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Systematic Review of Digital Interventions for Stress Management in Adults

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Abstract

Background

Stress is an inevitable part of everyday life. Proper management of stress is crucial in maintaining health of individuals. There are several program that help to manage stress. With the development of new technologies such programs are adapted in digital form. Studies on these digital programs show different results. There is need to review the literature to find out the effective interventions. The Objective of this review is to search systematically, assess and present literature on effectiveness of available digital interventions for stress management in adult population worldwide for the last five years.

Methods

MEDLINE, Embase, PsycINFO and CENTRAL databases have been systematically searched for the Randomized Controlled Trials (RCT) and Non-randomized Studies (NRS). The population of healthy individuals aged 18 years and above eligible for the review. The intervention is any stress management program or strategies that is delivered digitally, i.e. on digital device (computer, mobile phone etc.) online or offline mode. Cochrane Collaboration tool was used for assessing the risk of bias in RCT and NRS.

Results

Thirty eight relevant studies were included into the review which were based on the Cognitive Behavioral Therapy (CBT), Mindfulness, framework, combination of frameworks as well as other frameworks. Included studies on digital CBT interventions do not show its effectiveness on reducing stress in healthy populations. The majority of studies on Online Mindfulness-based stress management show a decrease in stress level with a small to a large effect size (d=0,23, d=1,57) in healthy adults. Most of the studies on digital intervention based on several frameworks and other strategies also show positive results in decreasing stress in healthy population.

Conclusion

Digital CBT Interventions alone are not effective in managing the stress. Online Mindfulness-based Interventions are likely to be effective in stress management in adult population. Digital stress management intervention that are based on several strategies and other frameworks are also showing promising results. The recommended framework for developing the tool for stress management is combination of cognitive behavioral and mindfulness intervention.

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Table of Content

List of Abbreviations

APA American Psychological Association

CBT Cognitive Behavioral Therapy

DM 2 Diabetes Mellitus type two

GSM General Stress Management

HASIC Healthy Ageing Supported by Internet and the Community

NRS Non-randomized Studies

PPI Positive Psychology Interentions

PSS Perceived Stress Scale

PRISMA Preferred Reporting Items for Systematic Review and Meta-Analysis

QoL Quality of Life

RCT Randomized Controlled Trial

SIT Stress Inoculation Training

WHO World Health Organization

1 Introduction

Stress is an inevitable part of modern life. It is generated within individuals under the demands of life which could be real or imagined. Some people respond positively to stress, but other fail to do so. The way individuals handle the stress is important to stay healthy, cope with illness and live happy life. If the stress is managed not properly it may lead to diseases. Stress is quite prevalent condition among adult population. There are several individual programs that train to handle stress and studies which test the effects of these programs. However, up to now there is no study which summarizes the effectiveness of these programs. For this reason there is need for conducting a systematic review on programs that help handling stress and look at the effectiveness of these programs.

There is also practical reason for conducting this systematic review on digital stress management programs. There is a need for an evidence on effectiveness of internet tool for stress management in a project. The project is called 'Healthy Ageing Supported by Internet and the Community, shortly HASIC. HASIC aims at helping elderly people to live healthy life, through keeping them physical active, eating healthy, moderate drinking of alcohol and taking part in social life. For this purpose elderly people are supported by peer- groups and internet program. The internet program is on such topics as healthy eating, social participation, coping with stress and pain. The initial review was focused on internet-based stress management programs in elderly people. Unfortunately there was not enough studies conducted in elderly people to include into review. In the next step it was decided to conduct a second review with focus on broader population.

The current review focused on studies that assess the effectiveness of digital stress management intervention in adult population. The inclusion criteria for this review are shaped by the need of project. For instance, in addition to healthy adults, population with chronic diseases and adults with symptoms of depression were included as these condition are quite frequent among adult and elderly people. The results of this review would be used for developing a stress management tool and lately tested and adapted for elderly population.

1.1 Background

1.1.1 Theoretical Overview and Definition

Over the course of history there were several approaches for understanding stress. A very early explanation of stress was proposed by (Canon, 1932) who described it from the physiological

perspective proposed to understand it as a 'fight or flight' reaction. Further developing this idea Selye (1956) defined stress as a non-specific reaction of body to adjust to any change that happens around individual and called it 'General Adaptation Syndrome', which is consisted of the stages of alarm reaction, resistance and exhaustion. Another approach developed later focused on studying social life events that require change for adjustment. With regards to this Holmes and Rahe (1967) developed a tool for assessing the daily stressful life events.

Another theory is the 'Transactional model of stress' which is proposed by Lazarus (1966). It emphasizes the meaning of stimuli to an individual, who is affected. Some events that are stressful for one person could not be the same for others. Stress remains subjective as a result of complex interaction between characteristics of persons and environmental conditions. According to Lazarus and Folkman (1984, p. 19): "Psychological stress is a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being". Two main constructs of the theory are important: cognitive appraisal and coping. Cognitive appraisal is defined as "an evaluative process that determines why and to what extent a particular transaction or a series of transactions between a person and the environment is stressful" (Lazarus & Folkman, 1984, page 19). Coping is a process of managing the events of individual-environment relationships appraised to be stressful and dealing with the arising emotions (Lazarus & Folkman, 1984).

World Health Organization (WHO) proposes the definition of job-related stress which is "the response of people may have when presented with work demands and pressures that are not matched to their knowledge and abilities and with challenge their ability to cope" (World Health Organization, n.d.[1]).

1.1.2 Public Health Relevance of Stress

Stress is an important public health issue because it is highly prevalent, it can lead to several mental and physical diseases and it quite often remains underestimated by many people who suffer from it.

According to a survey conducted by American Psychological Association (APA) 84 percent of adult population mentioned that their stress increased or stayed at the same level for the last year. About 67 percent of them reported experiencing emotional symptoms and 72 physical symptoms of stress during the last month (Anderson et al, 2014). In Norway, the results of survey indicate that 90 percent of general population experienced symptoms of stress (Ihlebaek et al, 2002).

More data is available on work-related stress across the countries. In Europe work-related

[1] n.d.-not dated

stress is the most frequently reported health concern among employees. More than half (51%) of all employees consider stress to be common in their workplace (European Agency for Safety and Health at Work, 2013). According to the latest survey 43 percent of workers report about increasing level of stress and pressure at work for the last two years in Germany (Lohmann-Haislah, 2012).

Not properly managed and prolonged stress can lead to a range of physical and mental diseases through its direct effect on health, as well as via unhealthy behavior responses to stress. Stress is a risk factor for cardiovascular diseases (Katasarou et al, 2013), cancer (Antoni et al., 2006), diabetes (Hu, et al., 2004), depression and anxiety (Carcia-Bueno, 2008). High level of stress is linked to maladaptive behaviors such as smoking, poor eating habits, reduced exercises and sleep (Cohen et al., 2007).

The significance of stress is often underestimated by individuals. Most people perceive stress as a minor issue and do not address a specialist for help (Oliver et al., 2005). The APA survey shows that people report much more higher levels of stress then they believe it to be healthy and they are not always successful at managing it (Anderson et al, 2014).

Stress as an inevitable part of the everyday life has also positive effect. There is distinction between stress to be 'positive'-eustress and 'negative' - distress. This line is drawn between expressions based on the amount of demand. In the distress the demand exceeds the capacity to perform and in eustress the demand is accepted as optimal (Ferve et al., 2003). Many people who had stressful events in their lives, learned lessons from these events and experience growth as it shown in the example of cancer survivors (Carver & Antoni, 2004).

The development of programs for reducing stress would not only help to prevent diseases but also contribute to a better mental health.

1.1.3 Stress Management Programs

Stress management is defined as any deliberate activity to prevent or reduce stress for people in general or special group of people with shared problem (Lazarus & Folkman, 1984). Different stress management programs teaches various techniques and strategies that help coping with stress such as cognitive behavioral therapy (CBT), relaxation, mindfulness, positive psychology and etc. 'Cognitive behavioral therapy' (CBT) and relaxation trainings are widely used in stress management programs (Glanz et al., 2008). In addition, there are programs based on the principles of mindfulness and positive psychology. More description about the strategies is given in the following paragraphs.

1.1.3.1 CBT

CBT is defined as “an active, directive, collaborative, structured, dynamic, problem-oriented, solution-focused and psycho-educational model of treatment” (Freeman, 2005, p. vii). It was initially developed for treatment of depression and used further for other mental disorders and conditions. CBT is directed at understanding and changing a patient's beliefs and behavior for improving his/her emotional state (Beck, 2011). Effectiveness of CBT is evident in treatment of depression, anxiety and panic disorders (Butler et al., 2006). Several stress management programs based on the principles of CBT also show promising results in reducing the level of perceived stress (Willert et al., 2009, Granath, 2006, Kirby et al., 2006).

1.1.3.2 Relaxation training

Relaxation training is understood as a coping strategy directed at emotional regulation and the introduction of an alternative way of responding to environmental demands and counteracting its effects (Glanz et al., 2008). It is based on the assumption about interaction between biological and psychological responses to stressors (Critchley et al., 2001). Relaxation training has been shown to be effective in dealing with stress-related diseases (Esch et al., 2003), in reducing anxiety (Manzoni et al., 2008) and perceived stress in pregnant women (Bastani, et al., 2005, Tragea, et al., 2014).

1.1.3.3 Mindfulness training

One of the founders of applied mindfulness, Kabat-Zinn, defines it as “the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment” (Kabat-Zinn, 2003, page 145). The effect of mindfulness training in reducing stress is explained by improving three constructs, such as self-regulation, self-exploration and self-liberation (Carmody et al., 2009). Mindfulness training is widely used for the treatment of a broad range of disorders in clinical and non-clinical populations and shown to be effective in the management of chronic pain, cancer, fibromyalgia, depression, anxiety, reducing stress and improving well-being (Grossman et al., 2004, Shapiro et al., 2008, De Vibe, 2012).

1.1.3.4 Positive psychology

Stress management interventions based on positive psychology are “treatment methods or intentional activities aimed at cultivating positive feeling, positive behavior, or positive cognition” (Sin & Lyubomirsky, 2009, page 467). Positive psychology interventions (PPI) are applied through exercises. Two exercises that frequently used are: “three good things in life” and “using signature strengths in a new way”. In “three good things in life” exercise participants are asked to write three things that went well each night for a week. The exercise “using signature strengths in a new way”

requires participant to fill in a questionnaire where they get feedback on five strength of character and are encouraged to use their strength. These exercises increased happiness and decreased depressive symptoms (Seligman, et al., 2005). The meta-analysis conducted earlier found PPI effective in improving well-being and reducing depressive symptoms (Sin & Lyubomirsky, 2009). More recent study conducted by Mongrain & Anselmo-Matthews (2012) that test the efficacy of PPI shows that it has only modest effect on happiness and reducing depression symptoms.

There are many other stress management interventions that deviate from the above mentioned strategies. The majority of stated interventions focus on psychological approaches of dealing with stress. There is plenty of evidence that various stress management techniques conducted in a conventional way are effective (Willert et al., 2009, Esch et al., 2003, Grossman et al., 2004, Sin & Lyubomirsky, 2009). However, traditional way of delivery of stress management interventions is limited in scope. This idea make us to think about alternative ways, for instance online delivery that is widening the scope of interventions.

1.1.4 Digital Mental Health Interventions

There is no commonly accepted definition of digital intervention. For this reason authors of this review understand by digital intervention all interventions that aim to reduce stress or improve mental well-being or reduce stress; interventions that are delivered on any digital devices including computers, mobile phones or other devices via internet connection or in offline mode.

Internet is widely used for providing information on mental health issues and serves as a mean for delivering interventions for prevention and promotion of mental well-being (Ybarra & Eaton, 2005). Using internet for delivery of mental health interventions helps to enlarge the scope of such interventions and reach populations who usually remain uninvolved. For instance, online mental health interventions could be used successfully in remote areas where populations' access to mental health services is limited (Griffiths & Christensen, 2007). Mental health promotional interventions conducted online can be used with low expenses as they require less personnel and cover more individuals in need for it (Powell et al., 2013). Moreover, internet-based mental health interventions have comparable effectiveness with those conducted face-to-face (Anderson, 2009, Barak, et al., 2008).

There are several internet-based mental health interventions that are built on the principles of cognitive-behavior therapy, mindfulness and positive psychology. An example of web-delivered program is 'MoodGYM' that is based on the principles of cognitive-behavior therapy and used initially for prevention of depression and later for improving mental well-being in the general population. The program showed to be effective in this context (Powell, et al., 2013). Another study

conducted by Krusche et al. (2013) found out that an online program based on mindfulness is effective in reducing stress, depression and anxiety. Web-based positive psychology interventions showed only partial positive effects on well-being (Seear, 2013).

Up to now plenty of other mental health interventions are delivered via internet. The evidence of efficacy from these interventions is tested in individual studies. However, the evidence from systematic reviews that summaries the effectiveness of digital stress management programs is needed.

1.1.5 Current State of the Research

Currently available systematic reviews focus on the effectiveness of conventional stress management strategies and online interventions for depression, anxiety and other conditions. There are reviews that explore the effectiveness of face-to-face mindfulness-based stress reduction for nurses (Smith, 2014) in clinical and non-clinical population (Grossman et al., 2004) and positive psychology intervention for breast cancer patients (Casellas-Grau, 2014). A range of other reviews assess the effectiveness of internet-delivered cognitive behavioural therapy for depression (Sikorski et al, 2010), anxiety (Spek et al, 2006, Wade 2010) and other health conditions (Cuijpers et al, 2008, Hedman et al, 2012). In a few reviews stress reduction was a component of a broader program for management of post-traumatic stress (Amstadter, et al., 2009), diabetes (Van Bastelaar, 2011), alcohol abuse (Matano et al., 2000).

Until the beginning of current review no other systematic review was found that assesses the effectiveness of online stress management interventions in the general population.

1.2 The Review Question and Objectives

The **Review Questions** is: “What digital interventions in RCT and NRS have been shown to be effective for stress management in the adult population in the world for the last five years?”

Sub-questions are:

- What kind of digital stress management programs are available in the literature for the last five years?
- What is the methodological quality of included RCT and NRS?
- In which countries are the studies done?
- What is the effectiveness of intervention in different stress management programs?

The **Objective** of this review is to search systematically, assess and present literature on effectiveness of available digital interventions for stress management in adult population worldwide

for the last five years.

Sub-objectives:

- to search, screen, select studies and assess full-text of articles on effectiveness of digital interventions for stress management interventions in general population worldwide, including articles published in English and German languages for the last five years;
- to assess the risk of bias in included Randomized Controlled Trial (RCT) and Non-randomized Studies (NRS) using Cochrane tool;
- to present the main findings and corresponding effect sizes of digital stress management interventions from the studies.

2 Methods

2.1 Study Design

The design of this study is a systematic literature review. It a secondary analysis of literature with the focus on digital stress management interventions. The review question, objectives and search strategies were defined before conducting this review. The process of systematic literature review consists of several steps; including search itself as well as the assessment and analysis of existing original studies for further presentation of effectiveness of interventions on related topics.

The inclusion criteria and search strategies were defined prior to conduction of the review and were adapted in the review process. Comprehensive search terms were developed and research was done in four major databases. The specific domain-based Cochrane Collaboration was used tool for assessment of risk of bias in the included studies. The results of individual studies are presented separately and synthesis is made in a qualitative manner through developing categories for based on an underlying framework of stress management interventions. However, this systematic review is not followed by a quantitative synthesis, i.e. meta-analysis.

Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines (PRISMA) (Moher et al., 2009) were used for the structure, conduction and reporting of this systematic literature review. The structure is based on the PRISMA requirements and it is reported according to the PRISMA checklist (appendix on p. 117). For the visual presentation of the study selection process the PRISMA flow-chart was used.

For formulating the research question and defining the inclusion criteria the 'Population, Intervention, Outcomes, Comparison and Study Design' - 'PICOS' approach was used (O´Connor et

al. 2008). As there was no special interest in the 'Comparison' of interventions, this aspect was ignored and the modified version 'PIOS' used for this review.

2.2 Inclusion Criteria

1. Population

The primary focus of review is on study populations of “healthy adults”. The term “healthy adults” refers to individuals of the general population aged 18 years and above; who do not have any acute somatic and/or mental diseases. Secondary focus is on study populations with common chronic diseases, which include patients with chronic heart diseases, arthritis, diabetes, and cancer. These four chronic diseases were chosen because they are prevalent in general population (HealthyPeople2020, 2014).

2. Intervention

The analysed interventions are stress management programs that include any strategies: such as cognitive-behavioural therapy, stress inoculation training, positive psychology and, mindfulness, as well as stress management techniques, such as relaxation and meditation. The review on digitally provided intervention, i.e. via Internet on digital devices (computer, mobile phone, etc.) or offline mode. Studies that comparing the effectiveness of several interventions are used for the review but a comparison of interventions is not a necessary inclusion criterion. The preferable settings of intervention are the community, home-based and outpatient care. Interventions on mental health promotion that are designed for the prevention of depression in healthy populations are also included in the review.

3. Outcomes

All studies that measure the state of psychological well-being or stress level as an outcome are acceptable. This includes measures of subjective stress, well-being, life satisfaction and other related measures. An example of an outcome measurement tool is the Perceived Stress Scale (PSS) which is used in the literature for assessment of subjective stress (Cohen et al., 1983).

4. Study Design

The reviewed studies has quantitative study design. RCT as well as NRS are included. All types of NRS including trials with pre- and post-assessment of outcomes are acceptable for the analysis.

5. Language

The language of included articles is English and German.

Place of Publication

There is no restriction to the place of publication; studies published in all countries over the world are included.

6. Publication Date

The publication date is limited to the last five years. Only studies that were published within the period from January 2009 to January 2014 are included in the review.

Table 1 Inclusion Criteria for the Review

#	Criteria	Description
1	Population	Healthy adults aged 18 or above; Participants with chronic diseases (diabetes, cancer, heart diseases, and arthritis); Participants with symptoms of depression.
2	Intervention	Stress management program including different strategies and techniques Digital delivery of intervention (on any devices including computer, mobile phone etc.) via Internet or on offline mode; Preferred setting: community-based, home-based, outpatient.
3	Outcomes	Measures of psychological well-being; Measures of subjective stress and well-being, quality of life and other related psychological outcome measures.
4	Study Design	RCT and NRT including studies with pre and post assessment of outcome
5	Language	English and German.
6	Publication Date	Last five years: from 2009 to 2014
7	Place of Publication	All countries around the world

2.3 Exclusion Criteria

1. Population

Studies including individuals with acute somatic and/or mental diseases, patients with a primary (e.g., Alzheimer disease) and secondary mental diseases (e.g., dementia), patients with clinical forms of depression, anxiety, rare diseases, or other special conditions are excluded. Also population below the age 18, i.e., children and adolescents are excluded from the reviewed studies.

2. Intervention

Interventions other than stress management program as well as or face-to-face stress management interventions were excluded. Online interventions for treatment of depression, anxiety and panic or other disorders in clinical settings were excluded from the review as well.

3. Outcomes

Physiological indicators of stress as an outcome measures were excluded. Measurements of depression and anxiety only were considered as insufficient for this review.

4. Study Design

Studies that have a qualitative study design were excluded as well as those that were not trial based. A published protocol of studies and literature reviews were not included into the review.

5. Language

Studies that published in other languages than English and German were excluded.

6. Publication Date

The publication date is limited to the last five years. Studies that are published earlier than January 2009 are excluded from the review as well as studies that published after January 2014.

Table 2 Exclusion Criteria for the Review

#	**Exclusion Criteria**	**Description**
1	Population	Patients with acute somatic and/or mental diseases; Patients with chronic mental diseases, e.g. clinical form of depression and anxiety; Population below 18 years of age, i.e. adolescents or children.
2	Intervention	Other than stress management; Face-to-face or telephone delivery of stress management programs.
3	Outcomes	Physiological measures of stress; Measure of depression and anxiety.
4	Study Design	Non-trial design, surveys, qualitative studies; Protocol of studies; Other literature and systematic reviews.
5	Language	Other than English and German.
6	Publication Date	Studies published before January 2009 and after January 2014.

2.4 Information Source

The search was done in four computerized databases, MEDLINE, Embase, PsycINFO and CENTRAL. The MEDLINE database is accessible to the public, whereas the other three databases were accessed via the Hamburg University library. The last date of search in databases is the 31st of January 2014. More details about the databases, the systems providing access and the periods of coverage are illustrated in table 3.

Table 3 The Computerized Databases for the Search

#	Database	System providing access for database	Periods of coverage
1	MEDLINE	PubMed	From 1946 to January 2014
2	Embase	OVID SP (Version: OvidSP_ UI03.11.00.120, SourceID 59447)	From 1974 to 2014 January
3	PsycINFO	OVID SP (Version: OvidSP_ UI03.11.00.120, SourceID 59447)	From 1806 to January 2014
4	CENTRAL	Cochrane Library: Cochrane Central Register of Controlled Trials: Issue 1 of 12	From 1991 to January 2014

2.5 Search Strategy

The search terms were developed and searched using advanced mode in the MEDLINE database. Later the terms were adapted to other databases. The creation of search terms was based on the researcher's assumptions about stress management techniques, basic literature in the field (Glanz et al., 2008, Lazarus & Folkman, 1984) and the result of pilot testing. The search strategy includes of three sub-sets of search terms.

The first sub-set is the search terms that are related to stress management strategies (below, in search terms list from #1- # 9).

The second sub-set looks at different means of interventions (search terms from # 10- # 18).

The third sub-set includes various ways of delivery of interventions (search terms # 19- # 26).

The final, fourth search string (# 27) is the combination of sub-set mentioned above.

The terms within sub-sets were first combined with the Boolean operator 'OR', so that at least one of the mentioned terms was included in the search results. At the end three sub-sets of search terms were combined with the operator 'AND' that in the final search one term from each three sub-sets were included.

The truncation (*-asterisk) was used after the term 'mindful' in order to include different variations of this world (mindfulness, mindfulness-based etc.). Quotation marks - ("") were used in some search terms for the purpose of limiting the search only to the exact expressions inside the marks. For example, in the search term "cognitive behavior" the search is done for the expression 'cognitive behavior', but not separately search for the term 'cognitive' and 'behavior'. Subject headings were not applied throughout the entire search, as they were different in all databases.

The full electronic search strategy is as follows:

1. stress management
2. stress inoculation
3. relaxation
4. cognitive behavioral
5. “cognitive behavior”
6. CBT
7. psychotherapy
8. mindful*
9. stress management or stress inoculation or relaxation or cognitive-behavioral or “cognitive behavior” or CBT or psychotherapy or mindful*
10. intervention
11. tool
12. program
13. programme
14. training
15. therapy
16. psychoeducation
17. “psycho education”
18. intervention or tool or program or programme or training or therapy or psychoeducation or “psycho education”
19. digital
20. “web based”
21. “internet based”
22. online
23. mobile
24. ehealth
25. “e health”
26. digital or “web based” or “internet based” or online or mobile or ehealth or “e health”
27. (stress management or stress inoculation or relaxation or cognitive-behavioral or “cognitive behavior” or CBT or psychotherapy or mindful*) and (intervention or tool or program or program or training or therapy or psycho-education or “psycho education”) and (digital or “web based” or “internet based” or online or mobile or ehealth or “e health”).

The complete electronic search history of all databases is attached in the appendix (p. 90).

2.6 Study Selection

Searching in databases resulted in a list of articles (items). Going through (screening) this list it was decided if the articles fulfilled the inclusion criteria or had to be excluded.

If the item did not fit the inclusion criteria it was documented in form of table of exclusion and if the title met the inclusion criteria it went into inclusion list of articles (on. p. 93).

The decision to include or exclude articles was done first by the title of article. If the title was unambiguous the abstract of article was reviewed. If necessary the full-text of article was assessed further. Details about the identification and selection of studies are described in the flow-diagram (fig.1 on p. 25).

The table of exclusion was developed in order to make the screening process more transparent and to bring the rationale for exclusion of items. The exclusion table is based on the exclusion criteria of the review. It consists of the following domains: 'not stress management intervention', 'not internet delivery', 'target group not healthy adults', 'outcome not psychological', 'study design not trial'. An example of the exclusion table is attached to the appendix (p. 100).

If an article did not fit the exclusion criteria it was added to the inclusion list. The full text of these selected articles was retrieved later. The author read the full-text of the articles and documented the process of selection in a form of full-text assessment table. Full-text table was based on the inclusion criteria. It consists of the following aspects: 'References', 'Study design', 'Intervention Definition', 'Language', 'Population', 'Outcome', and 'Decision'.

While the screening and selection of titles was carried out by one author, but the table and the preliminary list of included articles were additionally cross-checked by the supervisor.

During the screening and selection of studies there were several duplications of them. It was necessary to identify and eliminate those duplications. Several methods were used for this purpose. First the automatic tool for identification and elimination of duplicate article for the databases Embase and PsycINFO was used. Duplications of items in these databases were eliminated automatically by choosing the function 'Remove duplicates'. This tool was not available for other databases, so elimination of duplicates between other databases was done manually. The selection process was undertaken in each database and an inclusion list was created separately for each of the databases separately. At the end, the lists were merged altogether and duplicates identified by use of the 'Find and Replace' function of the software „OpenOfficeWriter” and eliminated manually.

2.7 Data Collection Process

A data extraction sheet was developed in order to collect relative information from the studies

and present it in the form of table. The data extraction table of an existing systematic review conducted by Kueider and colleagues (2012) was revised to create an own table. The pilot form of data extraction form was first tested on four randomly selected studies. The author of this thesis did data extraction, while the supervisor guided the process of data extraction and challenges that occurred during the extraction were resolved together. The pilot design of data extraction sheet is shown in the table below (table 4). The full version of data extraction table is presented in the results part of this thesis (p. 37).

Data was extracted from each included study on the following items:

1. Information about the study: author's surname, year of publication, country and study design;
2. Intervention: title, theoretical basis, other name of intervention if available;
3. Duration of intervention in weeks;
4. Characteristics of participants in intervention group: sample size, age mean, gender;
5. Characteristics of participants in control group: sample size, age mean, gender;
6. The main findings of the study;
7. Effect size of the intervention.

Table 4 The Pilot Design of Data Extraction Sheet

Reference Country	**Intervention (Stress Management Training or Techniques)**	**Duration**	**Intervention Group (IG), Sample Size (N), Age Mean (M, years), Occupation**	**Control group (CG) Sample Size, Age Mean (M, years), Occupation**	**Main Findings**	**Effect Size**
Feicht et al, 2013, Germany	Web-based Happiness Training.	7 weeks	N=85 Age M -37,61 (7,71)[2] Employees	N=62 M (age)-36,77 (10,42) Employees	Stress Warning Signals (SWS) ↓	SWS, d=0,84
Drozd et al., 2013, Norway	Web-based Stress Reduction Intervention (psychoeducation and exercises) - „Less Stress”.	4 weeks	N=126 Age M -32,0 (9,6) General Population	N=133 (CG) Age M – 33,2 (9,9) General Population	Stress ↓	Stress (Est)= -0,79
Radhu et	Web-based	12 weeks	N=28	N=30	Perceived	PSS

[2] Number inside the brackets represents standard deviation

al, 2012, Canada	CBT for perfectionism.		Age M-23,82 (5,55) Students	Age M-21,44 (2,36) Students	Stress Scale (PSS) ↓	η=0,02
Kajyama et al, 2013, USA	Internet-based Program for Reducing Caregivers Distress- „i-Care“.	7 months	N=75 Age M=55,22 (11,31) Caregivers	N=75 Age M =57,02 (12,53) Caregivers	PSS ↓	PSS M=18,46 (5,20)/15 ,83 (5,7).

2.8 Risk of Bias in Individual Studies

Bias is a systematic error that can influence the results of an intervention, whether by overestimation or underestimation of its real effects (Higgins, 2011). Assessment of risk of bias in the studies is necessary because it helps to understand validity of findings (Higgins, 2011). Several tools are available for risk assessment of bias. In this review the Cochrane Collaboration tool was used for assessing the risk of bias in studies. It is recommended by Cochrane Collaboration and provides individual assessment of bias in different domains (Higgins, 2011).

The standard 'Risk of Bias' table includes several aspects: sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting and other sources of bias (tab. 3). Sequence generation is considered adequate if the participants in a study are distributed randomly to the intervention as well as the control groups and the method of allocation is reported. Allocation concealment means that participants were kept unaware about a random allocation before the intervention in a way that they do not know to which group they belong. Blinding is about masking the intervention after the assignment of participants to the intervention and control groups. Incomplete outcome data addresses the issue of missing data and the methods of handling this issue. In selective outcome reporting the review's author tests if the previously defined outcome measurements are reported properly in the study. Other sources of bias can be associated with differences in baseline measurements in study population, cases of premature termination of intervention and other reasons for potential bias. The author's judgments on each domain are categorised in folowing ways: the answer 'Yes' indicates a low risk of bias, 'No'- a high risk of bias, and 'Unclear'- represents a lack of information on potential risk of bias (Higgins, 2011). To support the judgment made direct quotation from the studies were recorded or the decision was commented by the author.

Table 5 Cochrane Collaboration's Risk of Bias Tool for Randomized Controlled Trials (template)

Domain	**Author's Judgement**	**Support for Judgement**
Adequate sequence		

generation?		
Allocation concealment?		
Blinding?		
Incomplete outcome data addressed?		
Free of selective reporting?		
Free of other biases?		

For the non-randomized trials the tool was used with some modification. The first three domains from the tool, - random allocation, allocation concealment and blinding were eliminated because they are not adequate in the context of non-randomized studies.

Table 6 Modified version of the Cochrane Collaboration's Risk of Bias Tool for Non-randomized Studies (template)

Domain	Author's Judgement	Support for Judgement
Incomplete outcome data addressed?		
Free of selective reporting?		
Free of other biases?		

2.9 Summary Measures

The primary and secondary summary measures for this review were defined.

Primary measures are measures those closely related to the assessment of mental health or stress. These are various instruments that measure stress and coping, quality of life and mental well-being. For instance, the scale used to measure subjective stress is the 'Perceived Stress Scale' (Cohen et al., 1983). The PSS is a scale for assessing how much an individual perceived the events during the last month as overwhelming. It consists of 14 items with the answers ranging from 0 to 4 with the last being the highest score.

Secondary measures are all other measures that have been associated with stress, but are not directly related to it. Secondary measures are scales that evaluate mindfulness, perfectionism, positive mood, problem solving tool and the level relaxation.

From all outcome measures that are described in the studies only one primary or one secondary outcome measure was chosen (tab.7). The table 'Hierarchy Levels' was developed to facilitate selection of one outcome of interest among several other outcome measures that are

reported in one article. The measures on a higher hierarchy level were selected first if they were reported in a study.

Table 7 Hierarchy Levels of Outcome Measures

Position	Main Outcomes	Related Measures
1	Stress, Burnout, Distress	PSS[3], PSQ[4], NRS[5], SWS[6], MSP[7], MBI[8], DASS-S (stress subscale)[9]
2	Coping	COPE[10], NMR[11], MAC[12], CBC[13]
3	Mental Well-being	PWB[14], WEMWBS[15]
4	Quality of Life	HRQOL[16], ADDQoL[17], QLS[18]
5	Mindfulness	MAAS[19]
6	Perfectionism	MPS[20]
7	Problem Solving Skills	SPSI[21]
8	Positive Mood	PANAS[22]
9	Relaxation Level	VAS[23]

2.10 Effect Size Calculation

To measure the size of effect in interventions effect size was considered, which is a standardized measure of the magnitude of the observed effect (Field, 2005). Depending on the type of analysis different estimations of effect sizes exist. One way of reporting effectiveness is by the effect size index- Cohen's d, which represents the difference or changes of means in relation to the common standard deviations (Cohen, 1988). Another effect size index is eta square (η^2), which represents the proportion of explained variance. When the effect size is reported by Cohen's d it is used for the interpretation of the magnitude of effects. In other cases where effect size is not

[3] PSS-Perceived Stress Scale
[4] PSQ-Perceived Stress Questionnaire
[5] NRS-Numeric Rating Scale
[6] SWS-Stress Warning Signals Scale for subjective stress experience
[7] MSP-Measure du Stress Psychologique- Measure of Perceived Stress
[8] MBI- Maslach Burnout Inventory
[9] DASS-Depression Anxiety and Stress Score
[10] COPE-Coping Orientation to Problems Experienced, consist of active and denial subscales
[11] NMR- Negative Mood Regulation Scale for assessment of self-efficacy for coping with negative mood
[12] MAC-Mental Adjustment to Cancer
[13] CBC-Carver's Brief Cope for assessment of positive coping
[14] PWB-Psychological Well-being
[15] WEBWBS-Warwick-Edinburgh Mental Well-being Scale
[16] HRQOL-Health Related Quality of Life
[17] ADDQoL- Audit of Diabetes Dependence Quality of Life
[18] QLS-Quality of Life Scale
[19] MAAS- Mindfulness Attention and Awareness Scale
[20] MPS- Multidimensional Perfectionism Scale
[21] SPSI-Social Problem Solving Inventory
[22] PANAS-Positive Affect Negative Affect for measurement of positive mood
[23] VAS-Visual Analogue Scale for assessment of relaxation level

reported in the studies, Cohen's d is calculated using means and pooled standard deviations of outcome measurements if possible (Cohen, 1988, p. 20), where, M_A and M_B - being means of a measure, σ - the common standard deviation.

$$d=(M_A-M_B)/\sigma$$

For the majority of outcome measures there was no common standard deviation, for that reason a pooled standard deviation was calculated by use of the following formula, (Cohen, 1988, p 44.):

$$\sigma= \sqrt{(\sigma_A^2+\sigma_B^2)/2}$$

If eta square (η^2) is reported instead or can be calculated from reported data, eta square is translated into Cohen's d to make the interpretation of effect sizes comparable in between studies. The translation of eta square into Cohen's d was done in two steps described by Cohen (1988).

The first step is calculating the effect size index f from eta square (Cohen, 1988, p.284).

$$f=\sqrt{\eta^2/(1-\eta^2)}$$

The second step is calculating Cohen's d from the effect size index using the following formula (Cohen, 1988, p. 276):

$$d=2*f$$

The formulas for calculation and translation of effect size were adapted to the computer software Calculator of OpenOffice program and the calculation then was done automatically. Calculation of the effect size was done between the intervention and control group after the end of each intervention. If the effect size and required measures for its calculation are not reported in a study comparison of effects is not possible.

The effect size of an intervention is considered small if d=0,2 medium if d=0,5 and large if d=0,8 (Cohen, 1988).

2.11 Synthesis of the Results

A qualitative synthesis of the results is done. The studies are combined in four categories. The developed categories are based on the underlying framework that the included studies used. The four categories are:

1. Digital Cognitive Behavioral Therapy Interventions;
2. Online Mindfuness-based Stress Management Programs;
3. Digital Stress Management Interventions based on several strategies;

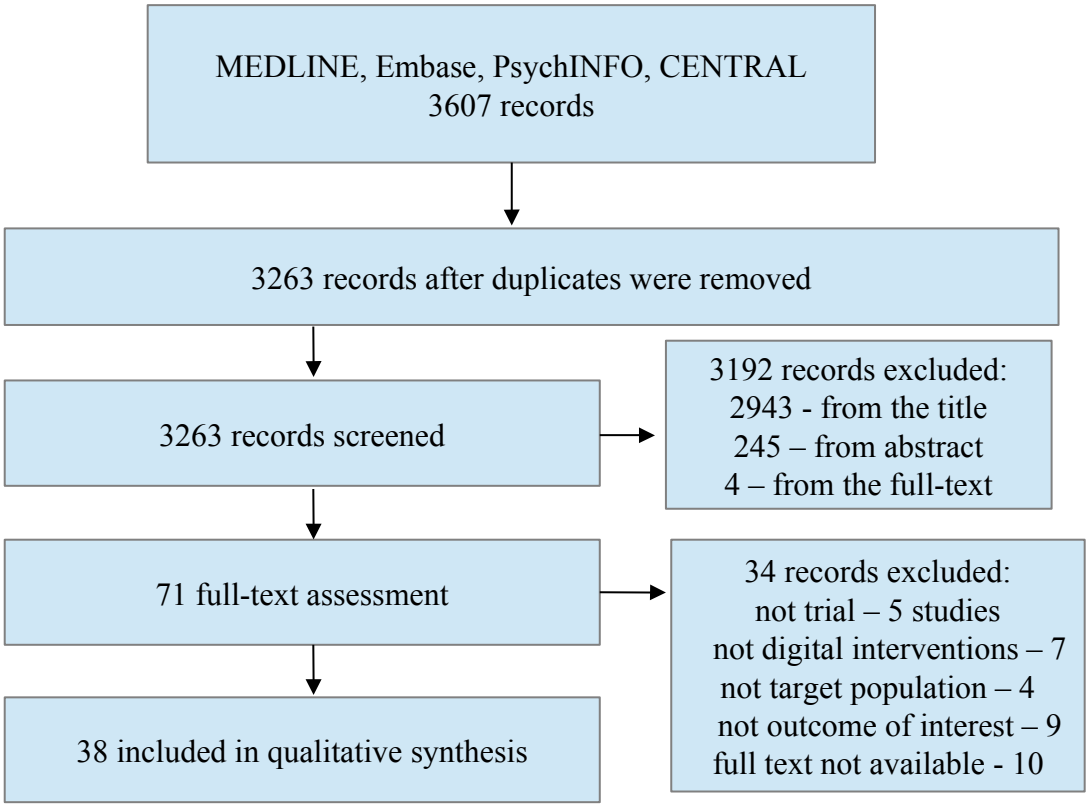
4. Digital Stress Management Intervention based on other frameworks.

3 Results

3.1 Study Selection

The search in databases MEDLINE, PsycINFO, Embase and CENTRAL databases resulted 3607 citations in total. After identification and removal of 344 duplicats, they were removed. Remaining 3263 records were screened further. The reviewing of titles, abstracts and full articles caused the exclusion of 3192 studies which did not meet the inclusion criteria. Most of the articles were excluded by screening the title (92,3%). The remaining articles were excluded after reading the abstract (7,6%) and the full-text version (0,1%). The reasons for exclusion at this stage were: intervention was not defined as stress management in 1339 studies, population criteria was not met in 1043 studies, study design was not trial in 237 studies, outcome measures were not psychological in 25 studies, 17 studies were not conducted digitally. More details on study selection are presented in the figure 1.

Figure 1 Flow-diagram of the Study Selection



Seventy-one full-text articles were assessed for eligibility criteria (see table 8). After reading these full-text articles 33 of them were excluded because they did not meet inclusion criteria.

The reasons for exclusions were the following: five studies were not trials; eight studies were not digital interventions; two studies were conducted in not targeted population, nine studies had other outcome than of interest of the review. Ten studies were discarded because their full-text articles were not available. The corresponding authors of absent studies were contacted. It appeared that in most of these cases the article was only available as a conference abstract and the publication of full-text version was still in the process of publication.

The remaining thirty-eight studies were included into this review. The article of Nes and co-authors (2013) included the description of three different studies, so each study was assessed separately and the article was counted as three articles.

The studies are listed in the table 8 in the order of selection from the databases; first the studies from the MEDLINE are enlisted, second – Embase and PsycINFO and third-CENTRAL. In the table it is described how each individual study was assessed with regard to inclusion criteria and the basis on which the decision whether to include or exclude was made. More details about the process of full-texts assessment, inclusion and exclusion of articles is given in table 8.

Table 8 Full-text Assessment of Articles

Required criteria	**Study design (1)**	**Intervention definition (2)**	**Intervention delivery (3)**	**Language (4)**	**Population (5)**	**Outcome (6)**	**Decision**
References	Trial (+[24]); *Not trial, (-[25])*	*Stress management technique (SM) (+);* *Other(-)*	Digital int (+), Conventional (-)	English, German (+); Other lang. (-)	General, age above 18 years (+)	Measure of perceived stress or related (+) Non-psychological (-)	Include (+, 'yes') Exclude (-, 'no')
1. Feicht et al, 2013	(+) RCT	(+) Happiness training	(+) Online training	(+) English	(+) Age Mean (M) =37 years	(+) Psychosocial well being	(+)
2. Krusche et al, 2013	(+) Follow up investigation	(+) Mindfulness	(+) Web-based	(+) English	(+) Age M=47,7 years	(+) Perceived Stress Scale (PSS)	(+)
3. Fortney et al, 2013	(+) Single sample pre-, post-design	(+) Abbreviated mindfulness	(-) Conventional	(+) English	(+) Age M=40,5 years	(+) PSS	(-) (3)
4. Villani et al, 2011	(+) Trial, between subject design	(+) Stress Inoculation Training (SIT), relaxation	(+) Via mobile phon, video clips	(+) English	(+) Age M=43 years	(+) Measure of perceived Stress (MSP)	(+)
5. Cavanagh et al, 2013	(+) RCT	(+) Brief mindfulness	(+) Online	(+) English	(+) Age M=25,3 years	(+) PSS	(+)
6. Shigaki et al, 2013	(+) RCT	(+) Cognitive-behavioral self management program	(+) Online	(+) English	(+) Age M=50 years, adults with rheumatoid arthritis	(+) Quality of life scale (QLS)	(+)
7. Day et al., 2013	(+) RCT	(+) Cognitive-behavioral therapy (CBT) self-help	(+) Internet-based	(+) English	(+) Age M=23,6 years, university students	(+) Depression Anxiety and Stress Score-(DASS 21)	(+)
8. Morledge	(+)	(+)	(+)	(+)	(+)	(+)	(+)

[24] '+' means that the inclusion criteria was met
[25] '-' means that the inclusion criteria was not met

Required criteria	**Study design (1)**	**Intervention definition (2)**	**Intervention delivery (3)**	**Language (4)**	**Population (5)**	**Outcome (6)**	**Decision**
et al., 2013	RCT	Mindfulness	Online	English	Age b/w 40-59 (59,1%), general population	PSS	
9. Lappalainen et al., 2013	(+) RCT, pilot study	(+) CBT and Acceptance and Commitment therapy - „P4Well“	(-) Personal health technologies + psychologist assisted group meetings; with WL[26] control group	(+) English	(+) Age M=47, 1 years, male workers	(+) Stress measure - Bergen Burnout Indicator	(-) (3)
10. Drozd et al, 2013	(+) RCT	(+) Mindfulness and Procrastination „Less Stress“ intervention	(+) Web-based	(+) English	(+) Age M=32,6 years	(+) Depression Anxiety and Stress Score (DASS-S)	(+)
11. Glozier, 2013	(+) RCT	(+) CBT for mild and moderate depression „E- couch“	(+) Internet delivered	(+) English	(+) Age M=58 years, participants with mild to mod. symp. of depression	(-) Depressive symptoms-Patient Health Questionnaire (PHQ-9),	(-) (6)
12. Reid, 2013	(+) Repeated-measure design,	(+) Mindfulness Curriculum	(+) Online	(+) English	(+) Occupational therapy students (first year master students)	(+) Mindfulness Attention and Awareness Scale (MAAS)	(+)
13. Geraedts, 2013	(-) Study protocol for RCT	(+) Problem Solving, Cognitive therapy	(+) Web-based	(+) English	(+) Workers with depressive symptoms	(+) Centre for Epidemiological studies Depression Scale (CES-D)	(-) (1)
14. Powell et al., 2012	(+) RCT	(+) CBT, MoodGYM“	(+) Web-based	(+) English	(+) Age M=41 years, general population	(+) Warwick-Edinburgh Mental Well-being Scale	(+)

[26] WL - waiting list

Required criteria	Study design (1)	Intervention definition (2)	Intervention delivery (3)	Language (4)	Population (5)	Outcome (6)	Decision
15. Rose et al. 2013	(+) RCT	(+) Self-guided Stress management and resilience program	(+) Multimedia	(+) English	(+) Age M= 27,3 years, graduate students	(+) PSS-10	(+)
16. Carpenter et al, 2012	(+) RCT	(+) Cognitive Behavioral Stress Management	(+) Web-based	(+) English	(+) Age M= 50, 9 years	(+) Negative Mood Regulation Scale (NMR)	(+)
17. Quintana et al, 2012	(+) Pre-, post-design	(+) Mindfulness training	(+) Online	(+) English	(+) Age M=39,1 years	(+) Perceived Stress Scale (PSS -10)	(+)
18. Schueller et al, 2012	(+) Open trial	(+) Positive psychotherapy (PPT), 2-, 4-, 6-exercise conditions	(+) Online	(+) English	(+) Age M=42, 3 years, particip. with mild/moderate depression	(-) Cener for Epidemiological studies Depression Scale (CES-D)[27]	(-) (6)
19. Kilbourn et al, 2012	(+) pre-, post-design, mixed method	(+) Psychosocial Intervention: CBSM and psychoeducation „EASE“	(-) Telephone delivered	(+) English	(+) Age M=60 years, patients with head/neck cancer	(+) Cancer specific distress, Quality of life (QoL)	(-) (3)
20. Radhu et al, 2011	(+) RCT	(+) CBT for maladaptive perfectionism	(+) Web-based	(+) English	(+) Age M=23,8 years, students	(+) PSS	(+)
21. Krusche et al, 2012	(+) Preliminary evaluation, no control group	(+) Mindfulness	(+) Online	(+) English	(+) Age M=48 years	(+) PSS	(+)
22. David et al, 2013	(+) RCT	(+) CBT coping with cancer, psychoeducation	(+) Internet-based	(+) English	(+) Age M=47,3 years	(+) Mental adjustment to cancer (MAC)	(+)
23. Hoch et al, 2012	(+) Mixed method design, pre-,	(+) Mind body stress reduction, relaxation program	(+) Online virtual reality	(+) English	(+) Age M=42 years, healthy volunteers	(+) PSS	(+)

[27] Measure of Depression (CES-D) only is not sufficient to include

Required criteria	**Study design (1)**	**Intervention definition (2)**	**Intervention delivery (3)**	**Language (4)**	**Population (5)**	**Outcome (6)**	**Decision**
	post- pilot study						
24. Classen et al. 2012	(+) RCT, Feasibility study	(+) Support group and psychoeducation	(+) Online	(+) English	(+) Age M=42,3 years, women with gynecological cancer	(-) Female sexual distress scale	(-) (6)
25. Villani et al, 2012	(+) Randomized trial.	(+) Self-help stress management (Stress Inoculation training)	(+) On mobile phone	(+) English	(+) Age M=42 years, female oncology nurses	(-) Anxiety state, coping skills acquisition, the outcome measure is not reported	(-) (6)
26. Wolever et al, 2012	(+) RCT, pilot study	(+) Mind-body Stress Reduction (yoga and mindfulness)	(+) Comparison of online vs. in-person mindfulness	(+) English	(+) Age M=42,9 years, employees	(+) PSS	(+)
27. Arpin-Cribbie et al, 2012	(+) RCT	(+) CBT, General Stress Management (GSM)	(+) Web-based	(+) English	(+) Age M=20,4 students	(+) Multidimensional Perfectionism scale (MPS)	(+)
28. Lindvedt et al, 2013	(+) RCT	(+) Self-help intervention based on CBT for prevention of depression.	(+) Internet-based	(+) English	(+) Age M=28,2 years students	(-) CES-D	(-) (6)
29. Bennett et al. 2011	(+) RCT	(+) Health and leadership development program to improve lifestyle habits (diet, exercise, stress, mood)	(+) Web-based	(+) English	(+) Age M=41,5 years Managers	(+) Symptom of Stress Scale	(+)
30. Bernocchi et al, 2011	(+) Non-randomized trial, feasibility study	(+) Physical Activity program and Telemedicine program	(-) Telehealth counseling via telephone	(+) English	(+) Under age 75 years with risk of smoking, hypertension, obesity, diabetes, hypercholesterolaemia	(+) Quality of Life (QoL-short, WHO)	(-) (3)

Required criteria	Study design (1)	Intervention definition (2)	Intervention delivery (3)	Language (4)	Population (5)	Outcome (6)	Decision
31. Greeson et al, 2011	(+) Prospective, observational open trial	(+) Mindfulness-based Stress Reduction	(-) Standard mindfulness program	(+) English	(+) Age M=45 years	(+) Health Survey-short form (SF-12)	(-) (3)
32. Wiegand et al, 2010	(+) RCT,	(+) Comprehensive programe for reducing stress	(+) Online	(+) English	(+) Age M=35,7 years	(+) Perceived Stress Scale (PSS)	(+)
33. Sexton et al, 2010	(+) RCT	(+) Coping with infertility, based on CBT	(+) Web-based	(+) English	(-) Age M=32,6 years infertile women	(+) Symptom Checklist 90-Revised (SCL-90)	(-) (5)
34. Van der Houwen et al, 2009	(+) RCT	(+) Brief self-help for bereaved	(+) Internet-based	(+) English	(+) Age M=43,2 years bereaved people	(+) Grief reactions (DSM-V) CES-D	(+)
35. Warmerdam et al, 2009	(+) RCT	(+) CBT for depressive symptoms, problem solving therapy	(+) Online	(+) English	(+) Age M=45 years	(+) SPSI (problem solving)	(+)
36. Hoffman et al, 2013	(-) No trial, only description of intervention	(+) Interactive cardiovascular education and coaching program inc. SM	(+) Web-based	(+) German	(-) No information	(-) No information	(-) (1)
37. Nes et al, 2013 (a)	(+) RCT	(+) Self-management of irritable bowel syndrome (based on CBT)	(+) Web-based	(+) English	(-) No information on age, patients with irritable bowel syndrome	(+) QoL	(-) (5)
37. Nes et al, 2013 (b)	(+) RCT	(+) Self-management of chronic widespread pain (based on CBT)	(+) Web-based	(+) English	(-) No information on age, patients with chronic widespread pain	(+) QoL	(-) (5)
37. Nes et al, 2013 (c)	(+) NRS, feasibility study	(+) Self-management of type 2 diabetes (based on CBT)	(+) Web-based	(+) English	(+) No information on age, patients with type 2	(+) QoL	(+)

Required criteria	**Study design (1)**	**Intervention definition (2)**	**Intervention delivery (3)**	**Language (4)**	**Population (5)**	**Outcome (6)**	**Decision**
					diabetes		
38. Beatty, 2013	(-)	Full-text article in the process of publication					(-)
39. Kajiyama, 2013	(+) RCT	(+) Psychoeducation–Stress Management e-Training Program.	(+) Internet-based	(+) English	(+) Age M=56,1 years Family caregivers of dementia patients	(+) PSS	(+)
40. Petzel, 2013	(-)	Full-text is missing					(-)
41. Watson, 2013	(-)	Full-text is missing					(-)
42. Mira, 2012	(-) Not trial, only description of intervention	(+) Psychological procedures for Stress management based on CBT.	(+) Internet-based	(+) English	(-) no information	(-) no information	(-) (1)
43. Crifaci et al, 2012	(-)	Full-text is missing					(-)
44. Cipresso et al, 2012	(-) Not trial, only description of intervention	(+) INTERSTRESS-assessment and treatment of psychological stress	(+) Technology -based	(+) English	(-) Not reported	(-) Not reported	(-) (1)
45. Bostock et al, 2013	(-)	Full-text is missing					(-)
46. Zautra, 2012	(+) RCT	(+) Personal Control/Mastery (MC) and Mindful Awareness and Acceptance (MA) Intervention	(-) In-person and telephone delivery of intervention, only dairies online.	(+) English	(+) Age M=54 years Individuals with mild to moderate symptoms of depression.	(+) Emotional health (SF-36)	(-) (3)

Required criteria	Study design (1)	Intervention definition (2)	Intervention delivery (3)	Language (4)	Population (5)	Outcome (6)	Decision
47. Griffiths, 2012	(+) RCT	(+) Depression Support group and Depression Internet Training Program (ITP)	(+) Online	(+) English	(+) Age M= 44 years Members of community with depression	(-) CES-D only measure of depression is not sufficient for inclusion	(-) (6)
48. Wootten et al, 2012	(-)	Full-text is missing					(-)
49. Beatty et al, 2012	(-)	Full-text article is in process of publication					(-)
50. Allexandre et al, 2012	(-)	Full-text is missing					(-)
51. Glueck, 2011	(+) RCT, pilot study	(+) Brief Mindfulness training	(+) Web-based	(+) English	(+) Age M= 33,7 years (IG), persons in dif. occupational setting	(+) Perceived Stress Questionnaire (PSQ)	(+)
52. Grassi, 2011	(+) Randomized trial	(+) Stress inoculation training, relaxation exercises	(+) audio and video materials on mobile mobile phone	(+) English	(+) Age M=20,8 years, students	(+) State Trait Anxiety Inventory (STAI) Visual Analogue Scale (VAS) for assessing relaxation.	(+)
53. Williams et al, 2010	(+) Feasibility study, mixed methods, with pre-, post measurement	(+) Self-management for Stress - „Stress Gym“	(+) Web-enhanced	(+) English	(+) Age M=41,1 years officers and sailors (age M=29,5 years)	(+) Perceived Stress-Numeric Rating Scale (NRS)	(+)
54. Kawai et al, 2010	(+) Single group pre-, post design	(+) Stress Management program	(+) Web-based	(+) English	(+) Age M=39,3 white collar workers	(+) Psychological well-being (Ryff's PWB) Depression - CES-D	(+)
55. Sharplin	(+)	(+)	(-)	(+)	(+)	(+)	(-)

Required criteria	**Study design (1)**	**Intervention definition (2)**	**Intervention delivery (3)**	**Language (4)**	**Population (5)**	**Outcome (6)**	**Decision**
et al, 2010	Prospective, pre and post design	Mindfulness Based Cognitive Therapy	Conventional training facilitated by counselor	English	Age M=51,36 patients wish cancer	Beck Depression Inventory II (BDI-II), Freiburg Mindfulness Inventory (FMI)	(3)
56. Clarke et al, 2009	(+) RCT	(+) Self-help Cognitive Behavioral Intervention for depressive symptoms	(+) Internet-delivered	(+) English	(-) Age M=22,6, adults who receive treatment for depression	(+) Patient Health Questionnaire (PHQ)	(-) (5)
57. Ruward, 2009	(+) RCT	(+) CBT for mild to moderate depression	(+) Web-based	(+) English	(+) Age M=42 years, population with mild to moderate depression	(+) Short form Well-being Questionnaire	(+)
58. Smith, 2009	(-) Not trial, survey	(+) Chewing gum as a relaxation technique	(-) Conventional	(+) English	(+) Age M=33,6 years	(+) Perceived stress, Anxiety and Depression Scale	(-) (1)
59. Grassi et al 2009	(+) Mixed method, pre-, post-design	(+) Use of narratives	(+) Mobile, video, audio narratives	(+) English	(+) Age M=23,27 University students	(+) Positive Affect Negative Affect Scale (PANAS)	(+)
60. Richards, 2012	(+) Randomized parallel group trial	(+) Comparison of CBT: self administered computerized CBT	(+) Online	(+) English	(+) Age M=26,5 years, university students	(-) Brief Symptom Inventory (BSI)	(-) (6)
61. Seear & Vella-Brodick 2013	(+) RCT	(+) Positive Psychology	(+) Online	(+) English	(+) Age M=33,1 years	(+) Mental Well-being Scale	(+)
62. George et al, 2012	(+) Randomized trial	(+) CBT, psychoeducation	(+) Online	(+) English	(+) Age M= 23 years medical students	(-) Evaluation of intervention usage	(-) (6)

Required criteria	Study design (1)	Intervention definition (2)	Intervention delivery (3)	Language (4)	Population (5)	Outcome (6)	Decision
63. Ruggiero, 2013	(+) Pilot study	(+) Motivational interviewing +Online program (1), online program (2), and fact sheets (3)	(+) Telephone-based MI+ Online program	(+) English	(+) Age M=46 years	(+) Health behavior self efficacy, health behavior stage of change, quality of life	(+)
64. Lehenbauer, 2013	(+) Pilot study, pre-, post- test	(+) Social Skill Training and CBT, relaxation for social phobia	(+) Online	(+) English	(+) Age M= 24,4 years voluntary students (bachelor degree)	(-) Social Anxiety Scale	(-) (6)
65. Beatty, 2011	(+) Pilot study	(+) Self-guided CBT- Cancer Coping Online	(+) Internet	(+) English	(+) Age M= 48,3 years adults with cancer	(+) Depression Anxiety Stress Scale	(+)
66. Leykin, 2011	(+) Randomized study	(+) Training for job-related burnout (CBT)	(+) Online	(+) English	(+) Age M=47,3 years substance abuse counselor	(+) The Maslach Burnout Inventory	(+)
67. King, 2009	(-)	Missing full-text dissertation					(-)
68. Baker, 2011	(+) Randomized trial	(+) Interactive Cancer Communication System	(+) Online training	(+) English	(+) Age M=50, 9 years, cancer patients	(+) Carver's Brief Cope (positive coping)	(+)
69. Van Vugt, 20	(-)	Full-text is in the process of publication					(-)
70. Weingardt et al., 2009	(+) RCT	(+) CBT, two models	(+) Web-based	(+) English	(+) Age M=47 years substance abuse counselor	(+) Maslach Burnout Inventory (job burnout)	(+)
71. Proudfoot et al, 2013	(+) RCT	(+) CBT, Interpersonal Psychotherapy, Problem-solving therapy, etc.	(+) Internet-based	(+) English	(+) Age M=38,9 years, volunteers with mild to moderate depression	(+) Depression, Anxiety and Stress Scale (DASS)	(+)

3.2 Study Characteristics

From the 38 studies included in the review 29 were randomized (table 9) and 9 non-randomized trials (table 10). All included studies were published in English language between the period of January 2009 and January 2014.

All studies were conducted in developed countries over the world. Most of the studies were published in USA (N[28]=14), Canada (N=4), UK (N=4), Italy (N=3), Netherlands (N=3), and Australia (N=3). A few other studies were published in Germany (N=2), Norway (N=2), Austria (N=1), Spain (N=1), and Japan (N=1).

With regard to the underlying concepts all psychological digital interventions were based on the following frameworks: cognitive behavioural therapy (N=13), mindfulness (N=8), combination of frameworks (N=12) and other frameworks (N=5). The duration of digital stress management interventions (studies that report duration N=37) ranged from 2 days to 24 weeks; an average duration of 7 weeks. A study of Williams and colleagues (2010) indicated that the intervention was relatively short, but did not report its duration in numbers of weeks.

Digital interventions for stress management were delivered in population of healthy adults (N=27), patients with chronic diseases (N=7), and population with symptoms of depression (N=4). The summed sample size in intervention group was 6485 and 3608 in control group. Ten studies did not have control groups. Only studies that considered adults over 18 years were included in the review. The average age of the participants in intervention and control group ranged from 20 to 55 years. Most of the studies that included both male and female participants resulted in higher proportions of female participants over male. In six studies stress management interventions were specifically designed for females.

The majority of the studies reported the outcomes measures that had primary relevance to the review. Reported primary outcomes were the measures of stress and burnout (N=20), coping (N=4), distress (N=2), quality of life (N=3), well-being (N=3). From the secondary outcome measures studies reported relaxation level (N=2), mindfulness (N=1), perfectionism (N=1), problem solving skills (N=1), positive mood (N=1).

The tables 9 and 10 are showing shortly the characteristics of the included studies. For each study there is information about intervention and its duration, data about intervention and control groups, main findings and effect size of intervention. A short description of each study is given in the table 9 and table 10. More details of the studies would be given in the section of 'Results of Individual Studies' (on p. 53)

[28]N-number of studies

Table 9 Characteristics of Randomized Studies

References, Country	Intervention and underlying strategy or technique	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation, gender, etc	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
1. Feicht et al, 2013, Germany	Web-based Happiness Training (HT, Positive Psychology Interventions+ mindfulness excersises)	7 weeks	n = 85 M age - 37, 61 (7,71) Employees Condition-HT Female 75,9% Male 24,1%	n = 62 M age - 36,77 (10,42) Employees Condition-waiting list (WL) Female -61,7% Male 38,3%	SWS[29] (stress) sign. IG↓, CG ↑	SWS b/w IG and CG (post), d = 0,64; p=0,003. within IG (pre, post) d=0,42
2. Villani et al, 2011, Italy	Self-help Stress Management through mobile phones (Stress Inoculation Training-SIT-CBT)	4 weeks	n=15 M age =43 (8.80)[30] Oncology nurses (female) Condition-SIT	n=15 M age-NR[31] Oncology nurses (female) Condition-Neutral video clips	MSP[32] (stress) - NR COPE[33] (coping): active (IG) ↑ denial (IG) ↓	COPE (active) b/w IG and CG, d=-1,02* COPE (denial) b/w IG and CG, d=0,28* COPE (active) within IG d=-0,75*; within CG d=0,39*; COPE (denial)
3. Cavanagh et al, 2013, UK,	Brief Online Mindfulness-based Intervention - “Moodle”	2 weeks	n=54 M age =25,3 (6,9) Students (91% female)	n=50 M age =24,1 (6,0) Students (86% female) Condition-WL	PSS sign. group*time interaction; (IG) sign↓, (CG) unchanged	PSS time*group interaction, d=0,62, p=0,02 PSS within IG, d=0,37

[29] SWS - Stress Warning Signals
[30] The mean of age only mentioned generally, and it is not clear to which group it does belong.
[31] NR-Not Reported
[32] MSP-Mesure du Stress Psychologique-measure of Perceived Stress
[33] COPE-Coping Orientation to Problems Experienced, consist of active and denial subscales.
* the effect size is calculated by review author from means and standard deviation presented in studies

References, Country	Intervention and underlying strategy or technique	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation, gender, etc	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
4. Shigaki et al, 2013, USA	Online Intervention for Individuals with Rheumatoid Arthritis (RA) (CBT, Self management) - "RAHelp"	10 weeks	n=55 M age=50,3 (11,6) Adults with RA Condition: "RAHelp" Female 93%	n=53 M age=49,3 (12,3) Adults with RA Condition:WL Female 92%	QLS[34] (IG↑, CG↓)	QLS (b/w CG and IG, post) d=0,66, p=0,003
5. Day et al, 2012, Canada	Internet-based self-help for anxiety, depression and stress (CBT)	6 weeks	n=33 M age=24,1 (5,8) Students Condition: CBT Female – 89,3% (total sample)	n=33 M age=22,9 (4,0) Students Condition: WL	DASS[35] -Stress sub-scale (IG, CG)↓, significant group*time interaction	DASS-Stress s/scale group*time interaction, ηp^2=0,12; p=0,004 d=0,74 **
6. Morledge et al, 2013, USA	Internet-based Stress Management (ISM) program based on Mindfulness	8 weeks	n1=183 (IG1-ISM) n2=184 (IG1-ISM+[36]) M1 age=50-59 (35,5%), 90,7% - female; M2 age=50-59 (35,9%), 88,6% - female, general population	n=184 M age=50-59 (32,6%), 87,5% - female general population	PSS (IG1, IG2, CG) sign. ↓	PSS b/w IG1 and CG, post, d=-0,23* b/w IG2 and CG, post d=-0,49* b/w IG1 and IG2, post d=0,30*
7. Drozd et al, 2013, Norway	Web-based Stress Reduction Intervention - „Less Stress" (LS) (mindfulness and cognitive therapy)	4 weeks	n=126 (LS) Age M=32,0 (9,6) general population Gender: women 76%, males 24% (in total sample)	n=133 (CG) Age M=33,2 (9,9) general population	DASS-S (stress sub-scale) ↓in stress over time	Stress over time (Est) = -0,79 The results could not be used for calculation of effect size.

[34] QLS-Quality of Life Scale
[35] DASS-Depression Anxiety and Stress Score, here DASS-21 is used
[36] ISM+ - Internet-based Stress Management plus Online message board
**- the effect size is translated

References, Country	Intervention and underlying strategy or technique	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation, gender, etc	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
8. Powell et al, 2013, UK	Web-based Cognitive Behavioral Tool to improve Mental Well-being – 'MoodGYM'	6 weeks	n=1534 M age=40,8 (12,9) General population Condition: MoodGYM Female 77,88% (total sample)	n=1536 M age=41,4 (13,1) General population Condition: WL	WEMWBS[37] IG sign.↑, CG ↓ Intervention*time effect sign.	WEMWBS b/w IG and CG, post, d=0,34
9. Rose et al, 2013, USA	Self-guided Multimedia Stress Management (CBT) and Resilience Training Program - "SMART-OP"	6 weeks	n=34 M age=27,3 2[38] Students Condition: SMART-OP Female 50%, Male 50%	n=32 M age=NR Students Condition: attention control (AC)	PSS (IG and CG) ↓ significant condition*time interaction	PSS condition*time interaction, η^2=0,14, p<0,01; d=0,81**
10. Carpenter et al, 2012, USA	Online Stress Management (SM-CBT) workbook for breast cancer	10 weeks	n=71 M=50,9 (9,9) [39] Women with breast cancer Condition: OSM	n=61 M=NR Women with breast cancer Condition: WL	NMR [40] (coping with neg. mood) IG, CG ↑ non-significant time*condition	NMR within subject effect-time*condition η^2= 0,06, p=0,08 d=0,51**
11. Radhu et al, 2012, Canada	Web-based CBT for perfectionism	12 weeks	n=28 Age M-23,82 (5,55) Students Condition: CBT Female 72,7% Male 27,3%	n=30 Age M-21,44 (2,36) Students Condition: WL Female 72,0% Male 28,0%	PSS IG,↓ not sign. CG↓ sign.(p=0,05)	PSS treatment effect η^2=0,02, p=0,30 b/w IG and CG d=-0,62* d=0,29**

[37] WEMWBS-Warwick-Edinburgh Mental Well-Being Scale
[38] Mean age is reported generally not distinguishing between groups
[39] Reported generally without clear specification of group belonging to it
[40] NMR- Negative Mood Regulation Scale for assessment of self-efficacy for coping with negative mood

References, Country	Intervention and underlying strategy or technique	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation, gender, etc	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
12. David et al, 2012, Germany	Internet-based program for coping with cancer (psychoeducation, CBT)	4 weeks	n=105 M age=47,21 (11,22) Patients with leukaemia Female 56%, Male 44%	n=81 M age=47,52 (13,08) Patients with leukaemia Female 65%, Male 35%	MAC[41]: FS - IG ↑, CG↓ HH - IG↓, CG↓ AP- IG↓, CG↓ F- IG↓, CG↓ A-IG↓, CG↓	MAC-FS b/w IG and CG, post, d=0,42 p=0,03 HH-b/w gr.d=0,22 p=0,24, AP-b/w gr.d=0,04 p=0,83 F-b/w gr. d=0,47,p=0,02 A-b/w gr. d=0, p=0,99
13. Wolever, et al. 2012, USA	Mind-Body Stress Reduction in the Workplace (Mindfulness Online vs. in-person)	12 weeks	N (IG-mindfulness online)=52 M age (1) = 42,7(9,7) Employee IG: Male-22,9, female 77,1	N (CG-mindfulness in person)= 44 M age = 41,6 (10,1) Employee Male-18,9%, female 81,1%,	PSS (IG, CG) ↓	PSS η^2=0,02, p>0,05, d=0,29**
14. Arpin-Cribbie, 2012, Canada	Web-based CBT and general stress management (GSM) for Perfectionism	10 weeks	n1 (IG1)=29 n2 (IG2)[42]=29 M age=20,14 (4,14)[43] 70 % of participants female Condition: IG1-CBT IG2-GSM Students	n=25 M age-NR Condition:WL Students	MPS [44] (perfectionism): SOP- sign.↓IG1, IG2 , OOP-IG1 sign, IG↓, IG2 ↑ (non-sign.); SPP-IG1 sign↓, IG2↑ non-sign. CM sign.↓IG1, IG2 ; D-IG1 ↓ sign.,IG2↓(non.sig n); PC-sign ↓ IG1sign , ↓IG2.	MPS: SOP (treatment effect) η^2=0,19, p<0,03; d=0,97** -OOP η^2=0,05, p=0,04; d=0,46** -SPP-η^2=0,19, p<0,01; d=0,97 -PC η^2=0,22, p=0,03; d=1,06** CM η^2=0,19, p=0,03; d=0,97** D η^2=0,22, p=0,10, d=1,06**

[41] MAC-Mental Adjustment to cancer for characterizing coping styles and evaluation of psychosocial intervention, consist of following sub-scales: Fighting spirit (FS), Helplessness/Hopelessness (HH), Anxious preoccupation (AP), Fatalism (F), Avoidance (A).

[42] GSM-General Stress Management

[43] Mean age is reported only generally without specification of the groups

[44] MPS-Multidimensional Perfectionism Scale, consist of six dimension: SOP- Self-Oriented Perfectionism, OOP-other-oriented perfectionism, SPP- socially prescribed perfectionsm, CM-concern over mistakes, D- Discrepancy, PC-Perfectionism Cognition.

References, Country	Intervention and underlying strategy or technique	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation, gender, etc	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
15. Bennett et al., 2011, USA	Web-based Health and Leadership development program- "Livewell" including components of improving lifestyle habits – diet, exercise, stress, and mood. (based on previous knowledge in the field)	24 weeks	n=72 Age M=39,7 (9,7) workers-managers Female 72%	n=73 Age M=43,2 (10,3) workers-managers Female 56%	Symptom of distress (IG) ↓, CG ↑	Distress, intervention effect mean dif.*(SD dif.)=-3,82 (1,46) d=-2,62*
16. Wiegand et al., 2010, USA	Comprehensive program for reducing stress in women (psychoeducation, Online Coaching (OC) on stress reduction, relaxation, breathing, meditation, use of personal care products (PCP))	14 weeks	n (IG1)=182 n (IG2)=181 Age M (IG1)=35,8 (5,84) Age M (IG2)=35,9 (5,92) Condition:IG1-OC+PCP; IG2-OC General female population	n=199 Age M (CG)=35,6 (5,61) Condition: no active stress management intervention General female population	PSS (IG1, IG2, CG) sign. ↓	PSS percent reduction (post/baseline): IG1=26,2%; IG2=22,1%, 17,0%. IG1 vs. CG sign. reduction baseline/post. (p<0,01) difference , - 2,03; 95% CI: -3,46, -0,60, p<0.01 IG2 vs. CG no sign. dif. (p<0,001), Effect size is not reported and cannot be calculated
17. van der Houwen, 2010, Netherlands	Brief Internet-based Intervention for Bereaved (Writing Intervention-WI)	12 weeks	N=460 M age=43,22 (10,98)[45] Condition:WI women – 93,5 % bereaved with distress	N=297 M age-NR Condition: WL bereaved with distress	PANAS (positive mood)[46] (IG, CG) ↑	PANAS post, d=0.30
18.Warmerdam	Online CBT or Problem	8 weeks	n (IG1)=88	n (CG)=87	SPSI[48] (problem	SPSI-PPO 8 weeks,

[45] Mean age is reported at baseline generally for participants without specification of group
[46] PANAS-Positive Affect Negative Affect for measurement of positive mood

References, Country	Intervention and underlying strategy or technique	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation, gender, etc	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
et al., 2010, Netherlands	Solving Therapy (PST) for depressive symptoms		n (IG2)=88 M age = 45 (12,1)[47] 71% female (in general sample) Conditions: IG1-CBT IG2-PST Participants with depressive symptoms	M age - NR Condition: WL Participants with depressive symptoms	solving): PPO-(IG1, IG2, CG) ↑ NPO-(IG1, IG2, CG) ↓ RPS-(IG1, IG2, CG) ↑ AS-(IG1, IG2, CG) ↓ ICS-(IG1, IG2, CG) ↓	IG1 vs. CG d=0,31 (p=0,14); IG2 vs. CG d=0,55, p=0,05 -NPO IG1 vs. CG d=0,51 (p=0,01); IG2 vs. CG d=0,73, p=<0,001 -RPS IG1 vs. CG d=0,03 (p=0,63); IG2 vs. CG d=0,54, p=0,22 -AS IG1 vs. CG d=0,35 (p=0,07); IG1 vs. CG d=0,67, p=<0,02 -ICS IG1 vs. CG d=0,05 (p=0,28); IG2 vs. CG d=0,32, p=<0,86
19. Kajiyama et al, 2013, USA	Internet-based program for reduction in care-givers distress - „ i-Care“ (ICC), (relaxation, pleasant activities, cognitive restructuring, improving communication skills)	12 weeks	n=75 Age M=55,22 (11,31) Condition: ICC-IG, Caregivers of dementia patients 85% women (in total sample)	n=75 Age M=57,02 (12,53) Condition: Educational /Informational (EIC)-CG Caregivers of dementia patients	PSS (IG) sign↓(t=3,18, p=0,003), CG not sign. (t=0,23, p=0,81) change sign. time*condition interaction	PSS group*time interaction η^2=0,05, p=0,017; d=0,46** PSS within IG d=0,51* within CG d=-0,02*

[47] Mean age is reported at baseline generally for participants without specification of group

[48] SPSI-Social Problem Solving Inventory, for measuring problem solving skills, it consists of: Positive Problem Orientation (PPO), Negative Problem Orientation (NPO), Rational Problem Solving (RPS), Impulsivity/Carelessness Style (ICS), Avoidance Style (AS)

References, Country	Intervention and underlying strategy or technique	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation, gender, etc	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
20. Gluck & Maercker 2011, Austria	Web-based Brief Mindfulness Training (WBMT)	2 weeks	n=28 Age M=33.7 (12.7) Female -71,4% Condition:WBMT general population	n=21 Age M=37.2 (14.4) Female-76,2% Condition:WL general population	PSQ[49] non-significant interaction effect	PSQ interaction effect d=0,46, p=0,11
21. Ruwaard, 2009, Netherlands	Web-based CBT of Mild to Moderate Depression	11 weeks	n=36 Age M=42 (10) General population Condition:WCBT Women 69%, men-31%.	n=18 Age M=42 (9) General population Condition:WL	DASS-Stress [50] ↓ IG, CG	DASS, IG vs. CG, post, d=0,8, p=0,057
22. Grassi, 2009, Italy	Mobile Narratives for Reducing Stress in Commuters - "Green Valley" (underlying SM framework is self-efficacy and sense of presence concept)	2 days	n (IG1)=30, n (IG2)=30, n (IG3)=30, M age = 23,3 [51] Conditions: IG1-video and audio; IG2 -video only; IG3-only audio , Students,50% male, 50% female	n=30 M age - NR Students Condition: no intervention	VAS-relax. IG1↑, IG2, IG3, CG ↓ significant difference in time*condition (p<0,001)	VAS-relax. IG1vs. CG post, d=1,32*, p<0,001 IG2 vs. CG post, d=0,19*, p<0,003 IG3 vs. CG post, d=0,09*, p=0,54
23. Seear & Vella-Brodick 2013, Australia	Online Positive Psychology Interventions (best possible selves-BPS and three good things -TGT)	1 week	n (IG1)= 73 n (IG2)= 71 M age =34 (13,9)[52] General population Conditions: IG1-BPS, IG2-TGT female 75%, male 25%	n= 67 M age -NR General population CG-no activity	WEMWBS (well-being) (IG1, IG2, CG) ↑	WEMWBS b/w IG1 and CG, post d=0,49*; b/w IG2 and CG d=0,64*; b/w IG1 and IG2 d=-0,07*

[49] PSQ-Perceived Stress Questionnaire
[50] DASS Stress-Depression Anxiety Stress
[51] Reported generally for study participants with no distinguishing between groups
[52] Reported generally for all groups

References, Country	Intervention and underlying strategy or technique	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation, gender, etc	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
24. Ruggiero, 2013, USA	Motivational Interviewing (MI) addition to Internet-based Health Promotion (IHP, Stage of change of behavior, self-efficacy) program for Vocational Rehabilitation (VR)	8 weeks	n=(IG1-MI+Online program)=39 n=(IG2-Online program)=52 Age M (IG1)=46 (11.5) Age M (IG2)=45.7 (11.9); female – 56,3% (general sample) Consumers of rehabilitation-population with disabilities, Conditions: IG1- MI+IHP; IG2-IHP	n=51 Age M (CG)=46 (12.9) Consumers of VR - population with disabilities	HRQOL[53] Non-significant group*time interaction	HRQOL η^2=0.01, p=0,70 d=0,20**
25. Baker et al, 2011, USA	Ehealth Breast Cancer Interventions – Comprehensive Health Enhancement and Support System-CHESS (CHESS Information , CHESS Information and Support-CIS, CHESS-full, CBT or mindfulness)	6 weeks	n=(IG1) 118 n=(IG2) 109 n=(IG3)=111 M age (IG1)=52.2 (9.8) M age (IG2)=50.6(10.8) M age (IG3)=50.9 (9.0) Women with breast cancer, Conditions:IG1-CHESS info.; IG2, CHESS info+sup. IG3-CHESS-full	n=112 M age=52.3 (10.2) Women with breast cancer Condition: Internet access	CBC[54] (positive coping) no sign. effects in b/w groups	M adj. (IG1)=1.62 M adj. (IG2)=1.63 M adj. (IG3)=1.60 M adj. (CG)=1.64 no ES is reported, no SD reported, no ES could be calculated
26. Weingardt et al , 2009 USA	Web-based Training in CBT	4 weeks	n 1 =74 n 2 =75 M Age IG1=47 (9.2) M age IG2=48 (10.0) Substance abuse counselors Conditions: IG1-low fidelity, IG2-high fidelity	No CG	MBI (burnout):- EE: ↓ time*condition interaction non-sign. -DP:IG1↓, IG2 ↑ time*condition	MBI-EE ηp^2=0.03, p=0,20, d=0,35** DP ηp^2=0.02, p=0,17, d=0,27**; PA ηp^2=0.04, p=0,04, d=0,41** IG1, IG2, pre-, post:

[53] HRQOL - Health Related Quality of Life
[54] CBC- Carver's Brief Cope part of instrument is used for positive coping

References, Country	Intervention and underlying strategy or technique	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation, gender, etc	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
			Female 62, 1%		interaction non-sign. -PA IG1, IG2↑ significant time*condition interaction effect	ηp^2=0.06, p=0,01, d=0,51**
27. Proudfoot et al, 2013, Australia	Mobile Phone and Web program on symptom and functional outcomes (based on CBT, Interpersonal Psychotherapy, Problem solving Therapy, Positive Psychology) - "myCompass"	7 weeks	n (IG1-myCompass)=242 n (IG2-attention control)=248 M age (IG1) =39 (10.73), M age (IG2)=40 (11.42) Community based volunteers with mild to moderate depression, anxiety and stress Female - 70%	n=230 (waiting list) M age=38 (10.26) Community based volunteers with mild to moderate depression, anxiety and stress Female 70%	DASS[55] (stress subscore) DASS-Stress subscale ↓ in all groups DASS-Stress sub-scale sign. group*time interaction, p<0,005	DASS b/w IG1 vs. IG2, d=0,22, p=0,025 IG1 vs. CG, d=0.35, p=0,01, IG2 vs. CG, d=-0,12*, p=0,28 Within groups: IG1, d=0.39, IG2, d=0.21 CG, d=0.10
28. Leykin et al, 2011, USA	Online Training on Job-related Burnout (CBT)	4 weeks	n=149[56] M age=47.3 (9.6)[57] Substance abuse counsellors Condition: IG1-CBT-high fedility; IG2-CBT-low fedility, Female - 62,6%.	n-NR M age-NRB Substance abuse counsellors	MBI[58] - EE IG2 lower than IG1 - DP IG2 lower than IG1 - PA (IG2, CG1) ↑ sign. interaction	MBI- EE, b/w IG2, IG1, d=0,31, p<0,05 DP, d=0,36, p<0,05 MBI-PA, b/w IG1 and IG2, post, d=-0,36*, p<0,05.
29. Grassi et al, 2011, Italy	Multimedia, audio-video approach based on Stress Inoculation	6 days	N=75[59] Age M=20,86 (1,27)[60] Conditions: 1.video and	n-NR Age M-NR Students female	VAS[61] (relaxation level) ↑ significant time effect	VAS (time by condition) t1-t2 F=9.47, p<0,001); t11-t12, F=7,8, p<0,001

[55] DASS-Depression, Anxiety and Stress measure, here DASS-21 was used
[56] Reported in total sample
[57] Reported in total sample
[58] MBI-Maslach Burnout Inventory: EE-emotional exhausion, DP-depersonalisation, PA-personal acomplishment.
[59] Reported generally, it is not clear to which group does it belong
[60] Reported generally
[61] VAS Questionnaire-Visual Analogue Scale Questionnaire for assessment of relaxation level

References, Country	Intervention and underlying strategy or technique	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation, gender, etc	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
	Training (CBT) for managing exam anxiety		audio on mobile phone (IG1), 2. video and audio on DVD (IG2) 3.only audio on mp3 (IG3), 4.only audio on CD (IG4), Students, female	Condition:CG		ES is not reported and cannot be calculated

Table 10 Characteristics of Non-randomized Studies

References, Country	Intervention	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation or setting, etc.	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
1. Krusche et al, 2013, UK (pre, post design)	Web-based Mindfulness course for stress anxiety and depression	8 weeks	n = 273 M age = 47,7 (11,98) Healthy adults Female -78%	No CG	PSS[62] (stress) IG ↓	PSS within IG (pre, post), d=1.20.
2. Reid 2013, Canada (pre-, post design)	Online Mindfulness Curriculum	8 weeks	n=15 (only IG) M age - NR Students Female - 100%	No CG	MAAS[63] (Mindfulness)(IG) significant ↑ (p=0,05)	MAAS (within IG) d=-1,29 *
3. Quintana & Rivera, 2012, Spain (pre-, post design)	Online Mindfulness Training for Stress Reduction	8 weeks	n=182 [64] Age M=39, 1 years Healthy adults Female - 64%	No CG	PSS	Negative correlation b/w PSS and FFMQ- r2 = -0,69, p<0,001. ES is not reported and cannot be calculated
4. Krusche,	Web-based Mindfulness	4 weeks	n=100	No CG	PSS IG ↓	PSS within IG, pre, post

[62] PSS-Perceived Stress Scale
[63] MAAS- Mindfulness Attention and Awareness Scale
[64] Reported generally for participants not related to any group

References, Country	Intervention	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation or setting, etc.	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
2012, UK (pre-, post design)	Stress Reduction Course, (scan, mindful eating, assignment).		M age= 48 years (11,25) Healthy adults, Female - 74%			d=1,57
5. Hoch et al, 2012 , USA (pre-, post intervention, pilot study)	Delivering Mind-body Intervention in Virtual World (positive psychology and meditation)	8 week	n=24 M age=42 (13) Healthy adults Male 57%	No IG	PSS IG ↓, not sign.	PSS within IG pre-, post d=0,11*, p=0,50
6. Williams et al, 2010, USA, (pre-, post, feasibility study)	Web-enhanced Behavioral Self-Management Program for Stress - "Stress Gym" (Cognitive appraisal of Lazarus theory)	NR (Relatively short)	n=142 (general) M age=41.1 (9.2) - officers M age =29.5 (7.9)- enlisted members Healthy military workers Female -55%, male -45%.	No CG	NRS[65] (stress) sign. ↓	NRS (pre-, post-) paired t (27) = 3.12, p=0,004 (officer) paired t (128) = 5.80, p=0.0001 ES is not reported and cannot be calculated
7. Kawai et al, 2010, Japan, (pre-, post design)	Web-based Stress Management Program to Promote Psychological Well-being based on CBT and, PPI)	2 weeks	n=239 M age = 39.3 (8.7) White-collar workers Male-69,6%, Female-29,8%.	No CG	PWB[66] (Well-being) ↑	PWB (pre-, post) M=183.6; M=190.5 post., p<0.001 ES is not reported and cannot be calculated
8. Beatty et al, 2011, Australia (pre-, post design, pilot)	Self-guided CBT Internet Intervention for cancer-related distress "Cancer Coping Online"	6 weeks	n=12 M age=48.33 (9.61) Patients with cancer 11 female	No CG	DASS (distress, negative effect) ↓	Within group d: Negative effect d=0.53

[65] NRS-Numeric Rating Scale of Stress for assessment of perceived stress
[66] PWB-Psychological Well-being, here Ryff's RWB scale was used

References, Country	Intervention	Duration	Intervention group (IG), sample size (n), average mean (M) in years, occupation or setting, etc.	Control group (CG) n-sample size age mean-M (SD) in years, occupation or setting, etc.	Main Finding	Effect size (between and within group)
9. Nes et al, 2013, Norway	Web-based Self Management Enhancing interventions for persons with chronic illness (type 2 diabetes, CBT)	12 weeks	n=11 M age-NR Participants with type 2 diabetes Gender -NR	No CG	ADDQoL[67] NR	NR

[67] ADDQoL- Audit of Diabetes Dependence Quality of Life

3.3 Risk of bias within studies

The risk of bias was assessed separately for randomized and non-randomized studies. First the results of risk of bias assessment in RCT are presented presented; then the results of NRS.The Cochrane Collaboration tool was used for assessment of the risk of bias in RCTs and its modification is usued for NRS. More information about the tool is given in the methods part (p. 21).

3.3.1 Risk of bias within randomized studies

The assessment of the risk of bias in RCTs was done separately in the following domains: sequence generation, allocation concealment, blinding, incomplete outcome data, selective reporting other bias. The summarized results of assessment is given in the related subtitles further, which is the description of table 11. The complete assessment of individual RCTs and the rationale for judgement is given in the appendix (p. 100).

3.3.2 Sequence Generation

From 29 studies only in 13 (Arpin-Cribbie et al., 2012, Baker et al., 2011, Carpenter et al., 2012, Cavanagh et al., 2013, David et al., 2012, Day et al, 2012, Drozd et al. 2013, Feicht et al, 2013, Morledge et al. 2013, Proudfoot et al., 2013, Powell et al. 2013, Ruward, 2009, Sear & Vella-Brodrick, 2012) studies the allocation of participants was reported as random and the method of randomization was given. In other cases (Bennett et al., 2011, Grassi et al., 2009, Grassi et al., 2011, Kajiyama et al., 2013, Leykin et al., 2011, Radhu et al., 2012, Rose et al., 2013, Ruggiero, 2013, Shigaki et al., 2013, van der Houwen, 2010, Vilani et. al., 2011, Warmerdam et al., 2010, Weingardt et al., 2009, Wiegand et al., 2010, Wolever et al., 2012) the authors of articles did not provide enough information to make judgement about the sequence generation. The study conducted by Gluck & Maercker (2011) labeled the trial as randomized and allocated the participants randomly. However, the random number list used throughout assignment (allocation by even and uneven numbers) is considered to have high risk of bias.

Allocation Concealment

The majority of studies (N=22) did not provide information on the allocation concealment. Only in six studies (Arpin- Sear & Vella-Brodrick, 2012, Cribbie et al., 2012, Day et al, 2012, Drozd et al. 2013, Feicht et al, 2013, Powell et al. 2013) there was an attempt to report the concealment of the randomization. In the study of Gluck and Maercker (2011) the randomization was open which means that the allocation was not concealed and there is a high risk of bias.

Blinding

Blinding is the domain that has the highest rate of 'unclear' answers. Twenty-four studies from 29 do not provide any information about blinding. Only two studies (Carpenter et al., 2012, Powell et al. 2013) reported that there was an attempt to blind the evaluators. In three (Carpenter et al., 2012, Powell et al. 2013, Gluck & Maercker, 2011) studies it was reported that blinding was not done properly.

Incomplete Outcome Data

Fifteen studies (Arpin-Cribbie et al., 2012, Bennett et al., 2011, Gluck & Maercker, 2011, Cavanagh et al., 2013, Day et al, 2012, David et al., 2012, Drozd et al. 2013, Powell et al. 2013, Proudfoot et al., 2013, Rose et al., 2013, Radhu et al., 2012, Ruward, 2009, Ruggiero, 2013, Warmerdam et al., 2010, Wolever et al., 2012) reported that they addressed incomplete outcome data. In eight (Baker et al., 2011, Grassi et al., 2009, Grassi et al., 2011, Kajiyama et al., 2013, Leykin et al., 2011, Morledge et al. 2013, Shigaki et al., 2013,Vilani et. al., 2011) studies it is not clear how the missing data was handled. In the remaining six studies (Carpenter et al., 2012, Feicht et al, 2013, Sear & Vella-Brodrick, 2012, van der Houwen, 2010, Wiegand et al., 2010, Weingardt et al., 2009) the incomplete outcome data was not addressed.

Selective Reporting

In almost all studies (N=28) the outcome measures were reported properly. Only in one study (Vilani et al, 2011) the outcome of interest was not reported. Vilani and colleagues (2011) described the measure of perceived stress (Mesure du Stess Psychologique) in the 'method' part of the article but did not report the results of the measure. Not reporting the outcome measure can cause bias in the interpretation of the results.

Other Bias

There is less concern over other biases in the randomized studies. Twenty-four studies appeared to be free from other biases. In five cases (Day et al, 2012, Radhu et al., 2012, David et al., 2012, Gluck & Maercker, 2011, Proudfoot et al., 2013) a high risk of bias was found from other reasons. In all five cases a baseline imbalance in measurements might cause the bias.

In the table below (table 11) the summary assessment of the risk of bias is described for each RCT. The domains where assessment was done are: sequence generation, allocation concealment, blinding, incomplete outcome data, selective reporting and other biases. The summary of the result is discribed in the paragraphs above.

Table 11 Risk of Bias Summary Table for the Randomized Studies

Domain References	Sequence generation	Allocation concealment	Blinding	Incomplete outcome data	Free from selective reporting	Free of other bias
1. Feicht et al, 2013	+[68]	+	+	-[69]	+	+
2. Vilani et. al., 2011	?[70]	?	?	?	-	+
3. Cavanagh et al., 2013	+	?	?	+	+	+
4. Shigaki et al., 2013	?	?	?	?	+	+
5. Day et al, 2012	+	+	+	+	+	-
6. Morledge et al. 2013	+	?	?	?	+	+
7. Drozd et al. 2013	+	+	?	+	+	+
8. Powell et al. 2013	+	+	-	+	+	+
9. Rose et al., 2013	?	?	?	+	+	+
10. Carpenter et al., 2012	+	?	-	-	+	+
11. Radhu et al., 2012	?	?	?	+	+	-
12. David et al., 2012	+	?	?	+	+	-
13. Wolever et al., 2012	?	?	?	+	+	+
14. Arpin-Cribbie et al., 2012	+	+	?	+	+	+
15. Bennett et al., 2011	?	?	?	+	+	+
16. Wiegand et al., 2010	?	?	-	-	+	+
17. van der Houwen, 2010	?	?	?	-	+	+
18. Kajiyama et al., 2013	?	?	?	?	+	+
19. Gluck & Maercker, 2011	-	-	?	+	+	-
20. Grassi et al., 2011	?	?	?	?	+	+
21.Ruward, 2009	+	?	?	+	+	+
22. Grassi et al., 2009	?	?	?	?	+	+
23. Sear & Vella-Brodrick, 2012	+	+	?	-	+	+
24. Ruggiero, 2013	?	?	?	+	+	+
25. Leykin et al., 2011	?	?	?	?	+	+
26. Baker et al., 2011	+	?	?	?	+	+
27. Weingardt et al., 2009	?	?	?	-	+	+
28. Proudfoot et al., 2013	+	?	?	+	+	-

[68] '+' - is equal to the answer 'yes', means 'low risk of bias'.
[69] '-' - is equal to the answer 'no', means 'high risk of bias'.
[70] '?' - is equal to the answer 'unclear', means 'unclear risk of bias'.

Domain References	Sequence generation	Allocation concealment	Blinding	Incomplete outcome data	Free from selective reporting	Free of other bias
29. Warmerdam et al., 2010	?	?	?	+	+	+

3.3.3 Risk of bias within non-randomized studies

The risk of bias in NRS was assessed for the domains of incomplete outcome data, selective reporting and other bias (table 12).

1) Incomplete Outcome Data

Most of the studies (Reid, 2013, Quintana & Rivera, 2012, Krusche et al., 2012, Williams et al, 2010, Kawai et al., 2010, Nes et al., 2013, Beatty et al., 2011) did not report how the incomplete outcome data was addressed. Two studies (Krusche et al., 2013, and Hoch et al. 2012) reported that only participants who completed the intervention were included into analysis.

2) Selective Reporting

Five studies from nine reported all previously defined outcome measures. In four studies the reporting of outcomes was not adequate. The studies of Williams et al, (2010) and Kawai et al., (2010) reported the means of outcome measurements without corresponding standard deviations, but this should not create any bias. In two other studies (Quintana & Rivera, 2012, Nes et al. 2013) the results of outcome measurements are not reported.

Other Bias

All included non-randomized studies are likely to be free from other bias.

In the table 12 the summary of modified Risk of bias assessment in NRS is presented. NRS are assessed only for the domains of incomplete outcome data, sevective reporting and other bias. The describtion of summary table for each domain is given above.

Table 12 Summary Table of Modified Risk of Bias Assessment Tool for Non-randomized Studies

Domain References	Incomplete Outcome Data	Selective Reporting	Other Bias
1. Krusche et al., 2013	-	+	+
2. Reid, 2013	?	+	+
3. Quintana & Rivera, 2012	?	-	+
4. Krusche et al., 2012	?	+	+
5. Hoch et al., 2012	-	+	+
6. Williams et al, 2010	?	+	+

Domain References	Incomplete Outcome Data	Selective Reporting	Other Bias
7. Kawai et al., 2010	?	+	+
8. Nes et al., 2013	?	-	+
9. Beatty et al., 2011	?	+	+

3.4 Results of individual studies

The description of individual studies are brought below. The studies are presented by the name of intervention and authors, underlying theory and concepts, some components and duration of intervention, short information about participants, the finding of the study with effect sizes and the results of risk of bias for concrete study. First the results of RCT are presented, second NRS (more detail on p. 36)

3.4.1 Randomized Controlled Trials

Web-based Happiness Training, (Feicht et al., 2013)

'Web-based Happiness Training for improving psychological well-being, reducing stress and enhancing mindfulness and flourishing' was a randomized study based on the principles of positive psychology interventions and included exercises on mindfulness. The training consisted of introductory week, five weeks of main training and the final week. The main training covered following topics: 'Joy of community', 'Joy of luck', 'Joy of pleasure', 'Joy of flow' and 'Joy of beauty' The study was conducted by Feicht and colleagues (2013) in an occupational setting with 147 employees of an insurance company. The results of the study showed that the training was effective in reducing stress. Stress warning signals decreased significantly (p=0,003) in the intervention group at the end of intervention. The effect size was medium: d=0,64. The results of the risk of bias assessment shows that there is low risk of bias in most domains with exception of one. The incomplete data is addressed not properly; only participants who completed the assessment were included in analysis, which could cause attrition bias.

Self-Help Stress Management Training, (Villani et al., 2011)

'Self - Help Stress Management Training through Mobile Phones' is conducted by Villani and colleagues (2011). Underlying basis for this study is 'Stress inoculation training' which was applied in the sample of 30 female nurses in an oncology department of a hospital. The training mainly consisted of video clips with narratives on mobile phones which were available during 4 weeks. The results showed that coping skills improved in the intervention group. Authors reported an increase of active coping and a decrease of denial. The calculated effect size for coping skills is large for

active coping skills: d=-1.02, and small for denial coping: d=0.28. In the assessment of risk of bias this study has unknown risk of bias in domains of sequence generation, allocation concealment, blinding and incomplete data and high risk of bias in selective reporting. The authors introduced the measure of stress (Mesure du Stress Psychologique[71]) in method part, but did not provide the results of this measurement, which may lead to reporting bias.

Brief Online Mindfulness Intervention (Cavanagh et al., 2013)

'Brief Online Mindfulness Intervention' was a randomized study conducted by Cavanagh and colleagues (2013). The study used a two weeks online mindfulness self-guided intervention in a student population to evaluate its effect on perceived stress, anxiety and depression symptoms. One hundred and four students participated. The online platform has following sections: 'What is Mindfulness-(text and video about mindfulness)', 'Daily Mindfulness Practice (mindfulness meditations)', 'Daily Practice FAQ' (information what experiences to expect),'My Daily Journal (space to reflect on)' 'Study Information' and 'Help and Assistance'. The the authors of study reported significant group by time interaction and significant decrease of perceived stress in intervention group with a small effect size (d=0,37 and medium effect size (d=0,62) and) within intervention group. The results of the risk of bias assessment shows that because this study provided not much information about how the allocation concealment and blinding there might be risk of bias in these domains. In the other domains there is low risk of bias.

Online Intervention for Individuals with Rheumatoid Arthritis, (Shigaki et al., 2013)

'An Online Intervention for Individuals with Rheumatoid Arthritis' shortly 'RAHelp' was a randomized study conducted by Shigaki and colleagues (2013) for the purpose of improving self efficacy of patients with rheumatoid arthritis (RA). The program was based on cognitive-behavioral therapy and lasted ten weeks. It had features for individual and 'community' use. The part for individual use covered the following topics: 'Overview and Rationale', 'RA Stressors', 'Effective Coping', 'Life Goals', 'Pain Management', 'Emotional Responses', 'Managing Change', 'Self Esteem', etc. It also had a “homework” journal - a tool for self-monitoring. The 'community' features provided in RAHelp made the communication with other participants possible. One hundred eight patients with RA participated in this intervention. The results showed significant changes in the measure of quality of life with medium effect sizes (d=0,66, p=0,003) after the intervention. The assessment of the risk of bias in this study shows that in most domains (incl. sequence generation, allocation concealment, blinding and incomplete data) there was not enough information provided to make judgment. However, the study appears to be free from selective reporting and other bias.

[71] Mesure du Stress Psychologique – a measure of perceived stress

Internet based Guided Self-help Program (Day et al., 2013)

'Internet based guided self-help' program was a randomized controlled clinical trial conducted by Day and colleagues (2013). The program was based on the principles of cognitive behaviour therapy and was designed for students with moderate anxiety, depression and stress. There were five core modules and six optional modules that address change of behaviour, beliefs and thoughts that cause depression, anxiety and stress. The topics of the module for example were: 'Introduction', 'Activity and Mood', 'Motivation', 'Thoughts and feelings', 'Advanced thoughts and feelings', 'Social relationship', 'Stress Management', 'Sleep', 'Irritability and Anger' etc. Sixty six distressed students participate in the program that lasted six weeks. The study showed significant decrease in stress measure ($p=0,004$) with the medium effect size ($d=0,74$) after the intervention. The risk of bias assessment for this study is low for most domains, including sequence generation, allocation concealment, blinding and selective reporting. There is only one concern about other biases; regarding the baseline difference in the measure of stress between intervention and waiting-list control group (higher in control group), which could cause a bias.

Online Mindfulness Program for Stress Management (Morledge et al., 2013)

'Online Mindfulness Program for Stress Management' was a program and parallel randomized study done by Morledge and colleagues (2013). The program is based on the principles of mindfulness and consisted of four components: 'Weekly Introduction to the concept and meditation', 'Weekly guided meditations', 'Daily articles on each week's theme' and 'Daily tips how to manage stress or incorporate mindfulness'. The duration of the intervention is eight weeks. Five hundred fifty one adult individuals from general population participated in the study. There were two intervention groups (online mindfulness program and online mindfulness program with additional online support) The results of statistical analysis showed that participants significantly achieved a reduction in the measure of perceived stress ($p<0,05$) after intervention, with small effect size ($d=-0,23$ b/w IG1 and CG; $d=-0,49$ b/w IG2 and CG; $d=0,30$ b/w IG1 and IG2). The study does not provide enough information whether the allocation was concealed, if there was blinding and how the incomplete data was addressed, that is why there is an unclear risk of bias in these fields. Other domains (sequence generation, selective reporting and other bias) have low risks of bias.

Web-based Intervention for Stress Reduction (Drozd et al., 2013)

'Web-based Intervention for Stress Reduction', otherwise called 'Less Stress (LS)' was a randomized study conducted by Drozd and colleagues (2013) for the evaluation of potential effects of various interventions on stress. The underlying concepts for LS were mindfulness and CBT. LS had 13 sessions over four weeks. Each session has two components: the first was a psychoeducation

emphasazing with stress-related topics; the second part provided techniques, exercises (mindfulness) and homework. Two hundred fifty nine participants from the general population took part in the entire intervention. The authors of the study concluded that LS was effective in reducing stress over time in participants, however this effect size was not quantified. At the same time presented data was not sufficient to independently calculate effect size for this study. The risk of bias assessment shows unknown risk for 'blinding' of this intervention. There is low risk of bias on the remaining domains: 'sequence generation', 'allocation concealment', 'incomplete data', selective reporting' and 'other bias'.

Web based Cognitive Behavioral Tool (Powell et al., 2013)

Powell et al. (2013) conducted a randomized study which revolved around a 'Web-based Cognitive Behavioral Tool', otherwise called the 'MoodGYM' program. The online program used the CBT approach with relaxation and meditation techniques to improve mental well-being in the general population. The program consisted of five modules where it addressing the relationship between thoughts and emotions, as well as issues related to stress and relationship. It had 29 online exercises that taught relaxation and meditation techniques. The duration of the online intervention was six weeks; a total 3070 individuals participated. The study results showed that the program improved the mental well-being of participants with significant and small effect size (d=0,34, p<0,001) by the end of intervention. The risk of bias assessment shows that neither the participants nor researchers were blind to intervention. For the remaining domains (sequence generation, allocation concealment, incomplete outcome data, selective reporting and other bias) the risk of bias was low.

Self-guided Multimedia Stress Management and Resilience Training Program (Rose et al., 2013)

'Self-guided, Multimedia Stress Management and Resilience Training Program', short from 'SMART-OP' was a randomized controlled study which is done by Rose and colleagues (2013). 'SMART-OP' was grounded on the combined approach of CBT and resilience training. The program consisted of six interactive sessions, such as video presentation and other forms. Each session provides information about different aspects of stress management, activities that focus on the feeling, thoughts and actions of individuals. Participants were asked to do a practical assignment, so called 'homework' between the sessions . The effectiveness of the program was tested in the healthy student population for the duration of six weeks. Sixty six students participated in the program. The study results showed that 'SMART-OP' is effective in reducing stress over the time (p<0,01) with the large effect size: d=0,81. The assessment of risk of bias in this study shows that there is unknown risk for the following domains: sequence generation, allocation concealment and blinding.

There is low risk of bias in remaining domains (incomplete outcome data, selective reporting and other bias).

Online Stress Management Workbook (Carpenter et al., 2012)

'Online Stress Management Workbook' was a randomized controlled study conducted by Carpenter and colleagues (2012) evaluating the effectiveness of online program among breast cancer survivors. The popular name of intervention was 'Coping with Cancer Workbook'. The online program was build on the principles of CBT and consisted of an introductory chapter and ten chapters comprised of CBT coping strategies and exercises on relaxation training, writing exercises, homework, video and audio materials. One hundred thirty two women with breast cancer participated in the program for the studie's ten week duration. The results of the study show that there was not significant (p=0,08) effect on coping with negative mood with the medium effect size (d=0,51). Assessment of risk of bias indicates that the study did not blind the researchers and the incomplete data was not addressed properly. It is not clear if the randomization process was concealed. On the other domains there is a low risk of bias, as the allocation methods was reported and considered adequate and there was no concern over selective reporting and other bias.

Web-based Cognitive Behavior Therapy (Radhu et al., 2012)

'Web-based Cognitive Behavior Therapy' was a randomized study conducted by Radhu and colleagues (2012) for changing the dysfunctional cognition and behavior in students with perfectionism. The web-based CBT lasted 12 weeks and had 13 modules despersed among on three main topics: 'Rediscovering clear thinking, 'Learning not to stress yourself', 'Bouncing back better'. The learning materials covered cognitive restructuring activities, coping with anxiety and negative mood and relaxation techniques. Fifty eight students participated in the program. The results of the study showed non-significant (p=0,30) reduction in the measure of stress among participants with the small effect size (d=0,29). The risk of bias in the study is unknown for the sequence generation, allocation concealment and blinding domains. There is low risk of bias for the incomplete outcome data and selective reporting. Because of the baseline difference in the measure of stress (higher in control group) there was a high risk of selection bias.

Internet-based Program for Coping with Cancer (David et al., 2013)

'Internet-based Program for Coping with Cancer' was a randomized controlled trial conducted by David and colleagues (2013). The program used elements of CBT for patients with haematologic cancer to cope with illness related distress. It consisted of four modules, where each module being one week. The topics of the modules were following: 'Basic knowledge on stress and behavioral assessment', 'Techniques for coping with acute stress situations', 'Techniques for coping with

upcoming stress situations' and 'Expressive writing'. The internet programme had 186 participants. The results of intervention show significant improvement in some sub-scales of measure of coping styles (MAC[72]): significant improvement (p=0,03) in the sub-scale of 'Fighting Spirit' with the small effect size (d=0,42), and significant reduction (p=0,02) in the sub-scale 'Fatalism' with the small effect size (d=0,47), in other sub-scales the reductions of measures were non-significant with small or no effect size (Helpless/Hopelessness d=0,22, p=0,24, Anxious Preoccupation d=0,04, p=0,83, Avoidance d=0, p=0,99). Risk of bias assessment revealed unclear risk for the domains of allocation concealment and blinding, low risk of bias for sequence generation, incomplete outcome data and selective reporting. For the reason of baseline imbalance in receiving the main treatment for cancer (patients in the intervention group were significantly more likely to be receiving chemotherapy, p=0,02) there was high risk of performance bias.

Mind-body Stress Reduction Intervention (Wolever et al., 2012)

'Mind-body Stress Reduction' was a randomized controlled trial conducted by Wolever and colleagues (2012) to test the comparative effectiveness of online versus in-person mind-body interventions (Mindfulness at Work), in the occupational setting. The underlying concept for the intervention was mindfulness meditation. The intervention was designed specifically for work sites and consisted of twelve weekly classes and two hour of mindfulness meditation. The content of in-person and online intervention was identical but the first was conducted in a typical classroom setting and the second in a virtual classroom. Ninety six employees participated in the program. The results indicated that there was reduction in the measure of perceived stress both in online and in-person delivery with the small effect size (d=0,29). The assessment for the risk of bias demonstrated the unknown risk of bias in the sequence generation, allocation concealment and blinding. Other areas (incomplete outcome data, selective reporting and other bias) appeared to have had a the low risk of bias.

Web-based Cognitive-Behavioral Therapy (Arpin-Cribbie et al., 2012)

'Web-based Cognitive-Behavioral Therapy' was a randomized controlled trial concucted by Arpin-Cribbie and colleagues (2012). The online trial consisted of two interventions: one intervention aimed at modifying perfectionist beliefs of university students (based on the principles of CBT) while the other intervention was based on general stress management (GSM) strategies. The CBT component had several characteristics: 'Living in the real world', 'Living in the world of “shouds”', 'Working out your mind', 'Dealing with negative moods', 'When a “want” becomes “necessity”', 'Dealing with academic and performance anxiety'. Ath the same time the GSM strategies consisted of the following topics: 'Recognizing and dealing with stress', 'Dealing with

[72] MAC-Mental Adjustment to Cancer

distractions', 'Changing your stressors', 'Exercise', 'Sleep' and 'Meditation'. These two interventions were available to participants for ten weeks. In total 73 students participated in the program. The results showed significant changes in the sub-scales of the measure of perfectionism (MPS [73]): a significant decrease in the sub-scale of 'Self-oriented Perfectionism' in CBT and GSM groups (p=0.03) with the large effect size (d=0,97), a significant decrease in the subscale of 'Other-oriented Perfectionism' in CBT group with medium effect size (d=0,46, p=0,04) and small non-significant increase in GSM group; a significant decrease of 'Socially Prescribed Perfectionism' in CBT group with large effects size (d=0,97, p<0,01), small, a non-significant increase in GSM group; a significant decrease in sub-scale 'Concern over Mistakes' in both CBT and GSM groups with the large effect size (d=0,97, p=0,03); a significant decrease in 'Perfectionism Cognition' in both groups with large effect size (d=1,06, p=0,39), and a significant decrease in 'Discrepancy' in CBT group (p<0,05) and a non-significant decrease in GSM with the large effect size (d=1,06, p=0,10). Risk of bias assessment: unclear risk of bias for blinding and low risk of bias in the remaining domains.

Web-based Approach to Address Cardiovascular Risk (Bennet et al., 2011)

'Web-based Appoach to Address Cardiovascular Risk' was a randomized trial conducted by Bennet and colleagues (2011) testing the effectiveness of online interventions in reducing cardiovascular risk factors in population of managers. The web-based program was based on the existing knowledge in the managerial field. It consistsed of the 'Livewell' principle, which promotes a healthy lifestyle through improving diet, exercises, stress and mood management. The online program presented in the form of interactive lessons, self-assessment, short videos, and additional health courses on the topics of weight loss, stress reduction among other factors. The program lasted six months with 145 managerial participants. The results of study show that the symptoms of distress significantly decreased in the intervention group in comparison to the control group with a large effect size (d=-2,62, p=0,01). The risk of bias assessment displayed an unknown risk in the following domains: sequence generation, allocation concealment, and blinding. There is low risk of bias in the remaining domains: incomplete outcome data, selective reporting and other biases.

Comprehensive Program for Reducing Stress, (Wiegand et al., 2010)

'Comprehensive program for reducing stress' was a randomized trial conducted by Wiegand and colleagues (2010) to evaluate the effect of program on reducing the stress of women aged 25 to 45. The program used a combination of CBT with an emphasis relaxation and the use of olfactive-based products. CBT was incorporated in the internet-based coaching and education program for the reduction of stress. Relaxation techniques included progressive muscle relaxation, breathing and

[73] MPS-Multidimensional Perfectionism Scale, consist of six dimension: SOP- Self-Oriented Perfectionism, OOP-other-oriented perfectionism, SPP- socially prescribed perfectionsm, CM-concern over mistakes, D- Discrepancy, PC-Perfectionism Cognition.

meditation. Olfactive-based products are personal care products, such as shower, and bath gels, - as well as body lotions. The comprehensive program lasted for 14 weeks with a and total of 562 women participants. Every participant was allocated to one of three groups: the intervention group that received all components of the intervention; the intervention group that received only internet coaching and education program, and the control group, which did not receive any stress management intervention. The program showed a significant decrease in the percentage of stress measure. The percentage of reported stress reduction was as following: 26,6% in first intervention group, 22,1% in the second intervention group and 17% in the control group. The effect size of the intervention was not reported. From the reported data it was impossible to make calculation of effect size. Assessment of risk of bias showed unclear risk for the sequence generation and allocation concealment. Blinding was not applied and incomplete outcome data was not addressed. There is low risk of bias in selective reporting and other bias.

Brief Internet-based Self-Help Intervention, (van der Houwen, 2009)

'Brief Internet-based Self-Help Intervention' was a randomized trial conducted by van der Houwen and colleagues (2009) testing the efficacy of an online writing intervention among bereaved individuals. The online writing intervention was based on research conducted earlier (Lange et al, 2003) and included exposure and cognitive restructuring as its central components. The duration of intervention varied from three to six months. Generally 757 bereaved individuals who were at risk of developing problems participated. The results indicated that the intervention significantly increased positive mood over time among participants (significant time by condition interaction $p<0,05$). The effect size of intervention is small ($d=0,30$). Risk of bias assessment in this study shows that there is unknown risk for in the area of sequence generation, allocation concealment and blinding. There was a low risk of bias in the areas of incomplete outcome data, selective reporting and other biases.

Online Cognitive Behavioral Therapy and Problem-solving Therapy, (Warmerdam et al., 2010)

'Online Cognitive Behavioral Therapy and Problem-solving Therapy' was a randomized study conducted by Warmerdam and colleagues (2010) for evaluating the effect of two online programs for depressive symptoms. These two interventions were based on the CBT and problem solving training (PST), which were separately conducted in two groups. The CBT consisted of eight lessons: psycho-education, acquisition of relaxation skills, cognitive restructuring and social skills. The online PST consisted from several steps, in which participant defined what was important for them, followed by a description of their problems concluding with a found and apply solution for those problems. The study lasted five weeks with a total of 263 participants. The results showed that

there was an improvement in the problem solving skills of participants in both the intervention and the control group. In the measure of 'Social Problem Solving Inventory' (SPSI[74]) sub-scale Positive problem orientation (PPO) increased in CBT, PST groups and control group; Negative problem orientation (NPO) decreased in both groups; Rational Problem Solving (RPS), Avoidance Styles (AS) and Impulsiveness/Carelessness Styles all decreased in both intervention groups. The effect size in the sub-scales between the intervention groups and the control group after the training is as follows: PPO between the CBT group and the control group small, a non-significant effect size (d=0,31, non-significant, p=0,14), between the PST group and the control group, a medium, significant effect size (d=0,55, significant, p=0,050), NPO between the CBT group and the control group, a medium, significant effect size (d=0,51, p<0,01), between PST group and control group significant medium effect size (d=0,73, p<0,01); RPS CBT group and control group a non-significant small effect size (d=0,03, p=0,63), between the PST group and the control group non-significant a medium effect size (d=0,54, p<0,21); AS between the CBT group and the control group a non-significant small effect size (d=0,35, p=0,06), between the PST group and the control group significant a medium effect size (d=0,67, p<0,02). ICS between the CBT group and the control group a non-significant small effect size (d=0,05, p=0,28), between tne PST group and the control group a non-significant small effect size (d=0,32, p<0,86). Risk of bias assessment demonsrate unknown risk for the sequence generation, allocation concealment and blinding. In the remaining areas, including incomplete outcome data, selective reporting there was a low risk of bias.

Internet-based Stress Management Program, (Kajiyama et al., 2013)

'Internet-based Program – iCare Stress Management e-Training Program' was a randomized study assessing the effectiveness of the program in a population of caregivers (Kajiyama et al., 2013). The online training was adapted from a previously existing conventional program, called 'Coping with Caregiving'. This program mainly taught coping skills for stress management, such as: relaxation training, learning to increase daily pleasant activities, cognitive restructuring-, and improved communication skills. The online program lasted for three months involving 150 caregivers as participants. The results of trial indicated that the program was generally effective in decreasing stress. The measure of Perceived Stress Scale decreased significantly in the intervention group (p=0,017) with a small effect size (d=0,46). Risk of bias assessment in this study point out that in the following domains there is unknown risk of bias: sequence generation, allocation concealment, blinding and incomplete outcome data. There was low risk of bias in the areas of

[74] SPSI-Social Problem Solving Inventory, for measuring problem solving skills, it consists of: Positive Problem Orientation (PPO), Negative Problem Orientation (NPO), Rational Problem Solving (RPS), Impulsivity/Carelessness Style (ICS), Avoidance Style (AS)

selective reporting and other bias.

A Brief Web-based Mindfulness Training (Gluck and Maercker, 2011)

'A Brief Web-based Mindfulness Training' was a randomized trial, conducted by Gluck & Maercker (2011) that evaluated the feasibility and effectiveness of an online training program. Based on mindfulness principles it was available in the form of modules consisting of audio files, animated exercises and written text. Furthermore these modules contained guided mindfulness exercises and such techniques as awareness of body sensation, attention to breath, acceptance of upcoming emotions, as well as, non-judgementally labelling distressing thoughts. The training duration was 13 days and 49 individuals from different occupational setting participated. The results of this intervention indicated a non-significant effect on stress (d=0,46, p=0,11). The risk of a bias assessment demonstrated a high risk of bias in the areas pf sequence generation, allocation concealment and other bias. It was not clear if the blinding of intervention was applied. There is a low risk of bias in the remaining domains (incomplete outcome data and selective reporting).

Web-based Cognitive Behavioral Therapy, (Ruwaard et al., 2009)

'Web-based Cognitive Behavioral Therapy' was a randomized controlled trial conducted by Ruwaard and colleagues (2009), that assessed the effects of program in individuals with mild to moderate depression. The web-based program was built on CBT and the behavioral activation concept. In the CBT portion participants were encouraged to recognize their maladaptive negative thoughts and change them with more realistic and constructive versions. At the same time, in the behavioral activation intervention participants learned how to engage in behaviors that resulted in positive reinforcement avoided the negative reinforcement and enhanced the feeling of self-respect. The training also consisted of home assignments and therapist sessions. There were eight phases including: 'Inducing awareness: writing', 'Inducing awareness: monitoring', 'Structuring activities', 'Cognitive restructuring: challenging negative thoughts', 'Cognitive restructuring: putting negative thoughts to the test in behavioral experiment', 'Positive self-verbalization', 'Social skills: interacting with others', 'Relapse prevention: the “tool kit”. The training’s duration was 11 weeks, in total 54 individuals participated. The results of analysis demonstrated that the online intervention reduced stress (DASS[75] stress sub-scale) overall among participant but with a non-significant effect size (d=0,8, p=0,057). The risk of bias assessment of the study showed that there is unclear risk of bias in the areas of allocation concealment and blinding. With regards to other domains (sequence generation, incomplete outcome measures, selective reporting other bias) there was a low risk of bias.

[75] DASS-Depression, Anxiety and Stress measure, here DASS-21 was used

Mobile Narratives for Reducing Stress (Grassi et al., 2009)

'Mobile Narratives for Reducing Stress ' was a pilot study conducted by Grassi and colleagues (2009) for evaluating the efficacy of mobile narratives in inducing relaxation state among students commuters. The mobile narratives were built on the self-efficacy notion, sense of presence concept and propose different relaxation techniques. The narratives were presented only in video and audio formats. The mobile intervention was done in a form of four sessions over two days. A total of 120 university students participated in the program. The analysis of data showed that the mobile narratives decreased the relaxation level in the groups over the time (a significant difference in time by condition, $p<0,001$). The effect sizes ranged between large to small (between first intervention group and control $d=1,32$, $p<0,001$, IG2 vs. CG, $d=0,19$, $p<0,003$). The risk of bias assessment for this study showed that there is unknown risk for the most domains (including sequence generation, allocation concealment, blinding and incomplete outcome data). There was a low risk of bias in the remaining areas (selective reporting and other bias).

Positive Psychology Interventions to increase Well-Being (Seear and Vella-Brodrick, 2013)

'Positive Psychology Interventions to Increase Well-Being' was a randomized controlled study conducted by Seear and Vella-Brodrick (2013) to examine the efficacy of two online interventions. The two online positive psychology interventions were: 'three good things' and 'best possible selves'. In the first intervention - 'three good things' participants were encouraged to recall on three good things happened to them each day, think about possible reasons for that and write down their experience for one week. In the second intervention participants are asked to imagine themselves in the future, in the state when all their life goals are accomplished. This intervention lasted also one week. A total of 211 volunteers participated in the program. The interventions resulted in improvement of mental well-being in all participants with a small ($d=0,49$ between the first intervention group and the control group) to medium effect size ($d=0,64$ between the second intervention group and the control group). The risk of bias assessment in this study displayed that there was low risk of bias in the domains of sequence generation, allocation concealment, selective reporting and other bias. In the area of incomplete outcome data there was a high risk of bias. From the report of article it was not clear if the blinding of intervention was used.

Internet-based Health Promotion Program, (Ruggeiero, 2013)

'Internet-based Health Promotion Program' was a randomized study conducted by Ruggeiero (2013) to test the effectiveness of an online program combined with motivational interviewing for the consumers of vocational rehabilitation. Theoretical framework for internet program relied on the

behavioural changes theories of the 'Ttranstheoretical Model' (check and put the name of authors here) and 'Social Cognitive Theory' (put the name of authors here). The online intervention included information for behavior change in four areas: diet, stress management, sleep, physical activity. Participants were free to choose the area of interest and set goals accordingly. The online intervention lasted eight weeks with142 participants. The results of the study showed that the intervention did not have a significant effect on quality of life of participants (p=0,70, d=0,20). The assessment of risk of bias in this study indicated that there is unknown risk of bias in the following domains: sequence generation, allocation concealment. In the areas of selective reporting, incomplete outcome data and other bias there was a low risk of bias.

Comprehensive Health Enhancement Support System (Baker et al., 2011)

'eHealth Breast Cancer Interventions' was a randomized trial conducted by Baker and colleagues (2011) to assess comparative effectiveness of three modes of 'Comprehensive Health Enhancement Support System (CHESS)' based on three modalities. The firsts modality was simply ‘information’, the second was ‘information and support’, the third ‘information, support and coaching’. The information comprised of general topics about cancer, frequently asked questions, articles, web links, further resources. The support was provided through an online discussion platform, getting support from an expert and communication in chat line. The coaching component of the third intervention was based on the principles of CBT and mindfulness. The coaching covered the topics such as 'Easing Distress', 'Healthy Relating', 'Action Plan' and 'My Profile'. The interventions lasted six weeks and 450 women with breast cancer participated. The results of all three interventions showed that there is no effect on the coping skills of participants. The calculation of effect size for these interventions was not possible because Baker and colleagues (2011) did not report the standard deviations of means. The risk of bias assessment showed that there is low risk of bias for the domains of sequence generation, selective reporting and other bias. However, there was an unknown risk for the areas of allocation concealment, blinding and incomplete outcome data.

Web-based Training in Cognitive Behavioral Therapy, (Weingardt et al., 2009)

'Web-based Training in Cognitive Behavioral Therapy' was a randomized trial conducted by Weingardt and colleagues (2009) for assessing the effectiveness of two modes of training in substance abuse counsellors. The web-based training was based on the CBT and consisted of eight modules. Participants in intervention group were divided into low fidelity and high fidelity mode. Participant in the low fidelity group had simultaneous access to all eight modules; the high fidelity group participants had access to the modules in the special designed order as determined by the researchers. Overall, 149 counsellors participated in the study. The online training lasted four

weeks. The results showed non-significant changes on the 'Emotional exhaustion' (p=0,20, d=0,35) and 'Depersonalization' sub-scales (p=0,17, d=0,27) and significant effect with the a small overall effect size on the 'Personal Accomplishment' (p=0,04, d=0,41) sub-scale, which measured the rate of burnout. The risk of bias assessment in this studed shows that there was an unknown risk for sequence generation, allocation concealment and blinding. There was a high risk of bias in the area of incomplete outcome data and low risk in the area of selective reporting and other bias.

Mobile Phone and Web program for depression, anxiety and stress, (Proundfoot et al., 2013)

'Mobile Phone and Web program' was a randomized controlled trial done to evaluate how various interventions impact on individuals with mild to moderate depression, anxiety and stress (Proundfoot et al., 2013). The colloquial name of the program is 'myCompass'. The interventions were grounded on CBT and had elements of problem solving therapy, interpersonal psychotherapy and positive psychology. The 'myCompass' fully automated online program, that contains twelve modules on topics, for instance: 'Managing Fear and Anxiety', 'Tackling Unhelpful Thinking', 'Managing Loss and Major Life Change', and 'Solving Problems'. The program's duration was seven weeks. In total 720 community-based volunteers with mild to moderate depression, anxiety and stress participated in the program. The results indicated that 'myCompass' was effective in reducing the symptoms of stress over time with a small effect size (group d=0,35, p=0,01). Risk of bias assessment showed low risk of bias in the domains of: sequence generation, incomplete outcome data and selective reporting; unclear risk in the areas of allocation concealment and blinding, and high risk of other bias. The high risk of other bias was due to imbalance in baseline measurements of outcome data.

Online Training on Job related Burnout, (Leykin et al., 2010)

'Online Training on Job-related Burnout' was a randomized trial, conducted by Leykin and colleagues (2010) to explore the effects of different type of training on burnout facets among substance abuse counsellors. The online training was built on the principles of CBT. The program had eight modules, that include topics on: 'Problem solving', 'Risk reduction', 'Decisions', 'Motivation', 'Coping plans', 'Coping with cravings', 'Refusal skills' and 'Case management'. Overall 175 counsellors participated in the online training, which occurred over a month period. Participants were divided into two streams of training: high fidelity and low fidelity. In the high fidelity stream participants were required to complete the modules in predetermined order over the month. Participants in the low fidelity category were free to complete the modules in any order within the same time period. The results of analysis showed that participants in the low fidelity group had lower scores for the 'Depersonalization' (d=0,36, p=0,05) and the 'Emotional Exhaustion' (d=0,31,

p<0,05) sub-scales after the training with the small significant effect size; the 'Personal Accomplishment' sub-scales equally increased in both groups with small and significant effect size (d=-0,36, p<0,05). The risk of bias assessment demonstrated an unknown risk in the domains of sequence generation, allocation concealment, blinding and incomplete outcome data. The risk of bias in the fields of selective reporting and other bias was low.

Multimedia Training in Students, (Grassi et al., 2011)

'New Technologies to Manage Exam Anxiety' was a randomized trial conducted by Grassi and colleagues (2011) to assess the effectiveness of multimedia training on the anxiety and relaxation level of university students. The training was based on one of the of CBT approaches – Stress Inoculation Training (SIT). The SIT training was performed in the form of audio and video narratives via mobile phone, on DVD and mp3 player. The SIT intervention lasted six days with 75 students participating. The study reported significant increase in the relaxation level over the time (significant time effect). However, there was no report on effect size and not enough information was provided to calculate independently the effect size (no means and standard deviations are reported). The assessment of risk of bias for this study showed that there was unknown risk in the domains of sequence generation, allocation concealment, blinding and incomplete outcome data. The risk of bias is low in the remaining domains: selective reporting and other bias.

3.4.2 Non-randomized Studies

Online Mindfulness based Course (Krusche et al., 2013)

'Mindfulness Online' was study conducted by Krusche and colleagues (2013) to assess feasibility of a web-based mindfulness course for stress, anxiety and depression in the general population. The online intervention was based on the elements of mindfulness based stress reduction and mindfulness-based cognitive therapy. There were ten interactive sessions which were covering the formal meditation skills (body scan, mindful movement, sitting meditation, breathing space) and informal mindfulness techniques (mindful eating) through videos, home assignments and emails. In total 273 participants completed the online course which lasted eight weeks. The results showed that the intervention significantly decreased perceived stress in participants with a large effect size (d=1,20, p<0,001). The assessment of risk of bias for this study displayed a high risk of bias in the domain of incomplete outcome data, and low risk of bias in selective reporting and other bias.

Online Curriculum of Teaching Mindfulness (Reid, 2013)

'Online Curriculum of Teaching Mindfulness' was a pilot study conducted by Reid (2013) for

examining the effect of online curriculum on occupational therapy students. The program consisted of eight modules including such areas of mindfulness as cultivating awareness, breathing meditations, body scan and loving kindness meditation. The duration of the program is eight weeks. Fifteen female graduate students participated in the study. The results of intervention indicated significant increase in the mindfulness measure (p=0,05) with a large effect size (d=1,29). Risk of bias assessment showed unclear risk for the incomplete outcome data and low risk of bias for the selective reporting and other bias.

Online Mindfulness Training for Stress Reduction, (Quintana and Rivera, 2012)

'Mindfulness Training Online for Stress Reduction' was a study conducted by Quintana and Rivera (2012), to gather data on stress and mindfulness state in participants. The mindfulness training was individualized for each participants to initiate the program, choosing from training periods from one to eight weeks. The mindfulness training consisted from single meditation session on attention training. The attention training was done through focusing attention on breathing via mouse click in computer program each time one breaths out. Overall 182 individuals participated in the program. A significant negative correlation between stress values and mindfulness trait scale (r=-0,69, p<0,001) was reported but there was no information about the change of stress and mindfulness outcome measures. It is impossible to assess the effect of intervention and calculate effect size. The risk of bias for this study showed an unknown risk for the domain of incomplete outcome data; a high risk of bias in the area of selective reporting, and a low risk of bias for other bias.

Online Mindfulness-based Course (Krusche et al., 2012)

'Mindfulness online' was a study conducted by Krusche and colleagues (2012) to test the feasibility and impact of web-based mindfulness course on the level of stress within the general population. This online intervention was modified from mindfulness based stress reduction and mindfulness based cognitive therapy. The online course consisted of ten modules which taught formal meditation skills (including body scan, mindful movement, sitting meditation, breathing space) and informal meditation (mindful eating). The online training lasted four weeks involving 100 participants. The study found that an online mindfulness intervention had a significant influence on reducing the stress reduction with a large effect size (d=1,57, p<0,001). The risk of bias assessment showed an unknown risk of bias in the area of incomplete outcome data, and a low risk in the domains of selective reporting and other bias.

Mind-body Intervention in a Virutal World, (Hoch et al., 2012)

'Mind-body Intervention in a Virtual World' was a pilot study conducted by Hoch and

colleagues (2012) testing the feasibility of an online virtual program. The online program was based on the cognitive application of positive psychology and contemplative meditation. Several techniques were taught, including breath awareness, mental repetition of a word, mindfulness meditation, guided body scan, Yoga and guided imagery. The intervention lasted eight weeks with 24 participants took part in it. The results of this study showed that the intervention has decreased the level of stress but not significantly and the effect was small (d=0,11, p=0,50). The risk of bias demonstrated a high risk of bias in the incomplete outcome data area and low risk of bias in selective reporting and other bias.

Web-Enhanced Behavioral Self Management Program, (Williams et al., 2010)

'Web-Enhanced Behavioral Self-Management Program' was a study conducted by Williams and colleagues (2010) assessing the feasibility of an online program, coined the 'Stress Gym' for the stress management in military personnel. The web-based intervention was grounded in the theoretical framework of cognitive appraisal. There were nine modules of the following topics: 'Stress and Emotionality', 'Reacting to Stress', 'Sleep', 'Problem Solving', 'Change your Thinking', 'Belonging', 'Relationships', 'Teamwork' and 'Balance'. The researchers admitted that the intervention was relatively short, but did not report its actual length. Totally 142 military personnel participated in the study. The researches concluded that the intervention significantly decreased stress in military personnel (p=0,004), despite not reporting the effect size. Subsequently, independently calculated the effect size was not possible, because necessary information was missing (means and standard deviations). The risk of bias assessment showed an unknown risk in the incomplete outcome data domain and a low risk in selective reporting and other bias.

Web-based Stress Management Program, (Kawai et al., 2010)

'Web-based Stress Management Program' was a non randomized study conducted by Kawai and colleagues (2010) to evaluate the effect of online intervention in well-being of white-collar workers. The online stress management program was based on the principles of positive psychology and CBT. The intervention consisted of four sessions which included an introduction followed theoretical sessions regarding constructive ways of coping with stressors and, cognitive restructuring, as well as theory-applied sessions. The program lasted two weeks and 139 white-collar workers participated. The results showed that the intervention significantly improved well-being (p<0,001), but the effect size is not reported. Independent calculation of effect size was not possible for the reasons of missing necessary information (means are reported without corresponding standard deviations). The risk of bias assessment for this study showed an unknown risk in the incomplete outcome data domain, a high risk in selective reporting and a low risk in other bias.

Self guided CBT Internet Intervention, (Beatty et al., 2011)

'Self guided CBT Internet Intervention' otherwise called 'Cancer Coping Online' was a pilot study conducted by Beatty and colleagues (2011) to test the effects of online intervention for cancer-related distress. The internet intervention was based on the principles of CBT. There were six modules addressing the following topics: 'Starting treatment', 'Coping with physical symptoms and side effects', 'Coping with emotional distress', 'Body Image', 'Your family and friends'. The study's duration was six weeks with 12 participants who had cancer with cancer. The result of the study showed that the intervention reduced distress with the medium effect size (d=0.53). The risk of bias assessment showed that there was unknown risk in the domain of incomplete outcome data, and a low risk of bias in the area of selective reporting and other bias.

Web-based Self Management Program (Nes et al., 2013)

'Web-based Self management' was a pilot study conducted by Nes and colleagues (2013) to test the feasibility of an online program in patients with diabetes type two (DM 2). The program was grounded on CBT and included electronic diaries, a healthcare tool, audio files with mindfulness exercises and written personalized feedback. Eleven patients participated in this study that lasted twelve weeks. The results of study show that the online intervention was feasible for supporting individuals with DM 2 diabetes regarding life style changes but the effect on quality of life was not reported. The risk of bias assessment for this study was unknown for incomplete outcome data, a high risk was present for selective reporting and a low risk for other bias.

3.5 Synthesis of Results

Qualitative synthesis of the results was done for this review. The synthesis of included studies was made on the basis of underlying concept or framework that the studies used to develop their unique stress management intervention. Overall, four common categories were distinguished among all the studies:

1. Digital Cognitive Behavioral Therapy Interventions;
2. Online Mindfulness-based Stress Management Interventions;
3. Digital Interventions Based on Several Frameworks;
4. Digital Intervention based on Other Frameworks.

3.5.1 Digital Cognitive Behavioral Therapy Interventions

Of all the presented studies involving digital interventions 13 (Beatty et al., 2011, Carpenter et

al., 2012, David et al., 2013, Day et al., 2012, Grassi et al., 2011, Leykin et al., 2010, Nes et al., 2013, Powel et al, 2013, Radhu et al., 2012, Ruwaard et al, 2009, Shigaki et al., 2013, Vilani et al., 2011, Weingardt et. al., 2009) were based solely on the principles of CBT. These interventions were conducted in different population groups and with variety of reported outcome measures (see table 13). Of these studies six were conducted in a healthy population (Grassi et al., 2011, Leykin et al., 2010, Powel et al, 2013, Radhu et al., 2012, Vilani et al., 2011, Weingardt et. al., 2009), five studies involved patients with a chronic diseases (Beatty et al., 2011, Carpenter et al., 2012, David et al., 2013, Nes et al., 2013, Shigaki et al., 2013) and two studies recruited individuals with depressive symptoms.

Digital stress management programmes based on principles of CBT among a healthy population showed a non-significant reduction in the measure of stress (Radhu et. al., 2012). The effect of interventions against burnout are inconsistent, in one study there were non-significant changes in the study's two sub-scales of burnout and a significant improvement in one sub-scale of (Weingardt et al., 2009). In another study there was a significant improvement in the sub-scales of burnout (Leykin et al., 2010). However CBT-based digital interventions improved coping skills (Vilani et al., 2011); as well as significantly improved well-being (Powell et al., 2013) and significantly increased relaxation level (Grassi et al., 2011).

A digital CBT intervention in a population with chronic diseases showed that interventions resulted in a significant improvement of quality of life (QoL) in patients with rheumatoid arthritis (Shigaki et al., 2013). In population with cancers the results were: there was a non-significant effect on coping with negative mood in patients with breast cancer (Cappenter et al., 2012); a significant improvement of some sub-scales of the Mental Adjustment to Cancer measure and not significant in other subscales in patients with haematological cancer (David et al., 2013); and a significant decrease in distress with medium effect size (Beatty et al., 2011). In the study by Nes and colleagues (2013) reported that a digital CBT intervention was feasible but did not report the changes in measure of QoL.

The effect of interventions was inconclusive in participants with depression. In one study the online interventions decreased stress (Day et al., 2012). In another study there was no significant effect of intervention on stress (Ruwaard et al., 2009).

The overall risk of bias in most of these studies is unknown and low.

The detailed description of studies related to digital CBT interventions is summarized in the Table 13. The table presents the studies' intervention, population, main results, effect size and risk of bias assessment in these studies.

Table 13 Digital Cognitive Behavioural Therapy Interventions

References	Name of Intervention	Population, sample size	Results, effect size	Risk of bias assessment
Healthy Population				
Radhu et al., 2012	Web-based CBT for perfectionism	Students, n=58	Non-significant reduction in stress (PSS) non-significant, small effect size, p=0,30, d=0,29.	Unknown risk: 3 domains Low risk: 2 domains High risk: 1- baseline imbalance
Weingardt et. al., 2009	Web-based Training in CBT	Substance abuse counsellors, n=149	Non sign. change in the 2 subscale of Burnout (Emotional Exhaustion, p=0,20, d=0,35	Unknown risk: 3 domains Low risk: 2 domains High risk: 1- incomplete outcome data
Leykin et al., 2010	Online CBT Training on Job-related Burnout	Substance abuse counsellors, n=149	Sign. improvement of burnout subscale:↓ Emotional Exhaustion (d=0,31, p<0,05)	Unknown Risk: 4 domains Low Risk: 2 domains
Vilani et al., 2011	Self-help Stress Management through mobile phones	Nurses, n=30	Improvement of coping skills: ↑ active styles, d=-1.02, ↓ denial styles, d=0,28.	Unknown risk: 4 domains High risk: 1 domain (selective reporting) Low risk: 1 domain
Powel et al, 2013	Web-based Cognitive Behavioral Tool - "MoodGYM"	General population, n=3070	Significant improvement of mental well-being with small effect size p<0,001, d=0,34	Low risk: 4 domains High risk: 1 domain (no blinding)
Grassi et al., 2011	Multimedia, audio-video approach based on Stress Inoculation Training	University students, n=75	Increase in relaxation level, effect size is not reported and cannot be calculated	Unknown risk: 4 domains, Low risk: 2 domains
Patients with Chronic Diseases				
Shigaki et al., 2013	Online Self-help Intervention for individuals with rheumatoid arthritis - 'RAHelp'	Patients with Rheumatoid Arthritis, n=98	Significant improvement of Quality of Life (p=0,003) with medium effect size, d=0,66	Unknown risk: 4 domains Low risk: 2 domains
Carpenter et al., 2012	Online Stress Management Workbook for breast cancer	Women with breast cancer, n=132	Not significant effect on coping with negative mood (p=0,08), with medium effect size, d=0,51	Unknown risk: 1 domain Low risk: 3 domains High risk 2 domains (Blinding, Incomplete outcome data)
David et al.,	Internet-based	Patients with	Sign. ↑ in sub-scale	Unknown risk: 2

References	Name of Intervention	Population, sample size	Results, effect size	Risk of bias assessment
2013	Program for coping with cancer	haematological cancer, n=186	'Fighting spirit' p=0,03, small effect size, d=0,42	domains Low risk: 3 domains High risk: 1 domain (imbalance in baseline treatment)
Beatty et al., 2011 NRS	Self-guided CBT Internet Intervention for cancer-related distress -"Cancer Coping Online"	Patients with cancer, n=12	Distress ↓ with medium effect size, d=0,53	Unknown risk: 1 domains Low risk: 2 domains
Nes et al., 2013 NRS	Web-based Self Management Enhancing interventions for persons with chronic illness	Population with type 2 diabetes, n=11	No results are reported for the measure of Quality of Life	Unknown risk 1 domain Low risk: 1 domain High risk:1 domain (incomplete outcome)
Population with symptoms of depression				
Day et al., 2012	Internet-based self-help for anxiety, depression and stress	Students with mild to moderate depression, n=66	Significant reduction of stress (p=0,004) with medium effects size, d=0,74	Low risk: 5 domains High risks: 1 domain (baseline imbalance)
Ruwaard et al, 2009	Web-based CBT of Mild to Moderate Depression	General population with mild to moderate depression, n=54	Not sign. ↓ in stress (p=0,057) with large effect size, d=0,8	Unknown risk: 2 domains Low risk; 4 domains

3.5.2 Online Mindfulness -based Stress Management Interventions

Eight studies were based on the mindfulness framework (Cavanagh et al., 2013, Gluck & Maercker, 2011, Krusche et al., 2012, Krusche et al., 2013, Morledge et al., 2013, Quintana & Rivera Reid 2013, 2012, Wolever et al., 2012). All online mindfulness-based interventions were conducted in healthy population (see table 14). Four studies reported a significant decrease in the measure of perceived stress with large, medium and small effect sizes (Cavanagh et al., 2013, Krusche et al., 2012, Krusche et al., 2013, Morledge et al., 2013). From these four studies two were RCTs and two NRS. The effect sizes in RCTs were small and medium; in non-randomized studies were large. In two other studies the online mindfulness intervention decreased stress, but not significantly (Gluck & Maercker, 201, Wolever et al, 2012). Both these studies had relatively small sample sizes. Reid (2013) found out that online mindfulness curriculum increased mindfulness and had a large effect size. Quintana and Rivera (2012) only reported olny the correlation between the measure of stress and mindfulness, but not the change of stress or mindfulness. The overall risk of bias in these studies utilizing online mindfulness was unknown and low. The study of Gluck and

Maercker (2011) had an overall high risk of bias.

The detailed description of studies related to Online Mindfulness-based Stress Management interventions is brought in the table 14. The table presents the studies' intervention, population, main results, effect size and risk of bias assessment in these studies.

Table 14 Online Mindfulness-based Stress Management Interventions

References	Name of intervention	Population, sample size	Results, effect size	Risk of bias assessment
Healthy Population				
Krusche et al., 2012, NRS	Web-based Mindfulness Stress Reduction Course	Self-referrals, n=100	Significant reduction in stress with large effect size p<0,001, d=1,57	Unknown risk: 2 domains Low risk: 1 domains
Krusche et al., 2013, NRS	Web-based Mindfulness course for stress anxiety and depression	Self-referral, n=273	Significant decrease in stress, large effect size, p= 0,001, d=1,20	Unknown risk: 2 domains High risk:1 domain (incomplete data)
Cavanagh et al., 2013, RCT	Brief Online Mindfulness-based Intervention - “Moodle”	Students, n=104	Significant reduction in stress, medium effect size, p=0,02, d=0,62	Unknown risk: 2 domains Low risk: 4 domains
Morledge et al., 2013	Internet-based Stress Management program based on Mindfulness	General population n=551	Significant reduction in stress, small effect size, p<0,05, d=-0,49, d=0,23	Unknown risk:3 domains Low risk: 3 domains
Wolever et al., 2012	Mind-Body Stress Reduction in the Workplace	Employees, n=96	Non-significant reduction of stress, small effect size, p>0,05, d=0,28	Unknown risk: 3 domains Low risk: 3 domains
Gluck & Maercker, 2011	Web-based Brief Mindfulness Training	Healthy Population, n=49	Non-significant decrease in stress, small effect size, p=0,11, d=0,46	Unknown risk:1 domain Low risk 2 domains High risk: 3 domains
Reid 2013. NRS	Online Mindfulness Curriculum	Female Graduate Students, n=15	Significant increase in the mindfulness, p=0,05, d=1,29	Unknown risk: 1 domain Low risk: 2 domains
Quintana & Rivera, 2012 , NRS	Online Mindfulness Training for Stress Reduction	Healthy population, n=182	Significant negative correlation b/w stress and mindfulness, no data on stress measure.	Unknown risk:1 Low risk: 1 High risk: 1

3.5.3 Digital Interventions based on Several Frameworks

Twelve studies used several frameworks (see table 15) as basis for digital stress management interventions (Arpin-Cribbie et al., 2012, Baker et al., 2011, Drozd et al., 2013, Feicht et al., 2013, Hoch et al., 2012, Kawai et al., 2010, Proundfoot et al., 2013, Rose et al., 2013, Ruggeiero, 2013,

Van der Houwen et al., 2009, Wiegand et al., 2010, Warmerdam et al., 2010). Eight studies were conducted among healthy population (Arpin-Cribbie et al., 2012, Feicht et al., 2013, Drozd et al., 2013, Hoch et al., 2012, Kawai et al., 2010, Rose et al., 2013, Van der Houwen et al., 2009, Wiegand et al., 2010); two-in patients with chronic diseases (Ruggeiero, 2013, Baker et al., 2011) and the remaining two studies were conducted in population with symptoms of depression (Warmerdam et al., 2010, Proundfoot et al., 2013). The frameworks that were used in studies included CBT, resilience training, positive psychology interventions, mindfulness, relaxation and meditation, exposure therapy, stage of change, self-efficacy, problem-solving therapy and interpersonal psychotherapy. In majority of studies CBT was used as one component of program (Arpin-Cribbie et al., 2012, Baker et al., 2011, Drozd et al., 2013, Kawai et al., 2010, Proundfoot et al., 2013, Rose et al., 2013, Van der Houwen et al., 2009, Warmerdam et al., 2010, Wiegand et al., 2010). In the study from Feicht and colleagues (2013) positive psychology interventions were used jointly with mindfulness exercises.

Four studies on digital interventions for stress management which were based on combined frameworks shown to be effective for reducing stress in healthy population (Drozd et al., 2013, Feicht et al., 2013, Rose et al., 2013, Wiegand et al, 2010); all these four studies are RCTs. In the study of Hoch and colleagues (2012) digital intervention based on the positive psychology and meditation did not decrease participants' stress levels. Other studies show that digital stress management interventions with combined frameworks had significant effect on well-being (Kawai et al., 2010), perfectionism (Arpin-Cribbie et al., 2012), and positive mood (Van der Houwen et al., 2009). The overall risk of bias in these studies is low.

Combined digital stress management interventions were not effective in improving QoL life and coping skills in population with chronic diseases (Baker et al., 2011, Ruggeiero, 2013). Overall risk of bias in these studies is low.

In population with symptoms of depression combined digital interventions were effective in decreasing stress and improving problem solving skills (Proundfoot et al., 2013 and Warmerdam et al., 2010). These studies have an overall low risk of bias.

In the table below the detailed description of studies that are based on several frameworks of Stress Management interventions is given. The table presents the intervention, population, main results, effect size and risk of bias assessment in these studies.

Table 15 Digital Stress Management Interventions based on Several Frameworks

References	Name of Intervention	Population, sample size	Results, effect size	Risk of bias assessment
Healthy Population				
Rose et al., 2013	Multimedia Stress Management (CBT) and Resilience Training Program	Students, n=66	Significance reduction in stress (p<0,01), large effect size, d=0,81	Unknown risk: 3 Low risk: 3
Feicht et al., 2013	Web-based Positive psychology interventions and Mindfulness	Employers, n=147	Significant decrease of stress, medium effect size, d=0,64, p=0,003	Low risk: 5 domains High risk: 1 domain (incomplete outcome data)
Drozd et al., 2013	Web-based stress reduction program based on Mindfulness and Cognitive therapy	General population, n=259	Decrease of stress, no effect size is reported and could be calculated	Low risk: 5 domains High risk: 1 domain
Wiegand et al., 2010	Comprehensive program for reducing stress (CBT, relaxation, meditation use of personal care products)	Healthy women, n=562	Significant decrease in percentage of stress, effect size is not reported, cannot be calculated.	Unknown risk: 2 domains Low risk: 2 domains High risk: 2 (blinding, incomplete data)
Hoch et al., 2012 NRS	Mind body intervention in virtual world (Positive psychology and meditation)	Healthy population, n=24	Not significant decrease of stress (p=0,50) with small effect size, d=0,11	Low risk: 2 domains High risk: 1 domain (incomplete outcome data)
Kawai et al., 2010, NRS	Web-based Stress Management Program (CBT and, Positive psychology interventions)	White-collar workers, n=139	Significant improvement of well-being (p<0,001), effect size is not reported and cannot be calculated	Unknown risk: 1 domain, Low risk: 2 domains
Arpin-Cribbie et al., 2012	Web based CBT or GSM for Perfectionism (two interventions are used in separate groups)	Students, n=73	Significant improvement of Perfectionism (p=0,03, d=0,97)	Unknown risk: 1 domain Low risk: 5 domains
Van der Houwen et al., 2009	Brief Internet-based Writing Intervention for Bereaved (Exposure therapy and cognitive restructuring)	Healthy bereaved individuals, n=757	Significant increase in positive mood (p<0,05) with small effect size, d=0,30	Unclear risk: 3 domains Low risk: 3 domains
Patients with chronic diseases				
Ruggeiero, 2013	Internet-based Health Promotion Program (Stage of change, self-efficacy)	Patients with chronic diseases using rehabilitation, n=142	Not significant effect on quality of life, p=0,70, d=0,20	Unclear risk: 3 domains Low risk: 3 domains
Baker et al., 2011	Comprehensive Health Enhancement and Support System (CBT or mindfulness)	Women with breast cancer, n=450	No effect on coping skills	Unclear risk: 3 domains Low risk: 3 domains
Population with symptoms of depression				
Warmerdam et al., 2010	Online CBT or Problem Solving Therapy (PST)	Population with symptoms of depression,	Improvement in problem solving skills: Increase of positive problem	Unknown risk: 3 domains Low risk: 3 domains

References	Name of Intervention	Population, sample size	Results, effect size	Risk of bias assessment
		n=263	orientation d=0,31, d=0,73	
Proundfoot et al., 2013	Mobile Phone and Web program (CBT, Interpersonal Psychotherapy, Problem solving Therapy, Positive Psychology	Healthy population with mild to moderate depression, anxiety and stress, n=720	Significant decrease of symptoms of stress, small effect size, d=0,35, p<0,005.	Unknown risk: 2 domains; Low risk: 3 domains High risk: 1 (baseline imbalance)

3.5.4 Interventions based on other approaches

Five digital interventions were based on other approaches (Bennet et al., 2011, Grassi et al., 2009, Kajiyama et al., 2013, Seear and Vella-Brodrick, 2013, Williams et al., 2010). All these studies were conducted in a healthy population (see table 16). Other approaches were identified as being: relaxation training, strategies for increasing pleasant activities, cognitive restructuring, cognitive appraisal theory, positive psychology, self-efficacy, sense of presence and previous knowledge in the field. These digital interventions showed significant reduction in stress (Kajiyama et al, 2013, Williams et al., 2010) a decrease in distress (Bennet et al., 2011), an improvement of mental well-being (Seear & Vella-Brodrick, 2013), and a decrease in relaxation level (Grassi et al, 2009). The effect sizes were small to large in the interventions. The overall risk of bias is low, unknown and moderate in these studies.

Table 16 Digital Interventions based on Other Approaches

References	Name of Intervention	Population, sample size	Results, effect size	Risk of bias assessment
Healthy Population				
Kajiyama et al., 2013	Internet-based program (relaxation training, increasing pleasant activities, cognitive restructuring, communication skills)	Caregivers, n=150	Significant decrease of stress, small effect size p=0,017, d=0,46	Unknown risk: 4 domains Low risk: 2 domains
Williams et al., 2010 NRS	Web-enhanced behavioral self-management program for stress (based on cognitive appraisal theory)	Military personnel, n=142	Significant decrease of stress (p=0,004) the effect size is not reported and cannot be calculated	Unknown risk: 1 domain, Low risk: 2 domains
Bennet et al., 2011	Web-based Health and Leadership development program (based on previous knowledge on the field)	Managers, n=145	Significant decrease of distress, large effect size, d=-2,62, p=0,01	Unknown risk: 3 domains Low risk: 3 domains

References	Name of Intervention	Population, sample size	Results, effect size	Risk of bias assessment
Seear and Vella-Brodrick, 2013	Online Positive Psychology Interventions	Healthy population, n=211	Improvement of mental well-being, d=0,49	Low risk: 4 domains High risk: 1 domain Unclear risk: 1
Grassi et al., 2009	Mobile Narratives for Reducing Stress (self-efficacy, sense of presence)	Students, n=90	Significant increase in relaxation level, p<0,001, d=1,32	Unknown risk: 4 domains Low risk: 2 domains

4 Discussion

4.1 Summary of Evidence

Thirty-eight digital interventions were found in randomized and non-randomized studies that evaluate the effects of stress management interventions in adult population worldwide. These studies were published during the last five years. All studies were conducted in different countries all over the world, including countries of Northern America, European and Asian countries. With regard to underlying concepts all digital stress management interventions were divided into four categories: digital cognitive behavioural therapy interventions (1), online mindfulness-based interventions (2), interventions based on several approaches (3) and interventions based on other frameworks (4). The participants of digital stress management programs were healthy adults, patients with chronic diseases and population with symptoms of depression.

The digital stress management interventions based on CBT alone are not sufficient for effective reduction of stress in healthy population. Mindfulness based digital interventions are more likely to be effective in managing stress in healthy adult population. Digital interventions based on combination of strategies are effective in reducing stress in healthy adults and in population with symptoms of depression. Interventions that are based on other strategies are showing also promising results in management of stress. The risk of bias in included studies is medium and low.

4.2 Study Findings in Context

No similar previous reviews on general digital stress management interventions were found to compare those results with the current review. However, there are other reviews that assess the effects of separate conventional stress management programs in different population.

This review shows that digital interventions which are grounded on CBT framework alone are not effective in reducing the stress, but they can lead to improvement of well being in healthy

adults. The effects of these interventions on the coping with chronic diseases and depression are inconsistent. CBT-based digital intervention showed significant reduction of stress in students with depression symptoms (Day et al., 2012) but non-significant reduction of stress in general population (Ruwaard et al., 2009). No previous reviews are found to evaluate the effect of CBT on stress in healthy adults.

The result of other review that is based on 16 studies indicated that internet and computer based CBT are effective interventions for treatment of depressive disorders (Sikorski et al, 2010). Internet based CBT is effective in other health conditions, such as pain, headache, tinnitus (Cuijpers et al., 2008), depression, anxiety and irritable bowel syndrome (Hedman et al., 2012).

Majority of the studies included in this review show that online mindfulness-based stress management programs are effective in reducing the stress and increasing mindfulness in healthy adults. Two studies reported not significant reduction of stress measures (Gluck & Maercker, 2012, Wolever et al, 2012). Both of these studies have relatively small sample size which could be the reason of statistical non-significance. Reid (2013) reported significant increase in mindfulness after online mindfulness program, which could decrease the level of stress indirectly because of negative association between mindfulness and stress (Quintana & Rivera, 2012).

There is no review that explores the effects of online mindfulness-based stress reduction, but few reviews exist on effectiveness of conventional programs. These conventional mindfulness-based stress reduction programs shown to have been effective in coping with work-related stress in nurses (Smith, 2014), for individuals who cope with clinical and non-clinical problems (Grossman et al., 2004) and coping with stress, anxiety and depression (de Vibe et al., 2012).

Digital stress management interventions based on several frameworks and interventions based on other frameworks shown to be effective in this review. There is no review on effectiveness of digital stress management interventions that based on several strategies. Among other reviews there is a review on effects of positive psychology. That review shows that positive psychology interventions have potential to improve mental well-being and quality of life (Casellas-Grau & Vives, 2014).

4.3 Discussion of the Methods

Systematic literature review approach was chosen to answer the research question about available digital stress management interventions that are shown to be effective in literature. The reseach question and the inclusion criteria were developed on the basis of PICO which is considered as good practice for developing the research questions in systematic reviews. For the structure and

reporting of the review PRISMA guidelines were used. PRISMA guidelines consist of evidence-based minimum set of items for reporting systematic review. Nowadays PRISMA is recommended guidline for conducting and reporting good quality systematic review.

The search strategies of the review were comprehensive and covered the key words, terms and their variations. With related search terms advanced search was done in four major electronic databases which to include most of the published titles of articles.

Cochrane risk of bias assessment tool was used for the evaluation of methodological quality of the randomized studies. This tool was developed by a group of researchers and has been used in assessment of bias in randomized studies in systematic reviews conducted by Cochrane collaboration. The validity of this tool is limited because it is difficult to know the true estimate of bias in the studies (Higgins, 2011). The domain 'blinding' in the tool was the one with the highest rate of unclear and negative answers in randomized studies. It needs to be mentioned that to apply blinding is challenging and sometimes impossible in the lifestyle interventions. The same tool was modified and used for the assessment of bias in non-randomized studies. The domains that are related only to non-randomized studies were chosen. As the tool was developed specifically for randomized studies it has limited scope to assess other possible bias in non-randomized studies.

4.4 Features of Effective Interventions

The effective digital stress management programs are diverse, as they used different features and elements for intervention. For this reason generalisation of results is challenging. Two examples of effective interventions from online mindfulness-based intervention and digital interventions using combined strategies is presented further.

The first intervention is 'Learning Mindfulness Online', was delivered on University's virtual learning platform among students (Cavanagh et al., 2013). The online program consisted of information about mindfulness and mindfulness meditation. Participant got access to programe via login during two weeks. The program had five sections with the following titles: 'What is Mindfulness?', 'Daily Mindfulness Practice', 'Daily Practice FAQ', 'My Daily Jounal' and 'Study Information, Help and Assistance'. The program's sections provided in form of text and video about mindfulness, guided mindfulness meditations, expected experiences, place for reflection on mindfulness experiences, information about the study and emails of researches. Mindfulness practice comprised of 10 minute audio track guded meditation for invitation to bring a non-judgemental awareness to body sensation, breath, thoughts and feelings. Participants also received email reminders each three days which provided them with hints and tips for mindfulness practice (Cavanagh et al., 2013).

The second intervention is 'Self-guided Multimedia Stress Management and Resilience Training', shorly 'SMART-OP', wich is computer-based program conducted among graduate students (Rose et al., 2013). SMART-OP consisted of six sessions presented in form of animations, interactive games, and video presentations. Each session contains educational aspect of stress management and at least one of the activities on feeling, thoughts, and action domains. Feeling activeities were focused breathing, guided progressive muscle relaxation and 'Biofeedback Challenge' (computer racecare game where participants accelerate their racecar by breathing smoothly). Thoughts activities (icluding Compartmentalization, Weighing Evidence) taught cognitive flexibility and realistic thinking in the context of the stressful events. Actions activities taught assertive communication, problem solving and writing as a journaling activity. Participants also received homework assignments and weekly email reminders for practicing the skills and upcomming appointments.

4.5 Strength and Limitations

This review has several strengths and limitations which are related to the review's exclusion criteria and process of conduct.

4.5.1 Strength

The strengths of this review are: novelty, comprehensive search strategies and wide scope of review, which covers most of the available studies on stress management strategies.

First, the review is novel. To the author's knowledge this is the only and the most recent systematic review on digital stress management interventions with the focus on healthy population, taking into account population with chronic diseases and depression.

Second, this review used comprehensive search strategies. Comprehensive search strategies were used with several sets of search terms and addvanced search was applied in four main databases: MEDLINE, Embase, CENTRAL, and PsycINFO.

Third, this review has wide scope of included strategies and studies. The review does not focus only on one framework or stress management strategy, but include all available psychotherapeutical approaches, for instance CBT, Mindfulness and other frameworks. All in all thirty-eight studies on effectiveness of different digital stress management interventions were included into this review.

4.5.2 Limitations

The limitations of the review are: language and time limitations, missing full-text articles and

short-term orientation.

The review related limitations are the time and language limitations. This review includes only studies published in English and German languages. The language limitation may have introduced publication bias and overestimation of effective interventions. The time limitation is concerning studies published in the last five years. The five-year time limit was decided on because of the rapid development of technologies and online interventions. It was expected that the studies using new technologies would be published in the last five years.

Missing full-text articles is another limitation. From seventy-one articles for full text reading ten studies were excluded for the reason of unavailability of full text versions. The corresponding authors of the articles were contacted. In most of the cases the full-text of the articles were not available as they were only the title of abstracts or presentations for the conference. In other cases the publication of full text version were in the process of publication.

This review is taking into account only the short-term benefits and does not focus on the long-term effects of the interventions. The outcomes measures directly after (post) intervention were considered because most of the studies reported only post interventions effects. The long-term effects (follow-up) were reported only in few studies.

5 Conclusions

From all studies included into this review and synthesised it can be concluded that digital stress management intervention based solely on the principles of CBT are not likely to be effective in reducing stress, but can improve mental-well-being in healthy adults. Mindfulness-based digital interventions have the potential to be effective as separate strategy in management of stress in healthy adults. Interventions based on several frameworks and other frameworks are likely to be effective in reducing stress and improving mental health in healthy adults and population with symptoms of depression.

5.1 Recommendations for Practice and Future Research

From the results of current review for the practice it could be mentioned that in development of online tool for stress management using the only CBT framework would not be sufficient. Online stress management tool based on mindfulness principles is likely to be effective in healthy population. Use of several approaches and other approaches might be effective as well. As in the most of the combined digital stress management strategies one component of programme is CBT, it

would be recommended that if the tool is developed on the basis of combined frameworks one component is CBT. The following combinations are possible: CBT and mindfulness (1), CBT and positive psychology (2), Mindfulness and positive psychology (3). The most preferable combination is the combination of CBT and mindfulness frameworks.

For the future research it would be recommended that studies should assess not only the short-term, but also the long-term effects of interventions. It would be useful to know the long-term effectiveness of digital stress management interventions in future systematic reviews. As this review summarized the results only in qualitative manner it would be suggested in future to conduct meta-analysis on this review. In future more high quality studies that assess the effectiveness of digital CBT interventions on stress in healthy population are needed.

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8 Appendix

8.1 Full Electronic Search Strategy in four Computerized Databases

1. MEDLINE

Access through: PubMed

Date: 25.01.2014

Last day of search 31.01.2014.

Search Terms: ((((((((((stress management) OR "stress inoculation") OR relaxation) OR cognitive-behavioral) OR "cognitive behavior") OR CBT) OR psychotherapy) OR mindful*)) AND (((((((intervention) OR tool) OR program) OR programme) OR training) OR therapy) OR psychoeducation) OR "psycho education")) AND (((((((digital) OR "web based") OR "internet based") OR online) OR mobile) OR ehealth) OR "e health")

Limits: Filters activated: published in the last 5 years.

Results: 1571 items.

2. Embase 1974 to 2014 January 31, 3.

3. PsycINFO 1806 to January Week 3 2014

Date: 2014-01-31

Access to database: OvidSP (Version: OvidSP_UI03.11.00.120, SourceID 59447)

Results: 1464

Table 17 Full Search History in Embase and PsycINFO Databases

#	Searches	Results	Search Type
1	stress management.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	11153	Advanced
2	"stress inoculation".mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	690	Advanced
3	relaxation.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	127064	Advanced
4	cognitive-behavioral.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	35485	Advanced
5	cognitive behavior.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	16937	Advanced
6	CBT.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	14985	Advanced

#	Searches	Results	Search Type
7	psychotherapy.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	201484	Advanced
8	mindful*.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	9891	Advanced
9	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8	376592	Advanced
10	intervention.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	641007	Advanced
11	tool.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	415200	Advanced
12	program.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	796523	Advanced
13	programme.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	102935	Advanced
14	training.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	574760	Advanced
15	therapy.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	3637917	Advanced
16	psychoeducation.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	8827	Advanced
17	psycho education.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	967	Advanced
18	10 or 11 or 12 or 13 or 14 or 15 or 16 or 17	5489984	Advanced
19	digital.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	117908	Advanced
20	web based.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	26545	Advanced
21	internet based.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	8832	Advanced
22	online.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	94096	Advanced
23	mobile.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	88233	Advanced
24	ehealth.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	1149	Advanced
25	e health.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, dv, kw, tc, id, tm]	1798	Advanced
26	19 or 20 or 21 or 22 or 23 or 24 or 25	322878	Advanced
27	9 and 18 and 26 Embase (1412) PsycINFO (1217)	2629	Advanced
28	limit 27 to yr="2009 -Current"	1759	Advanced
29	remove duplicates from 28 Embase (950) PsycINFO (514)	1464	Advanced

4. **CENTRAL** - Cochrane Central Register of Controlled Trials: Issue 1 of 12, January 2014,

web:http://onlinelibrary.wiley.com/cochranelibrary/search/advance

Access through: The Cochrane Library.

Date Run: 30/01/14.

Table 18 Full Search History in CENTRAL database

ID	Search Hits	Results
#1	stress management	1738
#2	stress inoculation	141
#3	relaxation	6353
#4	cognitive behavioral	5353
#5	„cognitive behavior“	727
#6	CBT	2324
#7	psychotherapy	7904
#8	mindful*	709
#9	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8	19562
#10	intervention	104490
#11	tool	14253
#12	program	54090
#13	programme	54090
#14	training	35049
#15	therapy	351769
#16	psychoeducation	569
#17	„psycho education“	204
#18	#10 or #11 or #12 or #13 or #14 or #15 or #16 or #17	431217
#19	digital	3976
#20	„web based“	1760
#21	„internet based“	990
#22	online	4482
#23	mobile	1621
#24	ehealth	73
#25	„e health“	233
#26	#19 or #20 or #21 or #22 or #23 or #24 or #25	11765
#27	#9 and #18 and #26	1271
#28	#27 in Trials	394
#29	#28 from 2009 to 2014	277

8.2 List of Included Articles for Full-text Assessment

1. Evaluation of a seven-week web-based happiness training to improve psychological well-being, reduce stress, and enhancemindfulness and flourishing: a randomized controlled occupational health study. Feicht T, Wittmann M, Jose G, Mock A, von Hirschhausen E, Esch T. Evid Based Complement Alternat Med. 2013;2013:676953. doi: 10.1155/2013/676953. Epub 2013 Dec 31. PMID:24489588

2. Mindfulness online: an evaluation of the feasibility of a web-based mindfulness course for stress, anxiety and depression. Krusche A, Cyhlarova E, Williams JM. BMJ Open. 2013 Nov 29;3(11):e003498. doi: 10.1136/bmjopen-2013-003498. PMID: 24293203

3. Abbreviated mindfulness intervention for job satisfaction, quality of life, and compassion in primary care clinicians: a pilot study. Fortney L, Luchterhand C, Zakletskaia L, Zgierska A, Rakel D. Ann Fam Med. 2013 Sep-Oct;11(5):412-20. doi: 10.1370/afm.1511. PMID: 24019272

4. Self-help stress management training through mobile phones: an experience with oncology nurses. Villani D, Grassi A, Cognetta C, Toniolo D, Cipresso P, Riva G. Psychol Serv. 2013 Aug;10(3):315-22. doi: 10.1037/a0026459. Epub 2011 Dec 12. PMID:23937091

5. A randomised controlled trial of a brief online mindfulness-based intervention.

Cavanagh K, Strauss C, Cicconi F, Griffiths N, Wyper A, Jones F. Behav Res Ther. 2013 Sep;51(9):573-8. doi: 10.1016/j.brat.2013.06.003. Epub 2013 Jun 28. PMID: 23872699

6. RAHelp: an online intervention for individuals with rheumatoid arthritis. Shigaki CL, Smarr KL, Siva C, Ge B, Musser D, Johnson R. Arthritis Care Res (Hoboken). 2013 Oct;65(10):1573-81. doi: 10.1002/acr.22042. PMID: 23666599

7. Internet-based guided self-help for university students with anxiety, depression and stress: a randomized controlled clinical trialBehav Res Ther. 2013 Jul;51(7):344-51. doi: 10.1016/j.brat.2013.03.003. Epub 2013 Mar 28. Day V, McGrath PJ, Wojtowicz M. PMID: 23639300

8. Feasibility of an online mindfulness program for stress management--a randomized, controlled trial. Morledge TJ, Allexandre D, Fox E, Fu AZ, Higashi MK, Kruzikas DT, Pham SV, Reese PR. Ann Behav Med. 2013 Oct;46(2):137-48. doi: 10.1007/s12160-013-9490-x. PMID: 23632913

9. Feasibility of a personal health technology-based psychological intervention for men with stress and mood problems: randomized controlled pilot trial. Lappalainen P, Kaipainen K, Lappalainen R, Hoffrén H, Myllymäki T, Kinnunen ML, Mattila E, Happonen AP, Rusko H, Korhonen I. JMIR Res Protoc. 2013 Jan 9;2(1):e1. doi: 10.2196/resprot.2389. PMID: 23611946

10. Multilevel growth curve analyses of treatment effects of a Web-based intervention for stress reduction: randomized controlled trial. Drozd F, Raeder S, Kraft P, Bjørkli CA. J Med Internet Res. 2013 Apr 22;15(4):e84. doi: 10.2196/jmir.2570. PMID: 23607962

11. Internet-delivered cognitive behavioural therapy for adults with mild to moderate depression and high cardiovascular disease risks: a randomised attention-controlled trial.Glozier N, Christensen H, Naismith S, Cockayne N, Donkin L, Neal B, Mackinnon A, Hickie I.PLoS One. 2013;8(3):e59139. doi: 10.1371/journal.pone.0059139. Epub 2013 Mar 26. PMID: 23555624

12.Teaching mindfulness to occupational therapy students: pilot evaluation of an online curriculum. Reid DT.Can J Occup Ther. 2013 Feb;80(1):42-8.PMID: 23550496

13 Web-based guided self-help for employees with depressive symptoms (Happy@Work): design of a randomized controlled trial. Geraedts AS, Kleiboer AM, Wiezer NM, van Mechelen W, Cuijpers P. BMC Psychiatry. 2013 Feb 18;13:61. doi: 10.1186/1471-244X-13-61. PMID: 23418886

14. Effectiveness of a web-based cognitive-behavioral tool to improve mental well-being in the general population: randomized controlled trial. Powell J, Hamborg T, Stallard N, Burls A, McSorley J, Bennett K, Griffiths KM, Christensen H. J Med Internet Res. 2012 Dec 31;15(1):e2. doi: 10.2196/jmir.2240. PMID:23302475

15. A randomized controlled trial of a self-guided, multimedia, stress management and resilience training program. Rose RD, Buckey JC Jr, Zbozinek TD, Motivala SJ, Glenn DE, Cartreine JA, Craske MG. Behav Res Ther. 2013 Feb;51(2):106-12. doi: 10.1016/j.brat.2012.11.003. Epub 2012 Nov 21. PMID: 23262118

16. An online stress management workbook for breast cancer. Carpenter KM, Stoner SA, Schmitz K, McGregor BA, Doorenbos AZ. J Behav Med. 2012 Dec 2. PMID: 23212928

17. Mindfulness training online for stress reduction, a global measure. Quintana M, Rivera O. Stud Health Technol Inform. 2012;181:143-8. PMID: 22954845

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Year of Publication 2012 (451, 55.) Link to the Ovid Full Text or citation:http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emed10&AN=70794952

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Figure 2 Table of Exclusion (an example of spreadsheet of search in Medline)

PMID	Not stressmanagement intervention	Not internet delivery	Target group not „healthy adults“	Outcome not psychological	Study design: not trail	Decision from title	Decision from Abstract
244911199			1			1	
24491195	1					1	
24497236	1					1	
24496173	1					1	
24491071	1					1	
24491034			1			1	
24487344			1			1	
24486914	1					1	
24485063	1					1	
24484373			1			1	
24480783					1	1	
24477627	1					1	
24472876			1			1	
24472527			1			1	
24472032	1					1	
24462528	1					1	
24461370			1			1	
24428084	1					1	
24427450	1					1	
24413342			1				1
24411112			1			1	
24411111			1			1	
24411110			1			1	
24408143	1					1	
24404239	1					1	

8.3 Tables of 'Risk of bias Assessment' for Randomized Trials

Table 19 Risk of Bias Assessment for Randomize Trials - Feicht et al, 2013

Reference: Feicht et al, 2013		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes[76]	Quote: “Randomization procedure was performed by drawing piece of paper (in lots)...”
Allocation concealment?	Yes	Quote: “...drawing piece of paper (in lots) from a bag (an untransparent cloth bag). All lots had the same look and were put into the bag and mixed thoroughly by one of the authors.”
Blinding?	Yes	Quote: “ ...The bag was provided by author and non involved person was drawing the lots (blinded). To avoid direct communication between IG and CG we differentiated between participants cites... To prevent a direct influence between IG and CG we stratified four groups, so that participants in one office were in the same office were in the same and not in competing groups”.

[76] “Yes” indicates the Low risk of bias

Incomplete outcome data addressed?	No[77]	Quote: "... We analysed the data following adherence-to-protocol: those participants who completed all test were evaluated. The total drop-out rate of 31,3%. Of these 46 drop-outs (IG:31, CG:15)". Comment: the rate of drop out is not proportional in IG and CG: two times more in IG. The reasons of drop-out is given, but not distinguished between groups.
Free of selective reporting?	Yes	Comment: All outcomes which were described in methods are reported in the result.
Free of other bias?	Yes	Comment: appears to be free of other sources of bias

Table 20 Risk of Bias Assessment for Randomize Trials – Vilani et al., 2011

Study: Vilani et al., 2011		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear[78]	Quote: "Participants were randomly allocated into two groups". Comment: no method of randomization is reported.
Allocation concealment?	Unclear	Comment: no information
Blinding?	Unclear	Comment: no information
Incomplete outcome data addressed?	Unclear	Comment: no information
Free of selective reporting?	No	Comment: the outcome measure of perceived stress (Mesure du Stress Psychologique) is described in the methods but not reported in the results of paper.
Free of other bias?	Yes	Comment: appears to be free of other sources of bias

Table 21 Risk of Bias Assessment for Randomize Trials – Cavanagh et al., 2013

Study: Cavanagh et al., 2013		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes	Quote: "...participants were randomized, using a computer generated blocked random allocation method..."
Allocation concealment?	Unclear	Comment: no information is provided
Blinding?	Unclear	Comment: no information is provided
Incomplete outcome data addressed?	Yes	Comment: number of withdrawal is not proportional; two times more in intervention group (n=31 to n=15). Quote: "No significant difference between study completers and those who dropped out were found with respect to... baseline scores on measure of mindfulness, stress, and depression/anxiety". "Four participants were excluded from the study due to either not having access to the University's virtual learning platform..." Comment: the reasons of drop-outs are not explained. The reasons of exclusions are explained generally. Intention to treat BOCF imputation is used for drop-outs.
Free of selective	Yes	All predefined measures are reported fully, with significance levels.

[77] "No" indicates High risk of bias
[78] The answer "Unclear" - Unknown risk of bias

reporting?		
Free of other bias?	Yes	Comment: appears to be free of other sources of bias

Table 22 Risk of Bias Assessment for Randomize Trials – Shigaki et al, 2013

Study: Shigaki et al., 2013		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: "Participants meeting all inclusion criteria... randomized into either the active treatment group or a waiting-list control group". Comment: no method of allocation is described.
Allocation concealment?	Unclear	Quote: "... the web site was not open to the public; only affiliated health professional, consented participants and technical support staff had access to the site". Comment: it is not clear how the information about allocation was hidden from the participants.
Blinding?	Unclear	Quote: "Each member created a structured profile and selected an avatar, which are then made available to other members in the RAHelp Village are"
Incomplete outcome data addressed?	Unclear	Quote: "... participants who dropped out had reported poorer AIMS2 physical functioning". Comment: the reasons of exclusions are described in both IG and CG. The number of drop outs is given, no reasons explained for the groups. The number of drop outs is not balanced b/w IG and CG (n=9 to n=3).
Free of selective reporting?	Yes	Comment: the results of all predefined outcomes are with the significance level.
Free of other bias?	Yes	Comment: appear to be free of other biases.

Table 23 Risk of Bias Assessment for Randomize Trials –Day et al., 2012

Study: Day et al, 2012		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes	Quote: "A computerized random permuted block sequence generator called Random Allocation Software... was used to generate the allocation sequence for the study".
Allocation concealment?	Yes	Quote: "The allocation placement was securely concealed in a double-envelop system".
Blinding?	Yes	Quote: "Study investigators, including primary program coach, reminded blind to the randomization of participants".
Incomplete outcome data addressed?	Yes	Comment: drop-outs are more in IG, (IG-9, CG-4), no reasons explained, but all participants are included in analysis (Intention-to-treat analysis).
Free of selective reporting?	Yes	Comment: described outcome measures are reported.
Free of other bias?	No	Quote: "... the delayed-access group endorsed higher baseline stress scores compared to immediate-access group (t(64)=-2,365, p=0,021)."

		Comment: imbalance in baseline measurement can cause a bias in outcome measure results.

Table 24 Risk of Bias Assessment for Randomize Trials – Morledge et al., 2013

Study: Morledge et al., 2013		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes	Quote: "...randomized, parallel, controlled trial... Participants...were automatically randomized (using computer-generated list with a block size of three)".
Allocation concealment?	Unclear	Comment: not enough information
Blinding?	Unclear	Comment: not enough information
Incomplete outcome data addressed?	Unclear	Comment: In the flow chart of participants the percentage of drop-out at post intervention is given which is showing high rates in IGs (51% and 56%), not clear how the missing data was addressed.
Free of selective reporting?	Yes	Comment: All defined outcome measures are reported with significance level.
Free of other bias?	Yes	Comment: Appears to be free from other biases.

Table 25 Risk of Bias Assessment for Randomize Trials –Drozd et al., 2013

Study: Drozd et al., 2013		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes	Quote: "The study was a randomized controlled trial... Every participant had an equal probability of being assigned to either the LS or control group. The allocation ratio was set to 1:1 and a series of zeros and ones were generated for each participant using a random integer generator".
Allocation concealment?	Yes	Quote: "Because recruitment was carried out through a private and social online network and participants were potentially identifiable through their email addresses, another research member on the team conducted the randomization procedure. This was done to avoid experimenter biases interfering with the randomization. As an extra precaution, email addresses were concealed during randomization."
Blinding?	Unclear	Comment: Not enough information to judge.
Incomplete outcome data addressed?	Yes	Quote: ".... selective attrition was assessed on the basis of study drop-outs and stayers at baseline. There were no sign. differences in variances... selective attrition did not affect the mean or variances". Comment: drop-outs percentage is higher in IG, the reasons are not explained, all data from participants allocated to IG and CG were analysed.
Free of selective reporting?	Yes	Comment: Pre-defined outcome measures are reported.

Free of other bias?	Yes	Comment: appear to be free of other biases.

Table 26 Risk of Bias Assessment for Randomize Trials –Powel et al., 2013

Study: Powell et al., 2013		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes	Quote: "...participants were automatically randomized... Randomization was in a 1:1 ratio predefined automated computerized block randomization with block size 2"
Allocation concealment?	Yes	Quote: "The automated computerized system was set up by technical staff not involved in the day-to-day management of the study. Allocation was concealed from the researcher".
Blinding?	No	Quote: "... participants were not blind to whether or not researchers... To prevent contamination in the control arm, we did not use the name "MoodGYM" in the study documentation".
Incomplete outcome data addressed?	Yes	Quote: "Attrition was 73,5% in the intervention arm and 29,9% in the control arm. No relationship between baseline characteristics and likelihood of withdrawal could be established. Missing values were imputed using the last observation carried forward (LOCF)".
Free of selective reporting?	Yes	Comment: All previously described outcome measures were reported.
Free of other bias?	Yes	Comment: Appears to be free form other biases.

Table 27 Risk of Bias Assessment for Randomize Trials – Rose et al., 2013

Study: Rose et al., 2013		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: "...participants were randomized to either SMART-OP or AC..." Comment: Method of allocation is not described.
Allocation concealment?	Unclear	Comment: No information about concealment.
Blinding?	Unclear	Comment: No information about blinding.
Incomplete outcome data addressed?	Yes	Comment: Proportion of withdrawal is relatively balanced between IG and CG (4 and 3), the reasons of withdrawal are not given. Withdrawal participant are less likely to bias the outcome measures. Quote: "Analysis was based on study completer".
Free of selective reporting?	Yes	Comment: pre-specified outcome measures are reported.
Free of other bias?	Yes	Comment: appears to be free from other biases.

Table 28 Risk of Bias Assessment for Randomize Trials – Carpenter et al., 2012

Study: Carpenter et al., 2012		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes	Quote: "...participants were randomized into the intervention or wait-list control condition according to a computerized random number table...".
Allocation concealment?	Unclear	Comment: No information about allocation concealment is reported.
Blinding?	No	Quote: "... the research assistant was not blind to condition assignment"
Incomplete outcome data addressed?	No	Comment: From the participants flow-chart there is high number of drop-outs in IG than CG (15 to 2), reasons of drop-outs are not given. Quote: "...who did not complete the 10 week assessment were more likely to be in the intervention group than the control group... no sign. differences between 10 week completers and non-completers with regard to any of the demographic, background or baseline outcome variables... we did not impute data".
Free of selective reporting?	Yes	Comment: All pre-defined outcome measures are reported.
Free of other bias?	Yes	Comment: Appears to be free form other biases.

Table 29 Risk of Bias Assessment for Randomize Trials – Radhu et al., 2012

Study: Radhu et al., 2012		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: "Participants were randomly assigned to 12-week Web-based CBT intervention and wait-list condition..." Comment: No method of allocation is reported.
Allocation concealment?	Unclear	Quote: "Students were informed that there was no a priori guarantee regarding group assignment". Comment: Not enough information to make judgment.
Blinding?	Unclear	Comment: No information about blinding reported.
Incomplete outcome data addressed?	Yes	Comment: the drop-out rate is relatively balanced b/w groups (IG, n=21,4%,- reasons: personal, no response CG, n=16,7% - reasons: lack of time, no response). From the flow-chart of participants it is obvious that only completers were analyzed. Missing values are less likely to bias the outcome measures.
Free of selective reporting?	Yes	Comment: all related outcome measures are reported.
Free of other bias?	No	Quote: "There was a significant difference at baseline between the wait-list control group and the treatment group on the PSS,... with the wait-list control group scoring significantly higher on the PSS than the CBT intervention." Comment: baseline imbalance in the measurement of stress may

		cause a bias.

Table 30 Risk of Bias Assessment for Randomize Trials – David et al., 2012

Study: David et al., 2012		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes	Quote: "...subjects filled out a pre-questionnaire and were randomly assigned … (computer-generated ratio 1:1)"
Allocation concealment?	Unclear	Comment: no information is provided.
Blinding?	Unclear	Comment: no information about blinding is reported.
Incomplete outcome data addressed?	Yes	Comment: from the participants flow-chart is obvious that number of drop outs are higher in IG (43,8% and 27,1% in CG, participants that did not complete post questionnaire). Seven participants were excluded due to late submission of questionnaire. Reasons of drop-outs are not given. Analysis made separately for completers. In addition imputation (LOCF) was applied, which is showing similar results with main analysis with the smaller effect size (d=0,13 compared to d=0,21, FS in intervention group).
Free of selective reporting?	Yes	Comment: All pre-specified outcome measures are reported.
Free of other bias?	No	Quote: "Patients in the intervention group were significantly more likely to be receiving chemotherapy…" Comment: There is imbalance in baseline measurement of receiving chemotherapy.

Table 31 Risk of Bias Assessment for Randomize Trials – Wolever et al., 2012

Study: Wolever et al., 2012.		
Domain	**Author's judgement**	**Support for judgement**
Adequate sequence generation?	Unclear	Quote:"...participants were randomized into one of four conditions... " Comment: Method of allocation is not described.
Allocation concealment?	Unclear	Comment: not enough information.
Blinding?	Unclear	Comment: no information about blinding.
Incomplete outcome data addressed?	Yes	Comment: drop-out number is not balanced between groups; higher in CG, (IG-, CG n=12). The reasons of drop-outs are not given. Quote: "... (LOCF) was used to handle missing data throughout... ITT and per protocol analyses were then compared to confirm findings".
Free of selective reporting?	Yes	Comment: All the results of outcome measures described in method part are reported.
Free of other bias?	Yes	Comment: Appear to be free from other biases.

Table 32 Risk of Bias Assessment for Randomize Trials – Arpin-Cribbie et al., 2012

Reference: Arpin-Cribbie et al., 2012		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes	Quote: "Individuals were randomly assigned to one of the three study groups using a random number table"
Allocation concealment?	Yes	Quote: "… it was not possible for the researcher to identify to which group a given participant was assigned based on the questionnaire package they were asked to complete".
Blinding?	Unclear	Comment: There is not enough information about blinding.
Incomplete outcome data addressed?	Yes	Comment: The number of drop-outs is relatively balanced between groups (IG1-0%, IG2-10%, CG-12%). Participants were excluded if they did not fill in the post-test, other reasons of drop outs are not given. Quote: "Intent-to-treat analyses (using LOCF) were also conducted for all tests of the treatment effect on each of the psychological distress outcome variables. The results were consistent with those reported for the current sample that excluded participants lost to follow-up…"
Free of selective reporting?	Yes	Comment: All outcomes that were pre-specified are described.
Free of other bias?	Yes	Comment: Appears to be free from other biases.

Table 33 Risk of Bias Assessment for Randomize Trials – Bennett et al., 2011

Reference: Bennett et al., 2011		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: "... managers received randomized group assignment". Comment: Method of allocation is not mentioned.
Allocation concealment?	Unclear	Comment: Not enough information to make judgement.
Blinding?	Unclear	Comment: There is not enough information about blinding.
Incomplete outcome data addressed?	Yes	Comment: The number of non-completers is higher in intervention group: IG-n=25, CG-n=11. Reasons of exclusions are not given. Quote: "This analysis... employed maximum likelihood estimation and included participants with incomplete data on outcome measures."
Free of selective reporting?	Yes	Comment: All outcomes that were pre-specified are described.
Free of other bias?	Yes	Comment: Appears to be free from other biases.

Table 34 Risk of Bias Assessment for Randomize Trials – Wiegand et al., 2010

Reference: Wiegand et al., 2010		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: "... subjects were enrolled and randomized... Eligible subjects were randomized, ..." Comment: Method of allocation is not mentioned.
Allocation concealment?	Unclear	Comment: Not enough information to make decision.
Blinding?	No	Quote: "Eligible subjects were randomized, in an unblinded fashion..."
Incomplete outcome data addressed?	No	Quote: "Cases with missing data were case-wise excluded from analyses".
Free of selective reporting?	Yes	Comment: All pre-specified outcome measures were reported.
Free of other bias?	Yes	Comment: Appears to be free from other biases.

Table 35 Risk of Bias Assessment for Randomize Trials – van der Houwen, 2010

Reference: van der Houwen, 2010		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: "... participants were automatically randomly assigned to the intervention or the control condition". Comment: No method of allocation is reported
Allocation concealment?	Unclear	Comment: Not enough information to make judgment.
Blinding?	Unclear	Comment: Not enough information to make judgment.
Incomplete outcome data addressed?	Yes	Quote: "... completers were older, had higher level of education, experienced less grief and were more likely to be part of the control condition" ...with regard to dropout, Little … has shown that when the panel attrition follows a pattern defined as missing -at-random, multilevel analysis leads to unbiased estimate. Multilevel modelling was implemented through MLWiN, Version 2.0"
Free of selective reporting?	Yes	Comment: all pre-specified measures were reported.
Free of other bias?	Yes	Comment: appears to be free form other biases

Table 36 Risk of Bias Assessment for Randomize Trials – Kajiyama et al, 2013

Reference: Kajiyama et al, 2013		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: "CGs were randomly assigned to the ICC condition or the EOC condition".

		Comment: Method of allocation is not described.
Allocation concealment?	Unclear	Comment: not enough information.
Blinding?	Unclear	Comment: not enough information.
Incomplete outcome data addressed?	Unclear	Quote: "... 31,3 were considered drop-outs. Of these 15% withdrew because of time commitments or lack of interest, 59% did not complete post-questionnaire even after several reminders, and 11% -excluded because of sign. missing data". Additionally, in 15% cases PWD had died during the course of study. Comment: there is high rate of dropouts, but method of addressing missing data is not reported.
Free of selective reporting?	Yes	Comment: all pre-specified outcome measures are reported.
Free of other bias?	Yes	Comment: appears to be free from other biases.

Table 37 Risk of Bias Assessment for Randomize Trials – Gluck et al, 2011

Reference: Gluck et al, 2011		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	No	Quote: "single case randomization with previously created random number list (assignment to even vs. uneven numbers)". Comment: method of allocation has non-random component.
Allocation concealment?	No	Quote: "single case randomization with previously created random number list (assignment to even vs. uneven numbers)". Comment: the method of allocation belongs to open random allocation, i.e., allocation is not concealed.
Blinding?	Unclear	Comment: Not enough information.
Incomplete outcome data addressed?	Yes	Comment: Drop-outs IG n=10, CG n= 4 Quote: "Intent-to-treat analysis (ITT) were conducted..."
Free of selective reporting?	Yes	Comment: all pre-specified measures are reported.
Free of other bias?	No	Quote: "There was a significant difference between groups at baseline for positive affect with a medium effect size". Comment: baseline difference could cause a bias.

Table 38 Risk of Bias Assessment for Randomize Trials – Grassi et al., 2011

Reference: Grassi et al, 2011		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: "... participants were randomly assigned to one of the file levels of experimental condition". Comment: method of allocation is not reported.
Allocation concealment?	Unclear	Comment: not enough information.

Blinding?	Unclear	Comment: not enough information.
Incomplete outcome data addressed?	Unclear	Comment: not enough information.
Free of selective reporting?	Yes	Comment: pre-specified methods are reported.
Free of other bias?	Yes	Comment: appears to be free from other biases

Table 39 Risk of Bias Assessment for Randomize Trials – Ruwaard 2009

Reference: Ruwaard, 2009		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes	Quote: "... participants were randomly assigned to the groups by means of a random number generator".
Allocation concealment?	Unclear	Comment: not enough information.
Blinding?	Unclear	Comment: not enough information.
Incomplete outcome data addressed?	Yes	Quote: "The analyses were conducted on an intention-to treat basis. Drop-outs, who did not complete the post-test measurements, were assumed to have gained nothing. Their pre-test scores served as post-test scores".
Free of selective reporting?	Yes	Comment: all described outcome measures are reported.
Free of other bias?	Yes	Quote: "The treatment group took longer than the planed 11 weeks to complete treatment... There was no indication that longer treatment were more effective..." 11 vs. 13. Comment: "the difference in duration of intervention was 13 weeks compared to 11 week that is planned, this could probably not produce high risk".

Table 40 Risk of Bias Assessment for Randomize Trials – Grassi et al., 2009

Reference: Grassi, et al., 2009		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: "The sample was randomly divided into the four conditions..." Comment: The method of allocation is not specified.
Allocation concealment?	Unclear	Comment: not enough information.
Blinding?	Unclear	Comment: not enough information.
Incomplete outcome data addressed?	Unclear	Comment: not reported.
Free of selective reporting?	Yes	Comment: all measures are reported
Free of other bias?	Yes	Comment: the duration of intervention is short, but this is not likely

		cause a bias.

Table 41 Risk of Bias Assessment for Randomize Trials – Sear & Vella-Brodrick, 2013

Reference: Seear & Vella-Brodrick, 2013		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes	Quote: "This study was randomized control trial... Computer generated random assignment to condition occurred when participants commenced the study..."
Allocation concealment?	Yes	Quote: "Computer generated random assignment to condition occurred when participants commenced the study and was revealed after participants completed the first set of measures".
Blinding?	Unclear	Comment: not enough information.
Incomplete outcome data addressed?	No	Comment: from the flow-chart the data of only the completer were analyzed.
Free of selective reporting?	Yes	Comment: all measures are reported.
Free of other bias?	Yes	Comment: appears to be free from other biases.

Table 42 Risk of Bias Assessment for Randomize Trials – Ruggiero, 2013

Reference: Ruggiero, 2013		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: "... VR consumers from Washington State were recruited and randomly assigned to one of three health promotion condition". Comment: method of allocation is not reported.
Allocation concealment?	Unclear	Quote: "Researcher had no identifying information about individual VR consumers..." Comment: not clear how the allocation was concealed.
Blinding?	Unclear	Comment: not enough information.
Incomplete outcome data addressed?	Yes	Quote: "All analysis employed an intent-to-treat approach".
Free of selective reporting?	Yes	Comment: all measures are reported.
Free of other bias?	Yes	Comment: appears to be free from other biases.

Table 43 Risk of Bias Assessment for Randomize Trials – Leykin et al., 2011

Reference: Leykin et al, 2011		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: "Participants were randomized into two training condition". Comment: method of allocation is not reported.

Allocation concealment?	Unclear	Comment: not clear how the allocation was concealed.
Blinding?	Unclear	Comment: not enough information.
Incomplete outcome data addressed?	Unclear	Comment: not reported.
Free of selective reporting?	Yes	Comment: all measures are reported.
Free of other bias?	Yes	Comment: appears to be free from other biases.

Table 44 Risk of Bias Assessment for Randomize Trials – Baker et al., 2011

Reference: Baker et al., 2011		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Yes	Quote: “Participants were randomized via a computer generated list”.
Allocation concealment?	Unclear	Comment: not clear how the allocation was concealed.
Blinding?	Unclear	Comment: not enough information.
Incomplete outcome data addressed?	Unclear	Comment: not reported.
Free of selective reporting?	Yes	Comment: all measures are reported.
Free of other bias?	Yes	Comment: appears to be free from other biases.

Table 45 Risk of Bias Assessment for Randomize Trials – Weingardt et al., 2009

Reference: Weingardt et al., 2009		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: “... counsellors were randomly assigned to one of two conditions”. Comment: the method of allocation is not reported.
Allocation concealment?	Unclear	Comment: not clear how the allocation was concealed.
Blinding?	Unclear	Comment: not enough information.
Incomplete outcome data addressed?	No	Comment: drop out rate 24%, the measure of emotional exhaustion is greater in dropped-out then completers.
Free of selective reporting?	Yes	Comment: all measures are reported.
Free of other bias?	Yes	Comment: appears to be free from other biases.

Table 46 Risk of Bias Assessment for Randomize Trials – Proudfoot et al., 2013

Reference: Proudfoot et al., 2013

Domain	Author's judgment	Support for judgment
Adequate sequence generation?	Yes	Quote: “A research assistant not involved in the RCT randomized participants after baseline using computerized random numbers”.
Allocation concealment?	Unclear	Comment: not clear how the allocation was concealed.
Blinding?	Unclear	Comment: not enough information.
Incomplete outcome data addressed?	Yes	Quote: “... study outcomes were evaluated using intention-to-treat (ITT) analysis”.
Free of selective reporting?	Yes	Comment: all measures are reported.
Free of other bias?	No	Comment: baseline imbalance in outcome measurements between intervention and control group.

Table 47 Risk of Bias Assessment for Randomize Trials – Warmerdam et al., 2010

Reference: Warmerdam et al., 2010		
Domain	Author's judgement	Support for judgement
Adequate sequence generation?	Unclear	Quote: “...participants were randomized to one of the three conditions...”.
Allocation concealment?	Unclear	Comment: not enough information.
Blinding?	Unclear	Comment: not enough information.
Incomplete outcome data addressed?	Yes	Quote: “Mediation analysis was performed using Linear Mixed Modeling (LMM) and based on the intention-to-treat sample. LMM includes incomplete cases in the analysis and employs restricted maximum likelihood estimation to calculate parameter estimates. LMM assumes that missing data are missing at random”.
Free of selective reporting?	Yes	Comment: all measures are reported.
Free of other bias?	Yes	Comment: appears to be free from other biases.

8.4 Tables of Modified 'Risk of bias Assessment' tool for Non-randomized Studies

Table 48 Modified Risk of Bias Assessment Table for Non-randomized Studies – Krusche et al, 2013

Study: Krusche et al, 2013		
Domain	**Author's judgement**	**Support for judgement**
Incomplete outcome data addressed?	No[79]	Quote: „this sample only includes completers and drop-out rates are not reported, however at the time of publication, 29% of people starting the course had completed it“.
Free of selective	Yes	Comment: All outcomes which were described in methods

[79] “No” indicates High risk of bias

reporting?		part are reported in the result part of the article.
Free of other bias?	Yes	Comment: appears to be free of other sources of bias.

Table 49 Modified Risk of Bias Assessment Table for Non-randomized Studies – Reid, 2013

Study: Reid, 2013		
Domain	**Author's judgement**	**Support for judgement**
Incomplete outcome data addressed?	Unclear	Comment: not enough information.
Free of selective reporting?	Yes	Comment: pre-defined outcome measurements are reported.
Free of other bias?	Yes	Comment: appears to be free of other sources of bias.

Table 50 Modified Risk of Bias Assessment Table for Non-randomized Studies – Quintana et al., 2012

Study: Quintana et al, 2012		
Domain	**Author's judgement**	**Support for judgement**
Incomplete outcome data addressed?	Unclear	Comment: not enough information
Free of selective reporting?	No	Comment: not all the results of outcome data are reported, only the association between measures is reported.
Free of other biases?	Yes	Comment: appears to be free of other sources of bias

Table 51 Modified Risk of Bias Assessment Table for Non-randomized Studies – Krusche et al., 2012

Study: Krusche et al., 2012		
Domain	**Author's judgement**	**Support for judgement**
Incomplete outcome data addressed?	Unclear	Comment: not enough information.
Free of selective reporting?	Yes	Comment: pre-defined outcome is reported.
Free of other bias?	Yes	Comment: appears to be free of other sources of bias.

Table 52 Modified Risk of Bias Assessment Table for Non-randomized Studies – Hoch et al., 2012

Study: Hoch et al, 2012		
Domain	**Author's judgement**	**Support for judgement**
Incomplete outcome data addressed?	No	Quote: „A complete data set for analysis was obtained in 24 of the 28 volunteers, because 4 subjects met the objective

		drop criteria of the study and were not included in the final analysis“.
Free of selective reporting?	Yes	Comment: All outcomes which were pre-defined are reported.
Free of other bias?	Yes	Comment: appears to be free of other sources of bias

Table 53 Modified Risk of Bias Assessment Table for Non-randomized Studies – Wiliams et al, 2010

Study: Williams et al, 2010		
Domain	**Author's judgement**	**Support for judgement**
Incomplete outcome data addressed?	Unclear	Comment: not enough information on how the missing outcome was handled.
Free of selective reporting?	Yes	Comment: the means of outcome measure are reported without corresponding standard deviations, but this could probably does not cause a bias
Free of other bias?	Yes	Comment: appears to be free of other sources of bias

Table 54 Modified Risk of Bias Assessment Table for Non-randomized Studies – Kawai et al., 2010

Study: Kawai et al., 2010		
Domain	**Author's judgement**	**Support for judgement**
Incomplete outcome data addressed?	Unclear	Comment: not enough information on how the missing outcome was handled.
Free of selective reporting?	No	Comment: the means of outcome measure are reported without corresponding standard deviations.
Free of other bias?	Yes	Comment: appears to be free of other sources of bias

Table 55 Modified Risk of Bias Assessment Table for Non-randomized Studies – Nes et al., 2013

Study: Nes et al., 2013		
Domain	**Author's judgement**	**Support for judgement**
Incomplete outcome data addressed?	Unclear	Comment: not enough information on how the missing outcome was addressed.
Free of selective reporting?	No	Comment: the results of outcome measure (quality of life) is not reported.
Free of other bias?	Yes	Comment: appears to be free from other sources of bias.

Table 56 Modified Risk of Bias Assessment Table for Non-randomized Studies – Beatty et al., 2011

Study: Beatty et al, 2011

Domain	Author's judgement	Support for judgement
Incomplete outcome data addressed?	Unclear	Comment: not enough information on how the missing outcome was addressed.
Free of selective reporting?	Yes	Comment: All outcomes are reported.
Free of other bias	Yes	Comment: appears to be free of other sources of bias.

8.5 PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	12
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	12
METHOD			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	-
Eligibility Criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	14
Information source	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	16
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	17
Study Selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	19
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	19
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	19
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	21

Section/topic	#	Checklist item	Reported on page
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	22
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	24
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	-
Additional analysis	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	-
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	25
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	36
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	49
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	53
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	69
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	-
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	-
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	77
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	80
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	81
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	82

From: Moher et al., (2009).

9 List of Tables

10 List of Figures