



Stress management for middle managers via an acceptance and commitment-based smartphone application: A randomized controlled trial



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ABSTRACT

Stress is a major health problem in today's workplace. Recent studies suggest that acceptance and commitment therapy (ACT) is effective for reducing stress at work, specifically among managers. Moreover, smartphone-delivered treatments have been developed and increasingly used in research. The objective of our study was to evaluate the efficacy of an ACT-based smartphone treatment among middle managers at medium- and large-sized companies (>50 employees) in Sweden. A total of 73 participants were randomized to either receive the six-week stress intervention ($n = 36$) or to a waitlist control group ($n = 37$). Results showed small to moderate within-group effect sizes (Cohen's d range 0.37–0.62) for the treatment group, and small to moderate between group effects (Cohen's d range 0.41–0.50). In conclusion, the study indicates that a smartphone administered stress intervention based on ACT can reduce perceived stress and increase general health among Swedish middle managers in the private sector.

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1. Introduction

Stress is a major health problem in today's workplace (American Psychological Association, 2009). Prolonged occupational stress has been associated with increased risk of burnout (Maslach et al., 2001), anxiety and depression (Melchior et al., 2007). Moreover, somatic problems such as cardiovascular disease (Cohen et al., 2007) and impaired function of the immune system (Mommersteeg et al., 2006) have been reported in association with stress. In the United Kingdom, 40% of work-related illness is related to stress (Health and Safety Executive, 2013), and in the United States, 40% of all professionals state that their job is very or extremely stressful (American Psychological Association, 2009). Stress-related illness is also associated with large costs for society (Boorman, 2009), with increased absenteeism and reduced efficiency at work being two consequences (Hardy et al., 2003).

Acceptance and commitment therapy (ACT) is a form of Cognitive-Behavior Therapy (CBT) that has been applied to organizational settings (Moran, 2011). The general objective in ACT is to promote psychological

flexibility, i. e. the ability to be present in the here and now and adjust one's behavior according to personal values. This ability is increased in ACT by using six central processes: acceptance, mindfulness, defusion, self as context, values and committed action (Hayes et al., 2006b). Recent studies suggest that ACT is effective for reducing stress at work (Hayes et al., 2006a). For example, one study showed a large between group effect size (Cohen's $d = 1.31$) for reducing psychological distress among working individuals when comparing ACT against a waitlist control group (Flaxman and Bond, 2010). In addition, the study showed that ACT worked just as well as the well-established CBT-method Stress Inoculation Training (Flaxman and Bond, 2010). In other studies, a one-day intervention with ACT has been shown to reduce fatigue symptoms and related sickness absence (Dahl et al., 2004; Hayes et al., 2004). Moreover, initial studies have found that ACT is effective for reducing stress specifically among managers (Bond et al., 2006). Since research suggests that managers at intermediate levels (middle managers), are particularly vulnerable to stress (Holden and Roberts, 2004), this is an attractive target group to develop a stress intervention for. However, research on ACT-based stress interventions is relatively new and more studies are needed, particularly with middle managers as a target group.

Since research has shown that the ability to cope with stress is crucial for leader performance (Bartone et al., 2009), there are reasons to believe that an ACT-based stress intervention might improve

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leadership as well. According to Stewart et al. (2006) there are parallels between the presumed mechanisms in ACT and the theory of transformative leadership (Bass and Riggio, 2012), e.g. the focus on acting in line with one's values and persisting in the face of challenges. The "Full-range theory of leadership", where transformative leadership is one of the main components, is one of the most established leadership models in research (Bass, 1998). Transformative leadership is characterized by four factors: idealized influence, inspirational motivation, intellectual stimulation and individualized consideration. Meta-analyses have shown that transformative leadership has a positive effect on employees' performance and motivation (Dumdum et al., 2002; Wang et al., 2011). To our knowledge, no studies have examined the effects of an ACT intervention on transformational leadership.

It is well established that guided self-help interventions, administered through the internet, can have positive effects in a clinical psychological context (Andersson, 2009; Andersson and Titov, 2014). Guided treatments distributed digitally have provided a way to reach a larger number of patients in a manner that in most cases requires less therapist time than face-to-face psychotherapy, but with similar clinical outcome (Andersson et al., in press). Recently, a number of studies have also investigated interventions administered via smartphones (Webb et al., 2010; Ly et al., 2014). Morris et al. (2010) concluded that these studies are promising and show the possibility of delivering psychotherapy in a new and efficient way. The smartphone as a platform for psychological interventions has, however, not yet been investigated to any great extent in an organizational context. Since smartphones already are socially accepted and come at relatively low costs considering their functionalities (Boschen and Casey, 2008), it has been suggested that smartphones will be integrated even further in society (Ly et al., 2014), and therefore may be important in distributing psychological and health interventions both in a clinical (Donker et al., 2013) and an organizational context.

The main objective of our study was to evaluate the efficacy of a smartphone administered stress intervention based on ACT's six basic tools (Hayes et al., 1999) among middle managers working in medium- and large-sized companies (>50 employees) in Sweden. We hypothesized that the participants given the smartphone stress intervention would, in comparison to a waitlist control group, 1) reduce their perceived stress; 2) increase their general health; and 3) increase the effect on transformative leadership.

2. Methods

2.1. Design

This was a randomized controlled trial, conducted in Sweden in 2013, comparing a smartphone stress intervention ($n = 36$) against a wait-list control group ($n = 37$) for middle managers.

2.1.1. Ethics statement

The study was approved by the Regional Ethics Board of Linköping, Sweden. Written informed consent was obtained from all participants by surface mail before the study started.

2.1.2. Recruitment and selection

A vast majority of the participants, 68 out of 73, were recruited after a short presentation about the project at 10 different companies. The typical company was of either Swedish or American origin and had around 10 000 employees worldwide. Five participants were also recruited via advertisements on the internet. Those who were interested were directed to a web page with information about the study, the intervention being tested and how to participate. From the web page, the participants were able to fill out an online screening assessment, which was necessary to complete in order to be included in the study.

2.2. Participants

Inclusion criteria for the study were a) being at least 18 years old, b) being a middle manager with staff responsibilities at a company in the private sector, c) using a smartphone at the workplace, d) not participating in any concurrent psychological intervention, e) not suffering from a severe psychiatric or medical condition that could interfere with the intervention (e.g. bipolar disorder or schizophrenia, assessed during a clinical interview), and f) not having severe alcohol or drug problems.

Of the 125 individuals who initially expressed interest in the study, 76 completed all the questions in the online screening (38 did not finish the screening and 11 did not begin the screening). A short telephone interview was conducted with the remaining participants. The purpose of the interview was to ensure that the participants were well informed about the effort necessary for the six-week intervention, and to ensure that the participants met the inclusion criteria. After the telephone interviews, two individuals were excluded, one because the inclusion criteria were not met and one because of a longer planned absence from work during the period of the study.

Finally, 74 participants were included in the randomization. However, one participant decided not to begin the intervention, leaving 73 participants for the data analysis. The flow of participants through the study is shown in Fig. 1. Among the randomized participants, there were 42.5% women ($n = 31$) and 57.5% men ($n = 42$). The mean age was 41.5 years ($SD = 7.2$) ranging from 25 to 57 years. See Table 1 for additional demographical data.

2.3. Outcome measures

2.3.1. Primary outcome measures

The primary outcome measures were the General Health Questionnaire (GHQ-12; Goldberg and Williams, 2000) administered at pre-treatment, post-treatment and on a weekly basis during the entire treatment phase (6 weeks), and the Perceived Stress Scale (PSS-14; Cohen et al., 1983) that was collected at pre-treatment and post-treatment. In addition to the PSS-14, the PSS-10 was used on a weekly basis. Hence, GHQ-12 and the PSS-10 were measured seven times, and PSS-14 two times during the trial. See Table 2 for an overview of the measurements administered at which time-point.

The GHQ-12 is a self-report instrument used to measure general mental health. Participants are asked to indicate to what extent they experience 12 common symptoms of psychological distress, e.g. hopelessness and dissatisfaction. The instrument is used widely as outcome measure in research on occupational health and has good psychometric properties (Hardy et al., 2003). The PSS-14 is widely used in research to investigate the effects of stress as well as the effectiveness of stress interventions (Cohen and Janicki-Deverts, 2012; Zetterqvist et al., 2003), and scoring on the scale correlates with cortisol level (Pruessner et al., 1999). The internal consistency of the PSS-10 has been shown to be comparable to that of the PSS-14 (Cronbach's $\alpha = .89$) (Roberti et al., 2006).

2.3.2. Secondary outcome measures

To measure leadership effectiveness the Multifactor Leadership Questionnaire (MLQ) was administered (Bass et al., 2003) at pre-treatment and post-treatment. Table 2 shows an overview of the measurements administered at which time-point. The MLQ is the most common tool to measure transformational and transactional leadership (Lowe et al., 2013). Since it is assumed that ACT skills primarily influence transformative leadership (Stewart et al., 2006), only the five subscales that measure this type of leadership were used in the current study. The MLQ contains one form where the participant rates his or her own leadership, and another form where employees rate the leadership of their manager. Due to time constraints, only the self-report form was used. The MLQ contains a subscale for each of the

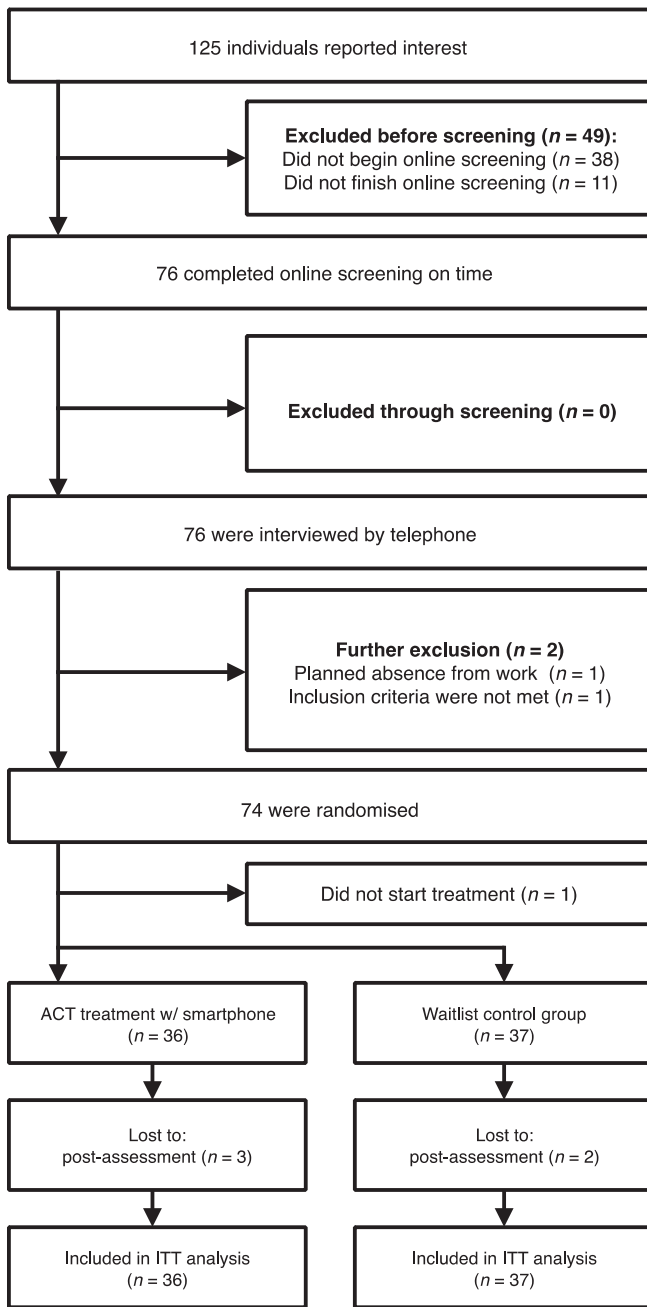


Fig. 1. Participant flow and reasons for dropping out throughout the trial.

four factors of transformative leadership, except idealized influence, which is divided into two subscales.

The Swedish-validated versions of all outcome measures were used in the current study. All outcome measures used have been shown to have good psychometric properties, with internal consistencies of at least $\alpha = .78$. Details of this can be found in the respective references of the outcome questionnaires.

2.4. Administration format of self-report measures

We used an online platform to administer the GHQ-12, the PSS-14, the PSS-10 and the MLQ. All data was collected through self-assessment. Previous psychometric research has validated internet-administration of self-rating scales for depression, quality of life and anxiety (Carlbring et al., 2007; Hedman et al., 2010; Holländare et al., 2010; Buchanan, 2003).

2.5. The intervention

Our research group developed the 6-week smartphone-based intervention for the current study. The intervention contained a smartphone application, which is used as a platform in a clinical context, for example in the treatment of depression (Ly et al., 2014) and anxiety disorders (Lindner et al., 2013). Also, a prototype of the smartphone application was tested in an early pilot study (Ly et al., 2012) to test the usability of the application prior to clinical use. The smartphone intervention consisted of a step-by-step behavior program with the purpose of educating the participant to use ACT's six basic principles to handle their stress. The application also aimed at helping the participant to accomplish small exercises, for example: *Actively explore the feeling of stress in your body*.

The program consisted of six modules, one for each week. Table 3 presents the content of the modules. Each module consisted of a short audio lecture (approximately 4–6 min), 2–3 texts and 2–4 exercises. The purpose of combining texts with audio files was to increase variation and thus make the program more attractive. The intervention entailed no physical meetings. Each participant worked independently with the application, but with the recommendation of spending about 15 min a day on the program.

When an exercise was completed, the participant could register this in the application, write a short reflection, as well as evaluate his or her experience on a scale from 1 to 5. The participant could also access personal statistics and summaries of his or her activity in the application.

There was also a back-end system where all the data from the participants was accessible from a website for a therapist. The therapist could send short text messages to the participants via a messaging system, similar to short message service (SMS). The therapist sent encouraging personal messages every other day to the participants. Since we wanted the participants to focus on behavioral tasks and not on discussions, the system functioned as a one-way communication, meaning that the participants were not able to reply to the messages. All internet (including the therapists' back-end system) and smartphone activities (including the participants' mobile application) were secured, with secure sockets layer (SSL) encrypted information. The application was built as a native application for Iphone, meaning that the application was coded in a specific programming language (Objective C), and as a mobile web application for other smartphones. See Fig. 2 for screenshots of the application.

2.5.1. Therapist

The therapist was a final-semester student from a five-year M.Sc. clinical psychologist program. The therapist had completed her clinical training as well as 16 weeks of practice. On average, the therapist devoted 3 h per week to providing individual feedback and group feedback to the participants in the intervention group. Each individual participant was given a minimum of 3 min and a maximum of 7 min per week, depending on how many questions they asked and how many reflections they wrote.

2.6. Procedure and design

Before the study started, a power analysis was conducted. Previous studies on ACT-based stress interventions have had a number of 20–30 participants per condition and were able to detect medium to large effect sizes (Flaxman and Bond, 2010). Clark-Carter (2012) recommended that the power calculation for a mixed design should use the same method as a power calculation for an independent design. Such an analysis showed that an overall number of 66 participants was required to achieve a power of 0.80 to detect a between-group effect size of $d = 0.50$ (α level = .05).

The results from the online screening were used as pre-treatment assessment. After the recruitment, participants were allocated using an online randomization tool (www.random.org), handled by an

Table 1
Demographic description of the participants at randomization.

		Treatment group (N = 36)	Control group (N = 37)	Total (N = 73)
Age	Mean (SD)	41.3 (6.6)	41.6 (7.8)	41.5 (7.2)
	Min–max	26–50	25–57	25–57
Gender	Female	15 (41.7%)	16 (43.2%)	31 (42.5%)
	Male	21 (58.3%)	21 (56.8%)	42 (57.5%)
Marital status	Married/cohabitant	33 (91.7%)	29 (78.4%)	62 (84.9%)
	Single/divorced	3 (8.3%)	2 (5.4%)	5 (6.8%)
	Other	0 (0.0%)	6 (16.2%)	4 (8.2%)
Highest educational level	High school	16 (44.4%)	10 (27.0%)	26 (35.6%)
	University < 3 years	4 (11.1%)	7 (18.9%)	11 (15.1%)
	University ≥ 3 years	16 (44.4%)	20 (54.1%)	36 (49.3%)
Number of employees for which directly responsible	1–10	22 (61.1%)	17 (45.9%)	39 (53.4%)
	11–20	5 (13.9%)	13 (35.1%)	18 (24.7%)
	21–30	3 (8.3%)	4 (10.8%)	7 (9.6%)
	31–40	2 (5.6%)	0 (0.0%)	2 (2.7%)
	41–50	1 (2.8%)	2 (5.4%)	3 (4.1%)
	>50	3 (8.3%)	1 (2.7%)	4 (8.2%)

independent person who was separate from the staff conducting the study. A total of 36 participants were randomized to the six-week stress intervention (see Fig. 1). The control group was, during the same time, ascribed to a waiting list. Both the intervention group and the control group filled out the same weekly measurement, consisting of the GHQ-12 and PSS-10. The average adherence, i. e. the average time that the participants continued to be active in the program, was 4.39 weeks ($SD = 1.82$). The waiting list control group, getting access to the program after the intervention group was finished, had an average adherence of 3.97 weeks ($SD = 1.83$).

2.7. Data analysis

All analyses were performed using SPSS 20 (SPSS, Inc., Chicago, IL). Independent t -tests and χ^2 -tests were used to test for group differences in demographics and pre-treatment data. In order to adhere to the intention-to-treat principle, the continuous outcome variables were analyzed using mixed effects models, given the ability of this procedure to handle missing data (Gueorguieva and Krystal, 2004). All analyses used maximum likelihood estimation. Random intercept models were selected for all measures. Differences between the stress intervention and the control group were primarily investigated by modeling interaction effects of group and time. For the GHQ-12, where weekly measures were available, the covariance between the random intercept and slope was not significant, and therefore was not included in the model. Hence, a random intercept model was used also for these measures. Within- and between-group effect sizes (Cohen's d) were calculated by dividing the differences in means by the pooled standard deviations (Borenstein et al., 2011).

Table 2
Overview of the measurements administered at which time-point.

Time	Measurements
Pre-measurement	GHQ-12, PSS-14, MLQ
Week 1	GHQ-12, PSS-10
Week 2	GHQ-12, PSS-10
Week 3	GHQ-12, PSS-10
Week 4	GHQ-12, PSS-10
Week 5	GHQ-12, PSS-10
Post-measurement	GHQ-12, PSS-14, MLQ

Abbreviations: GHQ-12: General Health Questionnaire; PSS-14/PSS-10: Perceived Stress Scale; MLQ (trans): Multifactor Leadership Questionnaire (transformational leadership).

3. Results

The two groups did not differ significantly on any of the measures at pre-treatment ($t(71) = -0.09$ to 1.18 , $p = .93$ to $.24$). There were no significant differences in demographic characteristics between the groups ($\chi^2(1) = 0.02$ to 9.26 , $p = .16$ to $.89$). See Table 1 for demographic data. See Table 4 for all outcome measurements at pre-treatment and post-treatment.

3.1. Attrition and adherence

Of the 74 participants randomized, one participant decided not to participate in the study. Five out of the 73 participants (6.8%) did not provide post-treatment data with a distribution of three participants from the intervention group and two participants from the control group.

Adherence to the treatment program was defined as a minimum of two registered activities in the application each week (i.e., per module). It was more common that inactive and active weeks were mixed than for participants to completely stop being active at a certain point. Of the 36 participants, 16 (44%) succeeded to adhere to the intervention all the 6 weeks.

3.2. Primary outcome measures

Participants in the intervention group had lower scores on the GHQ-12 at 6 weeks than the control group. A significant interaction effect of group and time on the GHQ-12 was found between the intervention group and the control group: $F(1,371.63) = 6.77$; $p = .01$. There was a significant between group effect size of $d = 0.41$; $CI [-0.80$ to $1.61]$. In addition, a small within-group effect size was found: $d = 0.37$; $CI [-0.78$ to $1.52]$ for the treatment group. Participants also scored lower than the control group on the PSS-14 at 6 weeks. A significant interaction effect of group and time on the PSS-14 was found between the intervention group and the control group: $F(1,70.24) = 7.67$; $p = .007$. The between group effect size was $d = 0.50$; $CI [-1.29$ to $2.29]$, and the within-group effect size was $d = 0.62$; $CI [-1.20$ to $2.45]$ for the treatment group.

3.3. Secondary outcome measures and mediation

The intervention had no significant effect on transformational leadership as measured by the MLQ. No significant interaction effects of group and time was found for the MLQ, $F(1,67.64) = 2.16$, $p = .15$.

Table 3
Description of session content.

Module	Content	Practical exercises
1. What is stress?	Introduction to the concept of stress. Particular focus on the cognitive interpretation involved. Introduction to the idea that stressful thoughts do not necessarily reflect reality.	Start registration of stressful thoughts. Reflecting on own leadership functioning under stress.
2. Mindfulness	Psychoeducation on mindfulness and the effects of constant multitasking. The benefits of mindfulness in a managerial position in particular.	Practicing complete focus on the activity currently at hand. Attending to only one work task at a time. Listening to an audiotape for mindfulness practice.
3. Acceptance	Introduction to the concept of acceptance; letting unpleasant stress sensations be without attempts at avoidance. Psychoeducation on the inner dialogs driving stress, and how these are kindled by lack of acceptance.	Practicing letting stressful thoughts and feelings be. Actively exploring bodily stress sensations.
4. More on stressful thoughts	Psychoeducation on how we tend to perceive thoughts as truths and act on them accordingly. Introduction to ACT metaphors to facilitate defusion.	Practicing the perception of thoughts as a flow of verbal constructions.
5. Values	Brief introduction to how self-images are formed by language and thoughts. Introduction of the concept of values as defined in ACT, and how these can be used as a compass in stressful situations.	Identifying and formulating one's core values as a manager, and using them to guide one's actions in stressful situations.
6. Valued direction	Introduction to how values are translated to action in everyday life. Summary of program. Maintaining progress.	Setting goals based on values. Summarizing individual learning and progress achieved through the program. Formulating a maintenance plan.

4. Discussion

The overall aim of this study was to evaluate the effects of a smartphone administered stress intervention among Swedish middle managers in the private sector. The main question was whether the ACT-based smartphone intervention could: 1) reduce perceived stress in a group of middle managers with staff responsibilities; 2) increase their general health; and 3) have a significant positive effect on transformative leadership.

Overall, the intervention had a moderate effect on stress and no effect on transformative leadership. Participants in the intervention group rated their general health and stress level to be significantly lower compared with the control group on the GHQ-12 and the PSS-14, and these results thus supported the stated hypothesis. The effect sizes for the two measures were small and moderate respectively, which is common in non-clinical samples. The results may be linked to the findings of Flaxman and Bond (2010) that participants with low initial mental distress levels tend to get small effects of stress interventions in the workplace. These results are in line with previous studies on similar ACT-based stress interventions, where the perceived stress level decreased significantly (Flaxman and Bond, 2010; Dahl et al., 2004). In some cases, however, effect sizes have been larger than those measured in this study. For example, Brinkborg et al. (2011) reported a comparable effect size for GHQ-12 ($d = 0.38$), but a larger effect size for the PSS-14 ($d = 0.72$). However, the participants in that study had a higher initial score on PSS-14, than the participants in this study.

The intervention did not have an effect on transformative leadership. These results are not in line with previous research, which has shown a negative correlation between stress level and leadership skills (Sparks et al., 2001). The results are also not in line with the theoretical assumption that ACT skills may improve transformative leadership effectiveness (Moran, 2011). One possible explanation of these results could be that training of ACT skills might have a delayed effect on leadership abilities, since ACT skills such as acceptance and valued direction often require a lot of practice (Hayes et al., 1999). Another explanation could be the high initial score on the MLQ ($M = 59.03$), which may have resulted in a ceiling effect and limited room for improvement. Finally, it is also possible that the specific modality of delivering ACT applied in this study (smartphone-based, no contact with therapist) was the reason that no effect on transformative leaderships was found.

The results are nevertheless promising and imply that further investigation of the smartphone-based format, not only in a clinical setting but also in the workplace setting, is worthwhile. These types of interventions can be a cost and time effective way to reach more working

individuals with psychological interventions, which could be important from both a public health and societal perspective. We believe that this intervention has the potential to be a cost effective way of impacting on important outcomes in society.

4.1. Limitations

There are a number of limitations that need to be mentioned. The first is that it is impossible to determine which aspect of the intervention that accounted for the effect on perceived stress. Since we did not control for the different components separately we cannot, for example, rule out that the results were an effect of the therapist support only. An additional treatment arm with only therapist support would make it possible to rule out this question, even if previous studies on internet interventions have shown that support only is less effective than specific interventions (Ivarsson et al., 2014).

Second, the current study did not include follow-up data and, as such, it cannot be determined if the effects of the smartphone stress intervention among middle managers are enduring over time. Also, a follow-up is needed to explore if our hypothesis that leadership skills might change over a longer time frame is correct. However, the aim of this study was to do a first evaluation of the efficacy of this new intervention in a rather unexplored area.

A third limitation concerns the therapist in the study, who was a trained psychologist and was in the last semester of training of a five-year program. Therefore, it is possible that a more senior therapist would have performed even better. However, there are research suggesting that therapist experience does not make a difference apart from the finding that experienced therapist may require less time to guide patients (Andersson et al., 2012). Also, for the entire duration of the study, the therapist received continuous supervision from an experienced psychotherapist.

A fourth limitation is that the vast majority of the participants were recruited through ten different companies in the private sector. Thus, we cannot be sure that this treatment would work for middle managers in other companies. However, the participants were relatively heterogeneous regarding age, educational level, managerial level and industry, which is an advantage.

5. Conclusions

The current study provides support for the idea that a smartphone administered stress intervention based on ACT can reduce perceived stress and increase general health among Swedish middle managers

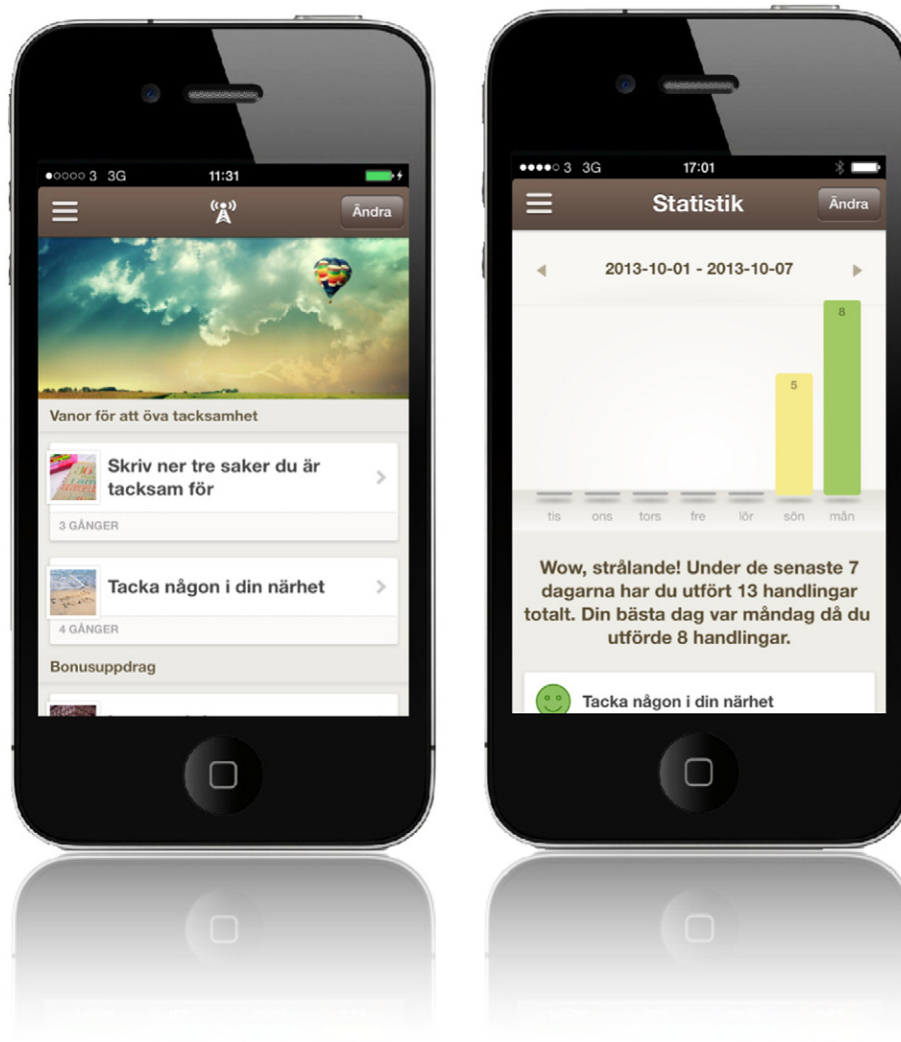


Fig. 2. Screenshots of the smartphone application.

in the private sector. Since no previous studies are available in this area, it is necessary to replicate the study before drawing firm conclusions' about the findings. It may be considered promising that a type of stress intervention, previously shown to be effective in other formats (Brinkborg et al., 2011; Flaxman and Bond, 2010), also appears to work with an entirely smartphone-based administration without any physical meetings. We believe that there are advantages to the smartphone format in the workplace context, since smartphone interventions might be more assimilated into people's daily life compared to other interventions, and thus be more accessible. The smartphone

format might also help increasing users' awareness of being in an intervention, even in a workplace setting, and therefore better help users to create direct incentives for activities related to the intervention in their work life. We hope that this study might pave the way for other studies using smartphones in the working life context. Possible future studies could investigate a similar program but on a population with higher stress levels than middle managers. Also, it is worthy to investigate other types of interventions using the smartphone format, for example a program that focuses entirely on transformative leadership. Another important area that future studies could look at is the possible side

Table 4

Means, SDs and effect sizes (Cohen's *d*) for measures of general health, perceived stress, and transformative leadership.

Outcome measure	Mean (SD)		Effect size, <i>d</i> (95% CI)	
	Pre-treatment	Post-treatment	Between group, post	Within-group, pre to post
GHQ-12				
Treatment group	9.83 (5.29)	8.03 (4.50)	0.41 (−0.78 to 1.52)	0.37 (−0.78 to 1.52)
Control group	9.22 (4.21)	10.09 (5.71)		
PSS-14				
Treatment group	24.33 (8.33)	19.52 (7.27)	0.50 (−1.29 to 2.29)	0.62 (−1.20 to 2.45)
Control group	24.49 (5.94)	23.29 (8.00)		
MLQ (trans)				
Treatment group	59.03 (7.92)	61.78 (8.12)	0.49 (−1.55 to 2.54)	0.35 (−1.48 to 2.17)
Control group	56.73 (8.69)	57.56 (9.27)		

Abbreviations: GHQ-12: General Health Questionnaire; PSS-14: Perceived Stress Scale; MLQ (trans): Multifactor Leadership Questionnaire (transformative leadership).

effects of the intervention, since it has been suggested that there is insufficient knowledge concerning the characteristics of negative effects in digital distributed treatments (Rozenal et al., 2014).

Authors' contributions

KHL and KA were the project managers for the study. KHL has developed the application. KA has developed the content in the stress program. KHL and KA drafted the current manuscript, and participated in analysis and interpretation of data. GA was the principal investigator and participated in the conception of the study and its design. All authors read and approved the final manuscript.

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