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Effects of a Mindfulness-Based Intervention for Police Officers

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Abstract

Objectives Although the effectiveness of mindfulness-based intervention for various populations is well-documented, research examining these effects for police officers is limited. This study aimed to increase knowledge on (1) the effects of a mindfulness-based intervention in police officers and (2) potential mechanisms of change by relating changes in facets of mindful awareness to changes in stress.

Methods In the present study, we investigated the effects of a 6-session group-based mindfulness-based intervention in police officers ($n = 82$) on self-report measures, using a quasi-experimental design consisting of a within-group 6-week baseline period; pre-test, 6-week intervention; and post-test, 6-week follow-up. Multilevel analyses were used to test intervention effects. Using structural equation modeling, we analyzed whether changes in facets of mindfulness were associated with changes in various types of stress.

Results After the intervention, police officers significantly and substantially improved on stress (primary outcome), facets of mindful awareness (explanatory variables), and related secondary outcomes including somatic complaints, sleep disturbances, positive affect, happiness, and work ability, while in baseline period, outcome measures did not change. Effects remained significant or improved further during the follow-up period. Further, we found that increases in particularly the facets of mindful awareness of acting with awareness and non-judging were associated with reductions in stress.

Conclusions Mindfulness-based intervention appears beneficial for police officers. Further, increases in both attention and acceptance skills such as acting with awareness and non-judging seem to be most important in explaining reductions of stress in police officers.

Keywords Occupational stress · Police · Law enforcement · Mindfulness · Intervention effects

Although there is some debate about the statement that policing is uniquely stressful, there is agreement that police work can be traumatic and stressful (Abdollahi 2002). Apart from general work-related stress that originates from sources such as time pressure, organizational climate, or job security (see Cooper and Marshall 1976, for an overview of

sources of stress), occupational stressors have been documented. During their work, police officers are exposed to traumatic events; for example, they may have to deal with victims from car accidents or victims from crime. Further, policing can be life-threatening as law enforcers may be confronted with violence in their work. It has been estimated that during a career, a law enforcement officer is exposed to on average over 900 highly stressful and potentially traumatic events (Papazoglou et al. 2018). Dealing with family disputes, battered children, killing someone in the line of duty, and experiencing a fellow officer being killed are among the most frequently reported stressors by officers (e.g., Violanti et al. 2016).

The work-related stress for police officers elevates the risk for psychological and physical health symptoms. For example, police officers experience relatively higher levels of depressive symptoms (Wang et al. 2010), posttraumatic stress

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disorder (PTSD; Marmar et al. 2006), and substance use problems (Cross and Ashley 2004), when compared with the general population. Further, they relatively often experience fatigue, sleeping problems, and irritability (Rajaratnam et al. 2011), and physical complaints, including back pain and migraine (Gershon et al. 2009). A recent systematic review showed that the rates of mental health problems in police officers are higher than in the general population and in other first responders and that occupational stress is among the important risk factors that explain these mental health conditions (Syed et al. 2020).

Given the consequences that have been found to be associated with stress, effective interventions that reduce stress in police officers are important. Various interventions aiming at reducing stress in police officers have been examined, such as stress management programs, counseling, nutrition and physical conditioning, circuit weight training, and writing intervention. Overall, findings have been mixed; for example, effects of stress management programs were nonsignificant (Patterson et al. 2014), resilience programs were found to have beneficial effects (e.g., Chitra and Karunanidhi 2020), and partial evidence was revealed for the effects of physical conditioning (e.g., Schilling et al. 2020).

Mindfulness training has been found to be effective in reducing stress and its consequences in various populations (e.g., Brown and Ryan 2003; Davis and Hayes 2011), including those in occupational settings (Virgili 2015). It has a variety of positive effects on, for example, well-being, psychological health, and behavioral outcomes (Keng et al. 2011). Mindfulness, defined as a specific way to direct the attention, that is, on purpose, in the here and now, and without judgment, facilitates awareness and acceptance of things as they are and approaching rather than avoiding difficult emotional experiences (Kabat-Zinn 2015). Recently scholars have suggested that mindfulness training may be beneficial in reducing stress symptoms and promoting health outcomes in police officers (e.g., Williams et al. 2010). Research in police officers has shown that mindfulness training could be beneficial. Several cross-sectional studies have found that higher levels of dispositional mindfulness were associated with lower levels of depression (Williams et al. 2010), aggression and hostile attribution bias, and higher levels of thought recognition (Kelley and Lambert 2012). Specific facets of mindfulness were found to be associated with positive health outcomes; for example, higher non-judging and describing were associated with lower levels of posttraumatic stress symptoms (Chopko and Schwartz 2013). Further, research has examined potential moderating effects of dispositional mindfulness. Mindfulness was found to weaken the associations between chronic stress and pain interference (Colgan et al. 2019), workload and both mental and physical symptoms of strain (Fisher et al. 2019), and occupational stressors and perceived stress (Kaplan et al. 2018).

A few scholars have examined the effects of mindfulness-based intervention for police officers. Krick and Felfe (2019) conducted a randomized controlled trial (RCT), dividing a relatively large group of 267 police officers at a German academy to a mindfulness-based intervention condition (integrated in the police education) and a control condition (receiving regular education without mindfulness training). They found that the intervention group at post-test had increased mindful awareness and self-care, as well as heart rate variability, and lower levels of psychological strain, health complaints, and negative affect, in comparison with the control group. Christopher et al. (2016) developed an 8-week mindfulness-based resilience training (MBRT) for police officers, which is based on mindfulness-based stress reduction (MBSR) and adapted for law enforcement officers. Examining differences between pre- and post-test in a small sample of 43 officers in the USA, significant improvements were found in mindful awareness, resilience, perceived stress, burnout, emotional intelligence, difficulties with emotion regulation, mental and physical health, anger, fatigue, and sleep disturbance (Christopher et al. 2016). In addition, in a sample of first responders among which were 47 police officers, significant improvement was found after MBRT at post-test in mindfulness. This, in turn, was associated with improved resilience and reduced burnout (Kaplan et al. 2017). Thus, several studies, including an RCT, found improvement in stress and health conditions of police officers directly after participating in a mindfulness-based intervention.

A few studies examined longer term effects. Grupe et al. (2019) examined the effects of an 8-week mindfulness training, based on MBSR and MBRT, in 30 law enforcement officers in the USA at pre- and post-test and follow-up (5 months after the training). At post-test and follow-up, relative to pre-test, burnout symptoms, sleep quality, anxiety, and posttraumatic stress disorder symptoms were improved. Further, Christopher et al. (2018) examined the effects of MBRT in 61 police officers in an RCT, comparing an intervention group with a no intervention control group. Those in the MBRT group reported greater improvement in aggression, organizational stress, burnout, sleeping problems, psychological flexibility, non-reactivity, and cortisol levels after the training at post-test. However, at follow-up, 3 months after the training, group differences were no longer significant. In sum, previous research on the effects of mindfulness-based interventions have shown promising results in that police officers after a mindfulness-based intervention showed improvement in mindfulness, resilience, and various health-related outcomes.

However, further research is needed as sample sizes of earlier research are often relatively small, and findings at follow-up measurements are inconsistent. In addition, although it has been hypothesized that when police officers'

mindful awareness is trained health-related outcomes will improve, it is not clear which mechanisms could explain improvements after participating in the intervention. Recently, Lindsay and Creswell (2017) proposed the monitor and acceptance theory (MAT), organizing the broad range of concepts used in the literature and suggesting that attention monitoring (i.e., the constant awareness and observation of present moment experiences) and acceptance (i.e., being accepting and non-judging toward present moment experiences) are the basic mechanisms underlying mindfulness and mindfulness training effects. MAT predicts that attention monitoring explains the effects of mindfulness on improving outcomes in experiences that can be considered as affectively neutral. In addition to attention monitoring, non-judging and acceptance skills are necessary for mindfulness to have an effect on outcomes related to emotional experiences such as stress-related health outcomes (Lindsay and Creswell 2017). Earlier studies that examined the effects of mindfulness-based interventions in police officers did often not investigate mechanisms that explain effects of mindfulness training. There are however a few exceptions; for example, Bergman et al. (2016) conducted secondary analysis of the earlier MBRT study of Christopher et al. (2016) and examined which specific facets of mindfulness accounted for the reduction in officer anger, operational stress, and organizational stress. Results revealed that increases in acting with awareness and non-judging in particular accounted for reductions in anger and stress. Changes in non-reactivity did not relate to changes in anger and stress.

The present study investigated the effects of a mindfulness-based intervention in police officers in the Netherlands. In addition, this study focused on mechanisms that explain potential intervention effects by examining whether changes in facets of mindfulness are associated with changes in four types of stress. We expected to find positive effects of the mindfulness-based intervention. To be more specific, we expected that the mindfulness-based intervention would result in lower levels of stress (primary outcome). Further, we expected the mindfulness-based intervention to have positive effects on resilience, sleep disturbances, positive affect, feelings of happiness, and work ability (secondary outcomes). In addition, after participating in the mindfulness-based intervention, police officers would improve in mindful awareness, attention, and self-compassion, given that the mindfulness-based intervention focuses on training of these skills. Finally, we expected that improvement in mindfulness during the training and follow-up period would be associated with a reduction in the levels of stress. More specifically, we expected that both changes in monitoring attention (attention, observing, describing, acting with awareness) and acceptance skills (self-compassion, non-judging, non-reactivity) would be associated with changes in stress measures.

Method

Participants

A total of 82 police officers participated in four mindfulness training groups. The participants were members of the Dutch Police Union (Nederlandse Politiebond, NPB), one of the largest trade unions for employees of the police in the Netherlands. The NPB was concerned about the high levels of stress and PTSD of their work force and aware of how police officers tend to not talk about their stress and PTSD symptoms, as it is generally regarded as “weak.” A variety of police officers participated in the study, including patrol officers, detectives, riot squad officers, forensic researchers, alarm room operators, human resource officers, managers, and teachers. Of the total sample, 36 were male (43.9%) and 46 were female (56.1%). The age ranged from 30 to 63 years ($M = 49.0$, $SD = 8.4$). The majority ($n = 66$, 80.5%) were of Dutch origin. Of those with an ethnic origin other than native Dutch, 6 (7.3%) had a Surinamese or Dutch Antillean background, 2 (2.4%) had a Turkish background, 2 (2.4%) had a Moroccan background, and 6 (7.3%) had some other ethnic background. The majority had been working for the police for a relatively long period. Over half of the respondents worked for 20 years or longer as police officer ($n = 42$, 51.2%), about a third worked more than 10 years at the police ($n = 31$, 37.8%), and only 11% worked less than 10 years at the police ($n = 9$).

Most police officers completed the training. However, mostly due to a lack of time in their busy lives, measurement drop-out rates were relatively high. At the four subsequent measurement waves, respectively, 78 (95.1% of the total sample size), 67 (81.7%), 60 (73.2%), and 48 (59.8%) participants filled out the questionnaires. We compared the data at the first wave between those who remained (remainders, $n = 63$) and those who did not complete (drop-outs, $n = 19$) the last two post-training waves. Remainders were those who participated at baseline or pre-test (before the training) and participated at least at post-test or follow-up. Participants who dropped out from the measurements did not differ significantly on demographic variables and stress related to policing. However, drop-outs reported significantly higher levels of general stress, $t(76) = 3.3$, $p = 0.001$; total PTSD symptoms, $t(76) = 2.4$, $p = 0.019$; intrusion, $t(76) = 2.4$, $p = 0.021$; and avoidance, $t(76) = 2.2$, $p = 0.028$, at the first measurement than remainders.

A post hoc power analysis was conducted using G*Power3 (Faul et al. 2007). We calculated a power for the difference between two dependent means using a two-tailed test, a medium effect size ($d = 0.50$), and an alpha of 0.05 for the comparison with the smallest number of participants ($n = 48$). Results revealed that with this sample, size we achieved a power of 0.96.

Procedure

Participants were recruited by the Dutch trade union. Before the training, during a company away day, members of the trade union had the opportunity to participate in a mindfulness 2-hour workshop, led by SB and one of the mindfulness trainers, in order to inform them about the possibility of participating in a mindfulness training. In this workshop, that was attended by a very large portion of the officers, we explored with them the causes of their work-related stress and how mindfulness could be beneficial, and we practiced several short meditations plus an inquiry. Participants were informed by the trade union about the study and were invited to participate. With each participant, an intake took place by e-mail before the first training session. The aim of this intake was to explain the content of the training and to check the participant's motivation to do daily home practice. The trainer asked participants via e-mail about the reason for participation, what they would hope to learn, whether it would be feasible to practice daily at home for 20 min, and emphasized it was desirable to attend at least five of the six sessions. In addition, exclusion criteria were verified. Participants would have been excluded from the training and study if they had been suffering from acute psychosis, suicidal ideation, current substance abuse, or borderline personality disorder. All participants were eligible to follow the training. All participants received an information letter about the training and study. After they agreed, they were contacted by the researchers. Members could voluntarily participate in the mindfulness training of which the costs were reimbursed by the trade union.

The first group did a mindfulness training in 2016, and in 2017, three other groups did. One of the trainings in 2017 lasted 6 weeks, and the other three trainings lasted 7 weeks because of a 1-week national spring vacation. Measurements were administered online on average 6 to 7 weeks before the training (baseline), around 1 week before training (pre-test), directly after training (post-test), and at least 6 and 7 weeks, respectively, after the training (follow-up). At the start of the first measurement, as part of the questionnaire, participants were asked to give consent for the study. The dataset was made anonymous before the analyses were conducted.

The mindfulness training was developed by Williams and Cullen (2013) and based on the book by Williams and Penman (2011). This mindfulness training is similar to the training used for a study at the company of Unilever (De Bruin et al. 2020). The training of eight sessions of 1.5 h was adapted to six sessions of 2 h, as the trade union preferred a shorter version for reasons of feasibility. No specific adaptations were made to the content of the training. However, the adaptations to the work situation of police officers became visible, for instance, in the enquiries and discussion after the meditations and the examples being used in exercises. This process of keeping the core exercises the same but adjusting

the examples and applications to a specific context or target group is also known as the warp and the weft of mindfulness-based interventions Crane et al. (2017). The program included the following exercises: body scan, sitting meditation, object meditation, walking meditation, seeing meditation, sounds and thought meditation, befriending meditation, 3-min breathing space, and mindful yoga. A detailed overview of the exercises and content in each week can be found in Supplementary Material Table 1. The participants received the book of Williams and Penman (2011), audio-guided meditations, a workbook with an overview of the content and homework of each session, additional information about mindfulness, and forms for making notes and register observations of doing the exercises. Homework was an important part of the training and consisted of reading the book chapters relevant for the session and on average 20 min of daily practices. Two trained and experienced mindfulness trainers of UvA minds, that had already experience with the Mindfulness in a frantic world program, provided the four groups. They received regular supervision by the fourth author (SB).

Measures

Demographics

For descriptive purposes, several details on demographic information were collected via a questionnaire administered to the participants, including gender, date of birth, country of birth of the participant and participant's parents, position, and length of affiliation to the police in years.

Primary Outcome

Symptoms of stress were measured by four instruments that measure different types of stress, including general feelings of stress and tension, physical stress, occupational stress during police work, and stress symptoms that are related to a traumatic event (i.e., PTSD symptoms). First, general stress was measured by the depression anxiety and stress scale (DASS-21; Lovibond and Lovibond 1995). The DASS-21 consists of 21 items covering statements related to the three subscales depression, anxiety, and stress. In this study, we used the subscale stress, which consists of 7-item general feelings of stress, tension, restlessness, irritable, and impatience. Participants are requested to indicate how much each of the statements applied to them in the past week on a scale ranging from 0 "never" to 3 "almost always." We used the average scores as well as the severity labels "normal," "mild," "moderate," "severe," and "extremely severe" as suggested by Lovibond and Lovibond (1995). Reliability of the scale was good in this study (Cronbach's alphas ranging from 0.86 to 0.90 across measurement occasions).

Table 1 Means and standard deviations at baseline, pre-test, post-test, and follow-up assessment

	Bl <i>M</i> (SD)	Pre <i>M</i> (SD)	Post <i>M</i> (SD)	Fu <i>M</i> (SD)
General stress	1.05 (0.61)	1.02 (0.55)	0.63 (0.44)	0.58 (0.43)
Physical stress	1.65 (0.51)	1.60 (0.52)	1.46 (0.48)	1.33 (0.26)
Occupational stress	3.17 (1.11)	3.19 (1.16)	2.96 (1.24)	2.84 (1.12)
PTSD symptoms total	2.00 (0.84)	1.90 (0.71)	1.74 (0.77)	1.59 (0.64)
Intrusion	2.12 (0.91)	2.04 (0.80)	1.81 (0.82)	1.70 (0.74)
Avoidance	1.87 (0.83)	1.77 (0.69)	1.66 (0.76)	1.49 (0.61)
Resilience	3.29 (0.65)	3.42 (0.55)	3.48 (0.59)	3.51 (0.65)
Sleep difficulties	2.38 (1.12)	2.41 (1.08)	1.84 (0.84)	1.90 (0.76)
Positive affect	3.34 (0.82)	3.33 (0.79)	3.73 (0.72)	3.80 (0.62)
Happiness	4.94 (1.37)	4.78 (1.22)	5.28 (1.29)	5.40 (1.09)
Workability total	6.45 (1.72)	6.73 (1.61)	6.97 (1.75)	7.31 (1.31)
Workability physical	6.59 (1.78)	6.75 (1.70)	6.98 (1.85)	7.31 (1.39)
Workability mental	6.31 (2.00)	6.72 (1.78)	6.95 (1.93)	7.31 (1.49)
Mindfulness total	3.33 (0.49)	3.31 (0.47)	3.53 (0.48)	3.58 (0.49)
Observing	3.46 (0.93)	3.45 (0.82)	3.66 (0.67)	3.74 (0.74)
Non-reactivity	3.04 (0.65)	3.09 (0.63)	3.31 (0.66)	3.43 (0.67)
Describing	3.58 (0.67)	3.52 (0.70)	3.71 (0.67)	3.72 (0.72)
Acting with awareness	3.34 (0.79)	3.25 (0.88)	3.41 (0.74)	3.58 (0.72)
Non-judging	3.21 (0.83)	3.23 (0.83)	3.56 (0.89)	3.43 (0.94)
Attentional control	2.61 (0.45)	2.63 (0.43)	2.75 (0.42)	2.80 (0.41)
Self-compassion	4.52 (1.35)	4.44 (1.23)	5.08 (1.19)	5.05 (1.11)

Second, physical stress was measured by the somatization subscale of the four-dimensional symptom questionnaire (4DSQ; Terluin et al. 2006). The 4DSQ is a self-rating questionnaire measuring four dimensions of common psychopathology: distress, depression, anxiety, and somatization. The somatization subscale reflects a tendency to experience a variety of medically unexplained somatic complaints at the same time, which the participants attribute to physical illness. These symptoms are known to be related to distress or psychopathology, for example, headache, palpitations, nausea, and muscle aches. For each symptom, participants are asked whether they observed the symptom in the past 2 weeks. The subscale consists of 16 items scored on a 5-point scale, ranging from 1 “no” to 5 “very often or always.” In the present study, the reliability was satisfactory to good (Cronbach’s alphas ranging from 0.71–0.88).

Third, occupational stress was measured by the operational police stress questionnaire (PSQ-Op; McCreary and Thompson 2006). The PSQ-Op measures occupational stressors related to policing and contains 20 items. Participants were asked to determine how stressful each item has been for them recently, using a 7-point Likert scale ranging from 1 “not at all stressful” to 7 “very stressful” (e.g., “overtime demands,” “risk of being injured on the job”). Reliability of the scale was excellent (Cronbach’s alphas ranged from 0.90 to 0.95).

Finally, PTSD symptoms were measured with the impact of event scale (IES; Horowitz et al. 1979; Van der Ploeg et al. 2004). The IES covers two scales: intrusion (7 items) and avoidance (8 items). Intrusion refers to the extent to which participants are triggered by stimuli associated with the traumatic event, and avoidance refers to the extent to which participants may want to avoid situations that remind them of the event. Participants were asked for every item whether the statement was present during the past 7 days on a 4-point scale ranging from 0 “not at all” to 5 “often.” Reliabilities of the scales were good to excellent (Cronbach’s alphas ranged from 0.93–0.95 for the total scale, 0.90–0.93 for intrusion, 0.85–0.90 for avoidance across measurement occasions).

Secondary Outcomes

To measure resilience, we administered the brief resilience scale (BRS; Leontjevas et al. 2014; Smith et al. 2008), which measures resilience to risk factors, particularly after a traumatic event, and the capability to recover after a stressful event. The BRS contains six items to be answered on a 5-point Likert scale ranging from 1 “strongly disagree” to 5 “strongly agree.” The BRS has received good psychometric ratings on several quality criteria (Leontjevas et al. 2014). In the present study, reliabilities were satisfactory to good, ranging from 0.74 to 0.80 across measurement occasions.

Sleep disturbance was assessed using the sleep difficulties subscale from the symptom checklist-90-revised (SCL-90; Ettema and Arrindell 2003). Participants rated three symptoms concerning their quality of sleep in during the past week on a 5-point scale ranging from 1 “not at all” to 5 “very much.” The three symptoms are trouble falling asleep, waking up early in the morning, and sleep that is restless or disturbed. In the current study, Cronbach’s alphas ranged from 0.71 to 0.82 across waves.

Positive affect was assessed with the Positive and Negative Affect Scale (PANAS; Watson et al. 1988). The PANAS consists of two 10-item scales, positive and negative affect, which describe different feelings and emotions. Only the positive scale was assessed in this study. Respondents rated the extent to which they have experienced each particular emotion within the last 2 weeks on a 5-point scale, ranging from 1 “very slightly or not at all” to 5 “very much.” Cronbach’s alphas were excellent, ranging from 0.93 to 0.95.

Participants’ level of feelings of happiness was measured with the subjective happiness scale (SHS; Lyubomirsky and Lepper 1999). The SHS consists of four items that are rated on a 7-point scale, ranging from 1 “less happy” to 7 “more happy.” Cronbach’s alphas were good to excellent, ranging from 0.87 to 0.93.

Work ability is an employee’s capacity to manage job demands in relation to health and mental resources. This was measured by two single items that directly ask participants’ rates on physical and mental work ability. To assess work ability, the work ability index (WAI) has been developed (Ilmarinen 2007). However, this instrument has been criticized to include many disparate items that are related to diagnoses and sick leave, which may not be always relevant for work ability. Single items that directly measure work ability have been found to be of similarly strong predictive value of sick leave, health, and symptoms as the WAI (Ahlstrom et al. 2010).

Explanatory Variables

Different aspects of mindfulness were measured with the short form of the five facets of mindfulness questionnaire (FFMQ-SF; Bohlmeijer et al. 2011; De Bruin et al. 2012). The FFMQ-SF is a 24-item self-reported questionnaire designed to measure the following facets of mindfulness: observing, describing, acting with awareness, non-judging, and non-reactivity. Items are scored on a 5-point scale from 1 “never or very rarely true” to 5 “very often or always true.” Observing refers to the tendency to notice or attend to internal and external experiences. Describing is the tendency to describe and label these experiences with words. Acting with awareness refers to directing undivided attention to one’s current activity. Non-judging reflects a non-evaluative attitude toward inner experiences. Non-reactivity is the tendency to allow thoughts and

feelings to come and go, without getting caught up in them or react instantly to them. In this study, the reliabilities of the scales across measurement occasions were satisfactory to good (Cronbach’s alphas ranging from 0.84–0.88 for total, 0.70–0.83 for observing, 0.67–0.76 for non-reactivity, 0.79–0.84 for describing, 0.81–0.89 for acting with awareness, 0.81–0.90 for non-judging).

The ability to maintain attentional control and to focus on one observation in the present moment was measured with the attentional control scale (ACS; Derryberry and Reed 2002). The questionnaire is a self-report measure that combines items on attentional focusing and attentional shifting. It consists of 20 items that can be answered on a 4-point Likert scale ranging from 1 “almost never” to 4 “always.” Earlier research has supported the validity of the ASC (Judah et al. 2014). Cronbach’s alphas in this study ranged from 0.87 to 0.88 across measurement occasions.

Self-compassion, relating to oneself and feel compassion toward the self when perceiving failure or suffering, was assessed with the 3-item self-compassion scale short form (SCS-SF; F. Raes, personal communication, April 10, 2012, based on the 12-item SCS-SF of Raes et al. 2011). Items are rated on a 5-point Likert scale ranging from 1 “almost never” to 5 “almost always.” In the present study, the reliability ranged from 0.64 to 0.71 across measurement occasions.

Data Analysis

Given the nested nature of our data (measurements were nested in respondents), we applied multilevel analyses to examine potential differences in scores between measurements. For this, we used linear mixed models in SPSS with time as repeated effects variable and each outcome measure as dependent variable. The dummy variables, baseline, post-test, and follow-up were entered as fixed effects variables in order to test for differences between baseline and pre-test, pre-test and post-test, and pre-test and follow-up. We used maximum likelihood estimation and an unstructured repeated covariance type to fit the models. Further, we used standardized scores of the outcome measures so that the parameter estimates could be interpreted as a measure of effect (Cohen’s *d*). Following the guidelines of Cohen (1988), we considered an effect size of 0.3 small, of 0.5 medium, and of 0.8 large. In order to decide whether a three-level model for repeated measures data where participants are nested within training groups was more suitable than the repeated measure two-level model, we tested unconditional models without predictors in which we added the random intercept for each outcome measure at the group level (training group). For each outcome measure, the variance of the intercept between groups was nonsignificant. Therefore, we applied the repeated measures within participant model without considering training group level.

In order to examine whether changes in mindfulness were associated with changes in stress, we computed change scores between pre-test and follow-up for mindfulness (total scale), each facet of mindfulness (observing, non-reactivity, describing, acting with awareness, non-judging), attention, self-compassion, and the four measures of stress. Next, in one model, we regressed the change scores, the four types of stress on the change scores of mindfulness, attention, and self-compassion in MPlus. In the next step, in another model, we regressed the change scores of the four types of stress on the change scores of facets of mindfulness.

Results

Of those who responded at post-test, 54 attended five or six training sessions (88%, $n = 61$). Further, about half meditated at least five times a week outside the training sessions (i.e., 30 participants, 49%, $n = 61$). Average duration of meditation practices during a week was very varied between participants, ranging from 4 to 420 min ($M = 84.3$, $SD = 77.3$). The average amount of time spend on home work during a week varied from 0 to 140 min ($M = 48.6$, $SD = 36.5$). The vast majority reported that he or she would continue practicing meditation after post-test: 58 participants mentioned to continue meditating, one did not planning to continue, and two participants were not sure ($n = 61$).

Table 1 presents means and standard deviations of all variables and Table 2 presents the multilevel analyses, evaluating the effects of training. We did not find any change during the baseline period in all except one outcome (resilience), indicating that time and measurement alone does not bring about change. After the training, many of the primary outcome, secondary outcome, and explanatory variables were significantly improved relative to pre-test.

Effects on Primary Outcome, Secondary Outcome, and Explanatory Variables

For the primary outcome stress, several significant effects occurred. At post-test for general stress, a medium to large effect, and for physical stress, a small effect was found (Cohen 1988). This indicates that the participants experienced significantly less feelings of general stress and physical stress complaints at post-test, relative to pre-test. At post-test, officers did not improve in feelings of stress related to police work (occupational stress) and in avoidance and intrusion, that is, PTSD symptoms related to traumatic events. However, at follow-up, significant improvement was found for all four stress measures, indicating that participants experienced significantly less general, physical, occupational stress, and PTSD symptoms.

For the secondary outcomes, at post-test, significant small to medium effect sizes of change were found in the expected direction for sleep disturbances, positive affect, and feelings of happiness, but effects were nonsignificant for resilience and work ability. At follow-up, significant effect sizes for all secondary outcomes were somewhat larger. For example, whereas work ability was not improved at post-test, at follow-up, a small significant effect was found. Resilience was the only secondary outcome that did not significantly improve.

For the potential explanatory variables mindfulness, attention, and self-compassion, we found small (for attention) to moderate (for self-compassion) effect sizes. All improvements were significant; only for the facet observing at post-test a trend ($p < 0.10$) was found.

Changes in Mindfulness Facets and Stress

Next, we examined whether changes in mindfulness, attention, and self-compassion were associated with changes in various types of stress (general stress, occupational stress, and stress symptoms related to trauma) from pre-test to follow-up (Supplementary Material Fig. 1). Improvement in mindful awareness (mindfulness total scale) was marginally significantly associated with a reduction in general feelings of stress and tension. Further, an increase in attention was significantly associated with reductions in general stress and occupational stress. Finally, an increase in self-compassion was (marginally) significantly associated with a decrease in general and physical stress.

Finally, we examined whether changes in facets of mindfulness (observing, non-reactivity, describing, acting with awareness, and non-judging) were associated with changes in various types of stress (general stress, occupational stress, and stress symptoms related to trauma) from pre-test to follow-up. Bivariate associations showed that improvement in acting with awareness and being non-judging in particular was associated with reductions in all types of stress, and an increase in observing was associated with a decrease in general stress (Supplementary Material Table 2). We found that improvement in the ability to observe was significantly associated with a reduction in general feelings of stress and tension (Supplementary Material Fig. 2). Surprisingly, a larger increase in describing was associated with smaller reductions in physical stress. Further, an increase in acting with awareness during and after the training was significantly associated with reductions in general stress, physical stress, and PTSD symptoms (intrusions and avoidance). Finally, improvements in non-judging were associated with reductions in physical stress.

Discussion

In the present study, we examined the effects of a mindfulness-based intervention in police officers. We found

Table 2 Parameter estimates, test statistics, and confidence intervals of multilevel analyses evaluating the effects

	Pre-test–baseline (<i>n</i> = 63)			Pre-test–post-test (<i>n</i> = 58)			Pre-test–follow-up (<i>n</i> = 47)		
	Estimate	<i>t</i>	95% CI	Estimate	<i>t</i>	95% CI	Estimate	<i>t</i>	95% CI
General stress	0.08	1.07	−0.07; 0.24	−0.64	−6.23***	−0.85; −0.44	−0.73	−6.08***	−0.96; −0.49
Physical stress	0.13	1.46	−0.05; 0.30	−0.29	−3.76***	−0.45; −0.14	−0.52	−5.77***	−0.70; −0.34
Occupational stress	0.03	0.40	−0.13; 0.19	−0.13	−1.41	−0.32; 0.06	−0.28	−2.27*	−0.52; −0.03
PTSD symptoms total	0.09	0.74	−0.16; 0.35	−0.12	−1.05	−0.35; 0.11	−0.38	−2.60*	−0.67; −0.09
Intrusion	0.06	0.46	−0.20; 0.31	−0.20	−1.64	−0.45; 0.05	−0.36	−2.26*	−0.68; −0.04
Avoidance	0.13	0.97	−0.14; 0.40	−0.03	−0.27	−0.25; 0.19	−0.38	−2.85**	−0.65; −0.11
Resilience	−0.21	−2.33*	−0.39; −0.03	0.03	0.32	−0.16; 0.22	0.10	0.91	−0.13; 0.33
Sleep difficulties	−0.04	−0.53	−0.21; 0.12	−0.56	−4.85***	−0.80; −0.33	−0.48	−4.93***	−0.68; −0.29
Positive affect	−0.08	−0.90	−0.24; 0.09	0.47	4.40***	0.26; 0.68	0.52	4.46***	0.28; 0.75
Happiness	0.10	1.49	−0.04; 0.25	0.34	4.48***	0.19; 0.50	0.42	5.87***	0.28; 0.57
Work ability total	−0.15	−1.73	−0.32; 0.02	0.15	1.32	−0.08; 0.38	0.27	2.31*	0.04; 0.51
Work ability physical	−0.08	−0.75	−0.31; 0.15	0.17	1.48	−0.06; 0.39	0.26	2.17*	0.02; 0.50
Work ability mental	−0.20	−2.08	−0.40; −0.01	0.11	0.97	−0.12; 0.34	0.24	2.04*	0.00; 0.47
Mindfulness total	−0.03	−0.46	−0.17; 0.11	0.38	4.61***	0.22; 0.55	0.44	4.33***	0.24; 0.64
Observing	−0.01	−0.10	−0.17; 0.15	0.22	1.94+	−0.01; 0.44	0.34	3.00**	0.11; 0.57
Non-reactivity	−0.10	−0.92	−0.31; 0.11	0.27	2.39*	−0.04; 0.49	0.38	2.61*	0.09; 0.67
Describing	0.02	0.23	−0.15; 0.19	0.29	3.38**	0.12; 0.46	0.34	3.60**	0.15; 0.53
Acting with awareness	0.12	1.35	−0.06; 0.29	0.22	2.36*	0.03; 0.41	0.33	3.01**	0.11; 0.54
Non-judging	−0.10	−1.08	−0.27; 0.08	0.31	3.46**	0.13; 0.49	0.24	2.17*	0.02; 0.46
Attentional control	−0.05	−0.60	−0.23; 0.13	0.27	3.79***	0.13; 0.42	0.35	4.45***	0.20; 0.51
Self-compassion	0.02	0.25	−0.17; 0.22	0.47	5.40***	0.29; 0.64	0.43	3.94***	0.21; 0.65

Note. Parameter estimates can be interpreted as Cohen's *d* effect sizes, since results were standardized into Z-scores. CI, confidence interval. +*p* < 0.10; **p* < 0.05; ***p* < 0.01; ****p* < 0.001.

that at post-test and follow-up, participants had significantly improved in various types of stress, related outcomes including sleep disturbances, positive affect, happiness, work ability, and mindfulness skills, while before the intervention (baseline period), outcome measures did not change. In addition, we found that changes in facets of mindfulness were differentially associated with changes in types of stress. Increases in attention, acting with awareness and non-judging in particular, were associated with reductions in general stress, physical stress, and PTSD symptoms.

Effects of the Mindfulness-Based Intervention

Police officers significantly benefited from the mindfulness-based intervention. Of the primary outcomes, the largest significant effect was found for general stress; we found a large effect at follow-up. Our finding indicates that police officers experience substantially less feelings of stress, including tension, impatience, and irritability after the training. Further, considerably less physical stress was reported; we found a medium effect at follow-up. Interestingly, the effect of the intervention on general stress was large, whereas the effect on mindfulness was small, while earlier as well as the present

research has suggested that mindfulness is a mechanism of change in experiencing stress. It may be that small changes in mindfulness result in larger changes in stress. Alternatively, other additional mechanisms of the mindfulness-based intervention may explain the large decrease in officers' feelings of stress, such as the experience of being in a group with other police officers, who also experience stress, and self-disclosing and sharing these experiences.

Investigation of the other measures of stress, that is, occupational stress and PTSD symptoms, revealed somewhat smaller effects. For example, at post-test directly after the intervention, no significant improvement was found in occupational stress and PTSD symptoms. One explanation might be that these types of stress will take more time to decrease. For example, stress related to police work included experiencing stress that is caused by relatively serious events, such as risk of being injured on the job or by traumatic events. Likewise, PTSD symptoms include avoidance and intrusion as a result of a traumatic event. To be able to decrease feelings of stress that are related to impactful events is likely to take more time and more mindfulness practice. Consistent with this explanation, at follow-up, about on average 7 weeks after the training, occupational stress and PTSD symptoms were

significantly improved, although to a lesser extent than general feelings of stress.

As expected, secondary outcomes, outcomes that were found to be associated with stress in earlier research, were significantly improved after the intervention. Sleep problems were reduced, and happiness, positive feelings (positive affect), and work ability were increased. Surprisingly, no effect was found for resilience. This finding is consistent with the finding of Christopher et al. (2018), who also found no effect of mindfulness training on resilience. These scholars explain this by their small sample size and related reduced power. Given that in our study the effect size for resilience was very low, this explanation is not very likely here. A possible explanation here might be that levels of resilience were already substantial or normal so that there was not much room for improvement; the mean level of resilience at pre-test was, for example, comparable to (i.e., not significantly lower than) the means of the normal population samples (e.g., undergraduate students) in the study of Smith et al. (2008).

Effects remained stable or even improved at follow-up. This is contrary to the findings of Christopher et al. (2018) who found that the significant group differences (intervention vs. no intervention controls) at post-test disappeared at follow-up 3 months after the mindfulness-based intervention for police officers. These scholars explained their finding by low adherence to ongoing mindfulness practice in the period after the intervention, which may be quite common in the population of law enforcement officers. In our study, practicing and doing homework varied between participants but were on average at least reasonable during the training, and the vast majority intended continuing meditation practices after post-test. Moreover, our findings are in line with those of Grupe et al. (2019) who also found significant effects of mindfulness intervention at follow-up measurement, 5 months after the intervention. Our finding that improvements at follow-up seem somewhat larger than at post-test could be due to more experience and practice in mindfulness. An alternative explanation might be that officers who benefitted most of the training were more likely to participate until follow-up, given that remainders had lower levels of general stress and PTSD symptoms. On the other hand, earlier studies have also found larger intervention effects for participants with worse baseline scores (e.g., Gawrysiak et al. 2018).

Mechanisms of Change

Examining potential mechanisms of change, we found those who reported more acting with awareness and more non-judging were more likely to experience larger decreases in general and physical stress and stress symptoms related to trauma. Consistent with Bergman et al. (2016), we found that facets of mindfulness accounted for differential variance in the reduction of types of stress. For example, like in the study of

Bergman and colleagues, we found that an increase in non-judging was associated with a reduction in physical stress. Further, those who reported improved observing skills after the training were more likely to experience higher reductions in general feelings of stress and tension.

We found that improvement in monitoring attention skills, such as attention, observing, and acting with awareness, as well as acceptance skills, self-compassion, and non-judging the present moment experience, was associated with decreases in one or more types of stress. This is in line with previous findings (Baer 2009) and predictions of MAT theory (Lindsay and Creswell 2017). The combination of monitoring attention skills and acceptance skills is expected to be a mechanism for explaining mindfulness to affect stress, as emotion regulation would be improved and feelings of stress could be reduced. In our study, we found some evidence for this hypothesis.

When officers improved skills of acting with awareness and non-judging, they experienced a decrease of multiple types of stress (general stress, physical stress, and PTSD symptoms). This indicates that these particular facets of mindfulness are important in decreasing stress in police officers. A possible explanation might be related with characteristics of the occupation of police officers who are exposed relatively often to stressful situations and have been trained to professionally act under stressful circumstances. Those who are able to act with awareness are better able to stay focused on their task and to recognize that a thought is just a thought (cognitive defusion; Hayes et al. 2012). Rather than to try to avoid or change these negative thoughts or feelings, accepting and being non-judgmental toward them allow them to weaken and fade away and to let other, including more positive, thoughts and feelings enter awareness (Lindsay and Creswell 2017). This may explain why stress levels decrease as skills of acting with awareness and non-judging improve.

Monitoring attention skills alone would only increase awareness or even exacerbate feelings of stress (and strengthen positive feelings as well) (Lindsay and Creswell 2017). This could be an explanation for our finding that improvements in describing present moment experiences were associated with a smaller reduction or increases in physical stress. When officers are better able to describe present moment experiences, that is, label observed feelings and thoughts with words, without the benefit of other characteristics of mindfulness, they may experience increased feelings of physical stress responses in the body. However, other monitoring attention skills such as observing and acting with awareness were associated with larger reductions in stress. Further, this result was however only found in the multivariate model (see Supplementary Figure 1.), and given the reduced sample size for this analysis, this result has to be interpreted with caution.

Limitations and Future Research

The strengths of the present study are the use of four waves, including a follow-up measurement, measures of different types of stress, and the analysis of a variety of secondary outcomes. Further, we did not only focus on the effects of the intervention but also on mechanisms of change. Several limitations should be noted. First, in the present study, we examined the effectiveness of an adapted corporate mindfulness training. Although adaptations to the work situation of police officers were made, such as in the enquiries and discussion after the meditations and the examples being used in exercises, no cultural adaptations were made to the content of the training, which could have diminished the positive effects.

Second, findings might not be generalizable to the entire population of police officers. Although our sample size is larger than most earlier studies on the effects of mindfulness-based intervention in police officers, the number of participants was small due to attrition at post-test and follow-up. It should be kept in mind that measurement drop-out rates in this study were relatively large, and analysis showed that those who dropped out were found to have significantly higher levels of general stress and symptoms related to stress. This suggests that missing data due to participant drop-out may not be at random, and therefore, the results should be interpreted with caution. Further, participants in our sample had been working as police officers already for a relatively large number of years, possibly because senior workers are generally overrepresented in unions in the Netherlands. Therefore, it should be kept in mind that the results may apply only to more experienced police officers and less to relatively young or inexperienced officers.

Third, because of practical considerations, an RCT was not possible. We tested the extent to which officers change before the intervention, using a baseline period as a control condition. However, in order to be certain that the effects can be attributed to the intervention, the golden standard is an experiment with random assignment to a treatment and control condition (Farrington 2003). Fourth, the present study relied on self-reported data, and therefore, associations might be inflated due to shared method variance. Fourth, reliability of the self-compassion and non-reactivity scales at two measurements was rather low, and therefore, the results related to these explanatory variables should be interpreted with caution.

Further research in larger sample sizes with experimental designs, preferably RCT, and follow-up measurements are needed to increase knowledge on the effects of mindfulness on stress and related problems in police officers. In addition, further research on mindfulness training that is adapted and culturally competent to police populations may result in increased effectiveness of mindfulness training for this group. Finally, further research on mechanisms is essential in order to be able to improve mindfulness-based interventions in general

and for police officers in particular. Scholars have been advised to design studies that specifically focus on mechanisms and are characterized by multiple time points and time scales, so that it is optimal to uncover the temporal relationships between mediators and outcomes (Alsubaie et al. 2017). For example, as earlier research found that observing and awareness skills are improved in the first weeks of the training while non-judging skills improve in later weeks (Baer et al. 2012), it would be interesting to examine potential differences in the strength of temporal mediating effects of these different facets on the reduction of stress, across different time periods. Continuing research on this population of police officers is important as increased knowledge affects the work and well-being of these officers and effective police work is of evident importance for society.

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Author Contributions MH designed the study, collected the data, conducted the data analysis, and wrote the first draft of the manuscript. EB designed the study and collaborated in the writing and editing of the final manuscript. FR collected the data and collaborated in the writing and editing of the final manuscript. SB designed the study and collaborated in the writing and editing of the final manuscript. All authors approved the final version of the manuscript for submission.

Data Availability The data are stored at the Data Management Depository of the Research Institute of Child Development and Education of the University of Amsterdam. Because of legal and ethical constraints concerning the privacy of participants, the data are not publicly available. In case of an official request, the research institute will decide whether the data are made available in accordance with official regulations.

Declarations

Ethics Declarations All procedures were in accordance with the ethical standards of the institutional and/or national research committee, Ethics Review Board of the Faculty of Social and Behavioral Sciences, University of Amsterdam, the Netherlands (project number 2016-CDE-6711), and with the ethical standards as laid down in the 1964 Declaration of Helsinki. Informed consent was obtained from all individual participants included in the study.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s12671-021-01631-7>.

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