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Review

ACTIVIDAD FÍSICA Y DEPRESIÓN EN MUJERES JÓVENES

PHYSICAL ACTIVITY AND DEPRESSION IN YOUNG WOMEN

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RESUMEN

La depresión es una enfermedad común que afecta a 121 millones de personas en el mundo, especialmente a mujeres. Diversos estudios han advertido sobre los beneficios derivados de la realización de actividad física para reducir el riesgo de padecer depresión. Sin embargo, no existe un consenso definido sobre el tipo de actividad física que mejor previene de la depresión en cada una de las diferentes etapas vitales de la mujer. El objetivo de esta revisión es explorar si la realización de ejercicio físico previene la aparición de síntomas depresivos en mujeres jóvenes. Además, se pretenden identificar los tipos de actividad física que mejor previenen la depresión en cada etapa vital. Se realizó una búsqueda bibliográfica exhaustiva en bases de datos (PubMed, SCOPUS, EBSCOHost, Dialnet) de referencia en investigación deportiva y salud, obteniendo 551 resultados de los cuales se consideraron relevantes un total de 25, atendiendo a los siguientes aspectos: Los artículos debían estar escritos en los idiomas inglés o español. El periodo de publicación de los artículos debía estar comprendido entre los años 2008 y 2018. La muestra incluida en el apartado metodológico de cada estudio incluye a mujeres jóvenes (menores de 40 años). Los artículos se clasificaron atendiendo a las diferentes etapas vitales de la mujer. El ejercicio físico está indicado para mitigar los efectos de los síntomas depresivos en todas las etapas vitales a excepción de la etapa postparto. Los tipos de ejercicio físico más indicados son: la realización de actividad física de manera regular en edades tempranas y la actividad física de intensidad moderada en embarazadas y en entornos desfavorecidos. La realización de actividad física regular y moderada es positiva para disminuir el número de episodios depresivos y mejorar la autoestima en mujeres jóvenes (excepto en la etapa postparto).

Palabras clave: depresión, mujer, joven, actividad física, etapa vital.

ABSTRACT

Depression is a very common disease that affects 121 million people all around the world, especially women. Some studies have demonstrated the benefits of physical activity in order to decrease depression symptoms, but there is no consensus about the physical exercise that best prevents from depression attending to each stage of life in young women. The aim of this revision is to explore if physical activity prevents from depression in young women. Besides, this study is intended to classify the best type of exercise to mitigate depression for each stage of life. An exhaustive scientific literature research has been made for four sport and health-specific research databases (PubMed, SCOPUS, EBSCOHost and Dialnet). 551 results were gathered and 25 of them were relevant to this study, taking into account the following considerations: Articles should have been written in English or Spanish. Articles should have been written in 2008-2018 period. Article samples should have included young women (less than 40 years old). All articles were classified taking into account the stage of life studied. Physical exercise can reduce depressive symptoms for every stage of life but postpartum in young women. Doing regular physical activity in early stages of life and doing moderate physical activity (for pregnant and women in disadvantaged environments) have been found to be good practices in order to mitigate depression. Regular and moderate physical activity helps to reduce depressive episodes and to enhance self-esteem among young women (with the exception of postpartum women).

Keywords: depression, women, young, physical activity, stage of life.



INTRODUCTION

Depression makes reference to a wide range of mental problems. These problems are characterized by the absence of positive feelings, lack of interest or joy for daily activities, persistent bad humor and a series of emotional, cognitive, physical and behavioral symptoms (NICE, 2009).

Depression is a common problem that affects 121 million people worldwide. It also ranks as the fourth leading cause of disease. In addition, depression is a major cause of mortality and produces a greater decrease in welfare than other chronic diseases like arthritis (Moussavi et al., 2007).

Traditionally, the scientific literature has focused on studying the effectiveness of exercise programs in physical parameters such as blood pressure and body composition (Dugdill, Graham, & McNair, 2005). Therefore, usually there has been little recognition of the value of exercise programs for mental health (Crone, Smith, & Gough, 2005).

However, at present, there is considerable scientific evidence that shows a positive relationship between physical activity and mental health (Callaghan, 2004). The key mechanism has been discussed and some critical issues have been identified: feelings of autonomy and success, achievement of objectives, perceptions of enjoyment and memorable experiences are some of the linkers (Crone, 2007). Moreover, people with mental problems involved in exercise programs identify self-acceptance as a key factor. In addition, the social support and the physical environment surrounding physical activity programs are also identified as key concepts for the development of this kind of positive experiences (Crone et al., 2005).

Both anxiety and depression are factors that contribute to negative perceptions of quality of life (Olmedilla-Zafra & Ortega-Toro, 2009). Beyond the loss of mental health and quality of life linked to this disorder, depression also increases the risk of developing certain chronic illnesses such as cardiovascular diseases and diabetes (Chapman, Perry, & Strine, 2005).

Depression can be considered as one of the most common mental health problems (Dowd, 2004) traditionally affecting more women than men

(Lehtinen & Joukamaa, 1994). One in five women will be diagnosed with depression throughout her life (Craft, Freund, Culpepper, & Perna, 2007). In a prospective study it was found that women who had experienced depressive symptoms before age 17 were also likely to gain weight over the next 10 years of their life and to have a high risk of obesity in adulthood (Hasler et al., 2005).

On the other hand, some sociodemographic variables (marital status, number of children and educational level) seem to affect rates of depressive symptoms, especially in women (Olmedilla, Ortega, & Madrid, 2008). Age is another of these factors associated with depression: during adolescence, the prevalence of depression and eating disorders is higher in girls than in boys (Matud Aznar, 2008). Furthermore, it can be considered that young women is a risk group, because in this age women report higher levels of depression than in most other age groups (Olmedilla, Ortega, & Candel, 2010).

Depression disorders during pregnancy are also common among young women, with an occurrence of between 10% and 13% of cases (Gaynes et al., 2005). Although medication is a reasonable option to treat many women, many patients and physicians prefer to use strategies to avoid drugs during pregnancy (Einarson, 2010). Therefore, investigation of other treatment is necessary.

Postpartum depression is a common problem that women have to face after the birth of the baby. This type of depression affects 13% of mothers, which ranks as one of the rising incidence alterations (Barakat, Bueno, Durana, Coterón, & Montejo, 2013). A physiological fact as is the process of pregnancy and childbirth, can greatly influence the future health and quality of life of women (Bjelica & Kapor-Stanulovic, 2004).

This literature review aims to make an analysis of the scientific literature and identify the relationship between exercise and depression in young women. It is intended to show that there are benefits of physical activity and list the types of physical activity that best mitigate depressive symptoms in each of the life stages of young women.



METHODS

The literature search was conducted electronically during the month of April in 2018, using the following databases:

- PubMed
- EBSCOHost
- SCOPUS
- Dialnet

Table 1. Keywords used for the literature search

KEYWORDS IN ENGLISH	KEYWORDS IN SPANISH
Physical activity AND Exercise AND Young women AND Depression	Actividad física AND Ejercicio AND Mujeres AND Depresión

551 results were obtained, of which 526 were articles and 25 revisions. In order to select the articles for this current revision, the following restrictions were considered: i) Articles must have been written in English or Spanish. ii) Articles must have been published between 2008 and 2018. iii) The sample included in the methodology section of each study includes young women (less than 40 years old).

The results obtained by the literature search were filtered according to the three criteria listed above. A total of 40 items were considered valid; however, 15 were excluded as they were repeated in different literature searches.

Finally, 25 articles were included in this review.

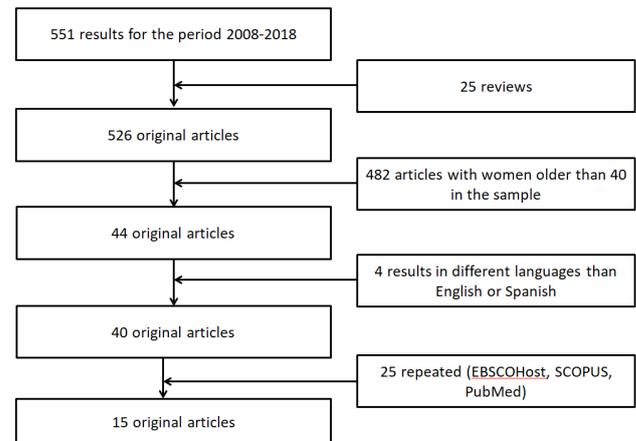


Figure 1. Selection flowchart

EXERCISE AND DEPRESSION IN YOUNG WOMEN

The studies found in the literature search will be summarized in the following sections. These studies were categorized into five main groups according to the number of studies found for each case. This analysis coincides with different life stages in which women are more susceptible to depression.

Thus, there will be a review of studies grouped in different categories attending to their samples: early ages (children and adolescents), university students, pregnant women, postpartum women and women in groups with social disadvantages.

Exercise and depression in childhood and adolescence

In this section it will be considered three studies that have linked depression and exercise at an early age (up to 20 years old). This group found two original articles and a literature review which in turn has considered four original articles on the subject treated.

One of the studies (Campillo, Zafra, & Redondo, 2008) aimed to analyze a sample of 226 female high school students in institutes of Murcia (Spain). The occurrence of depression was assessed by the questionnaire BDI (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). The study did not include results



showing significant differences in favor of physical exercise. In fact, the results showed that people who practice physical activity have higher mean scores on the depression scale.

In another study conducted in Australia (Jacka et al., 2011), a sample of 1494 women were asked, by a self-assessment questionnaire, the amount of physical activity during childhood and the occurrence of depressive symptoms in adulthood. Regression analysis showed that low physical activity in childhood is associated with the risk of depression in adulthood.

A systematic literature review (Eime, Young, Harvey, Charity, & Payne, 2013) on social and psychological benefits of sport participation by children and adolescents, reported four studies that related physical activity and depressive symptoms at early ages.

One of these studies (Boone & Leadbeater, 2006) was conducted in Canada with a sample of 449 adolescents (223 girls) by applying the questionnaire BDI (Beck et al., 1961) to measure depression and a questionnaire to measure sports participation (Achenbach, 1991). Less depressive symptoms were found in sport activity participants (in both girls and boys). The study concluded that the benefits of participation in team sports may be related to positive experiences of skill development, social acceptance perception and improvement in physical acceptance.

Another study (Gore, Farrell, & Gordon, 2001), was held in Boston (United States) with 1,036 adolescents (598 girls) and the CES- D questionnaire was used (Radloff, 1977) to measure the amount of depressive symptoms. There was also used an open response questionnaire to measure the amount of time engaged in physical activities. The study results showed that, in the case of girls, participation in team sports protected them against depressive symptoms associated with poor academic performance.

The third study reported in the review (Sanders, Field, Diego, & Kaplan, 2000) was held in Miami (United States) and it took a sample of 89 last grade (17-18 year-old) high school students (52 girls). Each individual filled a questionnaire (Field 1991) to measure depressive symptoms. This study found that moderate participation in sports activities (3-6 hours

per week) was associated with fewer depressive symptoms than a low participation (0-2 hours per week). However, no further information was provided describing each gender.

The last study reported in the review were conducted in Switzerland (Ferron, Narring, Cauderay, & Michaud, 1999) and adolescents were classified as athletes or non-athletes attending to their participation in sports clubs. It was used a sample of 9,268 people aged 15 to 20 years (3,993 girls). It was found, for both sexes, that athletes were less frequently depressed, apart from having fewer feelings of nervousness and anxiety.

Table 2. Summary of reviewed studies for early ages

Authors, year and place	Sample and method	Main results
Campillo, Zafra & Redondo (2008) Murcia (Spain)	N = 226 girls Age: 16-19 years Questionnaires (BDI and sociodemographic)	The girls who do physical activity have higher levels of depression (not significant)
Jacka et al. (2011) South Eastern Australia	N = 3014 (1,494 women) Age: 20-94 years Questionnaires on physical activity in childhood and depressive symptoms at present	Low physical activity in childhood is associated with greater risk of depression in adulthood
Studies included in: Eime, Young, Harvey, Charity, & Payne (2013)		
Boone & Leadbeater (2006) Canada	N = 449 (223 girls) Age: 13-16 years Questionnaires	Less depressive symptoms were found in sport activity participants of both sexes



(BDI and physical activity)		
Gore, Farrell, & Gordon (2001)	N = 1.036 (598 girls) Age: 14-17 years	The participation of girls in team sports protects them against depressive symptoms associated with poor academic performance
Boston (United States)	Questionnaires (CES- D and physical activity)	
Sanders, Field, Diego, & Kaplan (2000)	N = 89 (52 girls) Age: 17-18 years	A moderate participation in sports activities (3-6 hours per week) is associated with fewer depressive symptoms than a low participation (0-2 hours per week)
Miami (United States)	Questionnaires on depressive symptoms and number of hours of weekly physical activity	
Ferron, Narring, Cauderay, & Michaud (1999)	N = 9,268 (3,993 girls) Age: 15-20 years	Athletes are depressed less frequently, in addition to having fewer feelings of nervousness and anxiety
Switzerland	Questionnaire on health and lifestyle	

Table 2 shows that all studies used questionnaires as part of the methodology employed, and that 5 of the 6 studies found significant benefits in performing physical activity at early ages (children and adolescents).

Exercise and depression in female university students

In this section it will be summarized the studies found in the review that examined the effects of exercise in female university students. The four studies found will be analysed chronologically.

The first one (L. A. Taliaferro, Rienzo, Pigg, Miller, & Dodd, 2009) was implemented in the United States, and it analyzed the differences between students who performed different physical activities (aerobic, strength and toning) and those who did not, in terms of suffering feelings of depression, hopelessness, and suicidal behavior. A questionnaire on habits, behaviors and lifestyles was used and

completed by 43,499 university students (28,090 women) aged between 18 and 25 years.

The results showed that women who did aerobic physical activity had significantly fewer depressive symptoms. Moreover, those who performed moderate tone (from 3-5 times per week) or low frequency tone (1-2 times per week) also had fewer depressive symptoms.

Another study performed in the United States (Key, Ross, Bacon, Lavoie, & Campbell, 2009), investigated the relationship between depression and cardiovascular recovery after suffering mental stress. Cardiovascular capacity was measured before, during and after a task aimed to create stress (public speaking). This study used a sample of 63 women (22.5±6.0 years). One BDI (Beck et al., 1961) questionnaire and a questionnaire on visual analogue scales (VAS) was also administered to self-assess feelings of stress and depression during the last week and while performing the task.

The study found that depressive states may be associated with greater variations in beats per minute and blood pressure recoveries worse after performing stressful tasks.

A study in Murcia (Spain) (Olmedilla et al., 2010), on a sample of 371 female university students (age: 21.29±5.03 years), analyzed the correlations between physical activity and depression. A BDI questionnaire was used to measure depressive symptoms and a questionnaire on physical activity and sociodemographic variables (Candel, 2008) was also employed. The study showed that students who participate in physical activity, whether competitive or not, show lower levels of anxiety and depression.

The last study found for this group (Tyson, Wilson, Crone, Brailsford, & Laws, 2010), was held at the University of Gloucestershire (United Kingdom) and studied a sample of 100 students (80 women) who filled two questionnaires. The first one was the HADS (Zigmond & Snaith, 1983) and the second one was the PAQ (Thirlaway & Benton, 1992). The objectives of this study were to investigate the relationship between physical activity and mental health in a sample of British university students. The results showed significantly lower levels of



depression and anxiety the amount of exercise per week increased.

levels of depression in all the studies. However, one of them clarifies that exercise should not be made more than 5 days per week.

Table 3. Summary of studies reviewed for university students

Authors, year and place	Sample and method	Main results
Taliaferro, Rienzo, Pigg, Miller & Dodd (2009) United States	N = 43,499 (28,090 women) Age: 18-25 year Questionnaires on habits and lifestyle	Aerobic exercise is associated with lower depressive symptoms. The toning exercise without high frequency (1-5 times per week) also favours the non-occurrence of depressive symptoms
Key, Ross, Bacon, Lavoie & Campbell (2009) United States	N = 63 women Age: 20.5±6.0 years Questionnaires (BDI and VAS) Cardiovascular measurement	Depressive states can be associated with greater variations in beats per minute and worse blood pressure recoveries after performing stressful tasks
Olmedilla, Ortega & Candel (2010) Murcia (Spain)	N = 371 women Age: 21.29±5.03 years Questionnaires (BDI and physical activity)	The students who participate in physical activity, whether competitive or not, show lower levels of anxiety and depression
Tyson, Wilson, Crone, Brailsford & Laws (2010) Gloucestershire (United Kingdom)	N = 100 (80 women) Age: undefined Questionnaires (HADS and PAQ)	Lower levels of depression and anxiety as frequency of exercise per week increases

Table 3 shows that in all studies questionnaires were used to assess depressive symptoms. In addition, performing physical activity is associated with lower

Physical activity and depression in pregnant women

In this section, the various studies considered about the relationship between exercise and depression for pregnant women will be discussed.

A study in the United States (Rauff & Downs, 2011) analyzed the relationship between body image, depressive symptoms and physical exercise for trimester 2 and 3 of gestation. The sample taken was 151 women (mean age: 30 years) and was performed by a prospective longitudinal study using several questionnaires about body satisfaction (Cash & Henry, 1995), depression (Radloff, 1977), physical activity habits (Godin & Shephard, 1985) and sociodemographic variables. Negative correlations between body image and depressive symptoms were found, but they were not strong enough to say that exercise would mitigate depressive symptoms.

Another study conducted in the United States (Demissie et al., 2011b) analyzed the relationship between moderate-vigorous physical activity and prenatal depression using a sample of 1,220 women. A questionnaire was filled by with each woman on two particular moments of the pregnancy: one before the 20th week of gestation and another between weeks 24 and 29. In addition, two telephone interviews were conducted: one between weeks 17 and 22, and another between weeks 27 and 30. The study found that working women with moderate-vigorous activity up to 2.67 hours/week had almost half the odds of having high depressive symptoms as compared to women who did not engage in moderate to vigorous activity.

One study (Tendais, Figueiredo, Mota, & Conde, 2011) in Oporto (Portugal) examined patterns of physical activity in women before pregnancy until the second trimester of pregnancy and the relationship between them and the quality of life. The sample consisted of 56 women who were asked to complete a SF-36 questionnaire (Ware Jr & Sherbourne, 1992) and a GPAQ questionnaire (Hagströmer, Oja, & Sjöström, 2006) during 10-15 and 19-24 pregnancy



weeks. Depression rates remained constant and no significant differences between the quality of life of pregnant and amount of physical activity were observed.

One another study in the city of Cali in Colombia (Robledo-Colonia, Sandoval-Restrepo, Mosquera-Valderrama, Escobar-Hurtado, & Ramirez-Velez, 2012) considered a sample of 80 pregnant first-time mothers. An experimental group (N = 40) completed a controlled exercise program during 3 months (3 sessions per week, including 10 minutes of walk, 30 minutes of aerobic exercise, 10 minutes of stretching and 10 minutes of relaxation) starting at weeks 16 - 20 gestation. The control group did not change their usual program of activities in preparation for childbirth. Both groups were asked to complete a questionnaire CES- D (Wells, Klerman, & Deykin, 1987) between 16-20 weeks of gestation and at the end of the three-month intervention (weeks 28 to 32). The experimental group improved their depressive symptoms compared to the control group, although these results were not clinically significant.

One study conducted in the United States (Field, Diego, Delgado, & Medina, 2013) considered a sample of 92 pregnant women divided into a control group (N = 46) and experimental group (N = 46) who took a 12 week program where they held a 20-minute session of tai chi/yoga each week. All of them completed a SCID questionnaire (Spitzer, Williams, Gibbon, & First, 1992) at the beginning of the study, and a CES-D questionnaire (Radloff, 1977) between weeks 20 and 32 of gestation. Once treatment was concluded, the group that performed tai chi/yoga had lower depression scores, in addition to less anxiety and sleep problems.

The last study in this section was held in Bengaluru (India). This research (Satyapriya, Nagarathna, Padmalatha, & Nagendra, 2013) was faced prospectively and randomly on a simple of 96 women who were divided into two groups: a control group (N=45) who performed normal childbirth preparation exercises and an experimental group (N=51) who performed integrated yoga sessions, 6 hours per week during a month. A HADS questionnaire (Zigmond & Snaith, 1983) was given to each woman, in order to measure depressive symptoms at the beginning and at the end of the treatment. The results showed that there were significant differences between groups in

levels of depression: they were reduced in the experimental group (-30.67%) and increased in the control Group (+3.57%).

Table 4. Summary of reviewed studies for pregnant women

Authors, year and place	Sample and method	Main results
Rauff & Downs (2011) United States	N = 151 Mean age: 30 years Questionnaires on body satisfaction, depression, physical activity habits and sociodemographic variables	Exercise would not mitigate depressive symptoms. The physical and mental changes during pregnancy appear to be associated with each other
Demissie et al. (2011) United States	N = 1,220 Questionnaires, telephone interviews and clinic research visits	Active women with no more than 2.67 hours / week moderate - vigorous activity had fewer depressive symptoms
Tendais, Figueiredo, Mota, & Conde (2011) Oporto (Portugal)	N = 56 Age: 20-39 years Questionnaires: SF-36 and GPAQ	No significant differences were observed between the quality of life of pregnant women and the amount of physical activity
Robledo-Colonia et al. (2012) Cali (Colombia)	N = 80 Age: 16-30 years Experimental group: 3 months (Physical activity 3 times per week) Control group: normal activity CES-D questionnaire	The experimental group improved their depressive symptoms compared to the control group, although these results were not clinically significant



Field, Diego, Delgado, & Medina (2013)	N = 92 Age: 26,6±5,5 years	The group that performed tai chi / yoga had lower depression scores, in addition to less anxiety and sleep problems
United States	Experimental group: 12 weeks, 1 tai chi/yoga session per week Control group: normal activity	
	Questionnaires: SCID and CES-D	
Satyapriya, Nagarathna, Padmalatha, & Nagendra (2013)	N = 96 Age: 20-35 years	There were significant differences in both groups in levels of depression. There were reduced in the experimental group and increased in the control group
Bengaluru (India)	Experimental group: yoga (6h per week during a month) Control group: normal activity	
	HADS questionnaire	

Table 4 shows that questionnaires were used in all researches, as part of their methodology. At this stage of life (pregnant women) intervention groups were also used in three of the six studies. Interestingly, in these three studies significant differences were found between groups who exercised or not, getting fewer depressive symptoms those groups who performed physical activity.

Physical activity and depression in postpartum women

In this section, the studies that link physical activity and depression in the postpartum period will be discussed.

One of these studies was held in Australia (Craike, Coleman, & MacMahon, 2010) with a sample of 5,107 mothers of infants. It examined the role of physical activity during leisure time, in terms of mitigation of stress and depression for this group.

Data were collected by a PISC questionnaire (Johnstone, 2004) and a K6Scale questionnaire (Kessler et al., 2002). The results showed that the performance of physical activity during leisure time

helps maintain mental health of mothers of infants, although this relationship may be affected in the case of mothers with time constraints.

Another Research was made in North Carolina (United States) collected information About 550 women. This research studied the effect of moderate-vigorous physical activity during the first postpartum trimester and the risks of having depression during the first year after birth (Demissie et al., 2011a). Telephone interview was conducted on the third and twelfth month after birth. Depressive symptoms were assessed by an EPDS questionnaire (Cox, Holden, & Sagovsky, 1987). The results showed that mothers who performed moderate - vigorous physical activity were twice as likely to develop depressive symptoms during the first months postpartum, although some sociodemographic variables that mitigated this effect were found.

The last Research found for this group (Carballo, Bueno, de Durana, López, & Rodríguez, 2013) corresponds to a study conducted in Fuenlabrada (Spain) with a sample of 25 women (age: 33.6±3.6 years). Thirteen of them were included in an intervention program of physical exercise in 12 weeks, 3 times a week, and one hour per session.

The measurements of the variables were performed using three questionnaires: EPDS (Cox et al., 1987), SF-36 (Ware Jr & Sherbourne, 1992) and a sociodemographic questionnaire. Significant differences between the scheduled exercise and perception of their own health were found, but no significant differences in the occurrence of postpartum depressive symptoms.

Table 5. Summary of reviewed studies on postpartum stage

Authors, year and place	Sample and method	Main results
Craike, Coleman & MacMahon (2010)	N = 5,107 Age: 34.6±5.23 years Questionnaires:	The realization of physical activity during leisure time helps maintain mental health of mothers of babies



Australia	PISC and K6Scale	
Demissie et al. (2011a)	N = 550	Mothers who performed moderate-vigorous physical activity were more likely to develop depressive symptoms
North Carolina	Telephone interview and EPDS questionnaire	
(United States)		
Carballo, Bueno, de Durana, López & Rodríguez (2013)	N = 25 Age: 33.6±3.6 years	No significant differences were found in the occurrence of postpartum depressive symptoms in response to the realization of additional physical activity
Fuenlabrada (Spain)	Control Group and intervention group (12 weeks, 3h/week) Questionnaires: EPDS and sociodemographic	

Table 5 shows that questionnaires were used in all researches. Plus, additional measures (body composition and intervention group) were used in two of them. Only one of the studies found improvements in the occurrence of depressive symptoms if physical activity was performed. Moreover, this study highlighted that the exercise was contraindicated in women with little free time. Therefore, this group is the one found so far in that the realization of physical activity does not alleviate the occurrence of depressive symptoms.

Exercise and depression in women in risk environments or with social disadvantages

In this section, the various studies taken into account in the analysis of exercise-depression analysis for women in risk environments are discussed.

One study was conducted in Cartagena (Spain) and investigated the influence of physical activity on anxiety and depression. In addition, its aim was to determine higher risk profiles according to sociodemographic variables (Olmedilla-Zafra & Ortega-Toro, 2009).

In the study 200 women aged between 18 and 65 years (age: 36.85±14.59) participated. Depression was assessed by BDI questionnaire (Beck et al., 1961) and anxiety by STAI questionnaire (Spielberger, Gorsuch, & Lushene, 1970). The results showed that the profile more prone to depression were sedentary women aged 18 to 24 years (or over 54 years), with high-school study levels and housewives. Significant differences in anxiety levels, and signs of significant levels of depression among women who practiced physical activity were observed.

Another study was conducted in Australia (Teychenne, Ball, & Salmon, 2010) and investigated associations between physical activity, sedentary behavior and risk of depression in women living in deprived neighborhoods. A sample of 3,645 women aged between 18 and 45 years (mean age: 35 years) and residing in disadvantaged neighborhoods were considered. IPAQ-L questionnaire (Craig et al., 2003) was used to measure the behavior of physical and sedentary activity and a questionnaire CES- D (Radloff, 1977) to measure depressive behaviors. The results showed that the performance of physical activity in leisure time or during transfers were associated with lower levels of depression. Similarly, women having higher rates of sedentary behavior had higher rates of depressive behaviors.

The third study considered for this group was conducted in Japan (Ishii, Shibata, & Oka, 2011) and included a sample of 3,000 adults (1,360 women ,mean age 39.5±10.8 years) to investigate the associations between recommended levels of physical activity and depressive symptoms. Two questionnaires were used: an IPAQ questionnaire (Craig et al., 2003) and a CES- D questionnaire (Radloff, 1977). For both genders, the results showed significantly higher levels of depression if the group did not reach the physical activity recommendations of the World Health Organization. For women, these data were also related to age, marital status, educational level, employment status and salary levels. In this sense, women between 20 and 29 years old, unmarried and with low incomes had higher rates of depression.

Another study in Australia (Azar, Ball, Salmon, & Cleland, 2011) on a set of 451 women aged between 18 and 35 years, studied individual, social and



environmental factors that exerted influence on the amount of physical activity undertaken by women at risk for depression. The risks of depression were measured by GHQ-30 questionnaire (Goldberg, 1972), physical activity was measured by a questionnaire IPAQ- L (Craig et al., 2003) and the individual, social and environmental factors were measured by a specific questionnaire. The results showed no individual, social or environmental significant differences in physical exercise by women at risk for depression.

A study in the United States (Song, Lee, Baek, & Miller, 2012) examined 4,048 individuals (2,080 women) investigated physical activity by adults with depression for a description by sociodemographic groups. Health levels were measured by a PHQ-9 questionnaire (Kroenke, Spitzer, & Williams, 2001) and the amount of physical activity using an accelerometer. The results showed that the group with the highest risk of depression was middle-aged women who performed under moderate amounts of physical activity. However, no significant differences were found in the number of hours per week doing vigorous or no physical activity, so the most preventive activity against depressive symptoms is moderate activity.

The latest study has been considered in this group was held in Netherlands (van der Waerden, Hoefnagels, Hosman, Souren, & Jansen, 2013) on a sample of 161 women aged between 20 and 55 years. The study investigated the association between depressive symptoms and physical exercise in women of low socioeconomic status. Three study groups were proposed: a group that performed exercise of low to moderate intensity (including strength training, flexibility and relaxation), another that also incorporated cognitive behavioral techniques and a final control group that did not make any of these activities. Depressive symptoms were measured at four different points: at the end of the intervention (2 years and 9 months) and during months 2, 6 and 12. A CES- D questionnaire (Radloff, 1977) and a PSS questionnaire (Cohen, Kamarck, & Mermelstein, 1983) were used to measure depression and stress respectively. The results showed that the intervention was positive in both groups, but they were just valid for short term.

Moreover, these benefits were more significant in women with lower levels of education.

Table 6 summarizes the studies considered on the relationship exercise-depression for women in risk environments or with social disadvantages.

It shows that all studies used questionnaires as part of their methodology. In addition, accelerometer and an intervention group were also used in two different studies. All studies found significant benefits of physical activity to depressive symptoms. Moreover, one study found no significant differences in the individual, social or environmental conditions between groups performed physical activity and those who did not, so the intervention groups strategy could be successfully applied for this particular collective (women with social disadvantages).

Table 6. Summary of studies for socially disadvantaged women

Authors, year and place	Sample and method	Main results
Olmedilla-Zafra & Ortega-Toro (2009) Cartagena (Spain)	N= 200 Age: 36,85±14,59 years Questionnaires: BDI and STAI	Significant differences in anxiety levels, and evidence of significant levels of depression among women who practiced physical activity were observed
Teychenne, Ball, & Salmon (2010) Australia	N = 3,645 Age: 18-45 years (mean 35) Questionnaires IPAQ-L and CES-D	The realization of physical activity in leisure time is associated with lower levels of depression. Sedentary behaviours are associated with higher rates of depressive behaviours
Ishii, Shibata & Oka (2011)	N = 3,000 (1,360 women) Age: 39,5±10,8 years	Higher levels of depression in the group that did not reach the physical activity recommendations of the World Health



of study	significance	exercise	depression
Japan	Questionnaires IPAQ and CES-D	Organization. The salary status, age, marital status and educational level also correlated in the case of women	BDI
Azar, Ball, Salmon & Cleland (2011)	N= 451 Age: 18-35 Questionnaires GHQ-30 and IPAQ-L	No individual, social or environmental significant differences in physical exercise are found by women at risk for depression	BDI
Song, Lee, Baek & Miller (2012)	N = 4,048 (2,080 women) Questionnaire PHQ-9 and accelerometry	Moderate physical activity prevents against depressive symptoms, especially in middle-aged women	CES-D
Van der Waerden, Hoefnagels, Hosman, Souren & Jansen (2013)	N = 161 Age: 20-55 years Intervention group: physical activity. Physical activity and cognitive intervention techniques Control group Questionnaires CES-D and PSS	The intervention was positive in both intervention groups, but only in short term. Moreover, these benefits were more significant in women with lower levels of education	EPDS
Early ages	83% (5/6)	Participation in sport clubs, regular physical activity	BDI
Female University students	100% (4/4)	Exercising with no frequencies higher than 5 times a week	BDI
Pregnant	67% (4/6)	Moderate physical activity (including tai chi and yoga)	CES-D
Postpartum	33% (1/3)	Exercise should not cut out leisure time	EPDS
Socially disadvantaged	83% (5/6)	Moderate physical activity and reducing sedentary hours	CES-D

Table 7 shows that physical exercise is intended to mitigate the effects of depressive symptoms in all life stages except the postpartum stage. Furthermore, the only study that yielded favorable results warned of the importance of respecting the time and entertainment constraints with which women must live together in this stage.

The most commonly questionnaires used to measure depressive symptoms have been the BDI and CES-D. The first one was the preferred at early and college ages, and the CES-D was mainly used in pregnant and in groups with social disadvantages.

Synthesis

This review article has analyzed different research linking physical activity and depression in young women. In addition, this review has provided a classification of them according to different life stages, with the intention of studying this relationship in each of these stages.

Table 7. Synthesis of the studies reviewed

Group	% of studies with positive	Recommended	Most used questionnaires to measure



The types of exercise less related to the occurrence of depressive symptoms are those of moderate intensity, although at an early age the most important factors are: participation in team sports and generating regular physical activity habits.

META-ANALYSIS: FINDING A RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND DEPRESSION

The previous section referenced the team sports as an important factor to mitigate depressive symptoms in adolescence. At this stage, participation in team sports is associated with greater social acceptance and minor health problems, including depressive symptoms. The benefits of this type of physical activity may be related to the effect of sharing positive experiences, enhance social acceptance and reduce body dissatisfaction (Boone & Leadbeater, 2006). It has also been proved that , at the same levels of physical exercise, physical activity performing team protects about feelings of hopelessness and suicide (Lindsay A Taliaferro, Rienzo, Miller, Pigg, & Dodd, 2008).

For female university students, the association between physical activity and lower depressive symptoms is due to a better body image and improved cardiorespiratory fitness that withstand stressful events. In the case of body image, there is also an upper threshold of exercise. Exceeding this threshold (5 days per week) seems to be related to a permanent dissatisfaction with body image, which can also lead to depressive symptoms despite the fact of doing exercise.

The relationship between exercise and depression in pregnant women may be because at this stage women have less energy and greater difficulties when attempting to perform physical activity. These difficulties may gradually reduce motivation to exercise and could carry unhealthy habits and depressive symptoms. A regular and moderate physical activity reduces this risk.

In the case of postpartum stage, most studies have shown that physical exercise is not indicated, although this contraindication is related to the lack of time that women experience as mothers. Therefore, the amount of exercise done by women should not

interfere with the limited leisure time that women have at this stage of life neither be an obligation that generate additional stress.

The positive influence of exercise to mitigate depressive symptoms in women from disadvantaged environments has been discussed in most investigations, inviting to do further research in future studies. The synthesis of serotonin (a neurotransmitter that regulates mood and stress) and mental well-being produced by being outdoors are considered the main causes that explain this relationship.

CONCLUSIONS

Conducting physical activity prevents from depressive symptoms in young women.

Regular physical activity is indicated at an early age and for female university students, while moderate physical activity is recommended for pregnant women (as long as it does not cut leisure time) and in environments with social disadvantages.

Physical activity in groups helps to enhance self-esteem and to improve social support, while improving cardiorespiratory fitness enhance the response to stress episodes.

It is important to take into account that, despite the positive effects of improving physical condition through physical activity, there is a threshold of 5 days of training per week, that should not be surpassed: the lack of rest could become a new stressor for participants.

This review has provided a classification of types of physical activity considering the vital stage and has identified the most used questionnaires in the literature to measure depressive symptoms in each stage.

Study limitations

One of the most important limitation for this review is the overall heterogeneous sample found in literature research, and the different typologies of physical activity analysed (team sports, individual activities, group activities, etc.). This different approach in each study, in terms of intensity, volume,



frequency and density of the exercise, influences the results and, thus, it is important to bear it in mind for future research.

Future research

The future research could take into account the present classification to better identify the best kind of physical activity in each stage of life.

These studies should be prospective and should use intervention groups. This way exercise doses could be followed in order to refine the characteristics of future interventions.

Ethical standards

The manuscript does not contain clinical studies or patient data.

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