



Workplace mental health promotion online to enhance well-being of nurses and allied health professionals: A cluster-randomized controlled trial



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ABSTRACT

Objective: Well-being is an important prerequisite for the mental health and work functioning of nurses and allied health professionals. The objective of this study was to examine the effectiveness of a workers' health surveillance (WHS) module that offers screening, tailored feedback and online interventions targeting positive mental health and mental health complaints. WHS is a strategy at the workplace to implement preventive action by identifying and treating health complaints.

Methods: All wards of one hospital were randomized, and all nurses and allied health professionals working in these wards ($N = 1140$) were invited to participate in either the Online Intervention group (OI) or the Waitlisted control group (WL). Primary outcome was positive mental health (Mental Health Continuum – Short Form, MHC-SF); secondary outcomes were work engagement (Utrecht Work Engagement Scale, UWES), a specific well-being measure (WHO-5 Well-being Index) and mental health symptoms (Brief Symptom Inventory, BSI). Online self-report measurements were conducted at baseline, and after three and six months.

Results: Participation rate for the intervention at baseline was 32% ($N_{OI} = 178$; $N_{WL} = 188$). The intervention significantly enhanced positive mental health, in comparison to the control group ($F = 3.46$, $p = 0.03$). Cohen's d was 0.37 at post-test and 0.28 at follow-up, which can be considered as a moderate effect and a small effect respectively. In particular, psychological well-being (a subscale on the MHC-SF) was enhanced (Cohen's d 0.43 at post-test and 0.50 at follow-up). No significant or relevant differences between groups on secondary outcomes were found. The uptake and compliance of the online interventions was very low (28/178, 16% logged in; 9/178, 5% started with one or more modules within an intervention).

Conclusion: We can conclude that the intervention was capable of enhancing positive mental health. However, due to a high attrition rate, especially in the intervention group, this result should be considered with caution. Improvement of the screening instrument, more use of persuasive technology within the interventions and individual guidance to support engagement and compliance may be recommended.

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1. Introduction

1.1. Nursing, mental health and well-being

Many nurses suffer from mental health problems. A cross-sectional study reports a twice as high prevalence rate of depression in nurses as compared to the prevalence rate in the normal adult population

(Letvak et al., 2012). This state of affairs not only concerns themselves, but could also seriously affect their work productivity (Anderson et al., 2011) and functioning (Letvak et al., 2012). Impaired mental health in nurses is associated with medication errors, near misses, patient safety and patient satisfaction (Gärtner et al., 2010). Therefore, early detection of mental health complaints or reduced work functioning is essential for the quality of nursing care (Gärtner et al., 2012).

1.1.1. A focus on well-being

A focus on symptoms and impaired work functioning may not be sufficient to enhance the mental health of nurses. The mental health care system has traditionally focused more on the treatment of mental disorders

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and symptoms than on the promotion of well-being (Seligman and Csikszentmihalyi, 2000). However, it is widely recognized that mental health is more than just the absence of mental illness, as is stated in the World Health Organization's definition of mental health (WHO, 2004, page 12):

Mental health is a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively, and is able to make a contribution to his or her community.

According to this definition, well-being and well-functioning are core elements of mental health. Recently, these elements are captured into a dynamic concept of health in which empowering people to take charge of their own health, in the face of adversity, plays a central role: *Health is the ability to adapt and self-manage in the face of social, physical and emotional challenges* (Huber et al., 2011). This might be a highly applicable concept for nurses and allied health professionals, such as physiotherapists and radiotherapists, as working in this area can have a serious impact on mental well-being and resilience. This impact is due to high workload, time pressure and coping with human suffering and pain (McCann et al., 2013). The self-management capacity of a nurse to cope with the challenges at work and restore one's sense of well-being might determine to a certain extent their mental health.

The benefits of well-being on people's functioning are recorded both in cross-sectional and longitudinal research. They include improved productivity at work, better physical health and as a consequence less health care uptake, and having more meaningful relationships (Howell et al., 2007; Keyes and Grzywacz, 2005). In addition, the available evidence suggests that well-being reduces the risk of developing mental health complaints and disorders at a later point in time (Wood and Joseph, 2010). In this sense, well-being acts as a protective factor for mental health and healthy functioning. Three different types of well-being have been identified in various studies. Subjective well-being refers to positive affect and/or life satisfaction (Diener, 1984). Psychological well-being refers to the level of positive functioning containing constructs such as meaning in life, goal setting, and mastery (Ryff, 1989). Social well-being contains constructs such as the level of social integration and social contribution, together forming the construct of 'positive mental health' (Keyes, 2002).

1.1.2. Well-being in the nursing profession

In the context of work, a considerable amount of research has been conducted on the well-being related construct of *work engagement*, a positive, fulfilling, work related state of mind that is characterized by vigour, dedication and absorption (Bakker, 2011). For nurses and allied health professionals, promoting well-being strengthens work commitment and performance (Kanste, 2011; Sun et al., 2012). Nursing could be regarded as highly demanding work, both emotionally and physically, and therefore training programs to enhance work engagement and to strengthen personal resources seem warranted (Chou et al., 2012). Likewise for society, keeping our health care workforce mentally fit is of crucial importance. The need for health care workers is growing, as the population is ageing at a rapid pace. In the meantime the health care workforce is ageing at a similar rate. In the Netherlands, only 27% of the nurses predict they will be able to work until they reach retirement age, because of high work pressure and low work engagement (Maurits et al., 2012). This raises serious questions about the sustainability of health care in the long run (Lokkerbol and Smit, 2013). All in all, it seems important to promote mental health at the workplace (Czabala et al., 2011) and to foster well-being and work engagement among nurses and other health professionals in particular (Jenaro et al., 2011).

1.1.3. Workers' health surveillance

One strategy for prevention in the workplace involves workers' health surveillance (WHS), a system to detect work-related detrimental health effects at an early stage, in order to enable timely interventions

(Koh and Aw, 2003). In occupational healthcare, WHS is an important feature. In the Netherlands, it is a mandatory action for employers to allow their employees to do such a check-up that is aimed at preventing or reducing the risks that the work poses for the employee health. In the Netherlands, it has three aims: 1) to prevent the onset, recurrence, or worsening of work-related diseases, 2) to monitor and promote work-related health and work functioning, and 3) to monitor and improve sustained employability (NVAB, 2013). Although both the International Labour Organization and the Dutch guideline for occupational physicians prescribes supplementing WHS as an important part of surveillance (ILO, 1998; NVAB, 2013), not all workplaces have implemented this system and those who do usually don't follow the screening up with adequate interventions.

Enhancing WHS with automated individual feedback and an offer of online interventions targeting the well-being and mental health of nurses and allied health professionals is a new way to conform to this regulation and has not been reported before, as far as we know. Providing feedback and online interventions may offer a suitable and effective strategy for reaching a large target group in the workplace. In particular, online *self-help* interventions are potentially more affordable and accessible for many people, as opposed to face-to-face interventions which use up resources such as therapists' time (Muñoz, 2010). People can use self-help interventions at their convenience, at their own pace and in the privacy of their own homes.

1.2. The current study

The primary objective of the current study is to examine the effectiveness of a workers' health surveillance module combined with personalized feedback and an offer of online interventions (OI) on the well-being, work engagement and mental health of nurses and allied health professionals, compared to a waitlisted control group (WL). The study targets the effectiveness of the whole WHS module, including the screening, feedback and offer of online interventions. In theory, this WHS module could enable a large part of a working population to be reached with online interventions, thereby contributing to public mental health. The current study is part of a larger trial which includes a third study arm (invitation for a consultation with an occupational physician for the positively screened workers: OP group) (Gärtner et al., 2011). These results are published elsewhere (Gärtner et al., 2013). Former published results can be summarized as follows: regarding work functioning, the OI group was not more effective compared to the WL (Ketelaar et al., 2013a), although non-inferior to the OP group (Ketelaar et al., 2013c). Also, no significant effects were found on work-related stress and work-related fatigue for the OI group in comparison to the WL (Ketelaar et al., 2013a) and the OI group was not effective from a health economic perspective (Noben et al., 2014). Workers in the OP group showed less work functioning impairments in comparison to the WL (Gärtner et al., 2013) and produced this response against lesser costs (Noben et al., 2014).

We hypothesized that the OI group would demonstrate a significant increase in well-being and work engagement, as well as significant symptom reduction at three month and six month follow-up, compared to the WL. The online interventions offered in the WHS-module are all self-help interventions. Most have proved to be effective in separate trials on a range of clinical outcomes such as depression (Spek et al., 2008; Warmerdam et al., 2008), well-being (Bolier et al., 2013), and risky drinking (Riper et al., 2008). The workplace was a new setting for the implementation of these interventions.

2. Methods

2.1. Study design

The study is a cluster-randomized controlled trial in which the effectiveness of a WHS module, followed by tailored feedback and an offer of

online interventions, is compared to a waitlisted no-intervention control group. The study was carried out in one large academic medical centre in the Netherlands and is part of a larger trial which, besides the online and control group, includes a third study arm (invitation for a consultation with an occupational physician for the positively screened workers) (Gärtner et al., 2011). The randomization process took place at ward level, using a computer software program (Nquery Advisor), which generated a randomization list in blocks of three. This was performed by one researcher (KN) who was not involved in the practical recruitment of employees. The randomization took place before the recruitment and consent phase and can therefore be considered as a pre-randomization procedure (Schellings et al., 2009). Furthermore, an incomplete-double-consent design was applied, meaning that individuals were only informed about their own group (Schellings et al., 2006). Online measurements by self-assessment were conducted at baseline (March 2011), at three months and six months after baseline. At all times, the participants in both conditions retained unrestricted access to professional help, if so required. The study design and procedures of the whole trial with three arms (OI group, OP group and WL) are reported in detail elsewhere (Gärtner et al., 2011). The Medical Ethics Committee of the Academic Medical Center Amsterdam approved this study. The trial registration number of the study is NTR2786 (Dutch Trial Register: <http://www.trialregister.nl>).

2.2. Participants

The study population for this study consisted of nurses and allied health professionals, such as physiotherapists and radiotherapists ($n = 1140$). Because of the preventive nature of the intervention, participants were only included if they were not on sick leave for more than two weeks at baseline. In order to reach adequate statistical power, 210 participants in each group were required (see Gärtner et al., 2011 for the power calculation).

2.3. Procedure

First, all 1140 employees who worked in the wards that were randomized to the OI or the WL received a letter at their home address containing detailed information on study procedure and privacy assurance issues. After that, they received an invitation via their work e-mail containing information on the study, a link to the online questionnaire, and a log-in name and password. Before they could start the questionnaire, participants had to give their informed consent online. In the six weeks after sending the invitation, three reminders were sent to those employees that had not yet completed the questionnaire.

2.4. Intervention group

Participants in the intervention group completed online screening on the following aspects: impaired work functioning, distress, work-related fatigue, risky drinking behaviour, depression, anxiety and post-traumatic stress. The screening questions also partly served as a baseline measurement for this study (Gärtner et al., 2011). Immediately after filling in the questionnaire, they received personalized feedback, which was automatically generated using a programmed algorithm, on their screen and by e-mail.

Based on the personal screening results, participants were offered a tailored choice of online interventions and personalized advice, the participant could visit the website of the online intervention and log in. For example, if a participant scored above the cut-off point for case identification of depression (≥ 0.42) on the Brief Symptom Inventory (De Beurs and Zitman, 2006), an online intervention to prevent and treat depression was offered. If participants scored above 5 for men and 4 for women on the 3-item Alcohol Use Disorders Identification Test (AUDIT-C; Gual et al., 2002), an online intervention to reduce risky drinking was offered. Participants who screened positive on impaired

work functioning (regardless of mental health status) received an online educational leaflet on how to improve their work functioning. In the case of negative screening on all mental health complaints, participants were invited to follow an online course to promote well-being and mental fitness (Psyfit). Thus, the system provided both health promotion and indicated prevention efforts. Participants could be screened positive on different aspects and therefore could be offered a choice of different interventions at the same time. When screened positive, a minimum of two interventions was offered, depending on the number of complaints. If only one complaint was detected, the well-being intervention, Psyfit, was the second option (with a non-binding advice to follow the complaint-related intervention). From self-determination theory it can be reasoned that the opportunity to choose an intervention that fits the preference and need of its user would promote autonomy and subsequently lead to more engagement to follow the program (Ryan and Deci, 2006).

The following online interventions were used in our study:

- *Psyfit*, a course aimed at enhancing well-being and mental fitness, based on principles stemming from positive psychology, cognitive behavioural therapy and mindfulness (Bolier et al., 2013). Participant can choose one (or more) 4-week module(s), out of 6 modules;
- *Colour Your Life*, aimed at tackling (subclinical) depressive symptoms and based on cognitive behavioural therapy (Spek et al., 2008; Warmerdam et al., 2008). The course consists of 8 weekly 30-minute sessions and one booster session;
- *Strong at work*, aimed at reducing work stress and how to cope with it. This online self-help course is not yet tested on effectiveness itself, but is based on evidence-based principles of occupational stress management and cognitive behavioural therapy (Richardson and Rothstein, 2008). The course contains 8 weekly 30-minute lessons and one booster session after 12 weeks;
- *Don't Panic Online*, aimed at reducing panic symptoms in subclinical and mild cases of panic disorder, based on cognitive behavioural therapy (van Ballegooijen et al., 2013). There are six 30-minute sessions which can be completed in 8 weeks;
- *Drinking Less*, aimed at the reduction of risky drinking (Riper et al., 2008). The course is based on motivational, cognitive behavioural and self-control training principles. Participants are encouraged to use the program for a minimum of 6 weeks (for example for 10 min a day).

2.5. Control group

Participants in the control condition filled in the screener as a baseline measurement as well. After the six-month follow-up assessment they received the same offer as the online group: personalized feedback and a matched offer of self-help interventions.

2.6. Outcomes and instruments

Positive mental health was the primary outcome in this article; work engagement, well-being, and depression and anxiety symptoms were the secondary outcomes.

2.6.1. Positive mental health

The Mental Health Continuum – Short Form (MHC-SF) is a 14-item self-report questionnaire measuring positive mental health (Keyes, 2002). It contains subscales on subjective well-being as well as psychological and social well-being. Participants rated the items on a 6-point scale from 0 (never) to 5 (every day). The average score in a Dutch representative population sample was 2.98 (SD = 0.85) (Lamers et al., 2011). The MHC-SF has shown good internal consistency (Cronbach's alpha > 0.80) and discriminant validity (Lamers et al., 2011). In our study, Cronbach's alpha was 0.93.

2.6.2. Work engagement

The Utrecht Work Engagement Scale (UWES-9, short-form) measures engagement at the workplace (Schaufeli et al., 2006). It is a 9-item scale, and items are scored on a 7-point rating scale (0 = never, 6 = always). The scale contains three subscales: vigour, dedication and absorption. The mean score in a large group (N = 9679) of different populations was 3.82 (SD = 1.10). Cronbach's alpha of the UWES-9 varied between 0.85 and 0.92 across 10 different countries, including the Netherlands (Schaufeli et al., 2006). In our study, Cronbach's alpha was 0.94.

2.6.3. Well-being

The WHO-5 well-being scale contains five positively formulated items on subjective well-being. Participants were asked to rate the items using a 6-point scale (0 = never, 5 = all of the time). The total score is multiplied by 4, adding up to a possible maximum score of 100. The mean score of the WHO-5 in general population studies is around 70 (Bech, 2004). The WHO-5 has been validated in different populations with good internal consistency (Cronbach's alpha 0.84) (Bech, 2004; Henkel et al., 2003). In our study, Cronbach's alpha was 0.91.

2.6.4. Mental complaints: anxiety and depression

Anxiety and depression symptoms were measured with the corresponding subscales of the Brief Symptom Inventory (BSI). Each subscale has six items with a 5-point response scale (0 = not at all; 4 = extremely). Cronbach's alphas are 0.87 for both scales (De Beurs and Zitman, 2006). In our study, Cronbach's alphas were 0.84 for BSI Depression and 0.80 for BSI Anxiety respectively.

2.7. Analyses

The analyses were performed in the total sample of participants. Analyses were conducted following the intention-to-treat (ITT) principle, hence all participants were analysed in the group to which they were allocated. Reporting of the results follows the guidelines of the Consolidated Standards of Reporting Trials (CONSORT statement) (Altman, 1996).

2.7.1. Attrition

We applied t-tests and logistic regression analysis to examine possible baseline differences between drop-outs and nondrop-outs, as well as differential drop-out between the online group and the control group. A drop-out was defined as completing the baseline and three month follow-up questionnaire, but not the six month follow-up questionnaire; or completing the baseline questionnaire, but none of the follow-up questionnaires. If there were outcomes or demographical aspects that had a statistically significant effect on drop-out, they were included in the effect analyses as a covariate.

2.7.2. Effects

The effectiveness of the intervention was examined by analysing the differences over time through applying Linear Mixed Models (LMM). If the assumption of a normal distribution of residuals was not met, a log-transformation was used for the LMM, and the median and range were also used to describe the outcome. Otherwise, only the mean and standard deviation were used to describe the outcome. The main effects of *group* and *time*, and the interaction *group * time* were included as fixed effects in the model. *Hospital Ward* (the cluster level) and *ward * subject* (the individual level) were included as random effects. However, if the cluster did not have a statistically significant effect, it was excluded from the model. The main interest concerned the interaction effect of *group * time* (interpreted as the difference in change scores over time between the online and control group). LMM includes incomplete cases in the analysis and employs restricted maximum-likelihood

estimation to calculate parameter estimates. LMM assumes that missing data occurred randomly.

In addition, for continuous measures the size of the effect was estimated calculating Cohen's d, using the estimated values from the LMM analysis. Cohen's d was calculated as the difference between two means divided by the pooled standard deviation. A Cohen's d of 0.5 indicates that the mean of the intervention group is half a standard deviation larger than the mean of the control group. Values of d from 0.56 to 1.2 can be assumed to be large, 0.33 to 0.55 are moderate and 0 to 0.32 are considered small (Lipsey and Wilson, 1993).

All analyses were conducted using two-sided tests and alphas of 0.05. The analyses were carried out using the Statistical Package for the Social Sciences (SPSS), version 19.

3. Results

3.1. Flow of participants

Fig. 1 shows the flow of participants. A total of 58 hospital wards were randomized across the two study arms in this article. Of the 1140 employees, 423 (37.1%) started the baseline questionnaire. Of those, 178 in the online group and 188 in the control group completed the baseline questionnaire and were eligible for participation in the trial (n = 366 in total). This is the sample that is used for the intention-to-treat analysis. In the online group 28 participants (15.7%) logged in at least once into one or more online interventions. Nine participants (5.1%) started one or more of the modules within the online interventions (six started with *Psyfit* and three with *Colour your life*), which means that the other 19 participants merely logged in and did not start any of the intervention modules. More results of the track-and-trace data of the online interventions can be found in the process evaluation (Ketelaar et al., 2013c). 108 participants (60.7%) in the online group and 50 (26.6%) participants in the control group were lost to follow up.

3.2. Background characteristics

The demographic characteristics and scores on the outcomes at baseline are shown in Table 1. The mean age of participants was 40 years. Participants in the online group were on average younger (38) than those in the control group (42). Most participants were female (79.8%), were employed as a nurse (71.9%) and had a partner (75.2%). More than 80% of the participants screened positive on impaired work functioning and/or mental health. In the control group this positively screened group was larger (85.6%) than in the online group (78.1%). With regard to baseline characteristics of the outcomes, positive mental health and work engagement scores (3.32 and 4.37 respectively for the total group) were above the mean in the general population; the WHO-5 well-being score (63.8) was below average.

3.3. Attrition analysis

There were significantly more drop-outs in the online group compared to controls (61% vs. 27%, $\chi^2 = 43.28$, $p < 0.01$). Loss to follow-up was therefore not entirely random.

Tested at $p < 0.05$, drop-out analysis reveals that regarding background characteristics at baseline, age predicted drop-out ($\chi^2 = 4.54$, $p = 0.10$; Beta = 0.79, $p = 0.03$): the younger the participant, the more likely that the participant had dropped out. In addition, regarding the outcomes, those who did drop out showed lower work engagement as measured with the UWES-9 ($t_{363} = 2.46$, $p = 0.01$; Beta = -0.22 , $p = 0.07$) at baseline. There were no significant interaction differences for these characteristics between the online group and control group (no differential drop-out for young participants and/or participants with low work engagement).

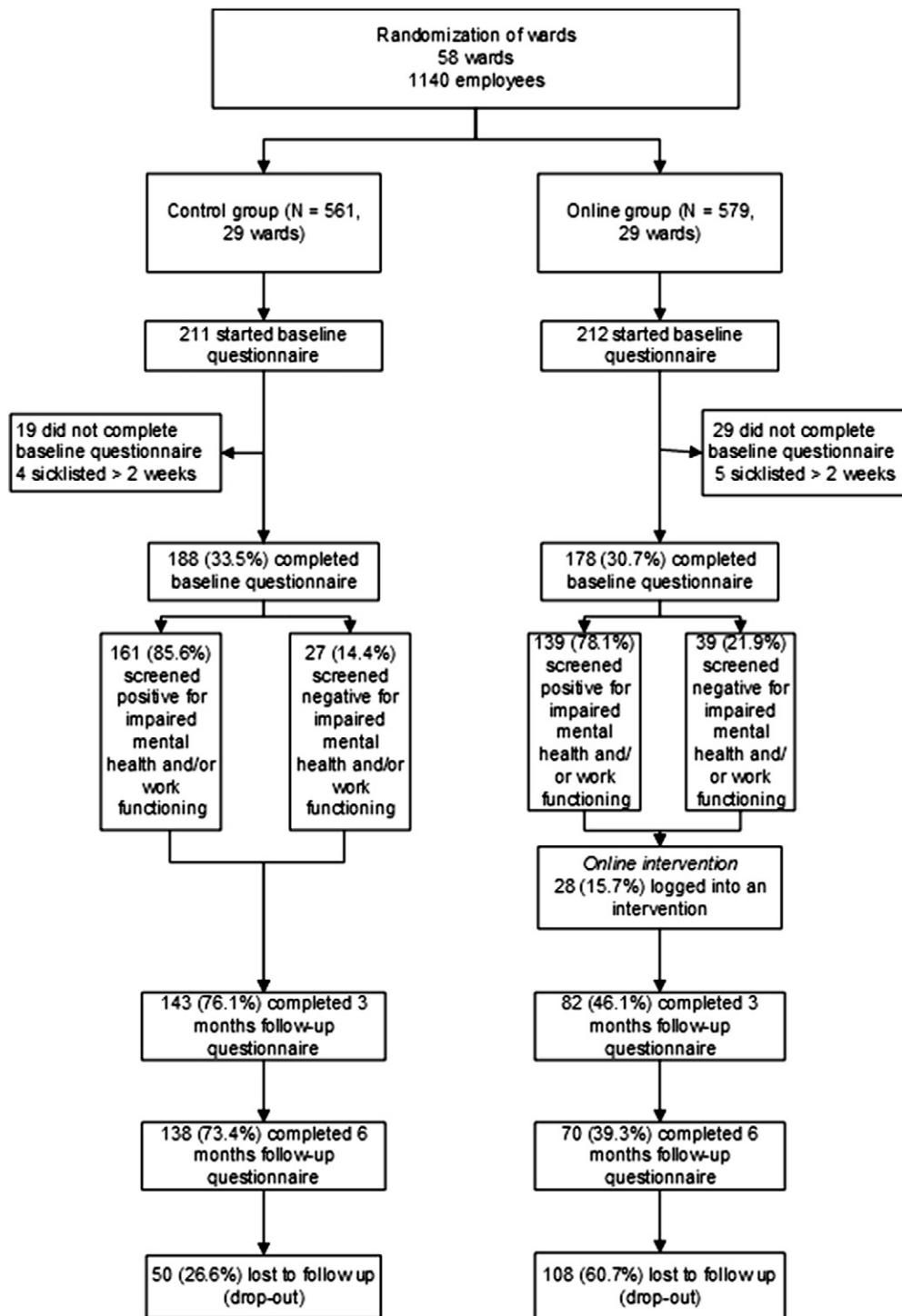


Fig. 1. Flow of participants through the trial.

3.4. Effects

The estimated effects according to the LMM-analysis are presented in Table 2. Because the random effect of ward (cluster effect) was not significant in the analyses, it was excluded from the LMM model.

Both the online group and the control group improved over time regarding positive mental health ($F = 8.30$, $p < 0.01$), well-being ($F = 11.02$, $p < 0.01$) and anxiety symptoms ($F = 4.33$, $p = 0.01$), with the largest improvements occurring between baseline and three month follow-up.

Considering the interaction effect of group * time, the primary outcome – positive mental health – was significantly enhanced in the OI group, in comparison to the control group ($F = 3.46$, $p = 0.03$, Cohen's $d = 0.37$ three months follow-up, 0.28 six months follow-up). The effect stems for a large part from the subscale psychological well-being (Cohen's $d = 0.43$ at post-test and 0.50 at follow-up, $F = 5.35$, $p = .01$). Furthermore, there was a significant effect on work engagement in the OI group ($F = 3.44$, $p = 0.03$, Cohen's $d = 0.25$ three months follow-up, 0.15 six months follow-up), but this seemed to be mainly due to a small deterioration in the control group, rather than

Table 1
Baseline characteristics of the online group and control group.

	Control group (n = 188)	Online group (n = 178)	All (n = 366)
Women, n (%)	145 (77.1)	147 (82.6)	292 (79.8)
Age (mean, SD)	42 (11.4)	38 (12.1)	40 (11.9)
<i>Civil status</i>			
Partner, yes, n (%)	141 (75.4)	132 (75.0)	273 (75.2)
Divorced, yes, n (%)	9 (4.8)	4 (2.3)	13 (3.6)
Foreign background, yes, n (%)	25 (13.3)	23 (12.9)	48 (13.1)
<i>Occupation</i>			
Nurses, n (%)	134 (71.3)	129 (72.5)	263 (71.9)
Surgery assistant	5 (2.7)	0 (0.0)	5 (1.4)
Nurse practitioners, n (%)	22 (11.7)	11 (6.2)	33 (9.0)
Allied health professionals, n (%)	27 (14.4)	38 (21.3)	65 (17.8)
Work experience in years, mean (SD)	11 (10.2)	10 (9.9)	11 (10.1)
Work hours per week, mean (SD)	31 (6.0)	31 (5.3)	31 (5.7)
<i>Impaired mental health</i>			
One or more mental health complaints, n (%)	119 (63.3)	109 (61.2)	228 (62.3)
Depression, above cut-off, n (%)	45 (23.9)	44 (24.7)	89 (24.3)
Anxiety, above cut-off, n (%)	30 (16.0)	32 (18.0)	62 (16.9)
Positively screened mental health complaints and/or impaired work functioning, n (%)	161 (85.6)	139 (78.1)	300 (82.0)

an enhancement in the OI group. The interaction effects on well-being, depression and anxiety symptoms were non-significant.

4. Discussion

4.1. Main findings

In this study, the WHS module including screening, personalized feedback and an offer of online interventions effectively enhanced positive mental health as measured with the MHC-SF for nurses and allied health professionals, and in particular psychological well-being, in comparison to a waitlisted control group. The effect can be considered as medium-sized at three month follow-up and small at six month follow-up for positive mental health in general and medium-sized at both time-points for the subscale psychological well-being. For work engagement a small positive effect was found, which might be due to a small deterioration in the control group. No significant differences between groups were found for well-being as measured with the WHO-5, depression or anxiety.

4.2. Comparison to other work and interpretation

In comparison to the randomized controlled trials examining the effects of the separate online interventions (Warmerdam et al., 2008; Spek et al., 2008; Riper et al., 2008; Bolier et al., 2013) which were used in the WHS, the effects in our study were smaller, did not occur across the entire range of outcomes and/or were sustained to a lesser extent. For example, for the Colour Your Life program medium-sized effects were found in previous studies for both depression (Warmerdam et al., 2008; Spek et al., 2008) and anxiety (Warmerdam et al., 2008) at three and six month follow-up. Likewise, the Psyfit program has been shown to be effective on a range of positive outcomes, and also reduced depressive and anxiety symptoms at follow-up (Bolier et al., 2013). The results in the current study are somewhat comparable to the findings in the 'Don't Panic Online' RCT which suffered from low adherence and a high drop-out rate as well (Van Ballegooijen et al., 2013).

What could have caused this difference in effect? A look at the track-and-trace data of the interventions shows that adherence to the offered online interventions was very low (Ketelaar et al., 2013b). Adherence – the extent to which people follow the protocol in the intervention as

intended – can be an important predictor of intervention effectiveness (Donkin et al., 2011; Kelders et al., 2012). Indeed, this seems to be also the case in the OP group (Ketelaar et al., 2013c): a post hoc analysis revealed that going to the preventive consultation of the occupational physician resulted in a larger effect at post-test ($d = 0.50$, medium sized effect) than screening and feedback alone ($d = 0.34$, small effect).

Regarding the OI group, 16% (28 out of 178 participants) logged in at least once to one or more online interventions, but only nine participants (5%) followed an intervention to some extent, which means that the participant has started with one or more modules within an intervention. Because of the very low adherence rate, a post hoc analysis on the relationship between adherence and effect was not possible. The adherence rate is different from other trials of separate online interventions, in which more than 75% of the participants adhered to an intervention to at least some extent (Spek et al., 2008; Bolier et al., 2013). Because of a lack of participants in the online interventions as well as low adherence, it is more likely that the actual process of screening and personalized feedback caused the effect rather than the online interventions themselves, perhaps by raising a sense of awareness and relevance (see for example Boon et al., 2011).

The low adherence rate could be related to the study population, which was different from the populations in the trials of the separate online interventions (Bolier et al., 2013b; Warmerdam et al., 2008; Spek et al., 2008). In these studies, people were purposely recruited in order to follow a program to reduce depression or enhance well-being. Participants in these trials could thus be regarded as a self-selected and probably more motivated sample. In our study, participants received the online feedback after filling in the screening questionnaire, but there was no explicit help-seeking initiated by themselves. In addition, more than 80% screened positive on mental health complaints and/or impaired work functioning, which might be due to low specificity in the screening instrument. Although it is known that hospital-employed nurses have higher rates of mental health problems than the general norm (Letvak et al., 2012), it could be argued that people did not follow the advice to participate in an online intervention because their complaints were not to the extent that they felt they needed help or an intervention. Likewise, many of the positively screened people received an offer of more than one intervention. We hypothesized that people would be strengthened in their autonomy when they have multiple options. However, the 'too-much-choice effect' could actually have lowered their motivation to start with and follow an intervention (Scheibehenne et al., 2010). A final issue that could have caused the low adherence rate is the lack of personal contact in the interventions, as they are all fully automated self-help interventions. This may conflict with the social nature and personality of many nurses who are characterized by empathy and the urge to care for others (Eley et al., 2012). For depression, the use of personal guidance in online interventions is related to enhanced effectiveness (Andersson and Cuijpers, 2009).

Another salient finding is the significant effect on psychological well-being as measured with the subscale of the MHC-SF, and not on subjective well-being (as measured with another subscale of the MHC-SF and the WHO-5). Apparently, the effect that was found meant more of an improvement in positive functioning (e.g. better relationships, more meaning), as opposed to higher positive affect or cognitive appraisal of life. It might be that the actions and functioning of a person would change first after following an intervention and that it precedes the better feeling. A better feeling (subjective well-being), and a reduction in depressive and anxiety symptoms would require a sustained effort, which was not supported by the current intervention. We do not know why there was a small deterioration in the WL control group regarding work engagement. There might be some changes in the organizational context such as changes in job demands at the wards in the WL group which might have affected the work engagement of the nurses (Schaufeli et al., 2009), but this is speculation because we did not measure these aspects.

Table 2
Estimated effects on and analysis of primary and secondary outcomes at baseline, 3 and 6 month follow-up (n = 366).

Outcome	Time	Online group (n = 178)				Control group (n = 188)				Cohen's Δd		LMM analyses		
		Relative frequency above cut-off (%)	Mean (SD)	Median (range)	Cohen's d	Relative frequency above cut-off (%)	Mean (SD)	Median (range)	Cohen's d	dOnline	- dControl	Group	Time	Group * time
Positive mental health (MHC-SF, 0–5)	B		3.39 (0.66)				3.25 (0.74)					F = 4.72	F = 8.30	F = 3.46
	3 m		3.68 (0.66)		0.44		3.30 (0.74)		0.07	0.37		p = 0.03	p = 0.00	p = 0.03
	6 m		3.65 (0.66)		0.39		3.33 (0.74)		0.11	0.28				
- Subscale MHC-SF subjective well-being (0–5)	B		3.81 (0.63)				3.73 (0.66)					F = 0.73	F = 3.19	F = 0.58
	3 m		3.97 (0.63)		0.25		3.80 (0.66)		0.11	0.14		p = 0.40	p = 0.04	p = 0.56
	6 m		3.97 (0.63)		0.25		3.79 (0.66)		0.09	0.16				
- Subscale MHC-SF psychological well-being (0–5)	B		3.62 (0.63)				3.49 (0.78)					F = 5.49	F = 7.18	F = 5.35
	3 m		3.91 (0.63)		0.46		3.51 (0.78)		0.03	0.43		p = 0.02	p = 0.00	p = 0.01
	6 m		3.96 (0.63)		0.54		3.52 (0.78)		0.04	0.50				
- Subscale MHC-SF social well-being (0–5)	B		2.86 (0.80)				2.68 (0.84)					F = 4.05	F = 7.08	F = 2.30
	3 m		3.22 (0.80)		0.45		2.76 (0.84)		0.10	0.35		p = 0.05	p = 0.00	p = 0.10
	6 m		3.11 (0.80)		0.31		2.83 (0.84)		0.18	0.13				
Well-being (WHO-5, 0–100)	B		63.7 (13.6)				63.8 (15.0)					F = 0.01	F = 11.02	F = 0.94
	3 m		70.1 (13.6)		0.47		67.3 (15.0)		0.24	0.23		p = 0.92	p = 0.00	p = 0.39
	6 m		67.8 (13.6)		0.30		67.9 (15.0)		0.28	0.02				
Work engagement (UWES-9, 0–6)	B		4.36 (0.99)				4.37 (0.99)					F = 0.02	F = 0.71	F = 3.44
	3 m		4.45 (0.99)		0.09		4.21 (0.99)		-0.16	0.25		p = 0.90	p = 0.50	p = 0.03
	6 m		4.46 (0.99)		0.10		4.32 (0.99)		-0.05	0.15				
Depression (BSI, 0–4)	B	37/178 (20.8%)	0.31 (0.32)	0.19 (0.07–1.82)		46/188 (24.5%)	0.30 (0.35)	0.18 (0.04–2.41)				F = 0.03	F = 2.93	F = 1.54
	3 m	32/178 (18.0%)	0.24 (0.32)	0.12 (0.00–1.75)	0.22	42/188 (22.3%)	0.26 (0.35)	0.15 (0.00–2.38)	0.11	0.11		p = 0.85	p = 0.06	p = 0.22
	6 m	30/178 (16.9%)	0.22 (0.32)	0.10 (-0.02–1.73)	0.28	46/188 (24.5%)	0.29 (0.35)	0.18 (0.03–2.41)	0.03	0.25				
Anxiety (BSI, 0–4)	B	25/178 (14.0%)	0.21 (0.24)	0.14 (0.05–2.01)		28/188 (14.9%)	0.25 (0.32)	0.16 (0.05–2.02)				F = 0.62	F = 4.33	F = 0.03
	3 m	19/178 (10.7%)	0.16 (0.24)	0.09 (0.00–1.96)	0.21	23/188 (12.2%)	0.19 (0.32)	0.10 (0.00–1.97)	0.22	-0.01		p = 0.43	p = 0.01	p = 0.97
	6 m	20/178 (11.2%)	0.17 (0.24)	0.10 (0.01–1.97)	0.17	23/188 (12.2%)	0.22 (0.32)	0.12 (0.02–1.99)	0.13	0.04				

4.3. Limitations

A number of limitations in this study have to be recognized. First, the number of participants required for adequate statistical power was not fully achieved. This may have contributed to the non-significance of effects. Second, there was a high attrition rate in this study, and in addition, differential drop-out between the study groups. Although this is not uncommon in online trials (Eysenbach, 2005), this may have produced bias in a direction that is not easy to predict. Third, the adherence rate was very low, which has already been mentioned as a possible predictor for the lower than expected results.

4.4. Conclusion and recommendations for practice and research

This study shows that a preventive workers' health surveillance program consisting of online screening, personalized feedback and a personalized offer of online self-help interventions is capable of enhancing positive mental health, and in particular psychological well-being, at three and six month follow-up. The effect should be considered with caution as there was a large attrition rate.

Potentially, the implementation of this WHS program could address positive mental health/well-being, work engagement and mental health complaints in nurses and allied health professionals, which are important elements for their work functioning and their own work enjoyment. By reaching a large group of employees at the same time, the WHS module could have a significant impact on occupational and thereby public mental health. The program could be part of a population health approach in which a large part of a certain population has to be reached for prevention purposes, in addition to the smaller already diseased population (Rose, 2008). However, based on the results of our study, widespread implementation is not yet warranted and the system should be improved first. The lack of participants and low adherence raise questions about the acceptability of online interventions to nurses and allied health professionals. Engaging nurses in the interventions may require human contact with a coach or occupational physician. This 'blended' work model should be further developed and investigated. Also, the role of persuasive technology and gaming elements requires attention in the future research agenda, as these elements can encourage a participant to begin and stick to an online intervention (Kelders et al., 2012). As regards to the screening system (which can be considered now as highly sensitive, but probably less specific), the optimal balance between sensitivity and specificity should be determined with the help of an ROC curve (receiving operating characteristics) (DeLong et al., 1988), in such a way that symptom profiles are matched better with the needs and preferences of the participants.

We adopted an individual approach to enhance the mental health of nurses and allied health professionals, and based on the results of our study, made some recommendations to refine and improve the WHS module. However, in order to establish a climate for work engagement and well-being in an organization, there has to be just as much focus on organizational factors and job resources, such as management styles and workload, as there is on personal resources (Bakker, 2011; Czabala et al., 2011). When nurses and allied health professionals feel that their organization provides support and involvement, and also nurtures their psychological needs, they will be more likely to function well and invest their time and energy in their patients and the organization (Bakker, 2011). Embedding the WHS module within an integral organizational strategy may help to contribute to the success of this preventive mental health program.

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Conflicts of interests

Trimbos Institute is the developer of Psyfit and has a share in the social venture that implements the intervention. Neither the authors working at the Trimbos Institute nor the institute itself derive financial income from the interventions.

Ethics approval

The Medical Ethics Committee of the Academic Medical Center Amsterdam approved this study.

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