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In-Person and Virtual World Mindfulness Training: Trust, Satisfaction, and Learning

Valerie J. Rice, PhD[1] and Paul J. Schroeder, PhD[2]

Abstract

Virtual worlds (VWs) present a viable, low-cost delivery mechanism for telehealth services. Although preliminary reports support the effectiveness of VWs in terms of health metrics, few studies have examined the perceived benefits and learning potential for military service members and veterans. Trust is integral to any interaction and may be even more important, and problematic to establish, during virtual interactions than in-person (IP) communications. The purpose of this study was to compare active duty and veteran U.S. Military service members' ($n = 92$) self-reported trust, class satisfaction, and didactic learning after completing either an 8-week training course in mindfulness-based stress reduction (MBSR) delivered IP or an 8-week mindfulness meditation class based on MBSR via the VW of Second Life. Results showed that learning performance was not significantly different between the IP and VW groups ($p > 0.05$). Although overall trust was high for both groups, participants in the IP group reported greater trust and class satisfaction compared with the VW group ($p < 0.05$). Trust, satisfaction, and learning were significantly correlated with one another, and trust in the instructor significantly predicted trust-in-classmates, trust-in-self, and class satisfaction for both groups ($p < 0.05$). In this study, IP group training was superior to VW training in terms of self-reported greater trust in the instructor, classmates, and self, and higher satisfaction with the training. Trust in the instructor is particularly important for group training, whether IP or in a VW. This study reiterates the arduous task of establishing trust in a VW setting and suggests that creating trust between the instructor and participants is high priority as a leading objective for VW communications. Suggestions for building trust are tight collaboration and clear communication, along with supporting and advocating for one another.

Keywords: mental health, meditation, telehealth, military

Introduction

ADVANCES IN INTERNET COMMUNICATIONS have facilitated the development of alternative delivery methods for health and wellness interventions.[1,2] Although there are distinct advantages and disadvantages to different delivery mediums,[3] online platforms are arguably most widely used for health-related training that is not administered in-person (IP). These platforms are popular because practitioners and patients favor the convenience, lower cost, ease of storing and updating information, and ability to connect remotely.[4–6] Relative to IP delivery, digital delivery of health evaluations, interventions, and training has surged, especially given the onset of coronavirus disease 2019 (COVID-19). Understanding learners' reactions to training is central to the design of course curriculum, pedagogical practices, and learning and retention strategies.

Internet-based virtual worlds (VWs) are an engaging alternative to traditional online forums. VWs are online communities in which users socialize and interact in a synchronous, persistent, real-time environment.[7,8] Visitors to VWs use avatars to represent themselves, which can provide a degree of anonymity, while still enabling users to establish relationships with others. In addition, VWs afford users an immersive social experience,[9] which may be ideal for participants who have physical limitations or issues with social interactions (such as social anxiety), are confined due to ''lock-down'' situations (such as with COVID-19), as well as for those who live in remote areas or are otherwise unable to engage in IP activities, such as deployment.[10]

[1]Army Medical Department Field Office, Army Futures Command, Army Combat Capabilities Development Command, Army Research Laboratory Future Soldier Technologies Division, Real-World Soldier Quantification Branch, FCDD-RLH-FA, Fort Sam Houston (JBSA), Texas, USA.
[2]Booz Allen Hamilton, McLean, Virginia, USA.

Although some health care practitioners and facilities embrace VWs as a platform for delivering health care training,[6,10] a few studies have investigated its applicability, feasibility, or effectiveness across multiple learning scenarios. A systematic review by Ghanbarzadeh et al.[11] identified nine articles published between 1990 and 2013 involving the use of VWs for health intervention purposes. Four of the articles involved treatment of stress-related issues. One study found that therapy delivered over Second Life (a VW platform that enables users to connect at no cost via virtual communities using avatars) was helpful in reducing social anxiety symptoms.[12] A study by Hoch et al.[13] reported that delivery of a mindfulness meditation course offered over Second Life was helpful in lowering participants' stress and psychological symptoms. However, the latter study was a pilot study ($N=24$), included only participants who were already familiar with Second Life, and did not include a comparative group. Thus, despite a few promising outcomes from prior research, there is a dearth of published studies that have systematically examined the effectiveness of VWs for delivery of programs that promote healthy behaviors, such as mindfulness training.

Another neglected aspect of VW telehealth research is the comparison of participants' learning of concepts presented during IP versus VW intervention or training. This is important, because wellness interventions involve teaching and learning, with anticipation of participant retention of information and consistent application of learned healthy behaviors. As such, these trainings offer participants' guidance and instruction in health-related techniques that are to be used after program completion (e.g., recognizing negative thoughts and response behaviors or changing eating or exercise behaviors). Moreover, identifying salient or memorable concepts during VW-based programs could inform both the development of the intervention itself and the design features of the virtual environment.[14] Although prior research has demonstrated that virtual environments can be used to teach familiar material,[15] again there is a scarcity of research examining whether VWs are effective for teaching unfamiliar or novel didactic information.

A third aspect of VW telehealth that has received minimal attention is the role of trust between participants and instructors.[16] This is noteworthy because trust is a critical determinant of how people interact with VW technology[17] and how they interact with other users.[18,19] Studies show that users' trust is significantly associated with perceptions of other users (e.g., social presence),[20] online learning experiences,[21] commitment to a virtual community,[22] and most especially, compliance.[23,24]

In this study, we examined active duty and veteran military service members' self-reported trust and class satisfaction, as well as their didactic learning performance after an 8-week mindfulness-based stress reduction (MBSR) training program delivered IP or a mindfulness meditation training program based on MBSR delivered online via the VW of Second Life. Although the military has utilized VWs for instructional purposes,[25] a few studies have systematically examined the effectiveness of these programs. An investigation of service members' perceptions, satisfaction, and learning will inform the design and delivery of future instructive efforts that utilize VW platforms.[26] In addition, should VW delivery be effective, a greater number of service members could be reached, even when they are in remote locations where health care providers/instructors are not physically available.

Mindfulness meditation was selected as the test case for comparing IP and VW training. This allowed assessment of didactic learning and subjective, objective, and behavioral responses, as demonstrated in our previous publications on mindfulness and stress.[27,28] Mindfulness training involves teaching participants to focus their attention, attune to the present moment, and to accept their thoughts, sensations, and emotions in a nonjudgmental manner.[29] Prior research has shown that, given the choice, civilian participants preferred the idea of completing mindfulness training online more than individually or as a group.[30] However, because participant engagement had been found to be greater during IP training than online training,[31] and both instructors and participants can respond to nonverbal communications during IP training, we hypothesized that IP delivery of mindfulness training would promote greater trust and class satisfaction, and superior learning performance compared with VW delivery.

Methods

Participants and procedures

Participants were volunteers recruited via a combination of posted announcements, flyers, word-of-mouth, on-location e-mail notices, and recruitment events from the catchment area of a military medical facility and several adjacent military facilities in the United States. Ninety-two U.S. military active duty and veteran service members volunteered. All volunteers signed a consent form before participation. The study was approved by the U.S. Army Institutional Review Board.

Training was delivered either IP ($n=50$) or over the VW of Second Life ($n=42$). Both training formats were offered at a time of day when most participants could attend, typically at the end of a duty day. Details about the activities of both the IP and VW classes are described elsewhere.[19,27,28] Both delivery mechanisms were taught by trained individuals from the Center for Mindfulness at UMass Memorial Medical Center and the University of California-San Diego Center for Mindfulness. Group assignment was by convenience, based on volunteers' availability and the process of filling first one group (e.g., IP) and initiating interventions and then filling another group (e.g., VW) and beginning the intervention. Filling a single group took $\sim$1.5 to 2 months, therefore we filled one group and then another sequentially, so those signing up would not have to wait 3 to 4 months before a class started. This was, in part, due to active duty personnel and veterans needing to fulfill their work-related duties, thus impacting their long-term availability (2.5 months) to participate. Participants were blinded to which group they would participate in until just before the group commenced. Volunteers were not compensated for their involvement.

In-person MBSR. The training for this group followed the program developed by Kabat-Zinn.[29] Kabat-Zinn's approach to mindfulness draws from Buddhist traditions. It involves teaching participants' exercises to enhance present-moment awareness by focusing on their physical sensations (tactile, hearing, interoception, sight, taste) accompanying their breathing, walking, sitting, listening, mindful yoga, etc.

Kabat-Zinn's training also involves the use of stories and poetry, with specific topics addressed each week. Each exercise, story, or poem is followed by group discussion about present-moment occurrences revolving around the just completed exercise or verbalizations. The group met once a week, for $\sim$2.5 hours, for 8 weeks, with an all-day silent retreat (7 hours) scheduled between classes 5 and 7. Weekly topics, handouts, and recordings were given to attendees.

VW mindfulness. The training for this group was based on MBSR, but classes were shortened after a survey of active duty service members and veterans indicated the length of time they were willing to spend in training in a VW. Instead of 2.5 hours, the group met once a week, for 1.5 hours with a 3-hour silent training scheduled between classes 5 and 7. Weekly topics were identical to those in the IP group and the same handouts and recordings were available to both groups. Figure 1 shows a typical group meeting in the VW.

Instruments

Demographic survey. The demographic survey queried volunteers' age, race, gender, education, marital status, military status, military branch, deployment (i.e., whether they had deployed into harms-way or not), and time on active duty. Anticipating a participant pool of individuals from varied ages and backgrounds, items in the demographic survey also queried participants' computer proficiency, Internet proficiency, social media use, and experience with VWs.

Trust survey. This 19-item self-report survey, created by the senior members of the investigative team, required respondents to rate their level of agreement with statements about their perceptions of the instructor, their classmates, and themselves in relation to their instructor and classmates, and their trust in the same. Each item required ordinal responses, where 1 = ''strongly disagree'' and 5 = ''strongly agree.'' The reliability of trust survey was found to be high, $\alpha = 0.96$.

Class satisfaction and benefits survey. This 10-item self-report survey, created by the senior members of the investigative team, had respondents rate their level of agreement with statements about the class. Each item required ordinal responses, where 1 = strongly disagree and 5 = strongly agree. An overall class satisfaction score was calculated by summing the responses from all of the survey items. The reliability of the class satisfaction survey items was found to be high, $\alpha = 0.97$.

Didactic assessment. This 20-question assessment measured knowledge about mindfulness and MBSR concepts, after training. The measure consists of 12 true/false items and 8 multiple-choice items. An example of a true/false item is, ''A body scan is an example of a formal (vs. informal) meditation practice'' (the correct response is ''true''). An example of a multiple-choice item is, ''During mindful meditation, one of the most important parts is to: (1) force yourself to stay on task, (2) concentrate of a word, phrase, thought or series of thoughts, (3) strictly control your mind, (4) let experiences (thoughts, emotions, sounds) come and go, (5) breathe as deeply and fully as you can, to relax deeper.'' [the correct response is (6)]. Correct responses were

FIG. 1. Research participants and instructors in the VW during the body scan. The instructor took control of the avatars during activities, such as the body scan or yoga, so all the participants moved in unison. The individual sitting is a technical guide, who helps if someone has technical difficulties during the training. VW, virtual world.

valued at one point, and a summary score was calculated by adding together the number of correct responses.

Data analysis

All data were analyzed by using SPSS version 20. Frequencies and chi-square analyses were used to compare the IP and VW groups' demographic data. An exploratory factor analysis using principle components analysis with varimax rotation (an approach that maximizes the variance of the factor loadings) was used to examine the structure of the trust measure and to investigate the aspects of trust impacted by the mindfulness training program. The Mann–Whitney *U* test was used to compare the item responses of the two groups on the trust, class satisfaction, and didactic assessment measures. The Mann–Whitney test was used, because responses to items on the measures were ordinal. Analysis of variance (ANOVA) was used to analyze differences on continuous variables when the number of independent variables was greater than the number of dependent variables (e.g., comparing the IP and VW groups age and time-in-service). Multivariate analyses of variance (MANOVA) was used to analyze differences on continuous variables when the number of independent variables was less than the number of dependent variables (e.g., comparing the IP and VW groups scores on the three trust measures). For both ANOVA and MANOVA analyses, Tukey's B *post hoc* test was used to compare group differences.

Pearson Product correlations were used to examine the relationships between demographic variables (age, time-in-service) and outcome measures, as well as the relationship between scores on each measure. A partial correlation was used to examine if controlling for group assignment influenced the relationship between scores on each measure. Forward entry linear regression was used to examine the predictive relationships between scores on the measures.

Results

No differences were seen in the self-reported demographics for the IP and VW groups or for computer and Internet proficiency (Fig. 2). Demographics, frequencies, and between-group comparisons are available in Tables 1 and 2. The average age (51.80 ± 11.34 years) and time-in-service of the IP group (16.87 ± 8.59 years) were not significantly different from those of the VW group (50.00 ± 11.15 years and 15.67 ± 9.83 years), p's > 0.05.

Analysis of responses on the self-reported trust survey

Median responses and factor loading for items on the trust survey are available in Table 3. Factor analysis revealed three unique factors that we labeled: *trust-in-instructor*, *trust-in-classmates*, and *trust-in-self*. The IP group reported greater trust than volunteers in the VW group for 17 of the 19 items, p's < 0.05. Responses to the following two items were not significantly different (p's > 0.05) for the two groups: ''I felt the MBSR instructor(s) was an expert at delivering MBSR training'' and ''I believe my MBSR classmates and instructor(s) perceived me as I intended.''

Scores were calculated for the three trust categories by summing responses to items in their respective category (Table 4). Significant group differences were found on the trust category scores, $F(3, 88) = 6.89$, $p < 0.001$, $\eta p^2 = 0.19$. The IP group had significantly higher trust-in-instructor, trust-in-classmates, and trust-in-self scores than the VW group.

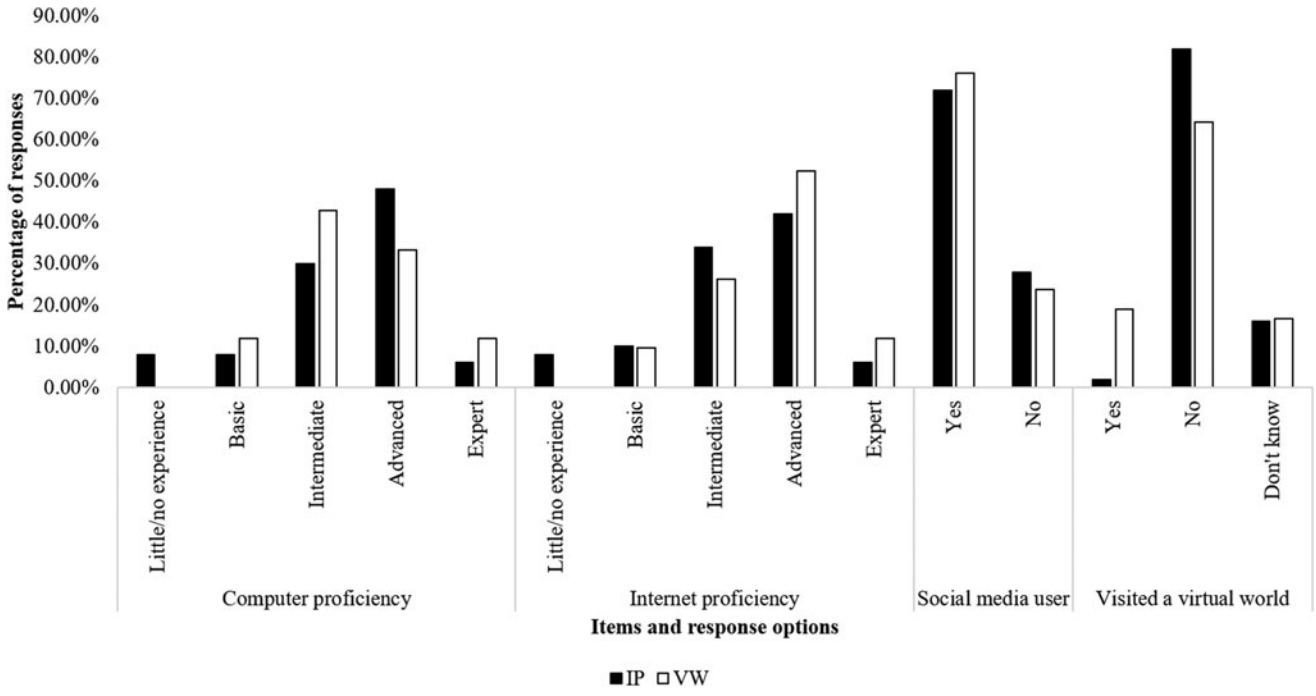

FIG. 2. Frequencies of the IP and VW groups' responses to the demographic survey items about computer use. None of the comparisons were statistically significantly different. IP, in-person.

Table 1. Demographics and Chi-square Comparisons for Participants in the In-Person and Virtual World Groups

Demographic	*IP* n *(%)*	*VW* n *(%)*	χ^2	p
Gender				
Male	24 (48.0)	24 (57.1)	0.00	1.00
Female	26 (52.0)	18 (42.9)	1.46	0.23
Race				
African American	12 (24.0)	7 (16.7)	1.32	0.25
Native American	1 (2.0)	1 (2.4)	0.00	1.00
Caucasian	25 (50.0)	28 (66.7)	0.17	0.68
Hispanic	11 (22.0)	4 (9.5)	3.27	0.07
Asian	1 (2.0)	1 (2.4)	0.00	1.00
Other	0 (0.0)	0 (0)	0.00	1.00
Education				
Diploma/GED	4 (8.0)	3 (7.1)	0.14	0.71
Some college/AA	15 (30.0)	10 (23.8)	1.00	0.32
Bachelors	11 (22.0)	12 (28.6)	0.04	0.84
MA/PhD	18 (36.0)	14 (33.3)	0.50	0.48
Other doctoral degree	2 (4.0)	3 (7.1)	0.20	0.66
Marital status				
Married	29 (58.0)	27 (64.3)	0.07	0.79
Divorced	8 (16.0)	7 (16.7)	0.07	0.80
Widowed	0 (0.0)	1 (2.4)	0.00	1.00
Single/separated	11 (22.0)	7 (16.7)	0.89	0.35
Partnered w/sig other	2 (4.0)	0 (0)	0.00	1.00

AA, associates degree; GED, general education degree; IP, in-person; VW, virtual world.

Correlations between demographics and scores on the trust survey

For the IP group, there was no significant effect for gender, race, education, or marital status on trust scores, p's > 0.05. Age was positively correlated with trust-in-self, $r(50) = 0.32$, $p = 0.02$, but not trust-in-instructor or classmates, p's > 0.05. No significant effect of military status, service branch, deployment history, or time-in-service was found on trust, p's > 0.05.

For the VW group, age, gender, race, and marital status had no significant effect on trust, p's > 0.05, and these were not significantly correlated with trust, $p > 0.05$. Education had a significant effect, $F(12, 110) = 2.04$, $p = 0.03$, $\eta p^2 = 0.18$. Across education levels, significant differences were found for reported trust-in-instructor, $F(4, 42) = 3.15$, $p = 0.03$, $\eta p^2 = 0.25$; classmates, $F(4, 42) = 3.39$, $p = 0.02$, $\eta p^2 = 0.27$; and self, $F(4, 42) = 2.76$, $p = 0.04$, $\eta p^2 = 0.23$. Relative to volunteers who reported some college/associates (AA) degree education, MA/PhD educated volunteers had significantly higher trust-in-instructor, $p = 0.04$ and classmates, $p = 0.02$, but not in self, $p > 0.05$. No statistically significant effects of military status, service branch, or deployment history were found, p's > 0.05. Although time-in-service was not significantly correlated with trust-in-instructor or classmates, p's > 0.05, it was significantly correlated with trust-in-self, $r(42) = 0.31$, $p = 0.04$.

Table 2. Military Service Demographics and Chi-square Comparisons for All Volunteers

Demographic	*IP* n *(%)*	*VW* n *(%)*	χ^2 *(1)*	p
Military status				
Active duty	10 (20.0)	16 (38.1)	1.39	0.24
Veteran	40 (80.0)	26 (61.9)	2.97	0.09
Military branch				
Army	31 (62.0)	27 (64.3)	0.28	0.60
Air force	15 (30.0)	9 (21.4)	1.50	0.22
Navy	3 (6.0)	4 (9.5)	N/A	N/A
Marines	1 (2.0)	2 (4.8)	N/A	N/A
Deployed				
No	19 (38.0)	17 (40.5)	0.11	0.74
Yes	31 (62.0)	25 (59.5)	0.64	0.42

Note: N/A, cell sizes were too small to calculate statistically meaningful results.

Analyses of responses on the self-reported class satisfaction survey

Table 5 contains the medians and ranges for responses to items on the class satisfaction and benefits survey. The IP group reported higher levels of satisfaction on all items, p's < 0.05, except "MBSR training improved my ability to cope with life," $p > 0.05$. Overall class satisfaction scores (sum of scores for the 10 items) were significantly higher for the IP group ($M = 43.34 \pm 7.83$) than the VW group ($M = 37.55 \pm 10.99$), $F(1, 89) = 8.50$, $p = 0.01$, $\eta p^2 = 0.09$.

For both the IP and the VW groups, gender, race, education, and marital status had no significant effect on overall class satisfaction scores, p's > 0.05, and overall scores were not significantly correlated with age, $p > 0.05$. Similarly, military demographics had no significant effect on the overall class satisfaction scores, p's > 0.05, nor was time-in-service significantly correlated with class satisfaction scores, $p > 0.05$.

Analyses of responses on the didactic evaluation measure

Scores on the didactic evaluation measure did not differ significantly between the IP ($M = 10.12 \pm 1.62$) and the VW groups ($M = 9.79 \pm 2.37$), $F(1, 91) = 0.64$, $p > 0.05$.

For both the IP and VW groups, gender, race, education, and marital status had no significant effect on didactic evaluation scores, p's > 0.05, and age was not significantly correlated with scores, $p > 0.05$. Military status and service branch had no significant effect on scores, p's > 0.05 and time-in-service was not significantly correlated with scores, $p > 0.05$.

Relationship between class/team trust, satisfaction, and didactic evaluation scores

Table 6 displays the bivariate correlation coefficients between scores on the trust survey, class satisfaction survey, and didactic evaluation measure. All three measures of trust, satisfaction, and didactic scores were correlated with one another at the 0.01 level.

Predicting class satisfaction and learning performance from self-reported trust

Output from the regression analyses for significant predictors is available in Table 7. The first regression analysis examined whether trust scores predicted class satisfaction scores. Trust-in-instructor was the sole significant predictor

Table 3. Median Responses, Ranges, and Factor Analysis Loadings for the Three Categories of the Trust Survey

	IP		*VW*		*Factor loading*		
Survey item	*Mdn*	*Min Max*	*Mdn*	*Min Max*	*(1)*	*(2)*	*(3)*
(1) Trust in instructor							
I felt the instructor(s) was competent in delivering MBSR training	5.00	3.00 5.00	5.00	1.00 5.00	0.86		
I felt the MBSR instructor(s) was an expert at delivering MBSR training	5.00	4.00 5.00	5.00	1.00 5.00	0.84		
I felt confident about relying on the MBSR instructor(s) for information on stress reduction techniques	5.00	3.00 5.00	5.00	1.00 5.00	0.84		
I felt content about relying on the MBSR instructor(s) for information on stress reduction techniques	5.00	3.00 5.00	4.50	1.00 5.00	0.82		
I felt the instructor(s) was able to teach me MBSR	5.00	2.00 5.00	5.00	1.00 5.00	0.82		
I felt the instructor(s) had expertise in MBSR	5.00	4.00 5.00	5.00	1.00 5.00	0.82		
I felt happy about relying on the MBSR instructor(s) for information on stress reduction techniques	5.00	3.00 5.00	4.00	1.00 5.00	0.82		
I felt the MBSR instructor(s) had good knowledge about MBSR	5.00	4.00 5.00	5.00	1.00 5.00	0.82		
I felt comfortable relying on the MBSR instructor(s) for information on stress reduction techniques	5.00	2.00 5.00	5.00	1.00 5.00	0.75		
I trust that MBSR instructors will keep my personal information confidential	5.00	4.00 5.00	5.00	1.00 5.00	0.62		
(2) Trust in classmates							
Overall, the people in my MBSR class were very trustworthy	5.00	3.00 5.00	4.00	3.00 5.00		0.87	
The people in my MBSR class were friendly	5.00	4.00 5.00	4.00	1.00 5.00		0.76	
I can rely on my MBSR classmates	4.00	3.00 5.00	3.50	1.00 5.00		0.75	
I trust that my MBSR classmates will keep my personal information confidential	5.00	4.00 5.00	4.00	1.00 5.00		0.66	
We were usually considerate of one another's feelings in this MBSR class	5.00	4.00 5.00	5.00	1.00 5.00		0.65	
(3) Trust-in-self							
I felt comfortable sharing my thoughts and feelings in a group setting	5.00	1.00 5.00	4.00	1.00 5.00			0.88
I was comfortable speaking during class	5.00	1.00 5.00	4.00	1.00 5.00			0.81
I felt secure sharing my experiences with the MBSR instructor(s)	5.00	1.00 5.00	4.00	1.00 5.00			0.73
I believe my MBSR classmates and instructors perceived me as I intended	4.00	2.00 5.00	4.00	1.00 5.00			0.65

Note: 1 = strongly disagree, 3 = neutral, 5 = strongly agree.
Max, maximum; MBSR, mindfulness-based stress reduction; Mdn, median; Min, minimum.

Table 4. Means, Standard Deviations, and Analysis-of-Variance Comparisons for Trust Scores

	IP		*VW*				
Trust	*M*	*SD*	*M*	*SD*	*F(1, 91)*	p	ηp^2
Instructor	47.52	3.54	43.21	9.02	9.63	0.01	0.10
Class	23.16	2.03	20.60	3.26	21.15	0.01	0.19
Self	17.72	2.86	15.98	3.72	6.37	0.01	0.07

of class satisfaction scores. A followup regression analysis using only trust-in-instructor scores as the predictor variable showed that trust-in-instructor accounted for 44% of the variance in class satisfaction scores, $R^2 = 0.44$, $F(1, 89) = 68.29$, $p < 0.01$.

A separate regression analysis examined whether trust scores predicted learning performance (didactic evaluation scores). Although scores on the three trust measures accounted for 11% of the variance in scores on the didactic evaluation measure, $R^2 = 0.11$, $F(3, 89) = 3.64$, $p < 0.04$, scores on the trust measures did not predict scores on the didactic evaluation measure, p's < 0.05.

Table 5. Medians and Ranges for Responses to Each Item on the Class Satisfaction and Benefits Survey

	IP		VW	
Item	*Mdn*	*Min Max*	*Mdn*	*Min Max*
Overall, how satisfied are you with the MBSR training?	5.00	3.00 5.00	4.00	1.00 5.00
Overall, this training has had a positive effect (i.e., made a difference) in my life	5.00	1.00 3.00	4.00	1.00 5.00
I feel I benefited from MBSR training	5.00	1.00 5.00	4.00	1.00 5.00
MBSR training was useful in reducing my daily stress	4.50	1.00 5.00	4.00	1.00 5.00
MBSR training was useful in reducing my overall stress	5.00	1.00 5.00	4.00	1.00 5.00
MBSR training was useful in helping me relax	5.00	3.00 5.00	4.00	2.00 5.00
MBSR training improved my ability to cope with life	4.00	1.00 5.00	4.00	1.00 5.00
My attitude toward life has improved from taking MBSR training	4.00	1.00 5.00	4.00	1.00 5.00
I plan to use what I learned during MBSR training after the study ends	5.00	1.00 5.00	4.00	2.00 5.00
I would recommend that others take an MBSR training class	5.00	3.00 5.00	5.00	1.00 5.00

Note: 1 = strongly disagree, 3 = neutral, 5 = strongly agree.

Discussion

This study examined the relationship between self-reported trust, class satisfaction, and learning performance in a sample of active duty and veteran U.S. Military service members who completed an 8-week mindfulness meditation training program delivered either IP or online via a VW. We hypothesized that participants in the IP group would report greater trust, class satisfaction, and learning performance relative to those in the VW group.

Consistent with our primary hypothesis that IP delivery of training would promote greater trust relative to VW delivery, the group attending IP reported higher trust in their instructor, classmates, and in themselves, as compared with the group attending in the VW. This suggests that face-to-face interaction between instructors, students, and classmates facilitated greater trust for the IP group, as compared with participants in the VW condition. One explanation for this finding is that physical contact (such as a handshake or a hug), reading and responding to facial expressions, or side-conversations may have contributed to greater trust in the IP group. Another possibility is that the length of the training (e.g., time spent in class, time spent doing homework, and/or the cumulative impact of the two) impacted trust. Future research should investigate the relationship between trust and instruction delivery format in greater detail.

Table 6. Bivariate Correlations between Scores on the Trust Survey, Class Satisfaction Survey, and Didactic Evaluation Measure

Item	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
(1) Trust in instructor	—	0.71**	0.72**	0.66**	0.44**
(2) Trust in classmates		—	0.59**	0.42**	0.33**
(3) Trust-in-self			—	0.48**	0.34**
(4) Class satisfaction				—	0.31**
(5) Didactic evaluation					—

*$p < 0.05$, **$p < 0.01$.

Table 7. Predicting Class Satisfaction from Self-Reported Trust (Output for the Followup Regression Analyses)

Variable	*B*	*SE*	*β*	t	*Sig*
Class satisfaction (Constant)	−9.68	6.15		−1.57	0.12
Trust in instructor	1.10	0.13	0.66	8.26	0.01

SE, standard error; Sig, significant.

Consistent with our hypothesis that IP delivery of training would promote greater class satisfaction relative to VW delivery, self-reported class satisfaction was higher for the IP group than the VW group. Because class satisfaction ratings were significantly positively associated with self-reported trust, it may be that greater perceived trust was tantamount to greater class satisfaction (or *vice versa*). It may also be that IP interactions, recognition of facial expressions and body postures, and physical touch (handshake, hug) created a greater sense of comradery, trust, and satisfaction. This possibility is consistent with the suggestion that individuals with military experience prefer learning environments that promote a sense of community.[32]

Third, despite the significant positive correlations between scores on the three factors of the trust measure and class satisfaction measures, only trust-in-instructor, but not trust in classmates or self, significantly predicted class satisfaction. One possibility is that participants' engagement and commitment to the study drove their trust in the instructor.[33] Another possibility is that because participants were unfamiliar with MBSR concepts, their experiences were driven by their interactions with the instructor. Mindfulness teaching uses the Socratic method, that is, trying a meditation technique and then discussing participants' experiences using the technique. Also, rather than strictly teaching the material, the instructor asks questions, which allow participants to discover their own insights into themselves and their experiences, memories, character, and patterns of behavior. This method of teaching intimately involves the instructor with the class experiences of the participants. A third possibility is that participants' trust was driven by the behavior of the instructor. Leaders may ''set the stage'' for class or team members, offering knowledge, guidance, and encouragement. For example, studies of leadership have shown that commitment to an organization and employee empowerment were associated with transformational leadership.[34,35] In the context of training in a VW, this suggests that participant empowerment and commitment within the context of mindfulness training may improve through instructors providing consideration or ''space'' for each individual's experience, inspiration, and intellectual stimulation, while maintaining integrity, clear goals, and high expectations.[36] This also relates to the aforementioned use of the Socratic method of teaching.

Despite the positive correlation between learning performance, trust, and class satisfaction, neither trust nor class satisfaction significantly predicted learning performance. Both the IP and VW groups learned the material equally well. This finding is consistent with outcomes from other studies that compared learning in IP and online formats.[37] However, it is inconsistent with our primary hypothesis that IP training delivery would promote greater learning performance relative to VW delivery. Thus, both IP and VWs are viable mediums for teaching and learning.

Although the data are not causative, drawing from the key findings, we offer the following recommendations to instructors and course designers. First, incorporate activities that promote trust between students and instructors, as these efforts would likely increase trust among class members, trust-in-self, and student satisfaction with training. One approach to promoting trust is to provide participants with clear explanations about the differences between IP and VW learning before the start of the class.[14] This includes encouraging participants to maintain an active presence when learning in a VW, such as responding to classmates and the instructor; using simple gestures, such as emoticons or emojis (i.e., thumbs-up); addressing participants by their avatar names; acknowledging student contributions; and including activities that encourage communication between participants, such as the use of dyads or triads. Importantly, emojis may need to be developed specifically for MBSR training, by experienced instructors, as relevant ''emoji comments'' are not likely to be readily available. A second approach to promoting trust is to make a concerted effort to understand students' expectations about participating in mindfulness meditation training and their personal needs, make personal connections, and foster a sense of community among the class.[32,38] These are typically part of teaching any MBSR class, but they need to be more comprehensively considered during VW training. Instructors need to recognize that virtual interactions do not foster the same level of trust as IP interactions, therefore we encourage exploring ways to promote trust that go beyond what one might do for IP learning situations.[39] This suggestion is reinforced by the finding that trust in the instructor predicted other forms of trust (trust-in-classmates and trust-in-self), as well as class satisfaction.

At the same time, instructors should be aware that the manner of teaching is critical to building trust. For example, MBSR uses the Socratic method of teaching, in which the instructor takes the group through an experience by using a particular meditation technique. They then discuss their physical, cognitive, and emotional reactions to their employment of the technique. This approach is excellent for involving participants, but it is also delicate. Instructors will not want to put participants ''on the spot,'' inadvertently appear to judge participants' responses by interpreting them through their own experiences, or fail to provide structure, boundaries, and additional constructive information. Finally, instructors may need to be prepared for students learning in a VW to report less satisfaction with instruction, even if evidence of learning is the same for both virtual and IP contexts.

The results of the current study have particular relevance for the military. With the dispersed locations of military personnel, including deployments and relocations, it is difficult to provide services that could benefit them each time (and to each location) they transfer. Using the findings and recommendations from this research, wellness programs could be offered via VWs, in real time, with immediate interactions between instructors (providers) and military participants. Learning the material via the VW appears, from our findings, to be equal to that of IP training.

By allowing users to maintain anonymity, VWs could be leveraged to support the military services' confrontation with suicide. This suggestion is supported by evidence that service members are more willing to openly report their struggles with mental health issues (including suicidal ideation) when there are assurances that their reports will remain anonymous.[40] Irrespective of participants' motivation for protecting their anonymity (retribution, stigma, accessibility/availability, concerns about providers' confidentiality/competence/trustworthiness, guilt, shame, or self-blame), a certain degree of anonymity can occur with VW training. One can choose his or her own name, design their avatar, and disguise their voice. However, care must be taken to provide the cyber-security necessary for personal protection, while someone (the instructor perhaps) must be aware of the participants' identity to arrange for intervention, if necessary. Notably, others have also recommended Internet-based services to reduce suicide in the civilian population,[41–43] using a variety of techniques. At a minimum, the research reported here indicates promising possibilities with telehealth for military and civilian populations. In addition, the challenges of such outreach deserve the attention of combinations of researchers, such as health care practitioners, human factors engineers, cyber-security and intelligence experts, and information technology professionals.

Limitations

One limitation was that the IP and VW course instructors were different, although all had been trained in teaching MBSR. A second limitation was that we did not assess volunteers' baseline trust in computers, technologies, or the Internet. A third limitation was that participants were assigned to the IP or VW groups based on availability, rather than random assignment, which limits the causal inferences that can be drawn about the effect of group assignment on response outcomes. Finally, as participants were recruited from military and veteran populations, this may limit the generalizability of the outcomes to other populations, including the general population. This limitation is based on the suggestion that individuals with military experience may approach learning situations differently than their civilian counterparts.[32]

Conclusion

The outcomes of the current study suggest that VWs can be used as an effective alternative to IP delivery of MBSR for didactic learning. However, those attending training in a VW are likely to experience lower levels of trust in their instructors, classmates, and themselves, and have lower satisfaction with the class than those who attend IP. Future research should examine whether other types of classes/training yield similar results when trainings are offered IP or in a VW, as well as what actions or behaviors increase trust when learning in a VW.

Disclaimer

The opinions and assertions expressed herein are those of the authors and do not reflect the official policy or position of the U.S. Army, the Department of Defense, or Booz Allen Hamilton.

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Address correspondence to:
Dr. Valerie J. Rice
Army Medical Department Field Office
Army Futures Command
3161 McIndoe Rd., Fort Sam Houston (JBSA)
Texas 78234
USA

E-mail: valerie.j.rice.civ@mail.mil