). Thus, participants may not ever had any intention to use the app on a regular basis or if they were too busy they did not prioritise the new behaviour. The combination of these factors makes it even harder for working adults to make use of the mindfulness intervention when no intention implementations have been formed in advance. These are all questions that could be addressed in future research. Firstly, which population to sample or how; second, whether a mindfulness intervention readily available on an electronic device proves to be successful in a working population; and lastly, future research could identify how people could be encouraged to use the app more frequently by addressing the notion of intention implementations. For example, self-taught meditation exercises could be combined with monthly group meetings to consolidate commitment.

The data also provided no evidence to support a treatment-by-baseline effect. That is, the intervention had no differential effects on work-related flow for participants scoring high or low on trait mindfulness (Hypothesis 2). The missing moderating effect of trait mindfulness could be explained by the fact that treatment-by-baseline interactions are typically designed for at risk-populations as interventions are thought to have stronger effects on participants who display low psychological functioning before starting with an intervention (Khoo, 2001). However, the intervention in the present study was applied within a work-related setting in which overall levels of psychological functioning are expected to be

higher as compared to a clinical sample. Thus, most data points measuring trait mindfulness might have fallen into the high range of possible values, causing a skewed distribution with limited variability. This makes it particularly difficult to assess any relationship (Baron & Kenny, 1986; Kraemer, Frank, & Kupfer, 2006). Indeed, further analysis supports this being the case in this study. On average, trait mindfulness seems to be quite high in the study sample ($M = 3.48$, $SD = .63$; participants indicated their responses on a five-point Likert scale ranging from 1 to 5).

Despite the fact that the hypothesised effects were not demonstrated, an additional finding worth mentioning is that trait mindfulness as well as state mindfulness significantly correlated with flow in a positive direction. In addition, the relationship between state mindfulness and flow was found to be highly significant (Model 2). This finding supports the previous idea that a mindfulness intervention may enhance the self-regulation of attention and may thus impact on an individual's flow experience at work. Consequently, the fact that high levels of mindfulness are associated with high levels in flow experiences at work is in keeping with the existing literature on the relationship between mindfulness and flow in the field of sports and music (e.g. Aherne, Moran, & Lonsdale, 2011; Diaz, 2011). It is not surprising that the present study did not support the hypothesis as a manipulation check revealed that the intervention itself did not induce state mindfulness. Future research should concentrate on how state mindfulness can be consistently induced in order to promote flow experiences at work. In fact, this study could be conducted again while ensuring greater participation with the meditation exercises. It would be useful to know whether differential mindfulness interventions can foster improved flow experiences at work.

In conclusion, the hypothesised effects were not established. Nevertheless, the set-up of this study had several advantages. First, by randomly sampling peoples' everyday experiences the present study was able to capture subjective experiences in a naturally occurring environment and thereby adopted a multilevel perspective (Bliese & Jex, 2002). Second, irrelevant of the changes the study brought, the present intervention was designed to build positive qualities within participants. Third, due to a wait-list control group better inferences about the intervention could be drawn. Additionally, the present study relied on a longitudinal design, allowing causal relationships to be assessed (Zapf, Dorman, & Frese, 1996). Longitudinal designs can also shed light on personal and situational fluctuations between pre- and post-intervention measurements. Another strength of the present study is that the method of data collection (surveys could not be completed retrospectively) allowed for an objective indication of the day and time that participants filled in the survey. A final

strength was the high reliability of measures indicating that items used within the questionnaires were measuring the same underlying dimension.

Limitations and Future Directions

Despite these strengths, this study must be viewed in light of its limitations, which suggest considerable possibilities for future research. As already alluded to above participants who decide to take part in a study may themselves represent a sample that differs from the general population (Halpern et al., 2003). Participation may have occurred as a favour, as the majority of participants were working adults recruited from the researchers' personal network. In addition, the present sample was quite heterogeneous due to the inclusion of a wide range of jobs. Thus, it is important to investigate whether these study results are applicable to the general population. Future research could also determine whether these effects apply to a more homogenous sample in which participants occupy similar jobs. In this study sample the number of female participants outweighed the number of male participants (50 females, 29 males) hence future research should consider the number of men and women represented in a sample, to ensure its finding can be extrapolated to the general working population. The present research concentrated on a population that worked on average 40 hours per week, it would be interesting to see how a mindfulness intervention affects people who work longer hours or work shifts. Finally, the study sample worked in a small geographical area of the western part of Germany therefore it remains questionable whether results are applicable to the wider population.

Despite longitudinal study designs having various advantages over cross-sectional studies, the large drop out rate could be partly explained by the fact that the study itself was too long. Participants attributed their drop out to illnesses or intervening holidays. In addition, participants complained about the number of surveys they received during the course of the study. Unfortunately, surveys were not distributed earlier than 4 p.m. during the study period. By that time some people reported that they already had left work and thus did not remember to fill out the questionnaire for the day, as they did not check their emails again. Another reason for dropping out could be confusion about whether they were allocated to the wait-list control group or the intervention. Even though this was explained in the introductory information participants might have over read this information, as it was quite lengthy. Thus people might have lost interest in participation, as they did not receive a code to access the meditation exercises. Alternatively, it could be argued that a language barrier might have kept participants from using the app, even though reported English proficiency in the study sample was relatively high ($M = 2.13$, $SD = .84$). Another obstacle that might have hindered

participants from meditating could have been the description that was provided for installing the app. Several participants reported having difficulties in understanding this and applying it. This may have prevented people from following the intervention. Future research should therefore shorten the number of surveys distributed among participants and shorten the testing period to ensure greater participation. Secondly, for a greater response rate surveys should be distributed earlier in the day. Thirdly, the information given at the start of the study should be shortened to encourage people to read this important information. Future studies should consider shortening the amount of time that people have to spend in the wait-list control group to improve compliance. The language used in surveys as well as for the meditation app should be consistent as this may lead participants to feel more comfortable using the app as well. Lastly, the information given about how to install the app should be simplified.

The use of self-report measurement is another limitation of the present study, as this measurement accounts for common-method variance (Podsakoff, MacKenzie, Lee & Podsakoff, 2004). Common method variance may cause systematic measurement error and may further bias judgements about the true relationship among theoretical frameworks. Future research could benefit by including a variety of objective measures (e.g. behavioural or peer evaluations). Finally, the present research only looked at the moderating role of trait mindfulness. Future studies should embrace other treatment-by-baseline interactions, such as the moderating role of personality. A study by Demerouti (2006) already demonstrated that flow predicts higher work performance for people who have high traits such as conscientiousness. Thus, by identifying differential moderators future research will benefit from understanding potential boundary conditions.

Implications

Whilst the present study did not yield significant findings, it has both theoretical and practical implications. Given that the mindfulness intervention had no effect on flow, it cannot be concluded that a mindfulness intervention may improve a person's ability to experience flow at work. However, due to participants' low compliance with using the meditation app this effect may have been distorted. This can be seen by the fact that the effect of state mindfulness on flow was highly significant. Previous studies (e.g. Chan & Woollacott, 2007; Jha, Krompinger, & Baime, 2007; Moore & Malinowski, 2009; Van den Hurk, 2010; Cahn & Polich, 2013) have shown that mindfulness training increases the capacity for self-regulation, which includes the ability to retain focused attention. Attentional performance plays a crucial part in the ability to experience flow; consequently it would make sense that improved mindfulness may enhance flow experiences. Thus, existing theories may

not incorporate mindfulness as a way to promote flow at work, yet. Subsequent studies should nonetheless consider mindfulness interventions as an important and relevant potential way to facilitate flow. This intervention had no differential effects on work-related flow for participants scoring high or low on baseline trait mindfulness. Similarly, existing theories may not fully integrate differences in the degree to which people vary in their natural disposition to be mindful. Additional clarification of the specific form of the moderating role of trait mindfulness is needed. Shapiro and colleagues (2011) argue that on the one hand, people displaying high mindfulness traits may benefit more from an intervention due to them feeling more comfortable with it. On the other hand, it is argued that people with low traits may benefit more as they have greater potential psychological gains. The answer to this may be study specific (clinical vs. non-clinical sample) and should be addressed in the future.

Practically, research relating to flow is important as it has been found to be a considerable source of well-being (Myers & Diener, 1995) which in turn is positively related to work performance (Bakker, Schaufeli, Leiter, & Taris, 2008). Consequently, organisations want to improve efficiency by promoting well-being in their employees. Moreover, work-related flow is an important component in enhancing satisfaction, motivation, and workplace productivity (Martins, 2004). These are all factors that are vital to employers who not only value a well functioning company but also their employees. Thus, interventions aimed at extending flow experiences at work may yet prove to be of great value. The idea of introducing a mindfulness intervention as a way to promote flow did not yield any effect in the present study. However, as state mindfulness was found to have an effect on flow this theory should not be abandoned. It would be useful to consider how to effectively implement the intervention directly in the workplace. As opposed to more traditional mindfulness interventions, the intervention used in this study is a self-taught programme readily available on an electronic device, involving daily mindfulness practices lasting approximately ten minutes. This is of particular potential value to organisations as the training is not costly and time consuming or restricted to a particular location. Adherence to the meditation training was quite low within the study sample, therefore employers who are willing to introduce the programme to their organisation should find ways to encourage participation. Allowing time during the working day may be a potential way to introduce this. Employers could use meditation exercises themselves to function as role models (Bandura, 1977), which would also allow them to assist their employees in case of problems occurring with the app.

Despite no moderating effect of trait mindfulness on the intervention-flow relationship being found within this study it may still be worth it for organisations to try to identify those

people most in need of mindfulness intervention. This would allow interventions to be focused and tailored to employees' needs, which in turn assists organisations in deciding how to most effectively allocate financial resources and in whom to invest the most time.

Conclusion

Research thus far has mainly focused on the impact of the self-regulation of attention as an important facet of an individuals' mental capability to experience flow. No research to date has examined the impact of mindfulness-based interventions on work-related flow. This study is the first to consider both the effects of mindfulness intervention and trait mindfulness on flow experiences at work. Whilst the present study may not have yielded significant findings, it suggests potential relevant areas for further study. Although flow could be experienced in any occupation this may be particularly relevant for jobs characterised by perceptions of a balance of high frequency of challenges and high frequency of skills. The notion of people who have high natural traits of mindfulness are potentially better at experiencing flow at work should be further investigated as the wider workforce could benefit from this.

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