

An experimental study of the psychological impact of a Mindfulness-Based Stress Reduction Program on highly sensitive persons

Ilse Soons

André Brouwers

Welko Tomic

The Open University, Heerlen, the Netherlands

Abstract

Background. The mindfulness Based Stress Reduction (MBSR) program has been provided in a variety of settings, and for a variety of individuals. Over two decades of research show that its effectiveness has been made plausible. However, the effects of MBSR interventions on highly sensitive persons (HSPs) have not been examined to date. *Aim.* This study investigated the effects of participation in a MBSR program on symptoms of stress, social anxiety, self-acceptance, emotional empathy, personal growth, and self-transcendence in HSPs. *Sample.* Forty-seven participants, 34 females (72%), enrolled in an eight-week MBSR program. *Method.* Participants were matched on sensitivity scores, the amount of experience in relaxation exercise, gender, age and level of education. Subsequently, they were randomly assigned to an experimental group (first trained group), and a control group (second trained group). The MBSR program, an intensive training in mindfulness meditation, consisted of eight sessions of two and a half hours each. *Results.* Findings showed that immediately after the eight-week program, as well as four weeks later, the participating HSPs suffered less from stress and appeared to have less social anxiety, whereas their scores for mindfulness, emotional empathy, personal growth initiative, self-acceptance and self-transcendence were significantly higher. Effect sizes ranged from medium (0.63) to very large (2.52). These effects persisted at 4-weeks follow-up and even improved significantly for stress, social anxiety and self-acceptance. *Conclusion.* The MBSR program has the capacity to help HSPs to deal with stress and social anxiety, as well as to develop their assumed greater capabilities for empathy, personal growth, and self-transcendence. MBSR could offer a meaningful supplement to therapies for HSPs.

Keywords: Emotional empathy, highly sensitive persons, MBSR program, personal growth initiative, sensitivity, self-acceptance, self-transcendence, social anxiety, stress.

Introduction

The current study examined the psychological impact of the Mindfulness-Based Stress Reduction program (MBSR) on highly sensitive persons (HSPs). Highly sensitive persons have the ability to perceive low-intensity stimuli that originates from the environment, the body, or self-cognition. They tend to process and respond to lower thresholds of information and to better detect subtle differences in the environment (Liss, Timmele, Baxley & Killingworth, 2005, p. 1430). Moreover, the HSP is more aware of emotional sensations associated with stimuli of low intensity. This trait might manifest itself in the observation of behavior that is both emotional and subtle in nature. In addition, the HSP is characterized by the presence of spontaneous cognitive activity in the form of thoughts and/or images that have no connection with the physical environment of the individual (Rothbart & Evans, 2007).

Based on an extensive search in databases such as PsycINFO, PubMed, Worldcat, Medline and Eric, it was observed that the MBSR program has not yet been examined for effectiveness among HSPs. Nevertheless, it may be expected that the MBSR program will be meaningful for HSPs. First, highly sensitive individuals, compared with non-HSPs, suffer frequently from stress and anxiety in social and crowded situations (Aron, 1996). Second, they have a lower level of self-acceptance as well as negative attitudes and resistance towards crowded and/or social situations (Liss et al., 2005; Benham, 2006; Hofmann & Bitran, 2007; Aron, 1996). The MBSR program has been shown to be effective in reducing the above-mentioned problems (Miller, Fletcher, & Kabat-Zinn, 1995; Shapiro, Schwartz, & Bonner, 1998; Chang, Palesh, Caldwell, Glasgow, Abramson, Luskin, Gill, Burke, & Koopman, 2004; Shapiro, Astin, Bishop, & Cordova, 2005, Kabat-Zinn, Massion, Kristeller, Peterson, Fletcher, Pbert, Lenderking & Santorelli, 1992, Carson & Langer, 2006, Thompson & Waltz, 2007).

MBSR is an eight-week training program that consists of eight sessions of two and a half hours each. It is an intensive training in mindfulness meditation. Participants commit themselves to spend at least 45 minutes daily, six days a week, conducting MBSR exercises during the training period. The MBSR program aims to teach participants to be primarily oriented to the experience of the present moment with everything what presents itself mentally with mild, non-judgmental and open attention (Kabat-Zinn, 1990). They are encouraged to allow and observe unpleasant thoughts and feelings, without judging and fighting them. In a few studies of people suffering from induced psychosis due to stressful factors, Chadwick et al. (2005) and Abba, Chadwick and Stevenson (2008) found that participants in the MBSR program learned to accept voices, thoughts and images instead of resisting them. Since HSPs

also wrestle with cognitive stimuli such as intense inner dialogues and images, it can be expected that they will also be better able to accept continued stimulation and themselves after participating in the MBSR training program.

Research shows that the MBSR program was effective in reducing several criteria relevant to HSP such as stress, social anxiety, self-acceptance and empathy. The current study experimentally examined the MBSR program among HSPs on the above criteria, among other things.

Stress. Stress refers to the strains that people encounter throughout life. Numerous studies found that participants experienced less stress after completing the MBSR program (e.g., Schapiro et al., 1998, Chang et al. 2004, Shapiro et al., 2005). Since HSPs, as compared to their counterparts, often evaluate the same situation as more stressful and report more stress (Benham, 2006; Aron, 1996), it is important to test the effectiveness of the MBSR program among HSPs.

Anxiety. Anxiety is a mental and physiological state characterized by cognitive, physical, emotional and behavioral components (Seligman, Walker, & Rosenhan, 2001). Social anxiety is a specific form, characterized by an intense and persistent fear of social situations or performance. A number of studies conducted in both clinical and non-clinical groups showed that participating in the MBSR program leads to anxiety reduction (e.g., Miller et al., 1995, Shapiro et al., 1998, Kabat-Zinn et al., 1992). Because HSPs have a higher sensitivity for (social) anxiety (Hofmann & Bitran, 2007; Aron, 1996), it is expected that they could benefit from the MBSR program.

Self-acceptance. Self-acceptance refers to the ability to accept the natural limitations of life, one's own possibilities and impossibilities, the self, and one's potentialities and intrinsic limitations. According to Loonstra, Brouwers, and Tomic, 2007, the latter refers to limitations that are not imposed by others but stem from one's own nature. For example, being left alone is not an intrinsic limitation, but rather a limitation imposed by others (Buber, 1970). However, feeling alone and having difficulties with being alone are intrinsic limitations (Loonstra, Brouwers & Tomic, 2007, 2009). HSPs often feel as though they fail in their duties (Aron, Aron, & Davies, 2005; Aron, 1996). This particular feeling has a negative influence on the extent to which they accept themselves. After all, it is conceivable that it is more difficult for a HSP to stay on his/her feet in environments overloaded with stimuli. For instance, others are not adversely affected by loud music or swarms of people, whereas HSPs experience these as excessively stimulating and stressful (Schütte, Marks, Wenning, & Griefahn (2007). Since the MBSR program is aimed at learning to

adequately cope with a variety of stimuli (Abba et al., 2008), it is likely that self-acceptance will increase among HSPs after participation in the training. In a study published by Abba et al. (2008), participants in a MBSR program reported a higher degree of self-acceptance after training.

Empathy. Empathy refers to the ability to imagine other persons' thoughts, feelings and emotions, conceptualized as empathy (Lesh, 1970). Nearly a decade before MBSR was applied, a survey among social workers demonstrated that mindfulness meditation has a positive effect on empathy. The results of Shapiro et al. (1998), who investigated the effects of MBSR among medical students, point in the same direction. HSPs have the ability to observe subtle stimuli of an emotional nature. Other persons who observe this particular ability turn to them for support and take them into their confidence (Van den Beuken, 2006; Aron, 1996; Rothbart & Evans, 2007). Since HSPs, compared to their counterparts, seem to have a higher level of empathic ability, the question remains whether participating in a MBSR program will contribute to further development of that ability.

In addition to stress, social anxiety, self-acceptance and empathy, the present study examined whether participation in a MBSR program reinforces the intention to personal growth among HSPs. Robitschek (1998) described the intention to personal growth as a meta-cognitive construct with a facilitating effect on the "intentional engagement in growth-enhancing cognitions and behaviors in all areas of life" (p. 184). Although the intention to personal growth has not yet been examined among MBSR program participants, it is plausible that the program will reinforce this intention. For example, in a study of college students, Chappell Hudgins (2006) found that stress management training resulted in an increased intention to personal growth.

Finally, higher scores on the criterion of self-transcendence are expected after participation in the MBSR program. Through this ability, the individual is able to make intentional contacts with the world beyond the self, which imposes ultimate meaning on life. One who transcends the self recognizes the otherness of the reality beyond the self, searches for respectful relationships with it, derives life-meaning from these relationships and feels responsible for them, feels as though he/she is part of a larger whole, distinguishes interests that surpass self-interests and is able to see the self in perspective of the outer reality (Loonstra et al., 2007; Reed, 1991).

Additionally, mindfulness meditation affects relational frameworks such as me versus you, now versus then, and here versus there. As a result of this form of meditation, participants increasingly consider their self as context and the relationship between

the self and the other is experienced differently (Hayes, Jason, Luoma, et al., 2006; McHugh, Barnes-Holmes, & Barnes-Holmes, 2004). The aforementioned perspectives are also the basic principles of Acceptance and Commitment Therapy, and mindfulness meditation forms an important part of this therapy (Hayes, Jason, Luoma, et al., 2006). It can be expected that participation in the MBSR program will increase the degree of self-transcendence in HSPs.

Method

Research design

Two groups of HSPs were compared: an experimental group, labeled as the first-trained group, and a control group (a waiting list group) labeled as the second-trained group. The MBSR program was administered to the first trained group between the pre-test (O1A) and the first post-test (O2A) (see Table 1). Four weeks later, this group participated in a second post-test (O3). The second-trained group was administered the MBSR program after the first trained group completed the first post-test (O2A). To function as a control group, two tests were administered to the second-trained group prior to the MBSR program (O1B and O2B), and at the same time, the first trained group completed the coinciding tests (O1A and O2A). Similar to the first trained group, two post-tests were administered to the second-trained group: directly after the MBSR program was administered (O4) and four weeks later (O5). The same instruments were applied (O1-O5). The period of time between O1A and O2A was equal to O2B and O4, namely eight weeks.

Table 1: Experimental design

Condition	Measurements				
	T1	T2	T3	T4	T5
First-trained Group	O1A x	O2A	4 weeks	O3	
Second-trained Group	O1B	O2B	O4	4 weeks	O5

Note. T: moment of measurement; O: observation; X: MBSR program of 8 weeks

Participants

Forty-seven HSPs participated in the MBSR program, 13 males (28%) and 34 females (72%). Their age ranged from 18 to 75 years, with an average of 39.23 years (SD=15.40). Their education varied from average (34%) to high (66%). None of the participants had a low educational level. All participants were born and live in Belgium.

The participants scored relatively high on the three dimensions of sensitivity, which were used to decide whether they satisfied the criteria of HSP's. Moreover, the variances of their sensitivity scores were relatively low, which indicates that they were rather homogeneous in this regard. In comparison with two studies of non-HSPs (N=258 and N=700, respectively; Evans and Rothbart, 2007), the mean scores of our sample were significantly higher on the Neutral Perceptual Sensitivity subscale ($t(303) = 10.81, p < .001$; $t(745) = 23.08, p < .001$), the Affective Perceptual Sensitivity subscale ($t(303) = 7.93, p < .001$; $t(745) = 21.52, p < .001$), as well as the Associative Sensitivity subscale ($t(303) = 5.66, p < .001$; $t(745) = 22.92, p < .001$). In addition, the mean scores on the sensitivity scales in our study (6.09 (SD=.35), 6.06 (SD=.42), 5.83 (SD=.43), respectively) were more than one standard deviation above the mean scores in two Evans and Rothbart's (2007) studies (4.96 (SD=.70) & 3.98 (SD=.62); 5.02 (SD=.88) & 3.40 (SD=.84); 5.16 (SD=.79) & 3.36 (SD=.73)).

If our participants were indeed HSP's, it was expected that their sensitivity scores were significantly more homogeneous than in the Evans and Rothbart (2007) studies. None of the participants in the latter studies were HSP's. To evaluate this hypothesis, Bartlett's test of equality of the variances was used. Results revealed that the variances in our sample were significantly lower on the Neutral Perceptual Sensitivity subscale ($\chi^2=7.94, p<.01$; $\chi^2=5.98, p<.05$), the Affective Perceptual Sensitivity subscale ($\chi^2=8.95, p<.005$; $\chi^2=8.50, p<.005$), as well as the Associative Sensitivity subscale ($\chi^2=6.24, p<.05$; $\chi^2=5.19, p<.05$).

The participants in the current study were matched on sensitivity scores, the amount of experience with relaxation exercises, gender, age and education. Subsequently, they were randomly divided into two groups. The matching variables are shown in Table 2. There was no difference between the first trained group and the second-trained group in gender ($\chi^2 = .06, p = .81$), age [$t(45) = -.07, p = .95$], education [$t(45) = -.50, p = .62$], degree of sensitivity [$t(45) = -.99, p = .33$] or relaxation experience ($\chi^2 = .17, p = .68$). A signed, informed consent form was obtained from each participant before data collection. The study was approved by the ethics committee of the research institute.

Table 2: Matching variables, participants in the MBSR program (N = 47).

Group	Gender		Age		Education			Experience Relaxation Exercise		Neutral Perceptual Sensitivity		Affective Perceptual Sensitivity		Associative Sensitivity	
	m	v	M	SD	Low	Average	High	No	Yes	M	SD	M	SD	M	SD
Experimental	7	17	39.08	17.08	0	9	15	16	8	6.02	0.28	6.05	0.42	5.81	0.39
Control	6	17	39.39	13.81	0	7	16	14	9	6.17	0.40	6.08	0.43	5.85	0.48
N	13	34	39.23	15.40	0	16	31	30	17	6.09	0.35	6.06	0.42	5.83	0.43

Measuring instruments

Sensitivity. Sensitivity was measured by the Orienting Sensitivity Dimension of the Dutch version of the abbreviated Adult Temperament Questionnaire (Rothbart, Ahadi & Evans, 2000; Hartman, 2000). Orienting Sensitivity refers to the ability to be aware of a neutral or emotionally low-intensity stimulus from the environment, one's own body, or one's cognition. It is measured with three subscales, each consisting of 5 items: Neutral Perceptual Sensitivity, Affective Perceptual Sensitivity and Associative Sensitivity. Neutral Perceptual Sensitivity measures the extent to which an individual is aware of low-intensity stimuli from the external environment or body. An example of an item is "Hardly visible visual details rarely attract my attention." Affective Perceptual Sensitivity measures the extent to which one is aware of emotional sensations associated with low intensity stimuli. An example of an item is "When I listen to the music, I usually notice subtle emotional aspects in the music." Associative Sensitivity measures the extent to which individuals experience spontaneously-occurring cognitive activity that is not a direct result of stimuli from the environment. An example item is "Sometimes I have different thoughts and images in my head that have little connection with each other." The items are scored on a 7-point Likert scale, ranging from 1 (not applicable) to 7 (fully applicable). In two studies of non-HSPs (N=258 and N=700, respectively) Evans and Rothbart (2007) found internal consistency coefficients of .81 and .68 for the Neutral Perceptual Sensitivity subscale, .90 and .79 for the Affective Perceptual Sensitivity subscale, and .85 and .66 for the Associative Sensitivity subscale.

Stress. Stress was measured with the Perceived Stress Scale (PSS) (Cohen, Kamarck, & Mermelstein, 1983). The PSS measures the perceived amount of stress experienced

one month prior to administration. This scale consists of 14 items, each scored on a 5-point Likert scale ranging from 0 (never) to 4 (very often). In studies by Cohen et al. (1983) and Koopman, Gore-Felton, Marouf, et al. (2000), averages ranged between 23.18 and 25.00. Internal consistency coefficients varied from .84 to .86; the test-retest reliability was .85. An example of an item is "How often did you become upset because something unexpected happened in the past month?"

Social anxiety. Social anxiety was measured using the Social Anxiety Scale (SAS; Willems, Tuender-de Haan and Defares, 1973). The SAS measures dispositional social anxiety and consists of 24 items that refer to four social situations, namely social interaction situations in which a person strikes, assessment situations, new and unexpected situations and informal contact situations. The items are scored on a 5-point Likert scale ranging from 0 (absolutely not) to 4 (absolutely so). Kienhorst, De Wilde, Van den Bout and Diekstra (1990) found internal consistency coefficients between .86 and .88. An example of an item is "I am little concerned about what people think of me."

Self-acceptance. Self-acceptance was measured with the Self-Acceptance Subscale of the Existential Fulfillment Scale (EFS; Loonstra et al., 2007). The subscale measures the extent to which a person accepts his/her capacity, including the limitations inherent to life in general. The 5 items are scored on a 5-point Likert scale ranging from 0 (not applicable to me at all) to 4 (fully applicable). Loonstra, Brouwers and Tomić (2009) reported an internal consistency reliability of .78 for the subscale. An example of an item is "I often feel that I should prove myself."

Emotional empathy. Emotional empathy was measured with the Emotional Empathy Scale (Caruso & Mayer, 1998). This scale measures the ability to imagine oneself experiencing others' feelings and emotions and consists of 30 items scored on a 5-point Likert scale, ranging from 1 (disagree) to 5 (agree). Caruso and Mayer (1998) report an internal consistency reliability of .78. An example of an item is "It touches me when I see someone in distress."

Personal growth initiative. Personal growth initiative was measured by the Personal Growth Initiative Scale (PGIS; Robitschek, 1998, 1999). This scale measures the extent to which a person is actively and knowingly involved in his or her change and growth process, and consists of 9 items scored on a 6-point Likert scale, ranging from 0 (strongly disagree) to 5 (strongly agree). Robitschek (2003) found internal consistency coefficients varying from .78 to .88. An example of an item is "I am aware of the stage of life I am in."

Self-transcendence. Self-transcendence was measured with the Self-Transcendence subscale of the Existential Fulfillment Scale (EFS; Loonstra et al., 2007). The Self-Transcendence subscale measures the extent to which one recognizes that he/she differs from others and differs from the reality outside the self and is in search of respect and meaningful relationships, and takes responsibility. The 5 items are scored on a 5-point Likert scale ranging from 0 (not applicable to me) to 4 (fully applicable). Loonstra et al. (2009) found an internal consistency coefficient of .86 for this subscale. An example of an item is "I think my life has a greater meaning that goes beyond my personal interests."

Procedure

Physicians and paramedics attached to a medical center recruited the participants. After permission for cooperation from the person who was in charge of the center, a personal talk was organized with each doctor and paramedic. They were informed about HSPs, including indicators of high sensitivity. The following criteria described by Evans and Rothbart (2007) were used as indicators: (1) recurring complaints of sensory discomfort, which was experienced as an unpleasant affect resulting from the sensory qualities of stimulation, for example from sensory sensitivity awareness of slight, low intensity stimulation from multiple modalities; (2) awareness of slight, low intensity stimulation arising from within the body and the environment; (3) awareness of emotional valence associated with low intensity stimuli; and (4) reactive cognitive content that is not related to standard associations with the environment. Doctors and paramedics were asked to examine their patient files and identify patients matching on high sensitivity characteristics and indicators to participate in the current study during a consult or a telephone call. They were asked to provide only the names and additional information of patients with a minimum (approximately) 18 years of age, who showed no signs of serious psycho-pathological disorders and who were interested in participation. Based on patient contacts, the researchers confirmed that doctors and paramedics were able to recruit and select the participants eligible for the study.

A letter with information about the research aim was sent to all participants provided by the recruiters. In addition, they were told that participation is voluntary, and the procedure was explained. Participants also received a questionnaire with a stamped return envelope. They were asked to return the completed questionnaire within seven days. The questionnaire contained The Orienting Sensitivity Factor of the Adult Temperament Questionnaire. In addition, there were items about age, gender, education, and experience with relaxation exercises. After matching, each

participant was notified of the time and place for an individual interview for admission to the study and the MBSR training period.

During the intake interviews, organized prior to the MBSR program, participants were invited to speak about themselves and their expectations for the training. In a personal admission interview preceding the MBSR program, participants were told that they were expected to spend at least 45 minutes a day, six days a week, doing one or more of the exercises. One week prior to the start of the MBSR training, the participants were interviewed.

The MBSR program

The MBSR program consisted of eight weekly sessions of 2.5 hours each (Kabat-Zinn, 1990), during which the participants did the following exercises: (1) the body scan, meant to get them to pay systematic attention to the whole body and simultaneously perceive sensations in various parts of the body; (2) yoga exercises involving stretching and striking poses to increase awareness of the muscular system; (3) sitting meditation, during which the participant's attention is drawn to the breath, physical sensations, thoughts and emotions. After the first, third and fifth session, the participants were also given a compact disc with the body scan, yoga, and sitting meditation exercises. The first author conducted the MBSR training. She had previously taken an MBSR trainer program and practiced the MBSR exercises daily.

Results

Table 3: Mean scores, standard deviations, and ANOVA results (N = 47)

Variable	Condition	O1	O2	O3	O4	O5	Comparison between first-trained and second-not-yet-trained at post-test 1		Comparison between the two trained groups at post-test 1			Comparison between the two trained groups at post-test 2				
		M (SD)	ANOVA F df p	Cohen's d	ANOVA F df p	ANOVA F df p	ANOVA F df p									
Stress	FTG	33.29(5.55)	24.96(3.16)	23.46(3.72)												
	STG	32.91(5.34)	33.00(4.29)		25.22(3.83)	23.48(3.04)	94.11	1,45	<.001	-1.84	.14	1,45	.72	.01	1,45	.93
Social anxiety	FTG	79.92(2.77)	71.08(4.13)	68.58(5.67)												
	STG	79.78(2.22)	79.70(2.14)		72.48(3.99)	69.52(4.90)	86.89	1,45	<.001	-2.52	1.68	1,45	.20	.40	1,45	.53
Self-Acceptance	FTG	2.79(1.35)	4.67(1.63)	5.37(2.10)												
	STG	2.04(1.43)	2.30(1.61)		4.61(2.17)	5.87(2.10)	33.54	1,45	<.001	1.25	.16	1,45	.69	1.82	1,45	.18
Emotional Empathy	FTG	133.12(3.46)	133.67(4.02)	133.87(3.79)												
	STG	132.17(2.23)	132.09(2.31)		133.70(2.51)	134.39(2.50)	21.25	1,45	<.001	0.68	2.35	1,45	.13	.50	1,45	.49
Personal growth initiative	FTG	34.21(1.22)	35.29(1.52)	35.50(1.53)												
	STG	34.78(1.31)	34.83(1.75)		35.83(1.40)	36.22(1.35)	10.25	1,45	<.01	0.79	.14	1,45	.71	1.04	1,45	.31
Self-transcendence Mindfulness	FTG	16.38(1.64)	17.33(1.34)	17.50(1.22)												
	STG	15.91(1.65)	16.00(1.68)		17.52(1.59)	17.78(1.35)	14.04	1,45	<.001	0.63	1.93	1,45	.17	3.14	1,45	.08
	FTG	3.98(.25)	4.59(.26)	4.71(.22)												
	STG	3.94(.21)	3.94(.19)		4.47(.19)	4.60(.16)	157.19	1,45	<.001	2.40	2.59	1,45	.12	3.26	1,45	.08

Note:

FTG = First-trained group

STG = Second-trained group

O1A & O1B = pre-test of first-trained and first pre-test of second-trained groups, respectively

O2A & O2B = first post-test of first-trained and second pre-test of second-trained groups, respectively

O3 = second post-test of first-trained group

O4 = first post-test of second-trained group

O5 = second post-test of second-trained group

Training effects on the first post-test

Table 3 shows the mean scores and standard deviations of the instruments applied during each of the test moments. The pre-tests are labeled as O1 for the first trained group and O1 and O2 for the second-trained group. The post-tests are labeled as O2 and O3 for the first-trained group and O4 and O5 for the second-trained group.

To determine whether the first trained group (FTG) differed from the second-trained group on the first post-test, ANOVAs were performed. It was expected that the scores on the second test (O2) would differ significantly by group, controlling for scores on the first test (O1). ANOVAs of the mean scores at O2 (dependent variable), the mean scores at O2 (covariate) and condition (FTG or STG) as a fixed factor revealed significant differences on the following variables: stress ($F = 94.11, p < .001$), social anxiety ($F = 86.89, p < .001$), self-acceptance ($F = 33.54, p < .001$), emotional empathy ($F = 21.25, p < .001$), personal growth initiative ($F = 10.25, p < .01$), and self-transcendence ($F = 14.04, p < .001$).

Cohen's d was calculated to determine the magnitude of the differences found between the pre-test and the first post-test (Cohen, 1977). As Table 3 shows, these effects range from medium to very large. The effects on the variables for stress, social anxiety, self-acceptance and personal growth initiative were very large (d values of -1.84, -2.52, 1.25 and 0.79, respectively). Emotional empathy and self-transcendence reached a medium effect ($d = 0.68$ and 0.63 , respectively).

Durability of the effects

To determine the durability of the effects after a four-week lapse, t-tests were performed on the first-trained group's scores on the two post-tests. The means were not expected to differ significantly, or only in such a way that the differences could be interpreted as an increased effect on the relevant variable. In line with the expectations, the means of the following variables of the first-trained group on the first post-test (O2) did not differ significantly from those on the second post-test (O3): Emotional empathy ($t = -1.55, p = .14$); personal growth initiative ($t = -1.55, p = .14$); and self-transcendence ($t = -1.70, p = .10$).

Likewise, the results for the following variables also appeared to be in line with expectations, as the means on the second post-test (O3) showed an improvement over those on the first post-test (O2): Stress ($t = 3.67, p < .001$); social anxiety ($t = 5.19, p < .001$); and self-acceptance ($t = -3.82, p < .001$). Stress and social anxiety scores were significantly lower, whereas self-acceptance scores were significantly higher on the second post-test compared to the first post-test. Four weeks after the training

program, participants experienced even less stress and social anxiety and even more self-acceptance.

The same analyses were performed on the scores for both post-tests taken by the second-trained group. In line with expectations, the mean score of the variable self-transcendence of the second-trained group on the first post-test (04) did not differ significantly from that on the second post-test (05) ($t = -2.02, p = .06$). Likewise, the results for the following variables were also in line with expectations, as the mean scores on the second post-test (05) once again improved over those on the first post-test (04): Stress ($t = 4.73, p < .001$); social anxiety ($t = 5.77, p < .001$); self-acceptance ($t = -5.52, p < .001$), emotional empathy ($t = -5.97, p < .001$), and personal growth initiative ($t = -3.76, p < .001$).

Comparison of effects between the two trained groups

The MBSR program was administered to the experimental group (first-trained group) first and later to the control group (second-trained group). As the training program and procedure were identical for both groups, we expected the training effects to be the same across groups. To determine whether the effects of the program were identical for the groups, the researchers computed repeated measures ANOVAs with the means of scores on the first and second post-tests, respectively (dependent variables), the pre-tests (covariates), and condition (fixed factor). As Table 3 shows, there were no significant differences (Stress: $F = .14, p = .72$ and $F = .01, p = .93$, respectively; social anxiety: $F = 1.68, p = .20$ and $F = .40, p = .53$, respectively; self-acceptance: $F = .16, p = .69$ and $F = 1.82, p = .18$, respectively; emotional empathy $F = 2.35, p = .13$ and $F = .50, p = .49$, respectively; personal growth initiative: $F = .14, p = .71$ and $F = 1.04, p = .31$, respectively; and self-transcendence: $F = 1.93, p = .17$ and $F = 3.14, p = .08$, respectively).

Discussion and conclusion

The current study examined the psychological impact of the MBSR program on HSPs with respect to stress, social anxiety, self-acceptance, emotional empathy, personal growth initiative, and self-transcendence. The study produced several important findings.

It was expected that the scores of the first trained group on the second test would differ significantly from the scores of the second-trained group, controlling for the scores on the first test. Results revealed significant differences on the variables stress, social anxiety, self-acceptance, emotional empathy, personal growth, and self-

transcendence. The effect sizes ranged from medium to very large. The effects on the variables stress, social anxiety, self-acceptance and personal growth were very large. Emotional empathy and self-transcendence reached medium effects.

In addition, outcomes were evaluated over time. The durability of the effects after a four-week lapse was determined, and the results showed no decreases. In contrast, effects improved on several variables, i.e., scores for stress and social anxiety reduced further, and scores for self-acceptance increased. Such gains over time were quite obvious. Participants committed themselves to spend at least 45 minutes daily, six days a week, conducting MBSR exercises during the training period. It is quite likely that they continued performing the exercises after that period. Carmody and Bear (2008) found empirical support for a central tenet of mindfulness-based treatment approaches, i.e., that the amount of time spent on daily practice of a formal mindfulness meditation practice, such as a body scan or sitting meditation, increases self-reported mindfulness, which in turn leads to improved psychological functioning. However, the increased effects found four weeks later could also be interpreted as sleeper effects, which occur sometime after training has been implemented (Hovland & Weiss, 1951; Gonella, Hojat, & Veloski, 2005).

The finding that stress and anxiety diminished considerably corresponds with the results of studies by Miller, Fletcher, and Kabat-Zinn (1995); Shapiro, Schwartz, and Bonner (1998); Chang et al. (2004); Shapiro, Astin, Bishop, and Cordova (2005); and Kabat-Zinn, Massion, Kristeller, Peterson, Fletcher, Pbert, Linderking and Santorelli (1992). This suggests that HSPs may benefit from the MBSR program.

One crucial question is: which mechanisms are responsible for the effects of the MBSR program? After all, the program consists of a number of components and elements (such as the body scan, sitting meditation, yoga positions, and other exercises), each of which may contribute to the improvements (Williams, Kolar, Reger, & Pearson, 2001; Reibel, Greeson, Brainard, & Rosenzweig, 2001). Besides these formal exercises, a number of therapeutic group intervention factors may play a role, such as receiving support from the trainer and group members and being able to express one's emotions during the group sessions held after the various parts of the program. The question remains: to what extent do these elements play a role in inducing the training effects found? A study involving psoriasis patients (Kabat-Zinn, Wheeler, Light, & Cropley, 1998) showed that, in addition to the therapeutic factors, the practice of mindfulness in itself can lead to beneficial effects. In this study, the participants played audio cassettes with recorded mindfulness instructions while receiving treatment in a light-booth. Although the intervention was void of any social support, it appeared as though the practice of mindfulness was in itself

effective. Nevertheless, the psychological impact of the MBSR program requires further investigation (Arch, 2006), for example, an examination of a single part of the program, such as the body scan (Ditto, Eclache, & Goldman, 2006; Cropley, Ussher, & Charitou, 2007).

This study not only involved an experimental group (the first-trained group) but also a control group (the second-trained group). A comparison of the effects of the MBSR program on the two trained groups revealed no significant differences. These findings suggest that the effects of the MBSR program are not accidental but require the implementation of a training protocol that can be applied by various trainers.

The results of this study must be considered in light of a number of limitations. First, a substantial number of the participants were highly educated; therefore, the effects cannot be generalized to the entire population of HSPs. It is possible that highly educated persons will derive greater benefits from the MBSR program than those with less education. Highly educated people may feel more daily stress, for example, because of their greater ability to intellectualize (Carlson, Ursuliak, Goodey, Angen, & Speca, 2001). Second, the participants in the MBSR program were selected by physicians, whose opinions about their patients concerning sensitivity indicators were used as a starting point. In order to select the participants, no additional objective information was used. On the other hand, after selection their sensitivity level was measured. The participants' mean scores proved to be significantly higher than the highest mean scores in Evans and Rothbart's (2007) studies on other groups. And what's more, the means on the three sensitivity subscales were more than one standard deviation above those found in the aforementioned studies, while the variances on these variables were fairly low. These findings strongly indicate that the participants had a relative high sensitivity level and were fairly homogeneous on that point. Moreover, participants were divided at random into the two groups after they were matched on sensitivity, gender, age, and education level. Third, the effect criteria were measured by questionnaires only. In other words, no objective measures were used, such as blood pressure, heart rhythm variability, or other tests to determine the level of stress or relaxation. Future studies on the effectiveness of the MBSR program should avoid this omission. Fourth, the final post-test took place four weeks after the MBSR program had ended. No data were available on the long-term effects after three, six, or twelve months. This study showed that both stress and anxiety levels were higher four weeks after the program had ended than immediately after the program. The question remains: how high might the scores have been after a longer period of time? Further study is required to determine the durability effects of the MBSR program.

The findings suggest that it may be helpful for HSP's to learn mindfulness meditation. If future studies also reveal positive effects of MBSR-training in HSP's, it may be important to find ways to inform HSP's about these possibilities. But as long as there is not much evidence about the efficacy of MBSR-training in HSP's, it is not recommended to implement it widely in advance.

In conclusion, the findings support the primary hypothesis that training HSPs in MBSR can increase levels of self-acceptance, emotional empathy, personal growth, and self-transcendence and can reduce levels of stress and social anxiety. These results are worthwhile, and they persisted for 2 months after treatment. We, therefore, conclude that the MBSR program could offer a meaningful supplement to therapies aimed at HSPs. The program merits further study as a potential mental health promotion instrument.

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About the authors:

André Brouwers is currently at the Open University of the Netherlands, Department of Psychology. He has published widely in the field of occupational and organizational psychology, in particular on burnout. His current work centers on coaching and mindfulness research. E-mail: andre.brouwers@ou.nl

Ilse Soons is working as a student coach and educational consultant in Antwerp, Belgium. Her primary interest is directed to the fields of education, communication and mindfulness. E-mail: ilsesoons@hotmail.com

Welko Tomic is currently at the Open University of the Netherlands, Department of Psychology. He has published extensively on issues related to teacher behavior, transfer, and burnout. His current work focuses on existential fulfillment, work engagement and psychosocial disorders. E-mail: welko.tomic@ou.nl