

Fusing Character Strengths and Mindfulness Interventions: Benefits for Job Satisfaction and  
Performance

Dandan Pang and Willibald Ruch

University of Zurich

Author Note

Dandan Pang and Willibald Ruch are at the Department of Psychology, University of Zurich, Switzerland, Binzmühlestrasse 14/7, 8050 Zurich, Switzerland.

Acknowledgement: This publication benefited from the support of the Swiss National Science Foundation [grant number 165465]. The authors would like to thank Luisa Niethammer and Valentia Vylobkova for helping with parts of the data collection, Alexander Hunziker for his help with leading one of the intervention groups, and Alexander Stahlmann and Cameron von Berg for proofreading an earlier version of the article.

Correspondence concerning this article should be addressed to: Dandan Pang, Section of Personality and Assessment, Department of Psychology, University of Zurich, Binzmühlestrasse 14/7, 8050 Zurich, Switzerland. E-mail: d.pang@psychologie.uzh.ch.

Data availability statement: Raw data were generated at the University of Zurich. Derived data supporting the findings of this study are available from the corresponding author DP on request.

Disclosure statement: The authors declare that they have no conflict of interest.

**© 2018, American Psychological Association. This paper is not the copy of record and may not exactly replicate the final, authoritative version of the article. Please do not copy or cite without authors' permission. The final article will be available, upon publication, via its DOI: 10.1037/ocp0000144**

### Abstract

In recent years both mindfulness and character strengths have started to garner interest in industrial and organizational psychology (IO). The growing research interest in their effects of those two on employee well-being and performance, individually, has strong practical implications for organizations. Given the interconnection of mindfulness and character strengths, the present study examined the effectiveness of training, which combined the two practices regarding well-being and work-related outcomes; and it tested the potential mediators of the effects at work. A total of 63 participants from various job branches were randomly assigned to three conditions: (1) Mindfulness-Based Strengths Practice (MBSP); (2) Mindfulness-Based Stress Reduction (MBSR); and (3) Wait-list Control. Participants' applicability of character strengths at work, well-being, perceived stress, job satisfaction, and task performance (supervisor rating) were assessed before and after the intervention, and 1-, 3-, and 6 months afterwards. A set of linear mixed-effects models was applied, modelling changes in participants' outcome variables over time. Potential mediators for the intervention effect of MBSP at work were tested using four criteria adapted from a previous study. Results showed the MBSR was effective for increasing well-being, reducing perceived stress, and increasing job satisfaction, whereas the MBSP was effective for increasing well-being, job satisfaction and task performance. These findings suggest that mindfulness alone seems to function better when regarding well-being at work, while fusing character strengths on top of it seems to influence the participants, on a motivational level, and thus bolsters task performance.

*Keywords:* character strengths; job satisfaction; mindfulness-based intervention; task

performance; workplace

## Fusing Character Strengths and Mindfulness Interventions: Benefits for Job Satisfaction and Performance

Mindfulness (“to pay attention in a particular way – on purpose, to the present moment, nonjudgmentally”, Kabat-Zinn, 1994, p. 4) has developed into a booming area of scientific research in less than 30 years. Particularly in the last decade, there has been a spate of interest in implementing mindfulness to promote employee health and well-being at work (e.g., Klatt, Buckworth, & Malarkey, 2009; Wolever et al., 2012). The organizational interest in mindfulness has been focused on the effectiveness of mindfulness training programs for employees and leaders. Findings suggest beneficial effects for stress reduction (Aikens et al., 2014; Baccarani, Mascherpa, & Minozzo, 2013), increase in job satisfaction (Hülshager, Alberts, Feinholdt, & Lang, 2013) and performance at work (Shao & Skalicki, 2009); and enhancing of resilience and social relationships in the workplace (Glomb, Duffy, Bono, & Yang, 2011). Leader’s mindfulness is positively associated with different facets of employee well-being (e.g., job satisfaction and need satisfaction), as well as employee performance (Reb, Narayanan, & Chaturvedi, 2014). Despite the initial evidence for the positive relationship between mindfulness and employee health and well-being, the critique of existing research on workplace mindfulness interventions has been raised (Jamieson & Tuckey, 2017). There are methodological limitations within the workplace mindfulness literature that need to be resolved in order to maximize the study validity in this area. For instance, of the 40 studies Jamieson and Tuckey (2017) reviewed, only half of them (50%) were randomized controlled trials (RCTs), around one fourth (27.5%) of them did not even utilize a control group, and only one study used a comparison condition. There is also a large gap in the literature regarding practice maintenance (i.e., if participants continue engaging in mindfulness practice even after the intervention period) and whether it influences the

effect of mindfulness for a longer period of time (Jamieson & Tuckey, 2017). Moreover, the potential mechanisms have been discussed from a theoretical framework (see a review, Good et al., 2016), yet possible mediators or moderators have not been explored empirically to understand how mindfulness has beneficial effects in the workplace.

Character strengths, a family of positive personality traits that are morally valued and associated with the good life (Peterson & Seligman, 2004; Park, Peterson, & Seligman, 2004; Ruch, Huber, Beermann, & Proyer, 2007), have also emerged as another important ingredient for employee health and well-being. Several character strengths were associated with work satisfaction across a range of occupation types (e.g., hope, and zest; Gander, Proyer, Ruch, & Wyss, 2012; Park et al., 2004; Peterson, Park, Hall, & Seligman, 2009; Peterson, Stephens, Park, Lee, & Seligman, 2010), as well as job performance (Harzer & Ruch, 2014), increasing productivity and decreasing turnover rates (Hodges & Asplund, 2010). Individuals who scored higher in zest would be more likely to experience their work as a “calling” (work for the fulfilment instead of financial gain or career advancement), and would report increased work satisfaction, greater reluctance to retire, and fewer sick days (Peterson et al., 2010; Wrzesniewski et al., 1997). Peterson and Seligman (2004) argue that each person possesses three to seven (out of the 24) character strengths, which characterize the person best and thus constituting so-called signature strengths (i.e., “[...] strengths that a person owns, celebrates, and frequently exercises”; Peterson & Seligman, 2004, p. 18). They argue that people experience a feeling of excitement while displaying their signature strength and that the use of the signature strength is invigorating rather than exhausting. Harzer and Ruch (2012, 2013, 2016) showed that when more signature strengths were applied at work, higher levels of positive experiences and employees considering their work as a calling were found (four or more is better). The association increased with the

centrality of the strengths (i.e., the personal ranking of the strengths) for the individual (Harzer & Ruch, 2012, 2013, 2016). These findings indicate that specific character strengths and the application of them at the workplace (especially when they fit with a person's work-environment) could play an important role for work-related outcomes like workplace well-being and job performance.

### **Bringing character strengths into mindfulness training**

Although both mindfulness and character strengths foster employee well-being and performance individually, only a few studies started to investigate their potential overlap and synergetic effect. There are mainly two approaches. First, Pang and Ruch (2018) put forward a mutual support model of mindfulness training and character strengths. They suggest that people with higher levels of certain character strengths (e.g., love of learning & appreciation of beauty) would pick up and engage in a mindfulness training more easily, while certain character strengths (e.g., curiosity & self-regulation) are enhanced by mindfulness training. Second, pioneer practitioners such as Niemiec (2013) started to combine and integrate the two into a training named Mindfulness-Based Strengths Practice (MBSP). While no published study investigated the effectiveness of the MBSP in a randomized controlled design, preliminary data showed that it has the potential to increase well-being. For example, Niemiec (2013) reported in his book that the participants' general well-being increased after the training. Ivztan, Niemiec, and Briscoe (2016) also suggest that participants' well-being was significantly increased (despite a very small sample) after taking part in the eight-week MBSP with Niemiec (2013) online; yet, there is no comparison to a control group. There are also case discussions on the first usage of the MBSP in a work setting, which suggest that the MBSP might help people in the workplace manage stressful situations better and recognize, appreciate and prioritize the character strengths

of their colleagues (Niemic & Lissing, 2016). These findings suggest that the combination of the two mutually supported concepts – mindfulness and character strengths – function not only separately as a pathway to positive experiences at the workplace but also have a joint effect. However, this has never been tested empirically, yet. Neither pretest and posttest designs, nor comparison groups or a randomization design have been implemented so far. Therefore, additional research such as RCTs that include a (wait-list) control and a comparison condition, alongside measures capturing within-group changes over time and between-group differences by means of pre-, and postintervention measurements, are needed in order to enhance the internal validity of the MBSP studies. Regarding internal validity, random allocation plays an important role because it eliminates possible sources of bias and reduces the risk of disparity between groups on unknown but important factors that could influence the outcomes of the study. On the other hand, there is recent evidence suggesting that mindfulness might not be “*a cure for essentially every ailment*” (e.g., Hafenbrack & Vohs, 2018). Although not impacting performance, mindfulness might impair task motivation, which could conflict with the general objectives of the organization to put forward mindfulness intervention at work (Hafenbrack & Vohs, 2018). However, adding character strengths on top of the mindfulness intervention might solve this problem by positively influencing the participants’ motivation as well.

Furthermore, as one of the key features of the MBSP is encouraging the participants to apply their character strengths in different ways with the help of mindfulness, one might assume that the application of the strengths could potentially contribute to the effect of the MBSP. As mentioned before, the applicability of the character strengths at the workplace is associated with workplace well-being and job performance, thus it could serve as a mediator for the effect of the MBSP on the work-related outcomes. There are a few character strengths that have been found to

be associated with work satisfaction across different studies. For instance, curiosity, zest, hope, gratitude, and spirituality are the *Big 5 strengths* predicting work satisfaction across several job types (Peterson et al., 2010). Furthermore, character strengths – especially curiosity, wisdom, bravery, perseverance, zest, love, social intelligence, and hope – correlate significantly with work satisfaction ( $r \geq .30$ , Gander et al., 2012). Therefore, we assume that, given there is an effect of the MBSP on job satisfaction, the applicability of these strengths (we labelled them as the work-satisfaction-related character strengths in the following sections) at the workplace could be the mediator of the effect. By the same token, Harzer and Ruch (2014) reported that the number of signature strengths used at work was related to all dimensions of job performance and employees who used four or more of their signature strengths had more positive work experiences and were more likely to consider their work as a calling than those who expressed less than four (Harzer & Ruch, 2012). Therefore, it is evident to assume that if there is an intervention effect of the MBSP on job performance, it could be mediated by the applicability of participants' signature strengths (top strengths) at the workplace.

### **The present study**

Using a randomized, wait-list controlled design, the present study aims at testing the effectiveness of two mindfulness interventions on psychological well-being and work-related outcomes, namely (1) the newly developed MBSP, and (2) the well-established MBSR. Additionally, the present study also aims at testing whether those intervention effects maintain over a longer period of time (i.e., up to six months after the intervention period). Given that the intervention effects of work-related outcomes could be corroborated, the present study additionally aims at testing the possible mediators of the intervention effects at the workplace.

The study's hypotheses were threefold: (1) The participants in the MBSP condition would report a reduced level of perceived stress, an increased level of well-being, job satisfaction and task performance regarding the difference between the baseline and the post-intervention, as compared to participants of the wait-list control condition; (2) The participants in the MBSR condition would report a reduced level of perceived stress, an increased level of well-being, job satisfaction and task performance regarding the difference between the baseline and the post-intervention, as compared to participants of the wait-list control condition; (3) The effects of MBSP on work-related outcomes would be mediated by the applicability of character strengths. For the follow-up measurements, we did not postulate specific hypotheses but rather decided to examine the stability of the effects exploratively.

## **Material and methods**

### **Participants**

Eligible participants were adults 18 years of age or older, meeting the following inclusion criteria: (a) no previous meditation experience; (b) level of employment  $\geq 50\%$ <sup>1</sup>; and (c) neither attending psychotherapeutic treatment nor using psychotropic/illegal drugs throughout the duration of the study. A priori power analyses were conducted using the G\*Power software (Faul, Erdfelder, Lang, & Buchner, 2007), indicating that at least 63 participants would be needed to detect a small towards medium effect in a repeated-measures design testing a within-between interaction while assuming an  $\alpha$  error probability = .05 and power = 95% with an

---

<sup>1</sup> This is related to the Swiss work culture. People in full-time posts (namely, 100% level of employment) work an average of 42 hours a week. Yet, an increasing number of people choose to work less, often for family reasons. A 50% position could mean two days of work one week, followed by three the next. In the present study, we set 50% as our inclusion criterion because we are interested in the workplace outcomes. A lower percentage of employment might have led to unnecessary confounding.

expected correlation of .50 among repeated measures. Eighty-Six Participants registered for the study online between June 2016 and September 2016 and completed a screening and baseline assessment. The final sample consisted of 63 participants (68.9% female) with an age ranging from 22 to 61 years ( $M = 44.2$ ,  $SD = 10.0$ ). They were randomly assigned to one of the three conditions: (1) Mindfulness-Based Strengths Practice (MBSP, Niemiec, 2013;  $n = 21$ ); (2) Mindfulness-Based Stress Reduction (MBSR, Kabat-Zinn, 1982;  $n = 21$ ); and (3) Wait-list Control (WL;  $n = 21$ ). Information on participant flow is provided in Figure 1. As shown in Figure 1, of the 63 participants who filled out the baseline measure, 52 completed the post-test and the first follow-up test and 50 completed the second and third follow-up test. We retained more than 76% of the participants at the six-month follow-up tests for both self- ( $n = 50$ ) and supervisor- ( $n = 48$ ) ratings.

---

Insert Figure 1 about here

---

More than half of the participants (61.9%) had a degree from university or university of applied sciences or were studying at the time they filled in the questionnaire. The participants were all employed (average level of employment was 88.43%) and covered a variety of job branches, including sales/administration (19.1%), medical/social help (19.0%), education and research (15.9%), HR (6.3%), finance/banking (4.8%), marketing/media (3.2%), management (3.2%), service (1.6%) with around one fifth of the participants reporting multiple branches (22.2%).

### **Procedure**

The procedure was approved by the Ethics Committee of the Department of Psychology at the University of Zurich. To reach a larger audience of people at the workplace, the study was

promoted by posting leaflets (with the instruction to participate in the study) through the internet (e.g., online forum, social media, and different kinds of mailing lists). In addition, the contact details of the human resource professionals (HR), in and around Zurich, were sought out on the internet. An invitation e-mail along with the leaflet was sent to the HR. They were asked to forward the e-mail to their colleagues who would potentially be interested in the study. Volunteers then signed up for participation through a web link (via Unipark platform) provided on the leaflet. All participants were asked to pay 100 CHF to attend the interventions (to motivate participants and reduce the dropout rate) and they were given individual feedback as the incentive.

After registration, participants were randomly<sup>2</sup> assigned to one of the three conditions. For both of the intervention groups, a confirmation e-mail was sent to each participant with the information on the trainer and when and where the mindfulness training would take place along with the informed consent. Before the intervention started, participants were asked to complete the baseline questionnaires online using their personal devices. One supervisor of the participant was contacted to rate the participant's task performance. The supervisor's rating was given anonymously, and both the participant and the supervisor were informed about this beforehand<sup>3</sup>.

---

<sup>2</sup> Upon registration, participants were asked to indicate their availability on the website because we only provided the mindfulness training on Monday or Tuesday evening after work. They were all informed that they would participate in a mindfulness-based training without knowing the details (and that there were different trainings on the two days). Altogether 38 participants could only attend on one of the two days; 25 participants (39.7%) indicated that they could come on both days and they were randomly assigned (i.e., 28.6% to MBSR, 47.6% to MBSP, and 42.9% to the control group). Thus, while randomization was limited, we assume that this did not bias the results because the participants did not know which conditions they were assigned to.

<sup>3</sup> A separate e-mail was sent to each participant with a link and instruction for the supervisor rating for them to forward to their supervisor. Participants were informed (with bold font) that the link would expire after 1 click, in order to make sure that they themselves do not

**The content of the interventions.** Participants in the two intervention conditions gathered once a week in a classroom at the University of Zurich for eight consecutive weeks and received the training in a group setting led by qualified trainers with each session lasting approximately 2 hours. The MBSP group received a training built on Nhat Hanh's and Kabat-Zinn's work on mindfulness (Kabat-Zinn, 1990; Nhat Hanh, 1975, 1991) as well as Peterson and Seligman's character strengths research (Peterson & Seligman, 2004). It typically started with an opening meditation; followed by a dyad or group discussion on reviewing the previous session and homework; then followed by a theoretical input introducing new materials; continued with an exercise of mindfulness or character strengths (or its combination) and subsequent debriefing; eventually concluding by a closing meditation with strength Gatha. The MBSR group received a two-hour version of the standard MBSR curriculum (without the retreat that is proposed in the manual). Homework (every day 20-40 minutes) was suggested to all participants in both intervention conditions between each session, which required them to repeat certain mindfulness/strengths practices by providing reflective journals and audio tapes. Within the Wait-list Control group, participants were advertised the same way as the other two conditions to participate in a mindfulness-based intervention. However, they were later informed that the current interventions were all booked out and they could only attend the intervention next year. The specifics of the wait-control design were explained, and they were asked to fill out the instruments and pay the fee. After the data collection was completed, the Wait-List Control group also received the MBSP intervention from May-04 to June-21, 2017.

---

click the link, which grants the anonymity of the rating (participants would have no access to what the supervisor rated).

Data collection was administered online via the Unipark survey platform. All participants were asked to complete the same self-rating questionnaires and forward the 5-item supervisor rating to their supervisors at the identical time point: one week, one month, three months, and six months after the interventions. Additionally, participants reported how often they completed the suggested homework on average as a measure of practice maintenance, both throughout the intervention as well as after the intervention on a 6-point scale (0 = *never*, 1 = *less than one day per week, on the average*, 2 = *one day per week, on the average*, 3 = *two or three days per week, on the average*, 4 = *four or five days per week, on the average*, 5 = *more than five days per week*). At the post-test, participants were also asked to rate their trainer on how motivated, friendly, competent, organized, and supportive he/she has been perceived. E-mail reminders to fill out the questionnaires were sent to participants at the relevant time points. Data collection lasted through April 2017; the study concluded when participants completed their 6-months follow-up assessment.

### **Measurements<sup>4</sup>**

**Applicability of Character Strengths Rating Scales (ACS-RS; Harzer & Ruch, 2013).** The ACS-RS assesses the extent to which each of the 24 character strengths is applicable at the workplace under four influences: (1) normative demands of a situation (actual wording: “it is demanded”); (2) appropriateness of the behavior (“it is helpful”); (3) perceived presence of factors that may facilitate or impede the behavior (“I do it”); and (4) intrinsic motivation to show it (“it is important for me”). For each of the character strengths, short paragraphs are provided describing relevant behaviour based on the definitions by Peterson and Seligman (2004). The

---

<sup>4</sup> This is part of a larger data collection, there were other instruments used in the same project. However, they were not relevant to the current research question and the data reported here have not yet been published elsewhere.

scale consists of 96 items with a 5-point scale (from 1 = *never* to 5 = *[almost] always*) and showed satisfactory internal consistency (from .77 to .93) and inter-rater agreement (Harzer & Ruch, 2012, 2013).

**WHO-Five Well-being Index (WHO5; WHO, 1998).** The WHO5 measures the subjective quality of life based on positive mood (good spirits, relaxation), vitality (being active and waking up fresh and rested), and general interest (being interested in things) during the past two weeks. The scale contains 5 positively phrased items with a 6-point Likert scale (from 0 = *none of the time* to 5 = *all of the time*).

**Perceived Stress Scale-10 (PSS-10; Cohen & Williamson, 1988).** The PSS measures a person's self-perceived stress level during the last month. The scale consists of 10 items with a 5-point Likert scale (from 1 = *never* to 5 = *very often*) and showed adequate internal consistency ( $\alpha = .78$ ; Cohen & Williamson, 1988). The 10-item German version of the scale (Büssing, 2011) was used in the current study.

**Job Satisfaction Questionnaire (JSQ; Andrews & Withey, 1976).** The JSQ measures job satisfaction consisting of five items utilizing a 7-point Likert-scale (from 1 = *terrible* to 7 = *delighted*). The JSQ showed high reliability ( $\alpha = .81$ ) and convergent validity (Rentsch & Steel, 1992). The German version of the scale was used in the current study, which also demonstrated high reliability ( $\alpha = .80$ ; Harzer & Ruch, 2013).

**Task Performance Questionnaire (TPQ; Williams & Anderson, 1991).** The TPQ is a questionnaire for supervisory ratings on task performance, which measures in-role behaviour independently from occupational groups. It consists of seven items with a 7-point Likert-scale (from 1 = *strongly disagree* to 7 = *strongly agree*). Satisfying internal consistency was reported by different studies ( $\alpha = .80-.96$ ; Diefendorff, Brown, Kamin, & Lord, 2002; Williams

& Anderson, 1991). The German version of the scale used in the current study showed satisfactory reliability ( $\alpha = .82$ ; Harzer & Ruch, 2014).

### Data Analysis

**Statistical model.** A set of linear mixed-effects models was applied, modelling changes in participants' outcome variables over time. The R package "lme4" (Bates, Mächler, Bolker, Walker, 2015) was used to conduct the analyses, which was based on the restricted maximum likelihood estimation (REML). We postulated a series of piecewise growth models, where we split the time variable into two different phases: (1) From baseline until right after the intervention (i.e., Month 0–2; acute intervention phase); and (2) From right after the intervention until the six-month follow-up tests (i.e., Month 2–8; follow-up phase). We dummy coded the time variable into two variables: Time1 (0, 2, 2, 2, 2) and Time2 (0, 0, 3, 5, 8) to represent the different time periods.

The statistical model for each outcome variable can be summarized as follows:

$$Y_{ij} = [\gamma_{00} + \gamma_{01} \text{Condition}_j + \gamma_{10} \text{Time1}_{ij} + \gamma_{11} \text{Condition}_j * \text{Time1}_{ij} + \gamma_{20} \text{Time2}_{ij} + \gamma_{21} \text{Condition}_j * \text{Time2}_{ij}] + [U_{1j} * \text{Time1}_{ij} + U_{2j} * \text{Time2}_{ij} + U_{0j} + R_{ij}]$$

$$\text{where, } R_{ij} \sim N(0, \sigma_R^2) \text{ and } \begin{Bmatrix} U_{0j} \\ U_{1j} \\ U_{2j} \end{Bmatrix} \sim N \begin{Bmatrix} 0 & \tau_{00} & \tau_{01} & \tau_{02} \\ 0 & \tau_{10} & \tau_{11} & \tau_{12} \\ 0 & \tau_{20} & \tau_{21} & \tau_{22} \end{Bmatrix}$$

$Y_{ij}$  refers to the scores of the perceived stress, the well-being, the job satisfaction and the task performance at all measurement points (i.e., one week, one month, two months, and six months after the intervention). Two levels of models were embedded in this linear mixed-effects model. The Level 1 model captures the within-person change in the outcome variables over all five time points. This within-person change in the outcome variables is referred to as slope (two slopes for Time1 and Time2, respectively). The Level 2 model reflects participants' condition

(MBSP, MBSR, WL) as the between persons' predictor (the WL served as a reference group). For all models, the continuous measures in the Level 1 model were centered at the pre-test (i.e., the intercept). The intervention effect was evaluated by examining the Time1\*Condition interaction ( $\gamma_{11}$ ) and Time2\*Condition interaction ( $\gamma_{21}$ ), which reflects group differences in improvement from pre-test to post-test and stayed unchanged from post-test to follow-up tests. It is represented by the  $\beta$  coefficient associated with the intervention conditions in the Level 2 model.

Subsequently, we also tested the potential mediators for the MBSP's intervention effect on the work-related variables over Time1, respectively. The visual representation of the hypothesized mediators of the intervention effect is presented in Figure 3. Four criteria were used to provide the estimation of the mediation effect, which was adapted from the procedure of a previous study (Stice, Presnell, Gau, & Shaw, 2007). They are displayed in Table 1.

---

Insert Table 1 and Figure 3 about here

---

**Intent-to-treat analysis.** To provide additional information about the generalizability of the findings, in addition to the linear mixed-effects models that were conducted with completers' dataset, a set of intent-to-treat (ITT) analyses was also conducted. Thus, we could test whether the same pattern of results would have emerged if dropouts (those who filled out the baseline measure but did not complete the later measures) had completed the study. Missing values were handled by multiple imputation (MI) to provide reliable estimations. In this procedure, missing data were imputed for each condition at each time point using the algorithm EM (R package "Amelia", Honaker, King, & Blackwell, 2011). It repeated this process 50 times to produce the 50 complete datasets where the observed values were the same and the unobserved values were

drawn from their posterior distributions. The effectiveness analyses were then performed on each of the 50 resulting data files, and the 50 estimates were combined into a single overall estimate using the MI inference rules of “smallsample” (Barnard & Rubin, 1999), which adjusted degrees of freedom for small samples. This yielded proper  $p$  values and confidence intervals for the estimates (R package “mice”, Van Buuren & Groothuis-Oudshoorn, 2011). This approach was shown to be superior to the other imputation methods (e.g., last observation carried forward) because it requires only a few assumptions to be made about the nature of missing data (Schafer & Graham, 2002).

## Results

### Preliminary analysis and intervention adherence

We tested the differences in demographics, work-related properties and the outcome variables among the three conditions at baseline, using one-way analyses of variances (for continuous variables) and chi-square tests (for categorical variables). No significant differences were detected across the three conditions in terms of age, gender, education, nationality, family status, religion, job type, working percentage, salary, wellbeing, perceived stress, job satisfaction, and task performance, suggesting the randomization created initially equivalent groups. Participants' rating on the trainers (how motivated, friendly, competent, organized, and supportive the trainers were) also did not differ. In addition, a correlation matrix (including their mean and standard deviation) among all outcome variables i.e., ACS-RS, PSS-10, WHO5, JSQ and TPQ at pre-test, can be found in the online Supplementary Materials of the study (Table S1) to better understand the relationship among the variables being studied.

To determine whether the completers and the dropouts differed from each other, a series of  $t$ -tests (for continuous variables) and chi-square tests (for categorical variables) was

conducted. No differences were found based on completion status for baseline levels of all variables (i.e., the demographics, the work-related properties, and all the outcome variables). Dropout rates did not differ across conditions with  $\chi^2(2) = 0.184, p = .912$ , indicating that the intervention type was not related to attrition.

---

Insert Table 2 about here

---

As shown in Table 2, participants in both the MBSP and the MBSR condition reported continued engagement in homework (practice) throughout the training and after the training ended. All participants reported practicing homework on average once a week or more during the training. Even when the training was over, still a considerable number of participants (42.9% of MBSP and 47.7% of MBSR) reported continuing practicing the suggested homework once a week or more until six months later. How much homework participants completed during and after the interventions did not differ across the two intervention conditions ( $\chi^2$  ranged from 1.77 to 5.42,  $p > .05$ ).

### **Intervention effectiveness**

The intervention effectiveness was evaluated by examining the significant difference between the rates of change (slope) in the score of outcome variables for the intervention condition (MBSP and MBSR) in comparison to the Wait-list Control condition (WL). The descriptive data (means and standard deviations) can be found in Table 3 (using the completers' data), whereas the piecewise linear mixed-effects models are given in Table 4 (using both completers' and ITT data).

---

Insert Table 3 and Table 4 about here

---

As shown in Table 4, generally, there was no time-related effect for all the outcome variables with only two exceptions, namely Time1 of the job satisfaction and Time2 of task performance, which means that the participants in the Wait-list Control became lower in job satisfaction from Month 0 to Month 2 and higher in task performance from Month 2 to Month 8. This should be taken into consideration while interpreting our results. The model showed significant intervention effects as expected (i.e., evaluated by examining the Time1\*Condition interaction and Time2\*Condition interaction). Compared to the waitlist control group, the models predicted (1) a significant decrease in perceived stress ( $\beta = 0.33, p = .007$ ) and a significant increase in well-being ( $\beta = 2.02, p = .040$ ) for participants in the MBSR condition and a marginally significant increase ( $\beta = 1.64, p = .091$ ) for participants in MBSP condition from the pre-test to the post-test; (2) a significant increase in job satisfaction for both participants in the MBSP condition ( $\beta = 0.28, p = .014$ ) and participants in the MBSR condition ( $\beta = 0.34, p = .013$ ) from the pretest to the posttest; (3) a marginally significant increase in task performance ( $\beta = 0.20, p = .081$ ) from the pretest to the posttest and a significant decrease in task performance ( $\beta = -0.06, p = .012$ ) from post-test to follow-up tests for participants in the MBSP condition, partially confirming hypotheses 1 and 2. No interaction effect on perceived stress, well-being and job satisfaction was found for the Time2\*Condition, meaning the effect did not drop up to six months after the intervention. Figure 2 visualized the findings. The results using the ITT datasets showed a similar pattern with a slight decrease in the  $\beta$  coefficients<sup>5</sup>. All the estimates obtained from the completers' datasets fell within the 95% confidence intervals of the

---

<sup>5</sup> The effects were not statistically significant in the models based on imputed data, but this is likely due to anomalies produced by MI when dealing with skewed data.

imputed estimates, which showed that comparable results would have been obtained if there had been no dropouts over time.

---

Insert Figure 2 about here

---

### **Test of hypothesized Mediators**

As shown in the previous section, the participants in the MBSP condition showed an increase in job satisfaction and task performance over Time1. In the next step, we tested whether the applicability of character strengths could serve as a mediator for the intervention effect of the MBSP on the work-related outcomes. More specifically, we tested (1) whether the intervention effect of MBSP on job satisfaction was mediated by the applicability of work-satisfaction-related character strengths at the workplace, (i.e., the applicability of curiosity, wisdom, bravery, perseverance, zest, love, social intelligence, and hope), and (2) whether the intervention effect of MBSP on task performance was mediated by the applicability of participants' top character strengths at work. We tested the applicability of the top 3 strengths, the top 7 strengths, and the top 4<sup>th</sup> to 6<sup>th</sup> strengths separately. The results of the four criteria for the mediation analysis were displayed in Table 5.

---

Insert Table 5 about here

---

As displayed in Table 5, we found significant mediation effect as expected: The intervention effect of MBSP on job satisfaction was mediated by the applicability of work-satisfaction-related character strengths at the workplace, and the intervention effect of MBSP on task performance was mediated by the applicability of participants' top 4<sup>th</sup> to 6<sup>th</sup> character strengths at work, but not the applicability of the top three strengths or the top seven strengths.

Criterion 1 – Participants in the MBSP condition showed significantly greater increases in job satisfaction ( $c = 0.69, p < .01$ ) and task performance ( $c = 0.47, p < .05$ ) than participants in the Wait-list Control group. Criterion 2 – Participants in the MBSP condition showed significantly greater increases in the applicability of the work-satisfaction-related character strengths ( $a = 0.46, p < .01$ ) and the applicability of the top 4<sup>th</sup> to 6<sup>th</sup> strengths ( $a = 0.62, p < .001$ ) than participants in the Wait-list Control group. Criterion 3 – The change in the applicability of the work-satisfaction-related character strengths predicted the change of job satisfaction over time 1 ( $b = 0.66, p < .001$ ) and the change of the applicability of the top 4<sup>th</sup> to 6<sup>th</sup> strengths predicted the change of task performance over time 1 ( $b = 0.49, p < .05$ ). Criterion 4 – The significant effect of the MBSP condition on job satisfaction was reduced after controlling for the change of the applicability of work-satisfaction-related character strengths ( $c' = 0.44, p > .05$ ) and the reduction ( $c - c'$ ) is significantly different from zero ( $t = 4.62, p < .001$ ); the significant effect of the MBSP condition on task performance was also reduced after controlling for the change of the applicability of the top 4<sup>th</sup> to 6<sup>th</sup> strengths ( $c' = 0.31, p > .05$ ) and the reduction ( $c - c'$ ) was significantly different from zero, as well ( $t = 2.43, p < .05$ ).

### Discussion

The study shows that the MBSR is effective for increasing well-being, reducing perceived stress, and increasing job satisfaction (the effect is sustained for up to 6 months), while the MBSP is effective for increasing well-being, job satisfaction (the effect is sustained for up to 6 months) and task performance (only effective right after the intervention). The study also demonstrated that the applicability of the work-satisfaction-related character strengths mediated the effect of the MBSP on job satisfaction, while the applicability of the top 4<sup>th</sup> to 6<sup>th</sup> strengths mediated the effect of MBSP on task performance.

When comparing the effect of the MBSP with the well-established MBSR at the workplace, the MBSR seems to function better when regarding employee well-being as reported in the previous studies (Aikens et al., 2014; Baccarani, et al., 2013; Hülshager et al., 2013), whereas the MBSP seems to be more effective when regarding employee performance. This is in accordance with the findings of a recent study (Hafenbrack & Vohs, 2018), in which they used five experiments and two meta-analyses, suggesting that mindfulness meditation might impair task motivation. They also argued that the performance does not decrease despite reducing motivation because mindfulness decreases concerns about stressors and increases the task focus (Hafenbrack & Vohs, 2018). Our findings suggest that, maybe due to the impairment of motivation, the mindfulness-only training did not work as well for task performance. However, fusing character strengths with the mindfulness training seems to buffer the impairment of participants' motivation and thus bolster their task performance.

The mediators of the intervention effects were chosen based on evidence from previous studies. On the one hand, it is straightforward to select the strengths that were robustly related to work satisfaction across studies as a mediator for the job satisfaction effect. On the other hand, it is not that easy to justify the choice of the signature strengths as a mediator for the task performance effect because there are still debates on how to operationalize signature strengths, in general. It could be any number from the top three to the top seven of the rank order listing of the 24 strengths (Peterson & Seligman, 2004). Yet, the number "four" seemed to be an inflection point for the positive effects at the workplace (Harzer & Ruch, 2012). Therefore, in our current study, we wanted to identify what works best despite the lack of a comprehensive theory, thus testing the top 3, the top 7 as well as the top 4<sup>th</sup> to top 6<sup>th</sup> strengths separately. The reason why the applicability of the top 4<sup>th</sup> to top 6<sup>th</sup> strengths is more important than the top 3 or top 7

strengths might be explained by the fact that the slightly lower ranking signature strengths left more room for change. This finding needs to be interpreted with caution as a replication is needed involving participants with a larger sample size.

A unique contribution of the current study is that we segmented the time variable into two different variables to represent the acute intervention phase and the follow-up phase. In doing so, we were able to capture the non-linear trend within the data, which is an improvement compared to the traditional strategies which conceptualize time with a single linear function or add additional variables such as treatment completion (Sergeant & Mongrain, 2014). The piecewise growth model was able to depict the intervention and follow-up effect in one simple model, illustrating whether there is an effect right after the intervention and whether the intervention effect lasts until the follow-ups.

### **Limitations and future research directions**

Several limitations of this study should be acknowledged. First, the sample size is comparatively small although it was balanced, with respect to the demographics, and outliers were checked before the analysis. Therefore, the problems associated with a small sample size might apply, including low statistical power and capitalization on chance. Some of the non-significant results might be explained by the small sample size and we could not conclude that the interventions did not work for those outcomes; it might just be due to the small sample size that we could not detect these effects. Consequently, the significant findings reported above might also not be conclusive and should be replicated in a larger sample. Second, the randomization of the participants was constrained due to participants' availability. We admit that this is a compromise between an ideal experimental design and reality. It is a lot to ask our participants to take part in the study, which lasts in total almost 10 months from the moment they

registered on our website until all the follow-up measures were completed. Still, we managed to attract and maintain a good number of participants from a variety of job branches. It is also understandable that as working adults they are not available every evening and we have to adjust our randomization accordingly. Thus, when interpreting our results, this should also be taken into consideration. However, we believe that the randomization works well because no significant baseline differences were detected across the three conditions, indicating no evidence of a systematic bias. Third, the supervisory-rated task performance was positively skewed, and this might have lowered the effectiveness of the intervention. Therefore, it will be of interest to use a more objective measure of performance in future studies. Fourth, several reminders were sent out if the participants forgot to fill out the questionnaires at the relevant time points, which meant that there were gaps of when participants were filling out the questionnaires (within 1-2 weeks). This could potentially have biased the results because too many rounds of reminders might have caused an aggravation towards the questionnaire. Fifth, since it is the very first study to look at the effectiveness of MBSP empirically at the workplace, we only included subjective reports. Measures capturing meaningful workplace behaviors such as sick leaves, turnover rates etc. as outcomes should have been included, as well. According to previous studies, our interventions (mindfulness or mindfulness combined with character strengths) are likely to have those effects on workplace related-behavior: Dane and Brummel (2013) found a negative relation between mindfulness and turnover intention (although it became non-significant when controlling for work engagement); in a study of 832 employees across 96 departments, strengths use support reduced absenteeism among workers with a high workload and high emotional demands (van Woerkom, Bakker, & Nishii, 2016). Future studies should consider including those behavior measures.

Despite the limitations, there are exciting future directions for this research. The current study compared only three conditions: a “mindfulness only”-training, a combined training of mindfulness and character strengths, and a Wait-List Control. Future studies could add a new condition, namely a “character strength only”-training group to further distinguish between the effects. Is the effect due to mindfulness, or character strengths, or a combination of the two, and which effect is stronger? Future studies could also use a more objective measure of performance or look at the other aspects of performance at work since the measures we used were rather focused on the task itself and there was little room for it to be changed. Moreover, other mediators could also be investigated, such as, we could investigate whether the two interventions also predict workplace atmosphere, work relationship etc. and thus have an impact on the outcomes. As outcomes, the current research focused rather on the general well-being, we could well imagine that the future studies could expand the interest in other aspects of well-being, such as the PERMA model.

### **Implications for organizations**

These findings have several important practical implications for organizations. Both of the interventions showed effects on job satisfaction. A number of recent workplace studies have shown that by focusing on increasing job satisfaction amongst the team, the organization can realize a range of benefits, including lower employee turnover (e.g., Tooksoon, 2011), higher company productivity (e.g., Böckerman & Ilmakunnas, 2012) and more organizational citizenship behavior (e.g., Koys, 2001), which could lead to a more productive workforce and higher rates of business success. The task performance only increased when character strengths have been fused into the mindfulness training. These findings suggest that integrating character strengths allows organizations to buffer the impairment on motivation that mindfulness alone

might cause. Thus, if improving performance is the ultimate goal, fusing character strengths on top of the mindfulness training might be a good forethought.

Our results also suggest that some effects of the mindfulness interventions do not vanish even when regarding longer time periods (up to six months after the intervention). We believe that the reason for the effects to last until six months after the interventions is mainly explained by our participants continuing to practice their exercises even after the interventions ended. Maybe asking them to fill out the questionnaires served as a reminder for them to continue practicing the exercises at home. We also believe that a considerable number of participants were more willing to practice on their own because we provided them with a website and audio tapes, and all the resources were easily available to them. These results have implications for the organizations on how they could implement mindfulness training. The organizations might consider facilitating their employees' training experiences with training websites and audio tapes, as well as sending out newsletters regularly (but not too often). Although the acute training period is essential, the continued engagement might be an important factor in explaining the continued effect of an intervention.

## **Conclusion**

The present research suggests that mindfulness interventions are useful resources for facilitating employees' well-being and performance. Mindfulness alone seems to function better when regarding psychological well-being at work, while the combination of character strengths and mindfulness seems to influence the participants on a motivational level and thus bolsters task performance.

## References

- Aikens, K., Astin, J., Pelletier, K., Levanovich, K., Baase, C., Park, Y., & Bodnar, C. (2014). Mindfulness Goes to Work: Impact of an Online Workplace Intervention. *Journal of Occupational and Environmental Medicine, 56*, 721-731.  
<http://dx.doi.org/10.1097/JOM.0000000000000209>
- Andrews, F. M., & Withey, S. B. (1976). *Social indicators of well-being*. New York, NY: Plenum Press.
- Baccarani, C., Mascherpa, V., & Minozzo, M. (2013). Zen and well-being at the workplace. *The TQM Journal, 25*, 606-624. <http://dx.doi.org/10.1108/TQM-07-2013-0077>
- Barnard, J. & Rubin, D.B. (1999). Small sample degrees of freedom with multiple imputation. *Biometrika, 86*, 948-955. <https://doi.org/10.1093/biomet/86.4.948>
- Bates, D., Mächler, M., Bolker, B., Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software, 67*(1), 1–48. <http://dx.doi.org/10.18637/jss.v067.i01>
- Böckerman, P., & Ilmakunnas, P. (2012). The job satisfaction-productivity nexus: A study using matched survey and register data. *ILR Review, 65*, 244-262.  
<https://doi.org/10.1177/001979391206500203>
- Büssing, A. (2011). Perceived stress scale -10 (PSS-10) [Fragen zum Thema Stress]. Unpublished instrument. Retrieved from  
[http://www.psy.cmu.edu/%7Escohen/German\\_PSS\\_10.doc](http://www.psy.cmu.edu/%7Escohen/German_PSS_10.doc)
- Cohen, S., & Williamson, G. (1988). Perceived stress in a probability sample of the United States. In S. Spacapan & S. Oskamp (Eds). *The social psychology of health: Claremont Symposium on applied social psychology* (pp. 31-67). Thousand Oaks, CA: Sage Publications.

- Dane, E., & Brummel, B. J. (2014). Examining workplace mindfulness and its relations to job performance and turnover intention. *Human Relations, 67*, 105-128.  
<https://doi.org/10.1177/0018726713487753>
- Diefendorff, J. M., Brown, D. J., Kamin, A. M., & Lord, R. G. (2002). Examining the roles of job involvement and work centrality in predicting organizational citizenship behaviors and job performance. *Journal of Organizational Behavior, 23*, 93-108.  
<http://dx.doi.org/10.1002/job.123>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191. <http://dx.doi.org/10.3758/BF03193146>
- Freedman, L. S., & Schatzkin, A. (1992). Sample size for studying intermediate endpoints within intervention trials or observational studies. *American Journal of Epidemiology, 136*, 1148-1159. <http://dx.doi.org/10.1093/oxfordjournals.aje.a116581>
- Gander, F., Proyer, R. T., Ruch, W., & Wyss, T. (2012). The good character at work: An initial study on the contribution of character strengths in identifying healthy and unhealthy work-related behavior and experience patterns. *International Archives of Occupational and Environmental Health, 85*, 895-904. <http://dx.doi.org/10.1007/s00420-012-0736-x>
- Glomb, T. M., Duffy, M. K., Bono, J. E., & Yang, T. (2011). Mindfulness at work. In J. Aparna, H. Liao, & J. J. Martocchio (Eds.), *Research in personnel and human resources management* (Vol. 30, pp. 115 - 157). Bradford, England: Emerald Group Publishing Limited.
- Good, D. J., Lyddy, C. J., Glomb, T. M., Bono, J. E., Brown, K. W., Duffy, M. K., . . . Lazar, S. W. (2016). Contemplating mindfulness at work: An integrative review. *Journal of*

- Management*, 42, 114–142. <http://dx.doi.org/10.1177/0149206315617003>
- Hafenbrack, A. C., & Vohs, K. D. (2018). Mindfulness meditation impairs task motivation but not performance. *Organizational Behavior and Human Decision Processes*, 147. Advance online publication. <http://dx.doi.org/doi/10.1016/j.obhdp.2018.05.001>
- Harzer, C., & Ruch, W. (2012). When the job is a calling: The role of applying one's signature strengths at work. *Journal of Positive Psychology*, 7, 362-371. <http://dx.doi.org/10.1080/17439760.2012.702784>
- Harzer, C., & Ruch, W. (2013). The application of signature character strengths and positive experiences at work. *Journal of Happiness Studies*, 14, 965-983. <http://dx.doi.org/10.1007/s10902-012-9364-0>
- Harzer, C., & Ruch, W. (2014). The role of character strengths for task performance, job dedication, interpersonal facilitation, and organizational support. *Human Performance*, 27, 183-205. <http://dx.doi.org/10.1080/08959285.2014.913592>
- Harzer, C., & Ruch, W. (2016). Your strengths are calling: Preliminary results of a web-based strengths intervention to increase calling. *Journal of Happiness Studies*, 17, 2237-2256. [10.1007/s10902-015-9692-y](http://dx.doi.org/10.1007/s10902-015-9692-y)
- Hodges, T. D., & Asplund, J. (2010). Strengths development in the workplace. In P. A. Linley, S. Harrington, & N. Garcea (Eds.), *Oxford handbook of positive psychology at work* (pp. 213–220). New York, NY: Oxford University Press.
- Honaker, J., King, G., Blackwell, M. (2011). Amelia II: A program for missing data. *Journal of Statistical Software*, 45(7), 1–47. <http://dx.doi.org/10.18637/jss.v045.i07>
- Hülshager, U. R., Alberts, H. J., Feinholdt, A., & Lang, J. W. (2013). Benefits of mindfulness at work: The role of mindfulness in emotion regulation, emotional exhaustion, and job

- satisfaction. *Journal of Applied Psychology*, 98, 310- 325.  
<http://dx.doi.org/10.1037/a0031313>.
- Ivtzan, I., Niemiec, R. M., & Briscoe, C. (2016). A study investigating the effects of Mindfulness-Based Strengths Practice (MBSP) on wellbeing. *International Journal of Wellbeing*, 6. <http://dx.doi.org/10.5502/ijw.v6i2.557>
- Jamieson, S. D., & Tuckey, M. R. (2017). Mindfulness interventions in the workplace: A critique of the current state of the literature. *Journal of occupational health psychology*, 22, 180-193. <http://dx.doi.org/10.1037/ocp0000048>
- Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry*, 4, 33-47.  
[http://dx.doi.org/10.1016/0163-8343\(82\)90026-3](http://dx.doi.org/10.1016/0163-8343(82)90026-3)
- Kabat-Zinn, J. (1990). *Full catastrophe living*. New York, NY: Dell.
- Kabat-Zinn, J. (1994). *Wherever you go, there you are: Mindfulness meditation in everyday life*. New York, NY: Hyperion.
- Klatt, M. D., Buckworth, J., & Malarkey, W. B. (2009). Effects of low-dose mindfulness-based stress reduction (MBSR-ld) on working adults. *Health Education & Behavior*, 36, 601–614. <http://dx.doi.org/10.1177/1090198108317627>
- Koys, D. J. (2001). The effects of employee satisfaction, organizational citizenship behavior, and turnover on organizational effectiveness: A unit-level, longitudinal study. *Personnel Psychology*, 54, 101-114. <https://doi.org/10.1111/j.1744-6570.2001.tb00087.x>
- Niemiec, R. M. (2013). *Mindfulness and character strengths: A practical guide to flourishing*. Boston, MA: Hogrefe Publishing.

- Niemiec, R. M. (2014). Mindfulness-based strengths practice (MBSP) for physicians: Integrating core areas to promote positive health. In M. W. Snyder (Ed.), *Positive Health: Flourishing lives, Well-being in doctors* (pp. 247–263). Bloomington, IN: Balboa Press.
- Niemiec, R. M., & Lissing, J. (2016). Mindfulness-based strengths practice (MBSP) for enhancing well-being, managing problems, and boosting positive relationships. In I. Ivztan, T. Lomas (Eds.), *Mindfulness in positive psychology: The science of meditation and wellbeing* (pp. 15-36). London, UK: Routledge
- Pang, D., & Ruch, W. (2018). *The mutual support model of mindfulness meditations and character strengths*. Manuscript under review.
- Park, N., Peterson, C., & Seligman, M. E. P. (2004). Strengths of character and well-being. *Journal of Social and Clinical Psychology, 23*, 603-619.  
<http://dx.doi.org/10.1521/jscp.23.5.603.50748>
- Peterson, C., & Seligman, M. E. P. (2004). *Character strengths and virtues: A handbook and classification*. New York, NY: Oxford University Press.
- Peterson, C., Stephens, J. P., Park, N., Lee, F., & Seligman, M. E. P. (2010). Strengths of character and work. In P. A. Linley, S. Harrington, & N. Garcea (Eds.), *Oxford handbook of positive psychology and work* (pp. 221–234). New York, NY: Oxford University Press.
- Reb, J., Narayanan, J., & Chaturvedi, S. (2014). Leading mindfully: two studies on the influence of supervisor trait mindfulness on employee well-being and performance. *Mindfulness, 5*, 36–45. <http://dx.doi.org/10.1007/s12671-012-0144-z>
- Rentsch, J. R., & Steel, R. P. (1992). Construct and concurrent validation of the Andrews and Withey job satisfaction questionnaire. *Educational and Psychological Measurement, 52*, 357-367. <http://dx.doi.org/10.1177/0013164492052002011>

- Ruch, W., Huber, A., Beermann, U., & Proyer, R. T. (2007). Character strengths as predictors of the “good life” in Austria, Germany and Switzerland. In Romanian Academy, “George Barit” Institute of History, Department of Social Research (Ed.), *Studies and researches in social sciences* (Vol. 16, pp. 123-131). Cluj-Napoca, Romania: Argonaut Press.
- Ruch, W., Weber, M., Park, N. & Peterson, C. (2014). Character strengths in children and adolescents. *European Journal of Psychological Assessment, 30*, 57-64.  
<http://dx.doi.org/10.1027/1015-5759/a000169>.
- Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7*, 147-177. <http://dx.doi.org/10.1037/1082-989X.7.2.147>
- Sergeant, S., & Mongrain, M. (2014). An online optimism intervention reduces depression in pessimistic individuals. *Journal of Consulting and Clinical Psychology, 82*, 263-274.  
<http://dx.doi.org/10.1037/a0035536>
- Shao, R., & Skarlicki, D. P. (2009). The role of mindfulness in predicting individual performance. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement, 41*, 195-201. <http://dx.doi.org/10.1037/a0015166>
- Stice, E., Presnell, K., Gau, J., & Shaw, H. (2007). Testing mediators of intervention effects in randomized controlled trials: An evaluation of two eating disorder prevention programs. *Journal of Consulting and Clinical Psychology, 75*, 20-32.  
<http://dx.doi.org/10.1037/0022-006X.75.1.20>
- Tooksoon, H. M. P. (2011). Conceptual framework on the relationship between human resource management practices, job satisfaction, and turnover. *Journal of Economics and Behavioral Studies, 2*, 41-49.
- Van Buuren, S., & Groothuis-Oudshoorn, K. (2011). Mice: Multivariate imputation by chained

equations in R. *Journal of Statistical Software*, 45(3), 1-67.

<http://dx.doi.org/10.18637/jss.v045.i03>

Van Woerkom, M., Bakker, A. B., & Nishii, L. H. (2016). Accumulative job demands and support for strength use: Fine-tuning the job demands-resources model using conservation of resources theory. *Journal of Applied Psychology*, 101, 141-150.

<http://dx.doi.org/10.1037/apl0000033>

Williams, L. J., & Anderson, S. E. (1991). Job satisfaction and organizational commitment as predictors of organizational citizenship and in-role behaviors. *Journal of Management*, 17, 601-617. <http://dx.doi.org/10.1177/014920639101700305>

Wolever, R. Q., Bobinet, K. J., McCabe, K., Mackenzie, E. R., Fekete, E., Kusnick, C. A., & Baime, M. (2012). Effective and viable mind-body stress reduction in the workplace: A randomized controlled trial. *Journal of Occupational Health Psychology*, 17, 246–258.

<http://dx.doi.org/10.1037/a0027278>

World Health Organization. (1990). *International statistical classification of diseases and related health problems* (10th rev. ed.). Geneva, Switzerland: World Health Organization.

Wrzesniewski, A., McCauley, C. R., Rozin, P., & Schwartz, B. (1997). Jobs, careers, and callings: People's relations to their work. *Journal of Research in Personality*, 31, 21-33.

<http://dx.doi.org/10.1006/jrpe.1997.216>

Table 1

*Four Criteria for the Estimation of the Mediation Effect*

Criteria	Estimated by	Description
<b>Criterion 1:</b> The effect of the intervention condition on the outcome variables over Time1 (Figure 3, path c)	$Y_{ij} = [\gamma_{00} + \gamma_{01}Condition_j + \gamma_{10}Time1_{ij} + \gamma_{11}Condition_j * Time1_{ij}] + [U_{1j} * Time1_{ij} + U_{0j} + R_{ij}]$	$Y_{ij}$ is the value of the outcome variables for person j at time i. The effect of condition on rate of change of the outcome variables is $\gamma_{11}$ (path c).
<b>Criterion 2:</b> The effect of the intervention condition on the mediator over Time1 (Figure 3, path a)	$Mediator_{ij} = [\gamma_{00} + \gamma_{01}Condition_j + \gamma_{10}Time1_{ij} + \gamma_{11}Condition_j * Time1_{ij}] + [U_{1j} * Time1_{ij} + U_{0j} + R_{ij}]$	$Mediator_{ij}$ is the value of the mediator for person j at time i. The effect of condition on rate of change of the mediator is $\gamma_{11}$ (path a).
<b>Criterion 3:</b> A relation in the intervention condition between change in the mediator and change in the outcome over Time1 (Figure 3, path b)	$Y_{ij} = [\gamma_{00} + \gamma_{01}\Delta Mediator_j] + [R_{ij}]$	$Y_{ij}$ is the value of the outcome variables for person j at time i. $\Delta Mediator_j$ is modelled as level-2 variable. The effect of change in the mediator on the change in the outcome is $\gamma_{01}$ (path b).
<b>Criterion 4:</b> The effect of the intervention condition on the outcome variables over Time1 controlling for the change in the mediator (Figure 3, path c')	$Y_{ij} = [\gamma_{00} + \gamma_{10}Time1_{ij} + \gamma_{01}Condition_j + \gamma_{11}Condition_j * Time1_{ij} + \gamma_{02}\Delta Mediator_j] + [U_{1j} * Time1_{ij} + U_{0j} + R_{ij}]$	$Y_{ij}$ is the value of the outcome variables for person j at time i, controlling for the change in the mediator. The effect of condition on rate of change of the outcome variables controlling for the change in the mediator is $\gamma_{11}$ (path c'). The standard error formula from Freedman & Schatzkin (1992) was used to generate a t-test for determining whether c-c' was significantly different from zero.

Table 2

*Completion of Homework within the two Intervention Conditions*

	During the intervention				After intervention till 1 month later				1 months till 3 months after intervention				3 months till 6 months after intervention			
	MBSP		MBSR		MBSP		MBSR		MBSP		MBSR		MBSP		MBSR	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Never	0	0.0	0	0.0	3	14.3	1	4.8	3	14.3	3	14.3	1	4.8	2	9.5
< once a week	0	0.0	0	0.0	2	9.5	4	19.0	4	19.0	5	23.8	5	23.8	6	28.6
once a week	5	23.8	2	9.5	4	19.0	3	14.3	1	4.8	2	9.5	5	23.8	3	14.3
2-3 times a week	5	23.8	5	23.8	6	28.6	7	33.3	6	28.6	6	28.6	3	14.3	6	28.6
4-5 times a week	6	28.6	8	38.1	2	9.5	3	14.3	4	19.0	0	0.0	1	4.8	1	4.8
> 5 times a week	2	9.5	3	14.3	1	4.8	0	0.0	0	0.0	1	4.8	1	4.8	0	0.0

*Note.* MBSP = Mindfulness Based Strengths Practice; MBSR = Mindfulness Based Stress Reduction; WL = Wait-list Control.

Table 3

*Descriptive Data of the three Conditions at the Five Time Periods for the Outcome Variables*

	Pre			Post			1 M			3 M			6 M		
	<i>n</i>	<i>M</i>	<i>SD</i>												
<b>Perceived Stress</b>															
MBSP	21	2.04	0.61	18	1.96	0.62	18	1.78	0.74	17	1.80	0.71	16	1.78	0.89
MBSR	21	2.00	0.74	18	1.43	0.45	18	1.56	0.51	17	1.47	0.67	18	1.47	0.40
WL	21	2.13	0.68	16	2.31	0.78	16	2.12	0.78	16	2.06	0.71	16	2.09	0.75
<b>Well-being</b>															
MBSP	21	13.05	5.08	18	14.67	6.23	18	14.28	5.77	17	15.88	6.09	16	15.50	5.80
MBSR	21	13.05	4.97	18	16.00	3.83	18	15.06	4.14	17	16.53	6.15	18	16.89	2.32
WL	21	13.05	6.03	16	11.25	4.99	16	12.75	5.07	16	12.75	6.29	16	13.00	4.99
<b>Job Satisfaction</b>															
MBSP	21	4.20	0.83	18	4.38	0.95	18	4.40	0.85	17	4.34	0.97	16	4.34	0.84
MBSR	21	3.88	1.09	18	4.26	1.00	18	4.26	1.01	17	4.14	1.11	18	4.13	1.03
WL	21	4.24	0.99	16	3.98	0.68	16	4.14	0.70	16	3.95	0.79	16	3.86	0.79
<b>Task Performance</b>															
MBSP	20	5.77	0.66	17	6.18	0.47	17	6.05	0.69	15	5.77	0.91	16	5.99	0.62
MBSR	21	5.92	0.81	18	5.90	0.90	18	5.76	0.81	18	6.01	0.68	16	6.09	0.68
WL	19	5.91	0.71	16	5.93	0.63	16	5.91	0.54	16	6.11	0.37	16	6.15	0.44

*Note.* MBSP = Mindfulness Based Strengths Practice; MBSR = Mindfulness Based Stress Reduction; WL = Wait-list Control. M = mean. SD = standard deviation. Pre = Right before the intervention; Post = 1 week after the intervention; 1 M = one month after the intervention; 3 M = three months after the intervention; 6 M = six months after the intervention.

Table 4

*Linear Mixed-Effect Model Tests of Outcome Variables by Time and Condition Using Completers' and ITT Dataset*

Measure	Model effect	Completers' Dataset				ITT Dataset				
		$\beta$	<i>df</i>	<i>t</i>	<i>p</i>	$\beta$	<i>df</i>	<i>t</i>	<i>p</i>	95% CI
Perceived Stress	Time1	0.08	86.80	1.10	.273	0.06	124.00	0.77	.444	-0.10, 0.22
	Time2	-0.03	32.98	-1.28	.211	-0.03	100.23	-1.07	.288	-0.08, 0.02
	Time1* MBSP	-0.15	87.72	-1.57	.121	-0.12	138.51	-1.06	.291	-0.34, 0.10
	Time2* MBSP	0.01	33.72	0.18	.855	0.01	121.57	0.18	.855	-0.06, 0.07
	Time1* MBSR	-0.33**	40.65	-2.85	.007	-0.30*	171.75	-2.61	.010	-0.53, -0.07
	Time2* MBSR	0.03	87.13	1.15	.252	0.02	130.85	0.80	.428	-0.04, 0.08
Well-being	Time1	-0.95	33.96	-1.39	.173	-0.71	152.17	-0.98	.328	-2.15, 0.72
	Time2	0.22	31.25	1.20	.240	0.21	119.27	1.07	.286	-0.18, 0.60
	Time1* MBSP	1.64†	33.63	1.74	.091	1.42	165.32	1.42	.157	-0.56, 3.40
	Time2* MBSP	-0.09	32.09	-0.34	.734	-0.07	133.44	-0.26	.792	-0.61, 0.46
	Time1* MBSR	2.02*	36.99	2.13	.040	1.91†	166.92	1.87	.063	-0.10, 3.93
	Time2* MBSR	-0.06	81.95	-0.25	.804	-0.08	115.67	-0.30	.765	-0.58, 0.43
Job Satisfaction	Time1	-0.15†	55.83	-1.91	.061	-0.10	158.13	-1.05	.293	-0.29, 0.09
	Time2	-0.01	33.37	-0.53	.597	-0.02	103.15	-0.67	.506	-0.08, 0.04
	Time1* MBSP	0.28*	54.92	2.53	.014	0.20	167.46	1.48	.142	-0.07, 0.47
	Time2* MBSP	-0.01	33.78	-0.16	.875	0.01	101.49	0.23	.818	-0.07, 0.09
	Time1* MBSR	0.34*	35.35	2.61	.013	0.29†	154.78	1.88	.062	-0.01, 0.59
	Time2* MBSR	0.01	54.15	0.23	.823	0.00	93.16	0.02	.984	-0.07, 0.08
Task Performance	Time1	0.00	39.85	-0.05	.961	0.00	158.31	-0.02	.984	-0.16, 0.16
	Time2	0.03*	90.33	2.00	.049	0.03	115.86	1.26	.209	-0.01, 0.07
	Time1* MBSP	0.20†	39.85	1.79	.081	0.17	148.71	1.43	.154	-0.06, 0.39
	Time2* MBSP	-0.06*	90.41	-2.57	.012	-0.05†	105.88	-1.78	.078	-0.11, 0.01
	Time1* MBSR	-0.04	35.07	-0.42	.678	-0.03	126.33	-0.30	.764	-0.23, 0.17
	Time2* MBSR	-0.01	49.45	-0.64	.523	0.00	108.21	-0.04	.966	-0.06, 0.06

*Note.* MBSP = Mindfulness Based Strengths Practice; MBSR = Mindfulness Based Stress Reduction; WL = Wait-list Control. ITT = Intent-to-treat. *M* = mean. *SD* = standard deviation.  $\beta$  = Beta coefficient; *df* = degree of freedom, *t* = T-ratio; 95% CI = 95% confidence interval. Negative coefficients indicate that participants in the intervention condition had greater decrease over the specific time compared to Wait-list Control participants. Positive coefficients indicate that participants in the intervention condition had greater gains over the specific time compared to Wait-list Control participants. Separate analyses were conducted for MBSP and MBSR. Due to space limit, we only included the intervention effects for both models, and depicted the time effects for MBSP, as they did not vary much across the two models. †  $p < .01$ , \*  $p < .05$ , \*\*  $p < .01$ .

Table 5

*Test of Hypothesized Mediators of the Intervention Effects*

Measures	Condition	Mediator	a (criterion 2)		b (criterion 3)		c (criterion 1)		c' (criterion 4a)		c - c' (criterion 4b)
			$\beta$	T-ratio	$\beta$	T-ratio	$\beta$	T-ratio	$\beta$	T-ratio	T-ratio
JSQ	MBSP	$\Delta$ AWCS	0.46	3.49**	0.66	2.45***	0.69	3.06**	0.44	1.58	4.62***
TPQ	MBSP	$\Delta$ ASS7	0.63	5.12***	0.48	0.04*	0.47	2.23*	0.40	1.38	0.96
TPQ	MBSP	$\Delta$ ASS3	0.71	4.23***	0.30	1.54	0.47	2.23*	0.51	1.83	-0.57
TPQ	MBSP	$\Delta$ ASS46	0.62	3.84***	0.49	2.36*	0.47	2.23*	0.31	1.18	2.43*

*Note.* JSQ = Job Satisfaction Questionnaire; TPQ = Task Performance Questionnaire; MBSP = Mindfulness Based Strengths Practice; MBSR = Mindfulness Based Stress Reduction; AWCS = Applicability work-satisfaction-related character strengths; ASS7 = Applicability of the top 7 strengths of the participant; ASS3 = Applicability of the top 3 strengths of the participant; ASS46 = Applicability of the top 4<sup>th</sup> to 6<sup>th</sup> strengths of the participant.  $\beta$  = Beta coefficient;  $\Delta$  = change.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\* $p < .001$ .

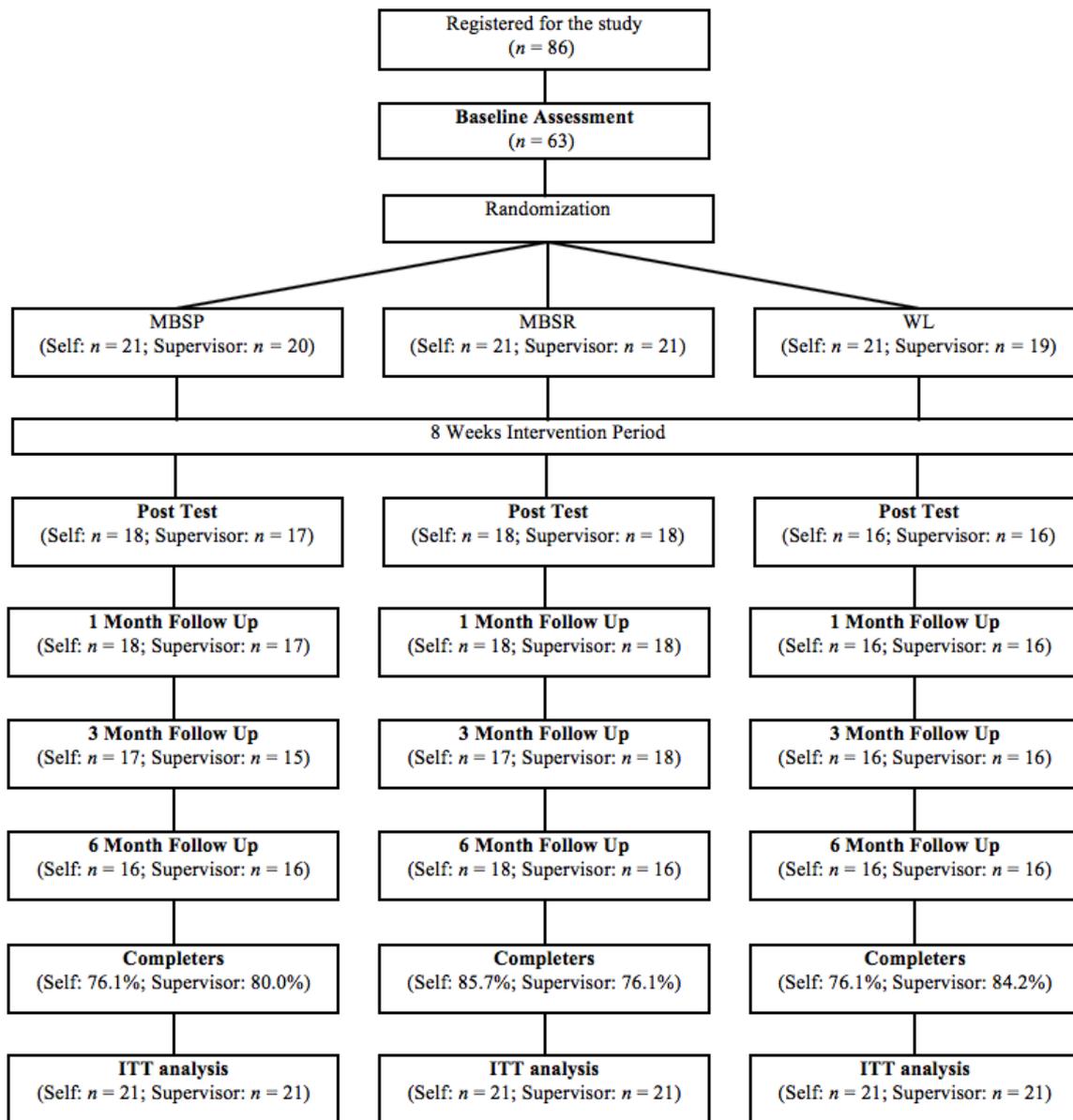


Figure 1. Participants flow through the study. MBSP = Mindfulness Based Strengths Practice;

MBSR = Mindfulness Based Stress Reduction; WL = Wait-list Control. ITT = Intent-to-treat.

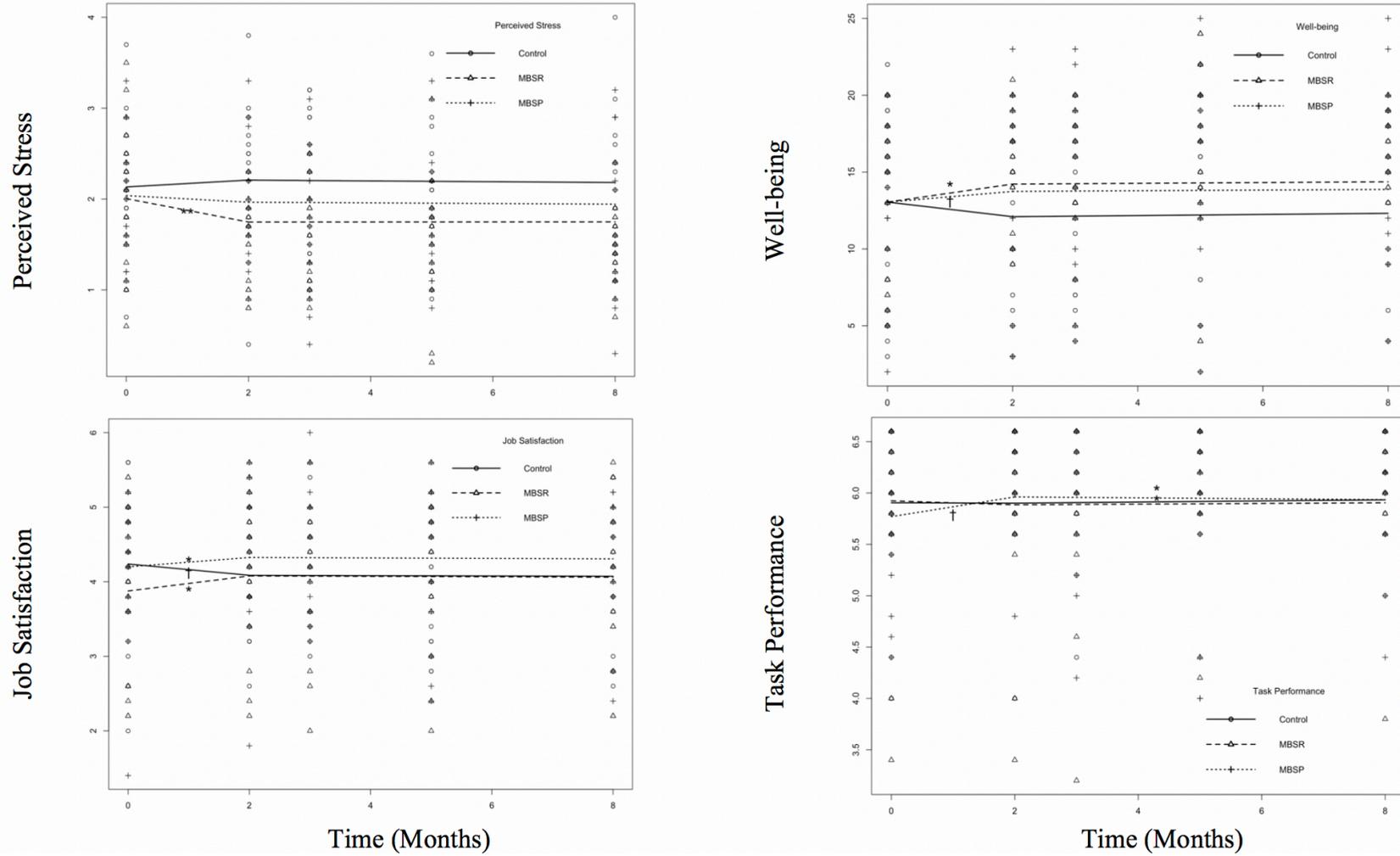


Figure 2. Outcome variables over Time by Condition (pretest [Month 0], posttest [Month 2]) and follow-up tests [Month 3, 5, and 8]. MBSP = Mindfulness Based Strengths Practice; MBSR = Mindfulness Based Stress Reduction; WL = Wait-list Control. † $p < .01$ , \* $p < .05$ , \*\* $p < .01$ .

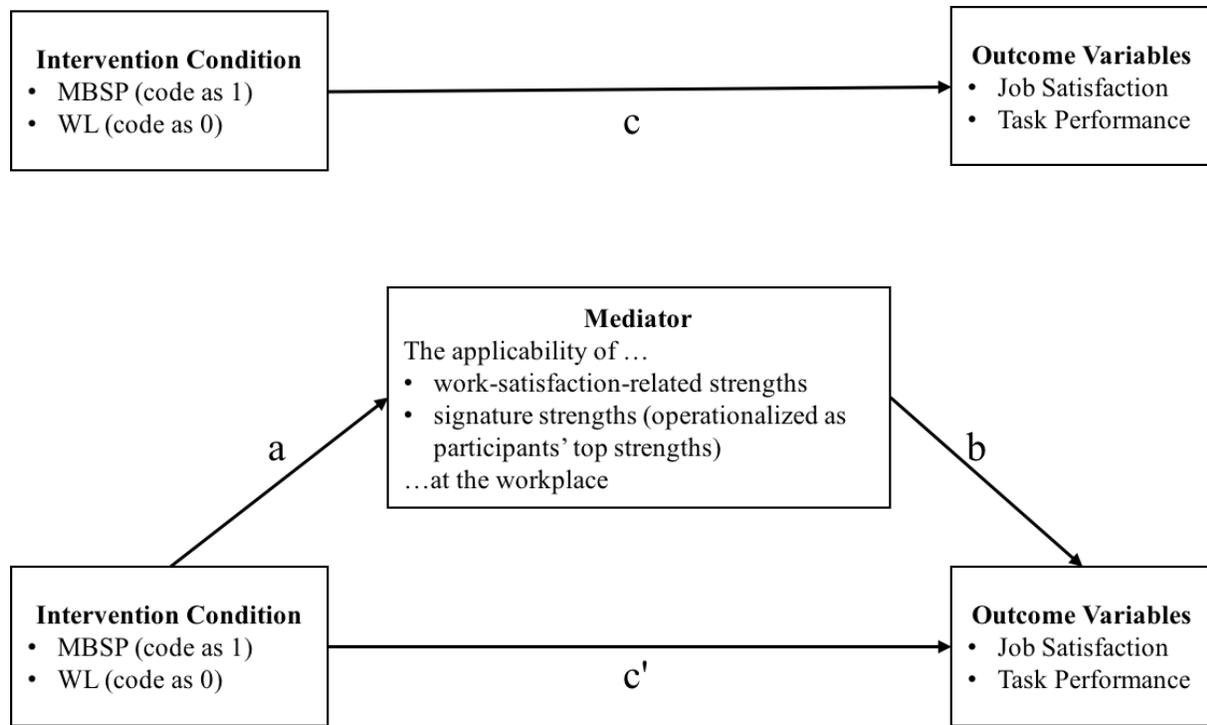


Figure 3. The graphical representation of the hypothesized mediators of the interventions.

MBSP = Mindfulness Based Strengths Practice; MBSR = Mindfulness Based Stress Reduction;

WL = Wait-list Control.

Supplementary Material

Table S1. *The Correlation Matrix (including their Mean and Standard Deviation) among all Outcome Variables at Pre-Test.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
2	.48***																												
3	.18	.29*																											
4	.37***	.65***	.43***																										
5	.13	.34**	.32*	.41***																									
6	.22	.25*	.21	.43***	.15																								
7	.38***	.39***	.14	.48***	.13	.57***																							
8	.22	.03	.25*	.09	.32*	.03	.22																						
9	.26*	.27*	.37***	.30*	.10	.08	.24	.32*																					
10	.20	.18	.09	.12	.11	.23	.38***	.09	.46***																				
11	.07	.08	.04	.17	.08	.16	.04	.26*	.41***	.20																			
12	.18	.24	.35***	.31*	.45***	.17	.17	.38***	.49***	.46***	.44***																		
13	.24	.16	.34**	.23	.09	.10	.27*	.24	.36***	.28*	.29*	.25																	
14	.20	.02	.04	-.06	-.12	-.06	.07	.27*	.42***	.14	.46***	.21	.39***																
15	.15	.42***	.29*	.49***	.52***	.30*	.22	.11	.28*	.14	.15	.46***	.20	.15															
16	.10	.02	.01	.04	-.05	.17	.18	.25*	.33**	.36***	.37***	.38***	.20	.24	.11														
17	-.04	-.01	.09	.11	.18	.13	.26*	.37***	.39***	.14	.47***	.40***	.39***	.43***	.24	.50***													
18	.04	.06	.36***	.29*	.20	.21	.12	.33**	.38***	.04	.36***	.18	.33**	.29*	.26*	.26*	.40***												
19	.13	.08	.30*	.27*	.19	.27*	.22	.28*	.15	.10	.29*	.16	.19	.16	.20	.24	.15	.28*											
20	.29*	.15	.04	.22	.18	.22	.27*	.18	.43***	.38***	.42***	.49***	.37***	.26*	.43***	.56***	.56***	.33**	.13										
21	.26*	.32*	-.03	.27*	.08	.06	.29*	.15	.47***	.36***	.36***	.30*	.26*	.36***	.30*	.43***	.41***	.33**	.04	.64***									
22	.31*	.45***	.15	.46***	.23	.07	.19	.14	.56***	.27*	.23	.24	.29*	.29*	.35***	.26*	.27*	.34**	.13	.37***	.58***								
23	.32**	.26*	.16	.32**	.20	.03	.21	.25*	.54***	.33**	.36***	.38***	.27*	.32*	.35**	.39***	.33**	.30*	.20	.42***	.45***	.58***							
24	.11	.11	.00	.12	.01	.11	.28*	-.06	.24	.41***	.23	.23	.14	.06	.20	.11	-.01	.16	.23	.26*	.31*	.18	.11						
25	.05	-.01	-.34**	.06	-.09	.13	.16	-.19	-.13	.07	.11	-.13	-.22	-.19	-.07	.14	.02	-.08	-.18	.24	.13	.00	.10	.09					
26	.17	.09	.27*	.01	.14	.01	.04	.36***	.38**	.21	.04	.24	.20	.35**	.29*	.02	.05	.12	.22	-.05	.08	.21	.16	.24	-.61***				
27	.18	.23	.21	.06	.06	.06	.17	.17	.14	.16	-.13	.10	.38**	.21	.21	.09	.10	.22	.04	.18	.18	.19	.18	-.01	-.39***	.30*			
28	-.11	.01	.07	-.01	.00	.06	-.03	.09	.09	.08	.03	.21	.07	-.04	.19	.18	.11	.12	.06	.13	-.02	.00	.20	.30*	-.24	-.03	.27*	--	
<b>M</b>	3.41	3.50	3.54	3.76	3.63	2.29	3.30	4.05	3.70	3.07	3.77	3.73	3.72	3.75	3.65	3.34	3.54	3.60	3.39	3.37	3.21	3.54	3.48	1.86	2.06	13.05	4.10	5.87	
<b>SD</b>	0.62	0.76	0.67	0.70	0.73	0.94	0.75	0.69	0.62	0.95	0.57	0.67	0.65	0.60	0.89	0.76	0.71	0.69	0.65	0.96	0.82	0.71	0.75	0.85	0.67	5.30	0.97	0.72	

*Note.* 1 = applicability of creativity; 2 = applicability of curiosity; 3 = applicability of open-mindedness; 4 = applicability of love of learning; 5 = applicability of perspective; 6 = applicability of bravery; 7 = applicability of perseverance; 8 = applicability of honesty; 9 = applicability of zest; 10 = applicability of love; 11 = applicability of kindness; 12 = applicability of social intelligence; 13 = applicability of teamwork; 14 = applicability of fairness; 15 = applicability of leadership; 16 = applicability of forgiveness; 17 = applicability of modesty; 18 = applicability of prudence; 19 = applicability of self-regulation; 20 = applicability of appreciation of beauty; 21 = applicability of gratitude; 22 = applicability of hope; 23 = applicability of humor; 24 = applicability of spirituality; 25 = perceived stress (PSS-10); 26 = well-being (WHO5); 27 = job satisfaction (JSQ); 28 = task performance (TPQ).

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ , two-tailed.