

# **Comparison of depressive symptoms in athletes and non-athletes: Results of a meta-analysis**

Master thesis in view of obtaining the  
Master of Science in Sports Science  
Teaching option

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Zurich, April 2023

## **Acknowledgment**

I would like to express my gratitude to all the individuals who have contributed to the success of this master thesis in various ways.

My primary thanks go to my supervisor, Dr. Philipp Röthlin, for his constructive and helpful suggestions throughout the entire supervision period. His support throughout the process was invaluable. I would also like to extend my gratitude to Dr. Michael Wälchli, whose approval allowed me to realize this master thesis in the form of a scientific paper.

Furthermore, a big thank you to my fellow student, Roger Untersander, as well. Our meaningful conversations and constructive feedback have played an important role in the completion of this project.

Lastly, I would like to express my gratitude to my parents and friends for their moral support during stressful times.

## **Abstract**

**Introduction:** Several recent literature reviews have addressed depression in competitive sports, but there are almost no systematic approaches to examine the literature. The purpose of this paper is to help raise awareness of depressive symptoms in athletes in competitive sports and provide better insight into the literature. Therefore, the aim of this study is to provide a systematic analysis of all relevant literature to address the question of whether depressive symptoms are more or less prevalent in athletes than in non-athletes.

**Methods:** The meta-analysis included a total of eight studies with a mean sample size of 371.88. The studies compared athletes with non-athletes and measured depressive symptoms with different instruments. Effect sizes (ES) for each study were calculated and combined with a random effects model. Heterogeneity was assessed using the Q statistic and the I-squared index ( $I^2$ ).

**Results:** The meta-analysis revealed no significant difference in depressive symptoms between athletes and non-athletes ( $ES = 0.039$ ,  $SE = 0.104$ ,  $z = 0.376$ ,  $p = 0.707$ ). There was significant heterogeneity between studies with a Q-statistic of 47.641 and a  $p$ -value of less than 0.001. The I-squared index was 83.208%.

**Discussion:** The results suggest that there is no significant difference regarding depressive symptoms between athletes and non-athletes. The relationship between athletic activity and depressive symptoms is very complex because type of sport, intensity, age, social support, environmental stressors, or other factors could play a central role in the development of depressive symptoms. Thus, it is important to consider individual differences when examining the relationship between physical activity and mental health. To further and better investigate depressive symptoms in both groups, utilizing clinical diagnosis data obtained through structured clinical interviews may be more beneficial than relying on self-reported questionnaires.

**Keywords:** depressive symptoms, depression, mental health, athletes, non-athletes

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# **1 Introduction**

## **1.1 Mental health**

In 2022, the World Health Organization published the "World Mental Health Report" with the aim of transforming mental health for all. In recent years, recognition that mental health plays a crucial role in achieving global development goals has increased (World Health Organization, 2022). Estimates suggest that approximately 792 million people lived with a mental disorder in 2017, which is slightly more than one in ten people worldwide (10.7%). The two most common mental disorders are anxiety disorders, affecting about 284 million people, and depression, affecting approximately 264 million people (Dattani et al., 2021). The health of both the body and mind is of great importance worldwide (Lora et al., 2020). Schulz et al. (2012) demonstrated that physical activity has positive effects on mental health in people with mental health problems as well as in healthy individuals of all ages. Physical activity has great potential as a preventive and therapeutic measure for mental disorders, as it alleviates depressive symptoms and improves well-being (Schulz et al., 2012). According to a meta-analysis conducted by Rebar et al. (2015), enhancing physical activity levels in non-clinical groups has been shown to alleviate symptoms of depression and anxiety.

## **1.2 Athletes, non-athletes and mental health**

Physical activity does not always improve mental health (Schulz et al., 2012). Recent research suggests that especially athletes in high-performance sports are at risk for mental disorders. The intensive psychological as well as physical demands placed on athletes can increase their vulnerability to certain mental disorders (Frank et al., 2013). Research has identified various stress factors that athletes face, such as demands and expectations in training and competition, injuries and rehabilitation, overtraining syndrome, and athletic burnout (Schulz et al., 2012). Particularly in aesthetic sports such as diving and gymnastics, concern about one's body image can lead to eating disorders and substance use disorders (Gorczynski et al., 2017; Rice et al., 2016). Studies have also shown that the fear of withdrawal from performance sports, especially when occurring suddenly and unexpectedly, leads athletes to feel vulnerable and depressed (Grove et al., 1997; Wippert & Wippert, 2010). Other well-known stressors are overtraining syndrome and athletic burnout (Schulz et al., 2012). Athletes tend not to seek support when mental disorders occur (Rice et al., 2016). Reasons for this include a lack of understanding of mental health, stigma, and a potential impact on performance. Moreover, the feeling that seeking help is a sign

of weakness is also a motive (Reardon & Factor, 2010; Schwenk, 2000; Watson, 2005). Finally, many athletes do not want to interrupt their athletic career, so they choose to remain silent about their mental health issues and not seek the support that would likely be necessary (Coyle et al., 2017). The silence could mean that mental disorders, especially depressive symptoms, are far more common in athletes than current research suggests (Schwenk, 2000). The general population also struggles with mental health problems, as can be seen, for example, in the workplace (Brohan et al., 2012; Brouwers et al., 2020). Gulliver et al. (2015) also found, through a national survey of Australian athletes, that almost half of the respondents reported symptoms of at least one of the examined mental disorders, including depressive symptoms, with prevalence rates similar to those in the general population. In a study that examined Swiss athletes, R othlin et al. (2023) came to similar conclusions.

In fact, there are few direct comparisons between athletes in competitive sports and non-athletes in the general population regarding mental disorders. Although the prevalence rates of mental health indicate a similar trend in both groups, the comparison of mental disorder rates between athletes and non-athletes is hindered by the fact that the data may have been collected at different times or in different locations. As such, direct comparisons are challenging. For example, some studies may have been conducted with athletes from a specific sport or geographic region, while others may have looked at non-athletes from a different population. Additionally, different studies may have used different methods or criteria for diagnosing mental health conditions, which can further complicate comparisons.

### **1.3 Athletes, non-athletes and depressive symptoms**

There are almost no meta-analyses comparing depressive symptoms between athletes and non-athletes. In a meta-analysis by Chapman and Woodman (2016), the question of whether male athletes exhibit symptoms of eating disorders was investigated. When all studies were considered as homogeneous groups, male athletes did not show symptoms of eating disorders that significantly differed from the control group of non-athletes. Despite that, a significantly higher incidence of eating disorders was reported in the sport of wrestling. In addition, in the data from the Eating Attitudes Test, there was a significantly higher incidence of eating disorders among athletes than among non-athletes. In another meta-analysis from Gorczynski et al. (2017), athletes and non-athletes were compared using a validated measure of depressive symptoms, and the prevalence of individuals reporting at least mild depressive symptoms was recorded. Five articles with data from 1,545 athletes and 1,811 non-athletes were analyzed for this purpose.

The meta-analysis found that athletes did not report depressive symptoms more frequently than non-athletes. However, the likelihood of male athletes reporting depressive symptoms was 52% lower than that of female athletes. Several recent literature reviews have addressed depression in competitive sports, but almost no systematic approaches to investigating the literature exist. With the emergence of new research since the publication of the study of Gorczynski et al. (2017) a few years ago, it is reasonable to conduct a subsequent meta-analysis to further advance this objective. Therefore, the aim of this study is to conduct a systematic analysis of all relevant literature to answer the question of whether depressive symptoms are more or less pronounced in athletes than in non-athletes. Furthermore, the present study seeks to raise awareness of depressive symptoms in athletes in competitive sports and provide better insight into the literature.

## 2 Method

In order to ensure comprehensive reporting of methods and results, as well as transparency, the guidelines of the PRISMA statement according to Moher, Liberati, Tetzlaff, and Altman (2011) were followed.

### 2.1 Selection criteria

The inclusion and exclusion criteria for the literature search were developed using the PICOS scheme (Liberati et al., 2009) and are presented in Table 1. Only studies that met these criteria were searched for and selected.

**Table 1**

*Selection criteria according to PICOS scheme*

Category	Criteria
Participants	Healthy athletes in competitive sports without current injuries or handicaps. All sports, including individual and team sports, are considered. Athletes must meet at least one of the following requirements: compete at international, national, or competitive level college sports competitions; have at least three guided workouts per week; or have more than 5.5 hr of guided workouts per week. Those who do not meet any of these criteria are categorized as non-athletes.
Intervention	Examination of the expression of depressive symptoms in athletes and non-athletes by means of a completed questionnaire or diagnostic interview.
Control	All studies are considered, including questionnaires as well as diagnostic interviews. In addition, a control group from the general population is necessary.
Outcome	The results provide information about the expression of depressive symptoms in athletes and non-athletes.
Study design	Use of original German and English language studies. The publication date as well as the quality of the studies do not play a central role.

*Note.* PICOS is a scheme that helps to formulate the selection criteria that guide the literature search and study selection. PICOS is derived from the five initial letters of the categories.



## **2.2 Sources of study search**

To identify suitable, specific studies, the following five electronic databases were systematically searched: SportDiscus, Cochrane Central Register of Controlled Trials (TRIALS), MEDLINE (PubMed), PubPsych (PSYINDEX), and Google Scholar. The search was conducted from October 30, 2022 until December 1, 2022. The final search string was: “depress\*” AND “elite athlet\*”, “depress\*” AND “elite sport\*”, “depress\*” AND “performance athlete”, “depress\* AND “professional athlet\*”, “depress\*” AND “Spitzensport”, “depress\*” AND “Leistungssport”, depression AND “elite athletes” OR “performance athletes” OR “professional athlete”, depression AND “elite sport” OR “elite sports”, depression AND Spitzensport, depression AND Leistungssport, depressive AND “elite athletes” OR “performance athletes” OR “professional athlete”, depressive AND “elite sport” OR “elite sports”, depressive AND Spitzensport, depressive AND Leistungssport. An overview of the database search is provided in Table 2 in the appendix.

## **2.3 Study selection**

I created a flowchart according to Moher et al. (2011) to filter the identified studies. The definitive flowchart can be found in Figure 1 in the appendix. First, all potential studies were searched for in the already defined databases. Second, all duplicates were removed. In a third step, the titles were analyzed, and it was decided whether a study would be included or excluded. Next, the abstract was read to exclude further studies. Subsequently, the full text was read to exclude further studies. From the full-text screening onwards, the four-eye principle was applied with the supervisor Dr. Philipp Röthlin and compared with each other. Finally, additional studies were identified based on supplementary searches in the reference lists. All steps were documented and justified and can be found in Figure 1 in the appendix. In addition, the excluded studies from the existing meta-analysis of Gorczynski et al. (2017) can be found in Table 4 in the appendix.

## **2.4 Meta-analytic procedures**

The results were analyzed using JASP (JASP, Amsterdam, Netherlands), statistically analyzed, and graphically presented. Based on the means, standard deviations, and number of subjects in the studies, the effect size (ES) and its standard error (SE) were calculated using a Practical Meta-Analysis Effect Size Calculator (Wilson D. B., n.d.). The factors such as author, year, ES, and SE of the respective studies were then inserted into an Excel data set in JASP in order to calculate a meta-analysis.

## **2.5 Risk of study bias or quality**

In order to be able to identify as many relevant studies as possible on the topic of depressive symptoms in athletes and non-athletes, no restrictions were made with regard to the quality of studies and no quality assessment was carried out. All research results that met the selection criteria of this literature search were included. This was a conscious decision made in advance in favor of the most comprehensive possible research.

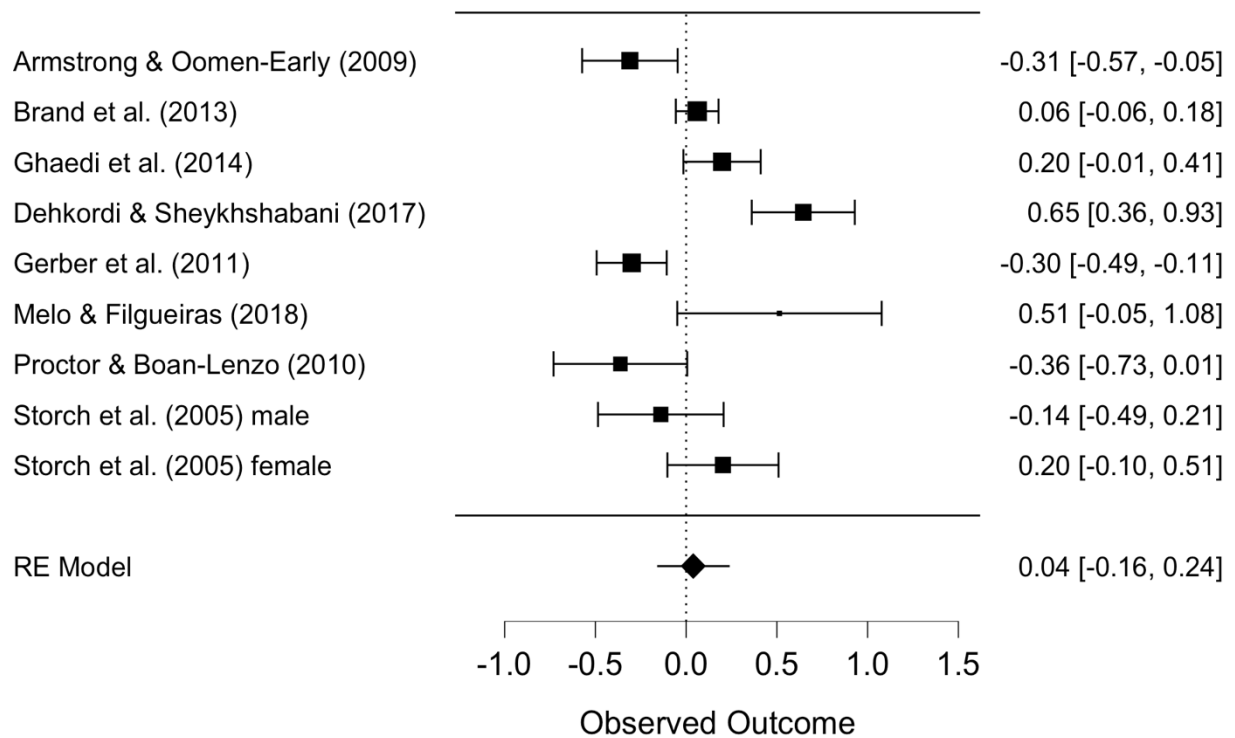
### 3 Results

The PRISMA search process is depicted in Figure 2. The initial database search yielded 571 articles. Of these, 177 duplicates were removed, and 359 articles were screened. A total of 31 full-text articles were assessed for eligibility. In total, eight articles were included in this review, reporting data from 1,605 athletes and 1,370 non-athletes. The average sample size of the studies included in this analysis was 371.88. The United States accounted for the majority of the interventions ( $n = 3$ ; 37.5%), while the rest were carried out in Iran ( $n = 2$ ; 25%), Brazil ( $n = 1$ ; 12.5%), Germany ( $n = 1$ ; 12.5%), and Switzerland ( $n = 1$ ; 12.5%). Table 3, located in the appendix, provides a summary of all studies included in the analysis, and Figure 1 shows a forest plot of the ES included in the overall analysis.

The comparison between athletes and non-athletes revealed no significant difference for depressive symptoms,  $ES = 0.039$ ,  $SE = 0.104$ ,  $z = 0.376$ ,  $p = 0.707$ . This overall ES is based on ES values ranging between -0.16 and 0.24 with significant heterogeneity,  $Q = 47.641$ ,  $p < 0.001$ ,  $I^2 = 83.208\%$ .

**Figure 1**

*Forest plot of the effect sizes (ES)*



*Note.* The Forest plot shows the weighted ES (size of the squares reflects the weight of each study) and coefficient interval (CI) used to determine the combined ES (diamond). RE Model = Overall ES and 95% CI. A positive ES indicates that the intervention or treatment had a beneficial effect on the outcome, while a negative ES indicates that the intervention or treatment had a detrimental effect on the outcome. The larger the ES, the greater the magnitude of the effect.

## **4 Discussion**

The aim of this meta-analysis was to determine whether depressive symptoms are more or less prevalent in athletes compared to non-athletes. To this end, the ES of the final studies were calculated after systematic analysis of all relevant literature. The results of the overall ES show that there is no significant difference between athletes and non-athletes. The data also show a significant heterogeneity.

### **4.1 Theoretical implications**

These observations have important implications for theory and practice. Some research suggests that athletes in competitive sports are at a high risk for mental disorders. The intense physical and psychological demands placed on athletes can increase their vulnerability to certain mental disorders (Schulz et al., 2012; Gorczynski et al., 2017; Rice et al., 2016). However, previous research has shown that athletes may attempt to ignore or suppress depressive symptoms due to the stigma surrounding depression and may be reluctant to seek help from sports psychologists or other mental health specialists (Gulliver et al., 2015; Castaldelli-Maia et al., 2019). As athletes may receive more comprehensive training or have greater access to training resources for cultivating mental toughness, defined as a set of cognitive attributes that enable individuals to cope with stressful situations while remaining determined, focused, confident, and psychologically composed, it is possible that elite athletes may underreport depressive symptoms in order to maintain or appear mentally strong. The act of disclosing depressive symptoms may be viewed as an admission of mental frailty, potentially giving the opponent an advantage (Rice et al., 2016). Unfortunately, this perception of mental fragility only perpetuates negative attitudes towards mental illness in sports and discourages athletes from seeking assistance. Non-athletes may also opt to overlook, suppress, or refrain from seeking help for depressive symptoms due to comparable stigma-related reasons, but they do not have access to advanced training opportunities for developing psychological resilience (Latalova et al., 2014).

From a theoretical perspective, the results of this study provide the first causal evidence that no significant difference exists in depressive symptoms between athletes and non-athletes. To the best of current knowledge, this study is one of the first to conduct a systematic analysis of all relevant literature and arrive at these conclusions.

## **4.2 Limitations and future directions**

However, the present study has some limitations. Only a small number of studies met the inclusion criteria and were included in the meta-analysis, which may limit the generalizability of the results. Attempts were made to contact study authors via email to obtain additional information on depressive symptoms. Regrettably, no response was received from the authors. This information could have increased the pool of eligible studies and afforded a more substantial comprehension of the contrast between depressive symptoms in athletes and non-athletes.

Additionally, the comparison between athletes and non-athletes is broad and does not consider the differences between sports. It is possible that the type of sport and the intensity of physical activity may have an impact on mental health and ultimately on depressive symptoms. Other factors, such as age, genetics, social support, or environmental stressors, could also play an important role in the development of depressive symptoms.

Lastly, a possible reason for the observed heterogeneity in the different methods of assessing depressive symptoms may lie in the fact that different instruments can produce different results in diagnosing depression. The studies differed in their design, sample size, and measurement instruments, which could also have contributed to the observed heterogeneity.

Overall, this meta-analysis suggests that the relationship between physical activity and depressive symptoms is more complex than depicted in earlier studies. Therefore, future studies should carefully consider the different factors, including those mentioned above, that could influence this relationship. Additionally, to further and better investigate depressive symptoms in both groups, utilizing clinical diagnosis data obtained through structured clinical interviews may be more beneficial than relying on self-reported questionnaires.

## **4.3 Practical implications**

These results have several practical implications for both athletes and non-athletes, as well as for professionals in the field of mental health and researchers.

This insight is important for athletes, as they do not need to feel pressured to engage in their sport and harm their mental health, even if they must achieve outstanding performances; this allows them to fully concentrate on their activities. Nonetheless, it is important for athletes to have access to psychological support to manage the effects of stressors in sports and prevent

mental disorders, such as depressive symptoms. One potential approach could be to offer education and training in effective coping strategies for the prevention and management of depressive symptoms and other mental health problems at an early age in the athlete's career.

For non-athletes, the finding that there is no significant difference in depressive symptoms between athletes and non-athletes may bring some relief to those who feel that they are missing out on the benefits of physical activity for their mental health. This may help to alleviate any concerns or pressures that non-athletes may have about not being involved in sports or physical activity. Instead of exercising for the sake of mental health, they can focus on activities that they enjoy and find fulfilling. Nevertheless, non-athletes should still engage in physical activity. Sport has been shown to have many positive effects on mental health, including reducing depression and anxiety symptoms, regardless of athletic ability or activity level (Rebar et al., 2015; Schulz et al., 2012). In addition, education and training in coping strategies for depressive symptoms and other mental health problems could be offered to the general population, particularly already at an early age. Regular mandatory courses could be provided in schools as a component of general education.

The results of this study underscore for professionals and researchers in the field of mental health how important it is to consider individual differences when examining the relationship between physical activity and mental health. The findings of significant heterogeneity in ES values could be used to investigate the factors that may influence the relationship between physical activity and mental health. This may include examining individual differences such as age, gender, and physical fitness level, as well as contextual factors such as the type of sport or physical activity. Mental health professionals can also use these findings to educate their clients who are non-athletes about the lack of significant differences in depressive symptoms between these two groups.

These findings suggest that both athletes and non-athletes are susceptible to experiencing depressive symptoms, emphasizing the importance of addressing mental health concerns in both groups. As such, the results of this study may serve to increase public awareness and understanding of the importance of promoting and maintaining good mental health in individuals from all walks of life.

## **5 Conclusion**

The present meta-analysis investigated whether depressive symptoms are more or less prevalent among athletes compared to non-athletes. The results showed no significant difference in the frequency of depressive symptoms between the two groups. The study has important implications for theory and practice as it provides the first causal evidence that there is no significant difference between the two groups. However, the analysis has some limitations, as the comparison between athletes and non-athletes is very broad and does not consider the differences between different sports. Other factors such as age, genetics, social support, or environmental stressors may play a more important role in the development of depressive symptoms. Overall, the relationship between physical activity and depressive symptoms is very complex, which makes it necessary for future studies to examine more closely the influence of sports on depressive symptoms. Therefore, data from clinical diagnoses in the form of structured clinical interviews may be useful instead of self-reports via questionnaires.



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## Appendix

**Table 2**

*Overview of the online database search on depression from October 30, 2022 to December 1, 2022, with the search terms used and filters set.*

SPORTDiscus	Number of studies: $n = 77$ / Duplicates $n = 0$
Search terms	Filter
“depress*” AND “elite athlet*”	German, English, Academic Journals
“depress*” AND “elite sport*”	German, English, Academic Journals
“depress*” AND “performance athlet*”	German, English, Academic Journals
“depress* AND “professional athlet*”	German, English, Academic Journals
“depress*” AND “Spitzensport”	German, English, Academic Journals
“depress*” AND “Leistungssport”	German, English, Academic Journals
Cochrane Library	Number of studies: $n = 31$ / Duplicates $n = 23$
Search terms	Filter
“depress*” AND “elite athlet*”	German, English, Title Abstract Keyword
“depress*” AND “elite sport*”	German, English, All Text
“depress*” AND “performance athlet*”	German, English, All Text
“depress* AND “professional athlet*”	German, English, All Text
“depress*” AND “Spitzensport”	German, English, All Text
“depress*” AND “Leistungssport”	German, English, All Text
Pubmed	Number of studies: $n = 169$ / Duplicates $n = 54$
Search terms	Filter
depression AND “elite athletes” OR “performance athletes” OR “professional athlete”	German, English, Keywords
depression AND “elite sport” OR “elite sports”	German, English, Keywords
depression AND Spitzensport	German, English, Keywords
depression AND Leistungssport	German, English, Keywords

depressive AND “elite athletes” OR “performance athletes” OR “professional athlete”	German, English, Keywords
depressive AND “elite sport” OR “elite sports”	German, English, Keywords
depressive AND Spitzensport	German, English, Keywords
depressive AND Leistungssport	German, English, Keywords

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PubPsych (PSYINDEX) Number of studies:  $n = 61$  / Duplicates  $n = 58$

Search terms	Filter
«depress*» AND «*elite athlet*»	German, English
«depress*» AND «*elite sport*»	German, English
«depress*» AND «*performance athlet*»	German, English
«depress*» AND «*professional athlet*»	German, English
«depress*» AND «*Spitzensport*»	German, English
«depress*» AND «*Leistungssport*»	German, English

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Google Scholar Number of studies:  $n = 58$  / Duplicates  $n = 5$

Search terms	Filter
depression AND “elite athletes” OR “performance athletes” OR “professional athlete”	German, English, Keywords
depression AND “elite sport” OR “elite sports”	German, English, Keywords
depression AND Spitzensport	German, English, Keywords
depression AND Leistungssport	German, English, Keywords
depressive AND “elite athletes” OR “performance athletes” OR “professional athlete”	German, English, Keywords
depressive AND “elite sport” OR “elite sports”	German, English, Keywords
depressive AND Spitzensport	German, English, Keywords
depressive AND Leistungssport	German, English, Keywords

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**Table 3***Characteristics of samples used in the meta-analysis*

Reference	Effect size (d) and standard error (SE)	Sports	Athletic sample	Non-athletic sample	Dependent variable
Armstrong & Oomen- Early (2009)	$d = -0.3099$ $SE = 0.1342$	Unknown	$n = 104$ 54.8% female; age: $M = 19.87$ , $SD = 1.33$ (athletes and non-athletes); depressive symptoms: $M = 13.78$ , $SD = 9.09$	$n = 123$ 64.2% female; age: $M = 19.87$ , $SD = 1.33$ (athletes and non-athletes); depressive symptoms: $M = 16.72$ , $SD = 9.81$	CES-D
Brand et al. (2013)	$d = 0.0609$ $SE = 0.06$	Varied	$n = 777$ 38.5% female, age: $M = 12-15$ ; training hours per day $M = 2.80$ , $SD = 1.1$ ; prevalence of at least mild depressive symptoms: male athletes = 19.3%, female athletes = 36.5%	$n = 432$ 42.0% female, age: $M = 12-15$ ; unknown training hours per day; prevalence of at least mild depressive symptoms: male non-athletes = 18.7%, female non-athletes = 42.2%	CID-S (Expanded 18-item version)
Dehkordi & Sheykhshabani (2017)	$d = 0.6453$ $SE = 0.1449$	Unknown	$n = 100$ 76.0% female; depressive symptoms: $M = 12.37$ , $SD = 4.93$	$n = 100$ 71.0% female; depressive symptoms: $M = 9.51$ , $SD = 3.87$	BDI-II

Reference	Effect size (d) and standard error (SE)	Sports	Athletic sample	Non-athletic sample	Dependent variable
Gerber et al. (2011)	$d = -0.3000$ $SE = 0.0985$	Varied	$n = 258$ 54.7% female; age: $M = 17.56$ , $SD = 1.34$ ; training hours per week: $M = 17.70$ , $SD = 5.65$ ; depressive symptoms: $M = 5.45$ , $SD = 5.01$	$n = 176$ 46.1% female; age: $M = 16.96$ , $SD = 1.33$ ; training hours per week: $M = 4.53$ , $SD = 1.24$ ; depressive symptoms: $M = 7.04$ , $SD = 5.70$	Zerssen Depression Scale
Ghaedi et al. (2014)	$d = 0.1979$ $SE = 0.1086$	Unknown	$n = 170$ 47.1% female, age: $M = 21.45$ , $SD = 1.66$ (athletes and non-athletes); prevalence of at least mild depressive symptoms: male athletes = 26.7%, female athletes = 31.3%	$n = 170$ 47.1% female, age: $M = 21.45$ , $SD = 1.66$ (athletes and non-athletes); prevalence of at least mild depressive symptoms: male non-athletes = 34.4%, female non-athletes = 42.5%	BDI-II
Melo & Filgueiras (2018)	$d = 0.5141$ $SE = 0.2874$	Kickboxing	$n = 25$ age: $M = 34.50$ , $SD = 12.7$ ; minimum of 5 trainings per week; depressive symptoms: $M = 37.80$ , $SD = 17.40$	$n = 25$ age: $M = 34.60$ , $SD = 12.3$ ; 2 to 4 trainings per week; depressive symptoms: $M = 28.70$ , $SD = 18.00$	FDI



Reference	Effect size (d) and standard error (SE)	Sports	Athletic sample	Non-athletic sample	Dependent variable
Proctor & Boan-Lenzo (2010)	$d = -0.3623$ $SE = 0.1879$	Baseball	$n = 66$ male age: $M = 20.30$ years, $SD = 2.03$ (athletes and non-athletes); training hours per week: $M = 20.70$ (in season); depressive symptoms: $M = 8.94$ , $SD = 6.60$	$n = 51$ male age: $M = 20.30$ years, $SD = 2.03$ (athletes and non-athletes); activity hours per week: $M = 9.50$ ; depressive symptoms: $M = 11.55$ , $SD = 7.92$	CES-D
Storch et al. (2005)	Male: $d = -0.1395$ $SE = 0.1766$  Female: $d = 0.2029$ $SE = 0.1562$	Varied	$n = 105$ 48.6% female; age: $M = 20.90$ years, $SD = 3.0$ (athletes and non-athletes); depressive symptoms in male: $M = 12.11$ , $SD = 9.97$ , depressive symptoms in female: $M = 15.22$ , $SD = 10.61$	$n = 293$ 73.0% female; age: $M = 20.90$ years, $SD = 3.0$ (athletes and non-athletes); depressive symptoms in male: $M = 13.53$ , $SD = 10.32$ , depressive symptoms in female: $M = 13.10$ , $SD = 10.41$	Depression subscale of PAI

*Note.* M = Mean. SD = Standard deviation. BDI-II = Beck Depression Inventory II (Beck et al., 1996). CES-D = Center for Epidemiological Studies Depression Scale (Radloff, 1977). CID-S = Composite International Diagnostic-Screener (Wittchen et al., 1999). DASS-21 = Depression – anxiety – stress – 21 scale (Yilmaz et al., 2017). FDI = Filgueiras Depression Inventory (Filgueiras et al., 2014). PAI = Personality Assessment Inventory (Morrey, 1991). Zerssen Depression Scale (Zerssen, 1976).

**Table 4***Excluded studies from meta-analysis of Gorczynski et al. (2017) with justification*

Nr.	Author and year	Title of the study	Justification
1	Ghiami et al. (2015)	Comparison of mental health components among athlete and non-athlete adolescents	Missing data for ES calculation
2	Junge & Feddermann-Demont (2016)	Prevalence of depression and anxiety in top-level male and female football players	Comparison group from a different study

**Figure 2**

*PRISMA flowchart*

