Higher physical activity level and perceived social support entail less psychological distress in people with anxiety (#83316)

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Higher physical activity level and perceived social support entail less psychological distress in people with anxiety

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Introduction. Anxiety is one of the most prevalent mental illnesses in first world societies, generating discomfort in the people who suffer from it, and high expenses and economic losses in the society. The physical activity (PA) performed, together with the perceived social support (PSS) by people with anxiety could be related to the psychological distress of people with anxiety. **Objectives.** To study the relationships between mental health and its dimensions, through Golberg's General Health Questionnaire (GHQ12), and the level of PA (PAL) and the PSS in the Spanish adult population with anxiety. Hypothesis. A higher PAL, and a higher PSS, is related to a lower psychological distress in this population. **Design and Methodology**. This study included 1661 adults with anxiety, residents in Spain. It was a cross-sectional study with data obtained from the Spanish National Health Survey. A Kolmogorov-Smirnov test was applied to examine the data distribution of the variables. The median and interquartile range were used to characterize the sample for continuous variables, and absolute and relative frequencies were used for categorical variables. The Mann-Whitney U test was used to examine the disfferences between the sexes. Dependence between PAL and sex was studied using the chi-square statistic. A Krustal-Wallis test was used to evaluate the existence of differences in the baseline medians on the GHQ-12, according to PAL level. Finally, the correlations between mental health and its dimensions with PAL and the Duke-UNC-11 scores were analysed, obtaining Spearman's rho and Pearson's correlation coefficient. **Results.** Moderate inverse correlations were found between the GHQ-12 and: PAL (rho: -0.219); PSS (r: -0.347). PAL and PSS presented moderate inverse correlations with successful coping (rho: -0.206 and

r: -0.325), self-esteem (rho: -0.222 and r: -0.333) and stress (rho: -0.158 and r: -0.288).
Conclusions. Greater PAL and social support could reduce psychological distress in people with anxiety.

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Abstract

Introduction. Anxiety is one of the most prevalent mental illnesses in first world societies, gener-ating discomfort in the people who suffer from it, and high expenses and economic losses in the society. The physical activity (PA) performed, together with the perceived social support (PSS) by people with anxiety could be related to the psychological distress of people with anxiety. **Objectives.** To study the relationships between mental health and its dimensions,

through Golberg's General Health Questionnaire (GHQ12), and the level of PA (PAL) and the PSS in the Spanish adult population with anxiety. Hypothesis. A higher PAL, and a higher PSS, is related to a lower psychological distress in this population. **Design and Methodology**. This study included 1661 adults with anxiety, residents in Spain. It was a cross-sectional study with data obtained from the Spanish National Health Survey. A Kolmogorov-Smirnov test was applied to examine the data distribution of the variables. The median and interquartile range were used to characterize the sample for continuous variables, and absolute and relative frequencies were used for categorical variables. The Mann-Whitney U test was used to examine the disfferences between the sexes. Dependence between PAL and sex was studied using the chi-square statistic. A Krustal-Wallis test was used to evaluate the existence of differences in the baseline medians on the GHQ-12, according to PAL level. Finally, the correlations between mental health and its dimensions with PAL and the Duke-UNC-11 scores were analysed, obtaining Spearman's rho and Pearson's correlation coefficient. **Results.** Moderate inverse correlations were found between the GHQ-12 and: PAL (rho: -0.219); PSS (r: -0.347). PAL and PSS presented moderate inverse correlations with successful coping (rho: -0.206 and r: -0.325), self-esteem (rho: -0.222 and r: -0.333) and stress (rho: -0.158 and r: -0.288). **Conclusions.** Greater PAL and social support could reduce psychological distress in people with anxiety.

Keywords: Health Survey; Psychology; Mental Health; Stress; Successful Coping; Self-steem.

Introduction

World Health Organization (WHO) in its pursue of universal health coverage, assigns mental health an essential role in its current concept of health (World Health Organization 2019). As defined by the World Health Organization (WHO), mental health is defined as a state of wellbeing where an individual is aware of their own abilities, is able to manage normal life stress, is productive and able to contribute to their community. From this definition, it can be inferred that mental health is a crucial aspect of overall health and goes beyond the mere absence of illness, and that it is closely linked to both physical health and behaviour(World Health Organization 2004).

Unfortunately, there are factors that disrupt mental health and undermine it, causing disorders such as anxiety (Kroenke et al. 2007). Most common mental disorders can be classified in to two main diagnostic categories: depressive disorders and anxiety disorders (Depression 2017). Anxiety disorders are a classification of mental health conditions marked by persistent and excessive feelings of anxiety and fear (Depression 2017). Similarly, to depression, symptoms can range from mild to severe, and the common duration of the symptomatology makes it more a chronic than an episodic disorder (Depression 2017). Anxiety disorders are characterized for experiencing a disproportionate fear and worry to actual threat that interferes sufferers normal functioning (Olthuis et al. 2016). These disorders translate into a variety of physical, cognitive, emotional, and behavioural symptoms that negatively affect the patient functioning, quality of life and wellbeing (Kandola et al. 2018; Olthuis et al. 2016; Simpson et al. 2010). Some of these

symptoms are rapid breathing, tense muscles, irritability, difficulty concentrating, difficulty sleeping and hyperarousal (Olthuis et al. 2016). The specific symptoms a patient experiences depends on the type of anxiety disorder he/she suffers from (Olthuis et al. 2016). Anxiety subtypes include: post-traumatic stress disorder, generalised anxiety disorder, social phobia, specific phobias, selective mutism, separation anxiety disorder, panic disorder, and agoraphobia (American Psychiatric Association 2013; Kandola et al. 2018; Kessler et al. 2009; World Health Organization 1992).

Anxiety disorders have large prevalence globally, some estimations go from 3.8% to 25% depending on the country, and increasing to 70% of individuals with chronic conditions (Kandola et al. 2018). According to the Global Burden of Disease study, anxiety disorders are the 6th largest contributor to disability worldwide, accounting for 26.8 million years lived with this condition and ranking second globally. (Baxter et al. 2014; Kandola et al. 2018; Xiong et al. 2022). Its prevalence is estimated to be higher in the more developed countries than in developing countries (Essau et al. 2018; Kessler et al. 2015), and it is more common among females than in males (Depression 2017). In Spain, the prevalence rate of mental disorders is 286.7 cases per 1000 inhabitants, affecting more women than men (Ministerio de Sanidad 2022). Among these mental disorders, the most prevalent is anxiety, with 74.6 cases per 1000 inhabitants (Ministerio de Sanidad 2022). The economic costs generated by anxiety are among the highest of all mental disorders, along with depression, accounting for 2.2 percent of the gross domestic product (GDP) of Spain (Ruiz-Rodriguez et al. 2017).

Globally 7.3% of individuals live with at least one anxiety disorder (Thibaut 2022). These kind of disorders have been shown to be associated with substantial impairment, that increases as the patient suffers from more than one anxiety disorder (Kroenke et al. 2007). The DSM-5 categorizes the following as anxiety disorders: Substance/Medication-Induced Anxiety Disorder, Selective Mutism, Social Anxiety Disorder, Separation Anxiety Disorder, Panic Disorder, Agoraphobia, Other Specified Anxiety Disorder, Unspecified Anxiety Disorder, Anxiety Disorder caused by a medical condition, Generalized Anxiety Disorder and Specific Phobia. (Morrison 2015). One of the strongest comorbidities of anxiety is depression; among those with major depressive disorder, 45.7% have developed at least one anxiety disorder, and 41.6% have had it concurrently with substance abuse disorder (Kalin 2020; Kessler et al. 2015). Several chronic conditions such as cancer, chronic pain, irritable bowel syndrome, asthma, and cardiovascular diseases have been associated with anxiety (McDowell et al. 2019; Roy-Byrne et al. 2008). When sufferers of any of this conditions also have anxiety, it has been shown that a worsening in the recovery and in some cases premature mortality may occur (McDowell et al. 2019; Roy-Byrne et al. 2008). Additionally, those who have suffered from a virus related to the SARS family are more likely to have a comorbidity with anxiety(Mak et al. 2009). The effects of anxiety diminish the quality of life of those who suffer from it, and can lead to disabilities and impairments that result in more visits to the healthcare system (Kroenke et al. 2007; Roy-Byrne et al. 2008).

Research has shown multiples benefits for PA, one of them is the positive effect of PA on mental disorders (Denche-Zamorano, Ajenjo-Gomez, et al. 2022; Galán-Arroyo et al. 2022a, 2022b; Saxena et al. 2005; Schuch et al. 2020; Warburton, Nicol, y Bredin 2006) and on the symptoms and problems derived from them, such as stress, self-esteem and resilience (Maugeri et al. 2020). PA has been proposed as a strategy to treat anxiety, various studies have corroborated that PA is effective combating anxiety, and reducing its symptomatology in those who suffer from it (Maugeri et al. 2020; McDowell et al. 2019; Rebar et al. 2015). With the advent of COVID-19, measures such as social isolation and quarantine were applied, these rules reduce the number of social interactions, increasing loneliness, which is one of the factors that increase the symptoms of depression and anxiety (Benke et al. 2020; Palgi et al. 2020). Additionally, quarantine limited citizens' ability to perform PA, reducing active hours and increasing sedentarism (Castañeda-Babarro et al. 2020), which constitutes another risk factor, since individuals who do not perform PA are up to 40% more likely to develop an anxiety disorder (Schuch et al. 2020).

PSS can be defined as the experience of being valued, respected and supported by the social groups to which one individual belongs (Roohafza et al. 2014; Shumaker y Brownell 1984), several studies show that PSS is related to anxiety and its symptomatology, so that a high level of PSS would improve an individual's mental state and reduce anxiety (Cheval et al. 2021; Procidano y Smith 1997; Roohafza et al. 2014). PSS has been found to be more important for mental health than social support during the COVID-19 pandemic (Gülaçtı 2010). PSS has been proposed as a significant predictor of wellbeing as it reflects an individual's subjective assessment of their resources and is a protective factor for mental health (Nauffal y Sbeity 2013; Patrick, Cottrell, y Barnes 2001). Research suggests that proper PSS can reduce anxiety and depression symptoms (Cheval et al. 2021; Grey et al. 2020; Stanton et al. 2020). Additionally, PAL has been shown to have a positive impact on PSS in both adolescents and older adults (Kang, Park, y Wallace 2018; Yusuf et al. 2021).

The aim of this study was to examine the relationships between Physical Activity Level (PAL) and perceived social support as measured by the Duke-UNC-11 Functional Social Support Questionnaire, with mental health and its dimensions, according to Golberg's General Health Questionnaire (GHQ-12), in Spanish adult population with anxiety. The initial hypothesis was that people with a higher PAL and PSS score would show lower levels of psychological distress as indicated by their GHQ-12 scores.

Materials & Methods

Design

The current cross-sectional study aims to find associations between PAL and PSS with mental health, and its dimensions defined by the GHQ-12 questionnaire, in the data reported by the Ministry of Health, Consumption and Well-being (MSCBS) in the National Health Survey of Spain 2017 (ENSE 2017) (Ministerio de Sanidad 2017). MCBS alongside the National Institute of Statistic (INE) carry out the ENSE every 5 years, with the purpose of knowing the health status of the Spanish residents. Interviews were conducted by certificate interviewers, who

informed the participants about the confidentiality of the data and encourage them to participate. The interviews were done in October of 2016 and October of 2017.

PARTICIPANTS

The sample of the ENSE 2017 was selected based on a random three-phase sampling system (Ministerio de Sanidad Consumo y Bienestar Social 2017): 23,089 residents in Spain, 10,595 males and 12,494 females, all over the age of 15, were selected. The sample calculation, data processing, communication and acceptance of participants, as well as all relevant information about these procedures were fully described in the methodology of the ENSE 2017(Ministerio de Sanidad Consumo y Bienestar Social 2017). For this research, the following selection criteria were applied to the sample that made up the ENSE 2017 in order to select the final sample: self-reported anxiety, being under 70 years of age and presenting data on the variables of interest: items corresponding to the GHQ-12 (Q.47.1-Q.47.12), physical activity performed (Q.113-Q.117) and the Duke-UNC-11 questionnaire (Q.131.1-Q.131.11).

Final sample was composed by a total of 1611 spanish residents (516 men y 1145 women) with chronic anxiety aged from 15 to 69 years old. To create this final sample, a total of 21.478 personas were excluded: 5312 due to their age, because participants older than 70 years old, were not asked about their PAL in the ENSE 2017, 16.088 which did not have chronic anxiety (answered “No” to ítem 25.21.a), 24 people who did not have all data in the GHQ-12 (at least one of the following ítems were not answered: p.47.1-p.47.12), and 4 people whose PAL data was not complete (one or more of the following ítems were nor answered: p.113-p.117). 59 participants were not considered in the analysis of the Duke-UNC-11 results, because they have not answered every item in this questionnaire (p131.1-p.131.11).

VARIABLES

Gender: Male or female.

Age: In years.

Mental health: It was derived from the GHQ-12 questionnaire in its spanish version (Goldberg y Williams 1996), which is included in the ENSE 2017. It has 12 ítems, with four possible answers, scored from 0 to 3. In the GHQ-12, mental health can have scores from 0 to 36, being 0 best mental health state and 36, worst mental health state possible. In the ENSE 2017, GHQ-12 corresponds to the items p.47.1-p.47.12. This questionnaire is used to identify psychological distress and possible psychiatric disorders. Various studies have shown the reliability and validity of this instrument in the spanish population, with a high internal consistency (α=0,86) (Goldberg y Williams 1996; Muñoz-Bermejo et al. 2020; Rocha 2011; Sánchez López y Dresch 2008).

Alongside mental health, the GHQ-12 allows us to evaluate three other dimensions, successful coping, self-esteem and stress (Muñoz-Bermejo et al. 2020; Sánchez López y Dresch 2008):

Successful coping (FI). The variable was calculated by adding up the responses to items: P.47.1, P.47.3, P.47.4, P.47.7, P.47.8 and P.47.12. The responses can range from 0 to 18, with 0

representing the best coping and 18 representing the worst coping. The factor has a validity of 0.82 and a p-value of 0.001 (Muñoz-Bermejo et al. 2020).

Self-esteem (FII). This variable was created by summing the answers to items P.47.6, P.47.9, P.47.10, and P.47.11. The responses can range from 0 to 12, with 0 representing the highest level of self-esteem and 12 the lowest. The factor has an external validity of 0.70 and a p-value of 0.001 (Muñoz-Bermejo et al. 2020).

Stress (FIII). This variable was constructed with the sum of the answers to the items: P.47.2, P.47.5 y P.47.9. These answers can take values from 0 to 9, where 0 is less stress possible, and 9, the highest levels of stress. The validity of this factor is 0.75 with a p-value: 0.001(Muñoz-Bermejo et al. 2020).

Perceived social support (PSS): This variable was formed summing the answers to the items 130.1-130.11 from the ENSE 2017. These items correspond to the Duke-UNC-11 Functional Social Support Questionnaire, which evaluates participants perceived social support. It presents 11 items, with five possible answers each, that can take values from 0 ("Much less than I would like") to 5 ("As much as I would like"). Thus, perceived social support is built summing all the answer, it can take values among 11 and 55.Scores under 32 show low perceived social support in Spanish population (Muñoz-Bermejo et al. 2020). This questionnaire has good internal consistency in this population (α=0,90) (Broadhead et al. 1988; Muñoz-Bermejo et al. 2020).

Physical Activity Index (PAI): It was constructed from the items p.113-p.116, which are included in the ENSE 2017, and belong to the International Physical Activity Questionnaire (IPAQ) in its version in spanish (Craig et al. 2003). The respondents were asked during how much time and frequency that they perform moderate and intense physical activity during a week. The PAI used, was an adaptation of the Physical Activity Index (Nes et al. 2011), it has the following formula: PAI = (Frequency of intense physical activity factor * Duration of intense physical activity factor) + (Factor for moderate physical activity intensity * Factor of moderate physical activity frequency * Factor of duration of moderate physical activity factor) which can take values between 0 and 67.5 (Denche-Zamorano, Franco-García, et al. 2022).

Physical Activity Levels (PAL): There were stablished four levels of physical activity, taking into account the scores obtained in the PAI, and the answers to the item P.117 (*Now think about the time you spent walking in the last 7 days,* with the following possible answers: "*Any day more than 10 minutes at a time*", or 1 to 7 days): Inactives (PAI = 0; Participants that reported not walking any day of the week for more than 10 minutes), Walkers (PAI = 0; Respondents that declared walking during 10 minutes or more at a time, at least one day of the week,), Actives (PAI= between 1 and 30) and Very actives (PAI over 30) (Denche-Zamorano, Franco-García, et al. 2022).

STATISTICAL ANALYSIS:

Statistical procedures were performed with IBM SPSS Statistics software version 25, using a level of significance under 0.05.

The distributions followed by the data of the study variables were analyzed with the Kolgomorov-Smirnov test. The sample was characterized using the median and interquartile range (IQR) for the continuous variables (Age, PAI, Sucessfull-coping, Self-steem, Stress, Perceived social support and Mental health), analyzing the possible differences between sexes, using the Mann-Whitney U test, and the absolute and relative frequencies for the categorical variable (PAL), analyzing its dependence on sex, using the chi-square statistic. The mental health scores, as well as their dimensions, were presented by median and IQR, for each PAL group, analyzing possible differences in their baseline, both in the general population and by sex, using the Kruskal Wallis test. A study of the correlations between PAL, and PSS, with GHQ-12 scores and items was carried out, using the correlation coefficients of Spearman and Pearson, and the correction of Bonferroni which was also applied as required. To predict the scores on: stress, self-esteem, successful coping and mental health (according to GHQ-12); and using sex, age, PAL, BMI and PSS as independent variables, linear regressions were used. The authors considered two-sided p-values ≤ 0.05 as statistically significant. All analyses were performed using IBM SPSS Statistics v.25 statistical software.

Results

The Kolgomorov-Smirnov test showed that there was not sufficient evidence to assume that the variables of study followed a normal distribution ($p<0.001$).

Statistically significant differences were found in the PA of men and women ($p=0.006$), according to PAI. Despite having identical medians, the mean was higher in men than in women (8.5 vs. 6.0). In this line, the association between PAL and sex was also found ($p=0.004$). No significant differences were found between sexes in the variables derived from the GHQ-12: mental health (14 vs 14. $p=0.499$), successful coping (7 vs 7. $p=0.098$) and stress (4 vs 4. $p=0.744$). Regarding PSS, the median was slightly higher in women (47 vs 46. $p=0.110$) but significant differences neither existed, (Table 1).

Table1

The Inactive group presented the highest scores, both in mental health and in its three dimensions, while the lowest score was in the Very active group, this was reported among both sexes and in the general population. For mental health scores, there was a 5-point difference in the medians between the Inactive and Very Active groups (17 vs. 12). The Krustal-Wallis test showed differences in the medians obtained in the GHQ-12 between the different PAL groups ($p<0.001$), both in mental health and in its three dimensions (Table 2) and in the general population and by sex.

Table 2

The correlations among PAL and the variables derived from the GHQ-12 are shown in Table 3. Weak inverse correlations were found between PAL and: stress (rho: -0.158. $p<0.001$), self-confidence (rho: -0.222. $p<0.001$), successful coping (rho: -0.216. $p<0.001$) and mental health

(rho: -0.219. p<0.001) (Mondragón Barrera 2014). Small inverse correlations were also found among PAL and GHQ-12 items (Table 3).

Table 3

Finally, Table 4 shows the correlations among PSS and the variables derived from the GHQ-12. Moderate inverse correlations were found between PSS and: stress (r: -0.288. p<0.001), self-confidence (r: -0.333. p<0.001), successful coping (r: -0.325. p<0.001), and mental health (r: -0.347. p<0.001) (Mondragón Barrera 2014). In addition, weak correlations were found between PSS and GHQ-12 items (Table 4) (Mondragón Barrera 2014).

Table 4

Table 5 show the linear regression models to predict the GHQ-12 (mental health and its factors) scores, based on the variables: Sex, Age, BMI, PSS and PAL.

Table 5

Discussion

The main purpose of this study was to explore the relationship among PAL, PSS and mental health in Spanish adults with chronic anxiety, living in Spain. The core result was that significant connections were discovered between PAL, PSS, and GHQ-12 scores.. Psychological distress, as defined by GHQ-12, was found to be reduced in people with higher PAL, the same occurred in all dimensions of mental health assessed with this questionnaire, where higher physical activity meant greater mental health.

Males presented significantly higher PA than females reflected in the PAI mean (8.5 vs 6.0) (p: 0.006). However, the medians for both sexes and the general population were zero. The distribution by groups in the PAL was similar in the general population and by sexes, with the Walkers group (general = 858 (51.7%); men = 246 (47.7%); women = 612 (53.4%)) being the most numerous and the Very Actives (general = 97 (5.8%); men = 45 (8.7%); women = 52 (4.5%)) being the least populated, likewise the percentage of participants in the groups Inactives (general = 364 (21.9%); men = 114 (22.1%); women = 250 (21.8%)) and Actives (general = 342 (20.6%); men = 111 (21.5%); women = 231 (20.2%)) was similar. On the other hand, associations were found between PAL and sex (p: 0.004). A larger proportion of males than females was found in the very active level (8.7% vs 4.5%). In contrast, the proportion of women in the walkers group was higher than men (53.4% vs 47.7%). This suggest that more males tend to get involve in physical activity of higher intensity and with greater frequency than females, but when looking at the individuals who only walk, it would be the other way around. Some research supports these findings, reporting that men are more active and prefer activities of higher intensity, while women perform more moderate PA such as walking (Abel, Graf, y Niemann 2001; Hernández Álvarez et al. 2010). Anxiety sensitivity has been proposed as a potential mediator in gender differences in PA, and one of the causes of women having lower levels of PA (DeWolfe et al. 2019). On the other hand, several studies do not find significant differences in the type of physical activity performed by gender, and report that the most frequent activity in both sexes is walking (Azevedo et al. 2007; Ceballos Gurrola, Alvarez Bermúdez, y Medina Rodríguez 2012; Lee 2005).

The median PSS was slightly higher in women than in men (47 vs 46), although no statistically significant differences were found between sexes. Supporting these results, other investigations did not found any differences in PSS between sexes (Barnett et al. 2021). Moderate opposite correlations were found among PSS and mental health (r: -0.347. p<0.001) and its three dimensions successful coping (r: -0.325. p<0.001), self-confidence (r: -0.333. p<0.001) and stress (r: -0.288. p<0.001). Other researches have reported similar associations between PSS and mental health (Adamczyk y Segrin 2015; Singh et al. 2022). Moderate inverse correlations have been reported between PSS and anxiety and depression (Guo, Tan, y Zhu 2022), and also small direct correlations among PSS and mental health (Dong et al. 2022). In this line other investigations found that mental health (evaluated by GHQ-12), successful coping, self-confidence and stress were inversely correlated to PSS (Denche-Zamorano, Pastor-Cisneros, et al. 2022; Denche-Zamorano, Urbano-Mairena, et al. 2022; Franco-García et al. 2023) in various populations. Which concords with the present results and indicates that higher PSS is related to greater mental well-being (Adamczyk y Segrin 2015; Dong et al. 2022; Guo et al. 2022; Singh et al. 2022). Furthermore, small inverse correlations were found among PSS and all the GHQ-12 items, meaning that greater PSS is associated with lower scores in the mental health variables derived from the GHQ-12, and therefore with more psychological well-being and less psychological distress. Similar results were found in a population of people with depression (Denche-Zamorano, Pastor-Cisneros, et al. 2022), asthma (Denche-Zamorano, Urbano-Mairena, et al. 2022) and people with cancerous tumours (Franco-García et al. 2023) where PSS had significant inverse correlations with the GHQ-12 items.

Regarding mental health and the three dimensions that integrated it (successful coping, self-steem and stress) no significant differences between sexes existed, a median of 14 points was found for the general population and for both sexes. But among PA groups, differences in mental health and its dimensions were reported. In fact, the Inactives group presented the highest scores in all four variables, while the Very Actives group had the lowest scores among PA groups. This means that the inactive Spanish adults with anxiety had the worst mental health, self-steem, successful coping ability and the highest stress levels, and also that the Very actives had the best state regarding mental health and the three dimensions that formed it. Moreover, small inverse correlations between PAL and mental health (rho: -0.347, $p < 0.001$) and its three dimensions, successful coping (rho: -0.325, $p < 0.001$), self-steem (rho: -0.333, $p < 0.001$) and stress (rho: -0.288, $p < 0.001$) were found. This entails that having greater PAL is associated with lower scores in all mental health variables studied, which means greater mental well-being.

Additionally, a linear regression model showed that PAL combined with PSS predict mental health in a 15.5% ($\beta = -1.633$; $t = -8.172$; $p = <0.001$), successful coping in a 14.3% ($\beta = -0.706$; $t = -8.283$; $p = <0.001$), self-steem in a 14.2% ($\beta = -0.721$; $t = -7.873$; $p = <0.001$) and stress in a 9.8% ($\beta = -0.369$; $t = -5.316$; $p = <0.001$). All this suggests that Spanish adults with anxiety that perform greater PA are more prone to have good mental health, self-steem, successful coping ability and less stress. PA and exercise have been commonly associated with greater mental wellbeing (Fox 1999), thus, PA activity has been shown to protect and prevent against anxiety

symptoms and anxiety (Fox 1999; McDowell et al. 2019), even regardless of demographic factors (Schuch et al. 2019). In line with the present results, a dose-response relationship between PA and psychological distress, where greater physical activity means better psychological condition seems to exist, but there is not an absolute consensus about it (McDowell et al. 2019). Suggestions for the best amount and highest limit of physical activity to decrease anxiety symptoms have been proposed for the general population (Kim et al. 2020), and both resistance and aerobic exercise have been proven to improve anxiety and psychological distress (LeBouthillier y Asmundson 2017). In line with the present findings, PA has been also reported to be inversely correlated with successful coping and self-esteem in adults with asthma (Denche-Zamorano, Urbano-Mairena, et al. 2022), the same was found for these two variables and also for stress in adults with depression (Denche-Zamorano, Pastor-Cisneros, et al. 2022), in adults with cancerous tumours (Franco-García et al. 2023) and in a population of informal caregivers (Denche-Zamorano, Muñoz-Bermejo, et al. 2022). Successful coping ability (Craven et al. 2022; Dahlstrand et al. 2021; Denche-Zamorano, Pastor-Cisneros, et al. 2022; Denche-Zamorano, Urbano-Mairena, et al. 2022), stress (Denche-Zamorano, Muñoz-Bermejo, et al. 2022; Denche-Zamorano, Pastor-Cisneros, et al. 2022) and self-steem (Denche-Zamorano, Muñoz-Bermejo, et al. 2022; Denche-Zamorano, Pastor-Cisneros, et al. 2022) seem to be improved by PA, which supports the available research that suggests the potential of PA on the prevention of depression, anxiety and other mental disorders (Harvey et al. 2010; Herring, Lindheimer, y O'Connor 2014; Ji et al. 2022; Kandola et al. 2018; Lautenschlager et al. 2004; Schuch et al. 2019; Stubbs et al. 2017; Wijndaele et al. 2007).

4.1.Limitations

The current study presented the limitations inherent to a cross-sectional research design. The main limitation of the current research was that causal relationships could not be set, so it would be convenient to carry out other types of study designs that could establish both optimal doses and causal relationships. No objective measures were available to quantify either the amount or the intensity of PA performed by the participants. It would be advisable to include PA measurement devices in the respondents of future ENSE. Some sociodemographic biases that could influence the results were also not taken into account, such as: level of education, socioeconomic level and rural or urban living area.

4.2.Practical applications

This study analyses the association among mental health, PAL and PSS in Spanish adults with chronic anxiety that live in Spain, it may create a reference system for future studies regarding mental health in this population. PAL and PSS are proposed as protective factors against mental health difficulties. Reducing psychological distress of people with anxiety may be key in order to decrease the health care costs derived from this disorder, especially given its prevalence in the Spanish adult population (Villagrasa et al. 2019). Several studies support the potential effect of PA (Harvey et al. 2010:20; Herring et al. 2014; Kandola et al. 2018; Lautenschlager et al. 2004; McDowell et al. 2019; Schuch et al. 2019; Stubbs et al. 2017) and good levels of PSS (Adamczyk y Segrin 2015; Dong et al. 2022; Guo et al. 2022; Singh et al. 2022), improving

mental health, and even the positive effect of greater PAL on PSS (Kang et al. 2018; Yusuf et al. 2021), but cause-effect associations cannot be established due to the design of our study. Thus, it seems that disseminating the importance of good social support networks for people with anxiety and promoting the relevance of having a physically active lifestyle in this population is a relevant action that should be taken from the institutions.

Conclusions

According to the presented results, it can be concluded that an association among mental health and its three dimensions (Sucessfull-coping, Self-steem and Stress) and PAL and PSS in the Spanish adult population with anxiety exists. Higher PAL and PSS individuals present lower psychological distress, evaluated by the GHQ-12. Thus, research to come should consider addressing the effects of physical activity centered interventions as a lifestyle strategy and a complementary treatment to prevent and improve psychological distress in adults with anxiety.

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Table 1(on next page)

Table 1. Descriptive analysis: age, PAI, dimensions-subscales GHQ-12, Duke-UNC-11 and PAL. Spanish adult with anxiety, ENSE 2017.

SD (Standard deviation); IQR (Interquartile range); % (porcentage); n (participants); a (p-value from U-Mann-Whitney test); b (p-value from chi square test); PAL (Physical Activity Level); Inactive (PAI=0; Subjects that do not walk any day of the week during 10 minutes at a time or more). Walkers (PAI=0; Subjects that walk at least one day of the week during 10 minutes at a time or more). Actives (PAI=1 to 30); Very actives (PAI= over 30); PAI (Physical Activity Index: Scores among 0 and 67.5); GHQ-12 (Goldberg's General Health Questionnaire. Scores range from 0 to 36. Being 0, best mental health and 36, worst mental health); Stress (Scores range from 0 to 9. Being 0 no stress, and 9 very stressed); Self-esteem (Scores range from 0 to 9. Being 0 the best self-esteem, and 9 the worst self-esteem); Successful Coping (Scores go from 0 to 18. 0 is the best coping and 18 is the worst coping).

Table 1. Descriptive analysis: age, PAI, dimensions-subscales GHQ-12, Duke-UNC-11 and PAL. Spanish adult with anxiety, ENSE 2017.

Variables	Total n=1661	Men n=516	Women n=1145	p
Age (Years)				0.004a
Median (IQR)	53 (18)	51 (16)	53 (18)	
Mean (SD)	50.5 (12.3)	49.4 (11.6)	51.0 (12.5)	
PAI				0.006a
Median (IQR)	0 (0)	0 (15)	0 (0)	
Mean (SD)	6.8 (13.6)	8.5 (15.6)	6.0 (12.6)	
Mental health				0.499a
Median (IQR)	14 (9)	14 (10)	14 (9)	
Mean (SD)	15.6 (6.0)	15.8 (7.1)	15.5 (6.8)	
Successful coping				0.098a
Median (IQR)	7 (3)	7 (4)	7 (3)	
Mean (SD)	7.9 (2.9)	8.1 (3.0)	7.8 (2.9)	
Self-steem				0.744a
Median (IQR)	4 (5)	4 (5)	4 (5)	
Mean (SD)	4.5 (3.1)	4.6 (3.2)	4.5 (3.1)	
Stress				0.935a
Median (IQR)	5 (3)	4 (3)	5 (3)	
Mean (SD)	4.6 (2.3)	4.6 (2.4)	4.7 (2.3)	
Perceived social support	Total n=1608	Men n=494	Women n=1114	0.110a
Median (IQR)	47 (13)	46 (14)	47 (11)	
Mean (SD)	45.0 (9.5)	44.3 (10.1)	45.3 (9.1)	
PAL				<0.004b
Inactives	364 (21.9%)	114 (22.1%)	250 (21.8%)	
Walkers	858 (51.7%)	246 (47.7%)	612 (53.4%)	
Actives	342 (20.6%)	111 (21.5%)	231 (20.2%)	
Very actives	97 (5.8%)	45 (8.7%)	52 (4.5%)	

SD (Standard deviation); IQR (Interquartile range); % (porcentage); n (participants); a (p-value from U-Mann-Whitney test); b (p-value from chi square test); PAL (Physical Activity Level); Inactive (PAI=0; Subjects that do not walk any day of the week during 10 minutes at a time or more). Walkers (PAI=0; Subjects that walk at least one day of the week during 10 minutes at a time or more). Actives (PAI=1 to 30); Very actives (PAI= over 30); PAI (Physical Activity Index: Scores among 0 and 67.5); GHQ-12 (Goldberg's General Health Questionnaire. Scores range from 0 to 36. Being 0, best mental health and 36, worst mental health); Stress (Scores range from 0 to 9. Being 0 no stress, and 9 very stressed); Self-esteem (Scores range from 0 to 9. Being 0 the best self-esteem, and 9 the worst self-esteem); Successful Coping (Scores go from 0 to 18. 0 is the best coping and 18 is the worst coping).

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Table 2(on next page)

Table 2. Associations between PAL and dimensions-subscales of the GHQ-12 in spanish adult with anxiety, ENSE 2017.

sd (standard deviation); m (mean); IQR (Interquartile range); mdn (median); p (p-value from Kruskal-Wallis test); PAL (Physical Activity Level); Inactive (PAI=0; Subjects that do not walk any day of the week during 10 minutes at a time or more). Walkers (PAI=0; Subjects that walk at least one day of the week during 10 minutes at a time or more). Actives (PAI=1 to 30); Very actives (PAI= over 30); PAI (Physical Activity Index: Scores among 0 and 67.5); GHQ-12 (Goldberg's General Health Questionnaire. Scores range from 0 to 36. Being 0, best mental health and 36, worst mental health); Stress (Scores range from 0 to 9. Being 0 no stress, and 9 very stressed); Self-esteem (Scores range from 0 to 9. Being 0 the best self-esteem, and 9 the worst self-esteem); Successful Coping (Scores go from 0 to 18. 0 is the best coping and 18 is the worst coping).

Table 2. Associations between PAL and dimensions-subscales of the GHQ-12 in spanish adult with anxiety, ENSE 2017.

Variables	Total n=1661			Men n=516			Women n=1145		
Mental health									
PAL	m (sd)	mdn (IQR)	p	m (sd)	mdn (IQR)	p	m (sd)	mdn (IQR)	p
Inactives	18.2 (7.7)	17 (12)		18.8 (8.2)	17 (12)		17.9 (7.4)	17 (11)	
Walkers	15.6 (6.7)	14 (9)	<0.001	15.7 (6.7)	14 (9)	<0.001	15.5 (6.7)	14 (8)	<0.001
Actives	13.8 (6.1)	12 (8)		14.4 (6.5)	13 (10)		13.6 (5.9)	12 (8)	
Very actives	12.6 (5.0)	12 (7)		12.5 (5.1)	12 (7)		12.8 (4.9)	12 (7)	
Successful coping									
PAL	m (sd)	mdn (IQR)	p	m (sd)	mdn (IQR)	p	m (sd)	mdn (IQR)	p
Inactives	9.0 (3.4)	9 (6)		9.3 (3.7)	8 (6)		8.8 (3.3)	8 (5)	
Walkers	7.9 (2.8)	7 (4)		8.1 (2.8)	7 (4)		7.8 (2.8)	7 (3)	
Actives	7.1 (2.4)	7 (3)	<0.001	7.5 (2.4)	7 (3)	<0.001	7.0 (2.3)	6 (2)	<0.001
Very actives	6.5 (1.9)	6 (2)		6.5 (2.2)	6 (2)		6.6 (1.7)	6 (1)	
Self-steem									
PAL	m (sd)	mdn (IQR)	p	m (sd)	mdn (IQR)	p	m (sd)	mdn (IQR)	p
Inactives	5.7 (3.3)	5 (5)		5.9 (3.4)	6 (6)		5.6 (3.3)	5 (5)	
Walkers	4.5 (3.0)	4 (4)		4.5 (3.0)	4 (5)		4.5 (3.0)	4 (4)	
Actives	3.8 (3.0)	3 (5)	<0.001	3.8 (3.2)	3 (5)	<0.001	3.7 (2.9)	3 (5)	<0.001
Very actives	3.2 (2.3)	3 (4)		3.2 (2.3)	3 (3)		3.2 (2.4)	3 (4)	
Stress									
PAL	m (sd)	mdn (IQR)	p	m (sd)	mdn (IQR)	p	m (sd)	mdn (IQR)	p
Inactives	5.2 (2.3)	5 (4)		5.3 (2.4)	6 (4)		5.2 (2.3)	5 (4)	
Walkers	4.6 (2.3)	5 (3)		4.6 (2.4)	5 (3)		4.6 (2.2)	5 (3)	
Actives	4.2 (2.3)	4 (4)	<0.001	4.3 (2.4)	4 (4)	0.001	4.2 (2.3)	4 (4)	<0.001
Very actives	4.0 (2.3)	4 (4)		3.9 (2.2)	3 (4)		4.2 (2.3)	4 (3)	

sd (standard deviation); m (mean); IQR (Interquartile range); mdn (median); p (p-value from Kruskal-Wallis test); PAL (Physical Activity Level); Inactive (PAI=0; Subjects that do not walk any day of the week during 10 minutes at a time or more). Walkers (PAI=0; Subjects that walk at least one day of the week during 10 minutes at a time or more). Actives (PAI=1 to 30); Very actives (PAI= over 30); PAI (Physical Activity Index: Scores among 0 and 67.5); GHQ-12 (Goldberg's General Health Questionnaire. Scores range from 0 to 36. Being 0, best mental health and 36, worst mental health); Stress (Scores range from 0 to 9. Being 0 no stress, and 9 very stressed); Self-esteem

(Scores range from 0 to 9. Being 0 the best self-esteem, and 9 the worst self-esteem); Successful Coping (Scores go from 0 to 18. 0 is the best coping and 18 is the worst coping).

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Table 3(on next page)

Table 3. Correlation between PAL and Goldberg General Health Questionnaire (GHQ-12) in spanish adults with anxiety.

Rho (Spearman’s correlation coefficients with the Bonferroni correction factor having (p=0.003); p (p-value); PAL (Physical Activity Level); Inactive (PAI=0; Subjects that do not walk any day of the week during 10 minutes at a time or more). Walkers (PAI=0; Subjects that walk at least one day of the week during 10 minutes at a time or more). Actives (PAI=1 to 30); Very actives (PAI= over 30); PAI (Physical Activity Index: Scores among 0 and 67.5); GHQ-12 (Goldberg's General Health Questionnaire. Scores range from 0 to 36. Being 0, best mental health and 36, worst mental health); Stress (Scores range from 0 to 9. Being 0 no stress, and 9 very stressed); Self-esteem (Scores range from 0 to 9. Being 0 the best self-esteem, and 9 the worst self-esteem); Successful Coping (Scores go from 0 to 18. 0 is the best coping and 18 is the worst coping).

Table 3. Correlation between PAL and Goldberg General Health Questionnaire (GHQ-12) in spanish adults with anxiety.

Target Variable	Rho	p
Mental Health	0.219	<0.001
Successful Coping	0.206	<0.001
Self-steem	0.222	<0.001
Stress	0.158	<0.001
1. Have you been able to concentrate well on what you were doing?	0.144	<0.001
2. Have your worries caused you to lose sleep?	0.098	0.002
3. Did you feel that you were playing a useful role in life?	0.144	<0.001
4. Did you feel able to make decisions?	0.180	<0.001
5. Have you felt constantly overwhelmed and under stress?	0.139	<0.001
6. Have you had the feeling that you cannot overcome your difficulties?	0.170	<0.001
7. Have you been able to enjoy your normal daily activities?	0.193	<0.001
8. Have you been able to cope adequately with your problems?	0.205	<0.001
9. Have you felt unhappy or depressed?	0.168	<0.001
10. Have you lost confidence in yourself?	0.205	<0.001
11. Have you thought of yourself as a worthless person?	0.219	<0.001
12. Do you feel reasonably happy considering all the circumstances?	0.172	<0.001

Rho (Spearman's correlation coefficients with the Bonferroni correction factor having (p=0.003); p (p-value); PAL (Physical Activity Level); Inactive (PAI=0; Subjects that do not walk any day of the week during 10 minutes at a time or more). Walkers (PAI=0; Subjects that walk at least one day of the week during 10 minutes at a time or more). Actives (PAI=1 to 30); Very actives (PAI= over 30); PAI (Physical Activity Index: Scores among 0 and 67.5); GHQ-12 (Goldberg's General Health Questionnaire. Scores range from 0 to 36. Being 0, best mental health and 36, worst mental health); Stress (Scores range from 0 to 9. Being 0 no stress, and 9 very stressed); Self-esteem (Scores range from 0 to 9. Being 0 the best self-esteem, and 9 the worst self-esteem); Successful Coping (Scores go from 0 to 18. 0 is the best coping and 18 is the worst coping).

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Table 4(on next page)

Table 4. Correlation between perceived social support (Duke-UNC-11) and Goldberg General Health Questionnaire (GHQ-12) in spanish adults with anxiety.

*(Pearson's correlation coefficients with the Bonferroni correction factor having p=0.003); **(Spearman’s correlation coefficients with the Bonferroni correction factor having p=0.003); p (p-value); GHQ-12 (Goldberg's General Health Questionnaire. Scores range from 0 to 36. Being 0, best mental health and 36, worst mental health); Stress (Scores range from 0 to 9. Being 0 no stress, and 9 very stressed); Self-esteem (Scores range from 0 to 9. Being 0 the best self-esteem, and 9 the worst self-esteem); Successful Coping (Scores go from 0 to 18. 0 is the best coping and 18 is the worst coping). Duke-UNC-11 (Duke-UNC-11 Functional Social Support Questionnaire. Scores go from 11 to 55 points). Interpretation of the “items” used in Table 4 and its corresponding official items of the GHQ-12 are displayed in Table S2.

Table 4. Correlation between perceived social support (Duke-UNC-11) and Goldberg General Health Questionnaire (GHQ-12) in spanish adults with anxiety.

Target Variable	Correlations	p
Mental Health	-0.347*	<0.001
Successful Coping	-0.325*	<0.001
Self-steem	-0.333*	<0.001
Stress	-0.288*	<0.001
1. Have you been able to concentrate well on what you were doing?	-0.185**	<0.001
2. Have your worries caused you to lose sleep?	-0.195**	<0.001
3. Did you feel that you were playing a useful role in life?	-0.189**	<0.001
4. Did you feel able to make decisions?	-0.182**	<0.001
5. Have you felt constantly overwhelmed and under stress?	-0.237**	<0.001
6. Have you had the feeling that you cannot overcome your difficulties?	-0.233**	<0.001
7. Have you been able to enjoy your normal daily activities?	-0.248**	<0.001
8. Have you been able to cope adequately with your problems?	-0.239**	<0.001
9. Have you felt unhappy or depressed?	-0.275**	<0.001
10. Have you lost confidence in yourself?	-0.254**	<0.001
11. Have you thought of yourself as a worthless person?	-0.234**	<0.001
12. Do you feel reasonably happy considering all the circumstances?	-0.264**	<0.001

*(Pearson's correlation coefficients with the Bonferroni correction factor having p=0.003); **(Spearman's correlation coefficients with the Bonferroni correction factor havingp=0.003); p (p-value); GHQ-12 (Goldberg's General Health Questionnaire. Scores range from 0 to 36. Being 0, best mental health and 36, worst mental health); Stress (Scores range from 0 to 9. Being 0 no stress, and 9 very stressed); Self-esteem (Scores range from 0 to 9. Being 0 the best self-esteem, and 9 the worst self-esteem); Successful Coping (Scores go from 0 to 18. 0 is the best coping and 18 is the worst coping). Duke-UNC-11 (Duke-UNC-11 Functional Social Support Questionnaire. Scores go from 11 to 55 points). Interpretation of the "items" used in Table 4 and its corresponding official items of the GHQ-12 are displayed in Table S2.

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Table 5(on next page)

Table 5. Linear regression analysis for mental health and its factor, with: sex, age, IMC, PSS and PAL; like independent variables.

PAL (Physical Activity Level); PSS (Perceived Social Support); B (Understandarized beta); t (t-value); p (p-value); R^2 (Nagelkerke's R Square).

Table 5. Linear regression analysis for mental health and its factor, with: sex, age, IMC, PSS and PAL; like independent variables.

Mental Health				
	β	t	p	R^2
PAL	-1.633	-8.172	<0.001	
PSS	-0.238	-1.603	<0.001	15.5%
Constant	29.696	37.715	<0.001	
Successful coping				
	β	t	p	R^2
PAL	-0.706	-8.283	<0.001	
PSS	-0.095	-12.667	<0.001	14.3%
Constant	13.602	37.279	<0.001	
Self-steem				
	β	t	p	R^2
PAL	-0.721	-7.873	<0.001	
PSS	-0.103	-12.844	<0.001	14.2%
Constant	10.646	27.134	<0.001	
Stress				
	β	t	p	R^2
PAL	-0.369	-5.316	<0.001	
PSS	-0.068	-11.134	<0.001	9.8%
Constant	8.448	28.429	<0.001	

PAL (Physical Activity Level); PSS (Perceived Social Support); B (Understandarized beta); t (t-value); p (p-value); R^2 (Nagelkerke's R Square).

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