

Efficacy of Exercise Therapy in Persons with Burnout. A Systematic Review and Meta-Analysis

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Abstract

An increasing amount of scientific work suggests positive effects of exercise-related interventions in patients with burnout. Exercise therapy could therefore be a useful intervention procedure in the treatment of burnout. The aim of this meta-analysis is to examine empirical findings for exercise therapy used to treat burnout in the occupational setting, including the variety of the application and variety of the exercise modality itself. Electronic databases (PubMed, Cochrane Library, Scopus, PubPsych, PsycInfo) were searched (January 2018) for randomized controlled trials reporting on exercise therapy intervention studies in persons with burnout. The burnout scores from the various measurement instruments as well as standardized mean differences (SMDs) with 95% confidence intervals (CI) were calculated and seen as the main outcomes and measures. Four out of six studies with a total sample of 248 participants could be used for meta-analysis. A statement on the combined effect size can only be made with caution due to the length of the confidence interval of [-0.41; 0.09]. With an I^2 value of 0%, no heterogeneity is present in this meta-analysis. Ultimately there was no clear difference found between intervention and control conditions. This paper does not support the widespread assumption that exercise therapy seems to be a successful means to alleviate burnout symptoms. However, the different types of physical activity and treatment modalities used in the included studies impede clear conclusions. Future studies should deal with the specific efficacy of different exercise modalities and their combination with further cognitive behavioural or mindfulness-based interventions.

Key words: physical activity, sports, adults, employment, occupational diseases, occupational health.

Introduction

Burnout syndrome in the occupational context has been a topic of concern for many years, affecting predominantly employed populations. The expression to be "burned-out" describes that a person is no longer able to "burn" or to be productive concerning their responsibilities, thus often their paid work. This requires that the affected persons assigned their work a high value. This may give people the impression that the person suffering from burnout has a high and therefore positive evaluation of his or her work effort and thus perceives his/her absence from work due to burnout not as a personal weakness. This "positive" use of the term burnout, in comparison to the concept of depressive disorder, which appears to be viewed significantly more negative, allows affected persons to expect less stigmatisation. The term burnout is therefore used more often than the term depression (Bahlmann et al., 2013; Berger et

al., 2012). The International Classification of Diseases published by the World Health Organization has not taken up burnout as an independent disease (Krollner and Krollner, 2018). It lists, in an appendix, factors which can affect the wellbeing of individuals. In section Z 73, "problems associated with difficulties in coping with life" are listed. Burnout is considered to be a state of physical and mental exhaustion and is encoded in a diagnosis by the number Z 73.0 (Berger et al., 2012). Burnout is described by the German Society of Psychiatry and Psychotherapy, Psychosomatics and Neurology as an exhaustion and overload syndrome, which is a risk condition for a later psychiatric or physical illness (DGPPN, 2017). The burnout syndrome is mainly work related and occurs very often after a long period of high workload in a combination with perceived stressful working conditions (Naczenski et al., 2017). According to Maslach (Maslach, 2003), job burnout is defined by three dimensions: exhaustion, cynicism and a sense of inefficacy. Current reports show an increase of the prevalence of the burnout syndrome. For example, the AOK - one of Germany's largest health insurance companies - published a report in 2014 focusing on work absenteeism (AOK, 2014). This report, written by the scientific Department (WidO) of the AOK, reported that between 2004 and 2013 there was an increase from 8.1 days to 87.6 days taken off work per 1000 insured persons of the AOK per year due to a medical inability to work classified under the diagnosis group Z 73. Associated with this increase in work absenteeism is of course the economic damage caused by losing time at work. The study by the Association of Psychotherapists in Germany (Bundespsychotherapeutenkammer, BPTK) on medically excused days off work from 2015 is based on data from nearly 85% of the statutorily insured individuals in Germany (BPTK, 2015). This study demonstrates that one in every 5 individuals who were medically excused from work for more than six weeks were diagnosed with a mental disease, such as burnout.

As burnout syndrome is not listed as an independent disease in the international classification of diseases, no clear diagnosis can be made based on explicit symptoms (ICD-10, 2017). In the literature, up to 100 single symptoms are mentioned as an indication of burnout (Ahola et al., 2005; Ekstedt et al., 2006; Kakiashvili et al., 2013; Kissling et al., 2014; Mohren et al., 2003; Peterson et al., 2008; Soares et al., 2007; Toker et al., 2012). The most frequently mentioned symptom in people with burnout is an excessive, persistent or even chronic physical as well as mental fatigue (Ahola et al., 2005; Appels and Mulder, 1989; Ekstedt et al., 2006; Kakiashvili et al.,

2013; Mohren et al., 2003; Peterson et al., 2008; Soares et al., 2007; Toker et al., 2012). The condition of fatigue is considered a risk factor for a number of other diseases, like acute myocardial infarction, heart disease, common colds, flu, gastrointestinal disorders, infections (Honkonen et al., 2006; Mohren et al., 2003) and many more (Corrigan et al., 1995; Kakiashvili et al., 2013; Peterson et al., 2008; Toker et al., 2012). Some studies mention that burnout increases the occurrence of mental and physical exhaustion and of diseases such as cardiovascular disease, metabolic syndrome and depression (Ahola et al., 2005; Appels and Mulder, 1989; Bianchi et al., 2015; Kakiashvili et al., 2013; Kitaoka-Higashiguchi et al., 2009; Soares et al., 2007; Toker et al., 2012). Studies conclude that the effects of burnout and cardiovascular disease incidence are interdependent (Appels and Mulder, 1989; Honkonen et al., 2006; Kakiashvili et al., 2013; Shirom, 2005; Soares et al., 2007; Toker et al., 2012).

This wide range of possible comorbidities weakens affected persons, thereby intensifies the state of exhaustion, which further encourages the above-described relationships. Medicine is confronted with the problem that for burnout there is no consensus in neither diagnosis and treatment (Kakiashvili et al., 2013). Therapy programs are highly varied and often unclear. Treatments for burnout include encouraging a healthy diet, taking vitamin supplements, reducing alcohol consumption, naturopathic remedies, relaxation and mindfulness therapies, gymnastics, sports, massages, creative activities, spiritual and/or religious practices, adopting an ancient or far-eastern philosophy, animal therapy, spending time with friends etc. (Hillert, 2012a). Often, individuals with burnout are treated with regimens designed to treat depression (Ahola et al., 2005; Kakiashvili et al., 2013). In fact, the most common drugs administered in the treatment of burnout are antidepressants (Kakiashvili et al., 2013). However, the general treatment is also aimed at mitigating the personal or environmental causes of the syndrome like developing coping skills or creating organizational changes at work (Kakiashvili et al., 2013). The contents of the various therapies are often comprising three parts: general-strengthening, relaxation and occupational support (Hillert, 2012b) in form of decreasing job demands, increasing job control or the level of participation in decision making (Awa et al., 2010). The content, however, is usually not selected on the basis of empirical findings, but rather on subjective experiences of the clinic and the possibilities of the respective treatment location (Hillert, 2012b).

A series of studies suggest that physical activity based interventions are indicated in the treatment of burnout in an occupational setting. The positive impact of physical activity is often mentioned, but the reasons for that remain unexplained. The effect of physical activity on burnout may be ascribed to psychological changes. Physical activity can be seen as a behavioural distraction from stressful situations and hereby degrade the psychological impact of a situation (Altshuler and Ruble, 1989). Physical activity fosters the development of perceptions like mastery and self efficacy (Salmon, 2001) and has therefore the

ability to diminish sensitivity to negative stimuli. Physiological changes by physical activity could reduce the persons' physiological sensitivity to chronic stress (i.e. burnout) (Forcier et al., 2006). Employees could deal with stress at work without being physiologically overwhelmed by it. This could lead to faster physical recovery after a stressful experienced situation and therefore to a reduction of the risk of burnout (Altshuler and Ruble, 1989; Jackson and Dishman, 2006; Klaperski et al., 2014; Salmon, 2001). Fundamentally, it is well established that regular physical activity has a preventive effect on various diseases (Pedersen and Saltin, 2015). For example it has a demonstrated positive effect on coronary heart disease, cerebrovascular diseases, arterial hypertension, diabetes mellitus, stress anxiety disorders and depression (Pedersen and Saltin, 2015; Reimers and Brooks, 2003). In addition, aerobic physical activity reduces anxiety which appears in an occupational context (Salmon, 2001). There is a positive relation between physical activity and emotional well-being (Galper et al., 2006). Studies show that the preventive effect of physical exertion increases with the progression in exercise intensity and duration (Kushi et al., 1997; Lee and Skerrett, 2001; Thompson et al., 2003).

In one study, more than half of the participants with mild to moderately severe depression, experienced a reduction in depression symptoms after an exercise intervention based on running (Greist et al., 1979). Another study shows that exercise (running) has positive effects on work-related fatigue and employee well-being (de Vries et al., 2017). It has been shown that aerobic exercise groups and/or strength training groups, compared to a control group, lead to a clear reduction in the depression score (Pappas et al., 1990). Furthermore, McCann & Holmes show in their study that a group, which conducted exercise achieved significantly better treatment results than the group which performed relaxation exercises as well as the control group (McCann and Holmes, 1984). The authors report a marked antidepressant effect after the endurance training protocol, while the relaxation exercises remained ineffective. This finding is supported by Blumenthal, who assigns an effect to exercise that is comparable to that of adequate psychopharmacological treatment (Blumenthal et al., 1999). The sport or exercise type does not seem to be decisive for the effectiveness of the exercise-based therapy.

The existing literature describes the effects of physical activity on symptoms and comorbidities of burnout, however, the listed therapeutic content does not have a high-quality, empirical evidence-base. A rigorous evaluation of high-quality studies with regard to the efficacy of a treatment of burnout through physical activity is still lacking. A first attempt was made by the systematic review of Naczenski et al. (2017), who conclude that physical activity seems to be effective in reducing burnout. However, this conclusion is based on the findings of only two randomized controlled trials and eight nonrandomized, non-controlled intervention studies or prospective observational studies and therefore should be treated with caution. The aim of this review article is to review the current literature for studies with the highest quality standard (randomized controlled trials) regarding the efficacy of physi-

cal activity in patients with burnout. Data from the included studies will be summarized in a meta-analysis.

Methods

Search strategy

We carried out a systematic literature search on articles published up to 23.01.2018 in the databases Pubmed (Medline), Cochrane Library, Scopus, Pubpsych and PsycInfo. We developed the search query based on the PICO model (Costa Santos et al., 2007). Depending on the capability of the databases MeSH-Terms were entered into the search. The Boolean operators "AND" and "OR" were used to combine the research terms. Over the course of the search query, several search combinations were examined in cooperation with an expert of the library of the University of Erlangen-Nürnberg and the respective sources were compared. An additional check was made by checking whether already known and relevant articles were found in the search results. Since the search for MeSH-Terms is not possible in the database Scopus, a modified search was carried out on that platform. In addition, the terms "motor activity" and / or "physical activity" were incorporated into the search query which resulted in partially different hit numbers. An additional query was made for the PsycInfo database. The complete search queries can be viewed in the appendix.

Selection criteria

Articles obtained by the systematic search were exported and saved into the Citavi literature management program. The query revealed a total list of 967 titles after removing the duplicates. A first selection was carried out independently by two reviewers (O.O. and C.H.) by reviewing titles and abstracts. The orientation was based on the following inclusion criteria: The articles must be written in

English or German and physical activity must be included as a primary intervention in the study. Furthermore, studies had to include questionnaires measuring the level of burnout. Studies have been excluded, if the participants haven't been in an employable age.

During this search, a 'movement-based therapy' or 'exercise therapy' was considered a planned physical activity intervention - developed with regard to a therapeutic treatment goal and prescribed to the patient (Pubmed, 2017). Physical activity is defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" (Caspersen et al., 1985). The inclusion criteria were applied to the retrieved articles by both reviewers (O.O. & C.H.) individually, with consultation in cases of uncertainty. Articles were included in the subsequent full text analysis only if consensus between the reviewers was achieved. After the first selection the citation list consisted of 137 articles.

Both reviewers then screened the full text of those articles included by title and abstract to identify all relevant data and make a decision regarding final inclusion. The process of selection is shown in Figure 1.

In this case, all full texts were reviewed except for two. The two remaining sources (Gillmann et al., 2015; Stevens, 2011) could neither be obtained through the inter-library loan of the university library, nor via direct E-mail contact with the authors.

Quality assessment

In a final selection, 6 articles were selected that were randomized and controlled in their design. Using a modified version of the 11-step PEDro scale (Macedo et al, 2010; Maher et al., 2003), the studies were assessed for possible risk of bias and overall quality (Table 1). The quality criterion "patient blinded" has been excluded, because patients can't be blinded for exercise therapy, since they receive an

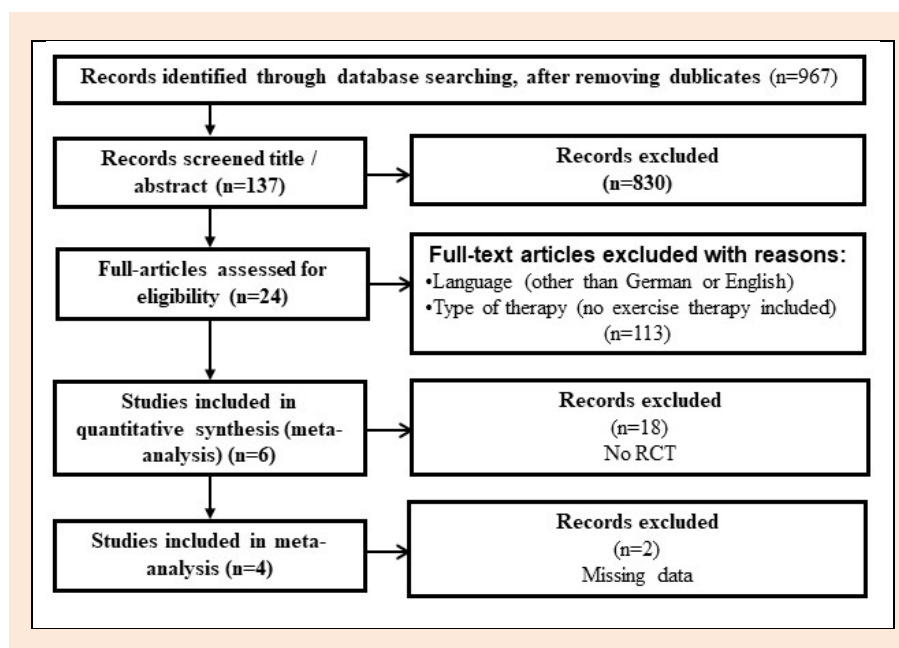


Figure 1. PRISMA flow diagram showing the selection process (PRISMA, 2017).

Table 1. Quality Assessment (PEDro) of included studies.

Authors	Randomization	Concealed Allocation	Baseline Comparability	Care Provider Blinded	Assessor Blinded	Adequate Follow-up	Intention to Treat	Between Group Comparisons	Point Estimates and Variability	Score
Bretland and Thorsteinsson (2015)	✓	X	✓	X	X	✓	✓	✓	✓	6
Heiden et al. (2007)	✓	X	✓	X	✓	✓	X	✓	X	5
Mealer et al. (2014)	✓	✓	✓	X	✓	✓	✓	✓	✓	8
Stenlund et al. (2009b)	✓	✓	✓	X	X	X	✓	✓	✓	6
Eskilsson et al. (2017)	✓	✓	✓	X	X	X	✓	✓	✓	6
de Vries et al. (2017)	✓	✓	✓	X	X	✓	✓	✓	✓	7

“active” intervention. The first criterion provides a statement about the external validity and is not taken into account in the determination of the total value. If any given criterion is present it gets a point (and is noted with a check in the table). If the criterion was absent (marked with an x in the table) it was awarded 0 points. Therefore the maximum PEDro score in our modified version is 9.

Data extraction and statistical analysis

From all articles that met the review criteria, basic information was extracted into a standardised spreadsheet which included the sample size, the test method used, the type of physical activity performed, etc. (Table 2).

Only the raw data, collected directly after the end of the intervention or the intervention period were included. In the case of missing data in the published studies, the authors were contacted by email. After a period of three weeks, a reminder was sent. Only Marina Heiden replied and sent mean values and standard deviations, thus the study of Heiden et al. (Heiden et al., 2007) could be included into the meta-analysis. The studies by Mealer et al. (Mealer et al., 2014) and Stenlund et al. (Stenlund et al., 2009b) could not be considered in the meta-analysis, since a shift of the analysed parameters was reported through the median and the 0.25-0.75 quartiles. A calculation of the mean values and standard deviations, which is necessary for the calculation of the meta-analysis, was not possible here, since the necessary raw data was not available and the authors could not be contacted. In this way, 4 out of 6 studies were ultimately eligible for evaluation through meta-analysis. In order to investigate the general effect of exercise therapy on burnout syndrome, the data from the burnout measurement of the physical activity intervention groups was compared to the values of the control groups who hadn't been exercising. In this meta-analysis, no analysis of subgroups could be carried out since too few studies were available. For the meta-analysis, the Review manager RevMan 5.3 (version 5.3.5) of the Cochrane Collaboration was used (The Cochrane Collaboration, 2014). All values used were steady and were entered in the form of mean

value and standard deviation. The standardized difference of two mean values (SMD) with a 95% confidence interval (CI) and the random-effects model was used in the calculation to pool the data from different identified measurement tools. The heterogeneity was determined by t^2 and χ^2 and a 95% CI. The I^2 statistic describes the percentage of variability in the estimated effect that is owing to heterogeneity rather than chance: 30% to 60% shows moderate heterogeneity, while greater than 60% represents substantial heterogeneity (Borenstein et al., 2009; Sterne et al., 2011).

Results

Study characteristics

The selection process resulted in a list of 6 RCTs (Table 2) that were considered for a meta-analysis. On the basis of missing or only partly existing data, only the first 4 RCTs of Table 2 could be included in the meta-analysis. All available studies were published in the period from 2007 to 2017. The most important study features are summarized in Table 2. The sample size varied between 27 and 96, with all participants being of an employable age. There was large variability in the physical activity used as a therapy modality, from individual activities such as running, cycling, swimming, walking to group activities such as water gymnastics and qigong. In some cases also strength training and endurance activities on various ergometers (treadmill, wheel ergometer, rowing ergometer, stepper) were used. The frequency of therapy was reported in the spectrum between daily sessions and sessions every 14 days. The duration of exercise sessions varied from 30 minutes to 1 hour. The study intervention period ranged from 4 weeks to one year, with the majority of the studies having a treatment period of 10 to 12 weeks. Follow-up was performed in 1 of 6 studies with a follow-up period of 6 months. The dropout rates varied between 3 and 23 participants. All six studies assessed physical activity and burnout or the main dimension of burnout, the emotional exhaustion, with questionnaires.

Table 2. Characteristics of included studies.

Author	n	Age	Job status	BLoP	IG	Control Condition	IP	Intervention dosage	Type of exercise	Intensity	Follow-up (wk or mo)	DoR	AssT
Bretland and Thorsteinsson (2015)	52	36.6 ±13.5	Employed or studying ≥ 20 h/wk	Low/ medium/ high BO: 34,5%/ 27,9%/ 37,6%	Cardiovascular exercise Resistance exercise	No change to exercise pattern	4	Minimum: 3x30min/ week	Individual exercise (running, cycling, swimming)	According to guidelines of the ACSM	2wk; 4wk	3	SEES; PSS; MBI
Heiden et al. (2007)	75	44.0 ±9.0	n.r.	n.r.	Cognitive behavioural programme; Physical activity programme	Usual care provided by the Swedish social insurance system during the course of the study	10	2 sessions /week	Warm water exercise and strength training /aerobics/swimming /walking	n.r.	10wk; 6mo; 12 mo	11	SF-36; SMBQ; CRI; KSQ
Esquilsson et al. (2017)	89	41.8 ±8.2	employed	SMBQ: IG 4,75; Control group 4,84 moderate-high BO	Aerobic training, Cognitive behavioural therapy, work training	Cognitive behavioural therapy, work training	12	3 sessions (40min)/ week	Group indoor cycling	70-85%maxHR (220-age)	-	23	SMBQ, HADS,
de Vries et al. (2017)	96	45.2 ±1.6	employed	UBOS: IG 3,28; Control group 3,62 High level of work-related fatigue	Aerobic training	No interventions were associated	6	3 sessions (60min)/ week	Running in group (2 sessions) and alone (1 session)	Low intensity	6wk/12wk	11	UBOS, FAS, Need for recovery scale
Mealer et al. (2014)	27	n.r.	Bachelor nursing degree	MBI: IG & Control group: medium-high BO;	Physical activity	No interventions were associated	12	3 sessions/ week	Aerobic exercise (treadmill, elliptical machine, stair climbing, stationary bicycle, rowing machine)	n.r.	12wk	n.r.	CD-RISC; HADS; MBI
Stenlund et al. (2009b)	82	43.8 ±9.7	63%/ 11%/ 26% work with people/ things/ data	SMBQ: Median: IG 5,8; Control group 5,8 moderate-high BO	Mindfulness training	Basic care at the Stress Clinic	12	2 sessions (60min)/ week	Qigong	n.r.	4wk/8wk/ 12wk	14	SMBQ; SCQ. Fatigue: CIS; HADS; SF-36; S-Pari

BLoP; Burnout level of the participants; IG = Intervention Groups; IP = Intervention period; DoR = Drop-out rate; AssT = Assessment tools; AVEM = Arbeitsbezogenes Verhaltens- und Erlebnismuster; CD-RISC = The Connor-Davidson Resilience Scale; CIS = Checklist Individual Strength Questionnaire; CRI = Coping Resource Inventory; FAS = Fatigue; HADS = The Hospital Anxiety and Depression Scale; KSQ = Karolinska Sleep Questionnaire; Need for recovery scale; MBI = Maslach Burnout Inventory; „n.r.“ = not reported; PSS = The Perceived Stress Scale; SCQ = The Self-Concept Questionnaire; SEES = The Subjective Exercise Experience Scale; SF-36 = Short Form 36 Item Health Survey; SMBQ = Shirom-Melamed Burnout Questionnaire; S-Pari = Perceived relaxation: Swedish Version of the Physical assessment scale; UBOS = The Utrecht Burnout Scale

Methodological quality

Before the assessment of the methodological quality, one has to be aware of our modification of the PEDro scale. Most studies are of moderate or rather good quality (PEDro value 5-7) and only one study had a very low risk of bias (PEDro value 8). As only randomized control trials (RCTs) were included in this meta-analysis, all studies fulfill the criterion of randomization. With one exception (Heiden et al., 2007), all studies also fulfill the criteria of intention-to-treat, the between-group comparison and the specification of point and scattering dimensions. A blinded group assignment of the participants took place in four studies (Mealer et al., 2014; Stenlund et al., 2009b). The study groups were com-

parable in the values of the initial measurements. In four out of six studies a central outcome could be measured in more than 85% of the originally participating subjects. None of the studies show a blinding of the subjects and therapists. In only one study, it is explicitly stated that the investigators were blinded to participant allocation (Mealer et al., 2014).

Effects of exercise therapy

For the meta-analytic comparison (exercise therapy vs. no exercise therapy), 4 RCTs with a total sample of 248 subjects could be considered. All of these studies report a significant

(de Vries et al., 2017; Bretland and Thorsteinsson, 2015; Heiden et al., 2007) or non-significant (Eskilsson et al., 2017) reduction of the burnout or the emotional exhaustion score. A statement on the estimation of the combined effect size is only possible to a limited extent due to the size of the confidence interval [-0.41, 0.09]. The confidence intervals of the studies overlap, thus indicating homogeneity (Zlowodzki et al., 2007). In addition, an I^2 value of 0% (p

= 0.41) is present, which is a reference for non-heterogeneity as well (Zlowodzki et al., 2007). In this regard, it can be concluded that the total variability across the results of the studies is attributable to chance (Weckmann et al., 2015). The fact that the confidence interval of the summary estimate cross the line of no effect, shows the absence of a significant difference between intervention and control condition (Weckmann et al., 2015) (Figure 2).

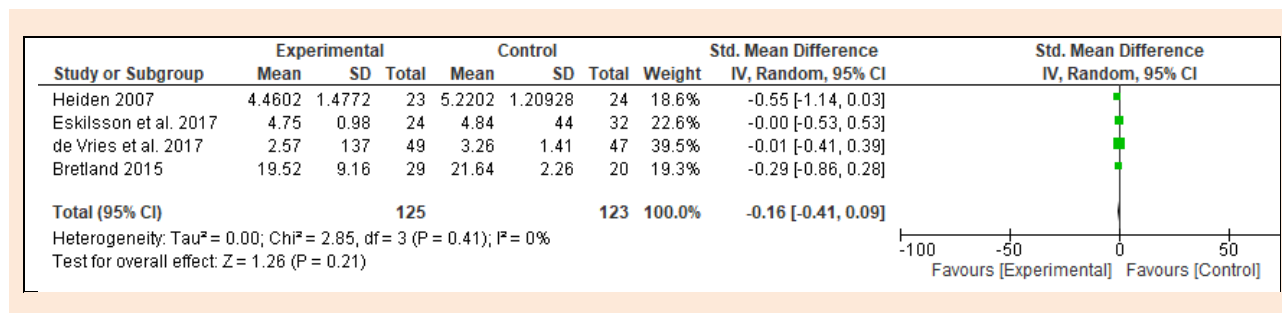


Figure 2. Forest plot showing the effect of exercise on Burnout compared with no exercise treatment.

Discussion

In this day and age, many employees suffer from burnout and therefore this syndrome constitutes a problem that has to be taken seriously. Therefore, great effort should be made to contain this syndrome. The positive effect of physical activity on burnout syndrome is indicated by several studies (Alarcon et al., 2009; Brenninkmeijer and van Yperen, 2003; Bretland and Thorsteinsson, 2015; Deligkaris et al., 2014; Ekstedt et al., 2006; Heiden et al., 2007; Higgins, 1986; Kristensen et al., 2005; Maslach and Jackson, 1986; Mealer et al., 2014; Stenlund et al., 2012; Schaufeli et al., 2009;). Given evidence and theory, we expected physical activity might be a helpful treatment for the reduction of burnout. The aim of this meta-analysis was the examination of this assumption on the basis of empirical analyses. In contrast to the study of Naczenski et al. (2017), we try to focus on solely high quality studies. From an initial selection of 24 studies, 6 studies - all randomized and controlled - were included in the study. Due to missing data, only four studies could be used for the meta-analysis. We recognise that a greater number of included studies would have strengthened the results of this meta-analysis. In partial defence of our approach, Valentin et al. argued that already a small number of two studies would be sufficient to perform a meta-analysis to overcome small sample sizes and to detect effects of interests (Walker et al., 2008). Therefore a statement on the effect of exercise therapy from the results of the meta-analysis is notable and consistent but needs to be treated with caution. This limitation is attributed primarily to factors which prevent the specification of an effect size. The length of the confidence intervals depends to a large extent on the sample size of the individual studies, however, less than 100 people participated in each single study. The width of the confidence interval [-0.41, 0.09] gives no clear indication of the effect size. Nevertheless, there was no heterogeneity ($I^2=0%$) between the studies. Although three out of four studies report a significant difference between intervention and control

conditions, there couldn't be found an overall effect with the help of the meta-analysis. This result is not in line with the findings of Naczenski et al. (2017), who conclude that physical activity seems to be effective to reduce burnout. This difference might have several reasons. First of all the conclusions of the included studies have to be considered with caution. In this line de Vries et al. (2017) already mentions that their results, that participants with exercise intervention recovered more with respect to the outcomes emotional exhaustion and overall fatigue, are based on imbalances at baseline with regard to work characteristics and outcome measures. Further the findings of Bretland and Thorsteinsson (2015), who couldn't find an association between exercise and fatigue, which is the primary outcome of de Vries et al. (2017), contradicts the above mentioned findings. Heiden et al. (2007) report only small differences between intervention and control group. Another reason might be the small number of included studies. Strikingly, the reported intervention modalities are quite heterogeneous (Table 3).

Table 3. Exercise modalities.

Study	Intervention modalities
Bretland and Thorsteinsson (2015)	Aerobic exercise (running, cycling, swimming) and strengthening exercises
Heiden et al. (2007)	Cognitive behavioural training, movement in warm water, and a chosen activity from either strength training, swimming, walking or aerobics
de Vries et al. (2017)	Aerobic exercise (low intensity running)
Eskilsson et al. (2017)	Aerobic exercise (group indoor cycling)
Mealer et al. (2014)	Aerobic exercise (running by using a treadmill, elliptical machine, stair climbing, stationary bicycle, rowing machine)
Stenlund et al. (2009b)	Qigong

The variability in intervention modalities is even in the small number of included studies high. The participants were treated with cardiovascular training, strength training,

cognitive behavioural training and / or a combination of some of the above mentioned. Regarding the long-term effects, only two studies (de Vries et al., 2017; Heiden et al., 2007) report follow-up measures, but the time intervals of these measures differ from six weeks (de Vries et al., 2017) to 6/12 months (Heiden et al., 2007). Based on this variability a comparison of the individual intervention measures is hardly possible. In addition, there is often no precise information on the duration and intensity of the interventions. In some cases, only minimum requirements for the participants are mentioned (Bretland and Thorsteinsson, 2015; Mealer et al., 2014). This lack of information causes possibly a reporting bias. The duration of the intervention also varies from 4 weeks to 12 weeks. The interventions were partly carried out in a supervised group setting and / or alone (de Vries et al., 2017; Bretland and Thorsteinsson, 2015; Heiden et al., 2007; Mealer et al., 2014; Stenlund et al., 2009b). Obviously a stringent intervention concept and the understanding of the underlying mechanisms of action is missing. The documentation of the intervention was partly self-reported (frequency of training sessions and weekly training hours) and is therefore subject to bias (de Vries et al., 2017; Bretland and Thorsteinsson, 2015; Heiden et al., 2007; Mealer et al., 2014). A comparison of the effectiveness of the individual interventions is therefore difficult. Furthermore, the combination of cognitive behavioural therapies and exercise-therapeutic contents only allows the assessment of the effectiveness of the individual interventions to be conditional (Heiden et al., 2007).

The use of different measuring instruments (Table 2) with their different definitions also makes it difficult to compare the results. This meta-analysis examined merely of whether exercise as an intervention had a positive effect on burnout syndrome or not.

Finally the number of included studies of high quality is too small to make a reliable statement. This is a huge limitation and reveals a research desideratum. Hence the need for more high quality studies in this field is evident.

In conclusion the results of this meta-analysis do not provide evidence that exercise therapy is effective in persons with occupational burnout.

Nevertheless, it would go too far to conclude, that exercise therapy is not effective in persons with burnout at all, because several studies have reported positive changes (Bretland and Thorsteinsson, 2015; Heiden et al., 2007; van Rhenen et al., 2005; Gerber et al., 2013a; 2013b; White et al., 2011).

But, besides exercise therapy also other promising types of therapy exist like cognitive behavioural therapy and mindfulness-based therapy (Heiden et al., 2007; Grossmann et al., 2004; Fjorback et al., 2011; Jouper and Johansson, 2013; Smith et al., 2008; Felton et al., 2015; Stenlund et al., 2009a; van Rhenen et al., 2005; White et al., 2011; Yung et al., 2004). All of these interventions seem to be effective in reducing perceived stress and burnout (Smith et al., 2008; Stenlund et al., 2009a). Regarding long-term effects, cognitive behavioural therapy has a sustained advantage compared to pure exercise therapy interventions (Heiden et al., 2007). Cognitive behavioural therapy may have a long-term effect as the affected persons benefit from their acquired ability to break up and alter old patterns of

behaviour (Stenlund et al., 2012). They can use these abilities in the long term and thus protect themselves against a relapse. It appears that self-care activities can be seen as a protective factor in therapy, which protects the people concerned from renewed burnout.

A systematic review (Fjorback et al., 2011) of only randomized controlled trials concludes that mindfulness-based stress reduction is a useful tool for increasing mental health and reducing symptoms of stress and anxiety. Another meta-analysis states, that mindfulness-based stress reduction is useful for a lot of chronic disorders, by improving coping strategies (Grossmann et al., 2004). The same problem, as with exercise therapy is, that the mechanisms by which mindfulness-based programs achieve these benefits are still unclear (Fjorback et al., 2011).

Conclusion

Due to a lack of high quality studies the current meta-analysis does not support the widespread assumption that exercise therapy is a successful means to alleviate burnout symptoms. The results of the single studies with high quality included in this review only partially suggest the positive effect of exercise in patients with burnout syndrome. The conducted meta-analysis summarizes the effects and reveals that there is no clear evidence for the efficacy of exercise therapy in persons with burnout. The different types of physical activity used in the included studies and the different treatment modalities impede clear conclusions. Often, in the treatment of burnout, cognitive behavioural therapy or mindfulness-based therapy is used in parallel with exercise therapy, which enables the persons concerned to cope better with their stressors. A combination of cognitive behavioural therapy, mindfulness-based therapy and exercise therapy might also help to increase adherence to physical activity.

The informative value of the present study is limited by some aspects. The results of this review are based on only four studies in the meta-analysis and a total of six studies in the narrative evaluation due to the inclusion criteria of randomized controlled trials. Thus, the results summarized here cannot support the statement that exercise has a positive influence on burnout. Countervailing the above mentioned limitations, the rigor and extent of this paper's literature search criteria and the adherence to PRISMA guidelines for conducting and reporting and the focus on high qualitative studies, may be this review paper's strength and a significant contribution to existing literature (Prisma, 2017).

In summary, the meta-analysis clearly shows, that there is lack of high quality studies, thus revealing a huge research gap. This is astonishing because the interrelationship of effects between physical therapy and burnout is frequently mentioned in studies.

In future studies, high methodological standards are necessary, on the one hand with regard to evaluation design, on the other hand with a view to the detailed description of the intervention contents and methods (Slade et al. 2016). Future studies would benefit from a generally accepted definition of burnout syndrome as well as a consensus in the use of assessment methods. Future work should

also address the specific efficacy of different exercise modalities as well as their combination with further cognitive behavioural or mindfulness-based interventions.

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Key points

- First systematic review and meta-analysis of high quality studies (randomized controlled trials) analysing the state of research in the field of exercise therapy and burnout.
- This study relativized the view of physical activity as an effective treatment.
- This study highlights the lack of a stringent intervention concept and the understanding of the underlying mechanisms of action.

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