



Short communication

## Association between joint hypermobility and anxiety in Brazilian university students: Gender-related differences



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### ABSTRACT

**Introduction:** Anxiety disorders may be associated with several non-psychiatric disorders. Current literature has been investigating the association between anxiety and joint hypermobility (JHM), with special interest in non-articular symptoms that may be related to autonomic dysfunction. This study investigated the association between anxiety and JHM in a sample of Brazilian university students.

**Methods:** Data were cross-sectionally collected in two Brazilian universities (N = 2600). Participants completed three validated self-rating anxiety scales: Beck Anxiety Inventory (BAI), Social Phobia Inventory (SPIN) and the brief-version of SPIN (Mini-SPIN). They also answered the self-rating screening questionnaire for JHM: the Five-part Questionnaire for Identifying Hypermobility.

**Results:** Hypermobile women showed significantly higher scores in all the anxiety scales, when compared with men: BAI total score ( $t = 3.77$ ;  $p < 0.001$ ), its four subscales, SPIN score ( $t = 2.71$ ;  $p < 0.007$ ) and Mini-SPIN ( $t = 2.58$ ;  $p < 0.01$ ). Among BAI subscales, the autonomic subscale was shown to be more significantly ( $t = 3.89$ ;  $p < 0.001$ ) associated with joint hypermobility in women.

**Conclusions:** The results of the present study support earlier evidence on the relationship between anxiety and JHM in women, showing specific gender-related features in this field. It also directs attention to non-articular symptoms that may be enrolled in this association.

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### Introduction

Joint hypermobility (JHM) is a clinical condition related to connective tissue. It is usually heritable, more prevalent in women and mostly characterized by an increased elasticity, with a wide range of joint movements [1]. The most used method to assess JHM is the Beighton score [2], which requires clinical examination, and previous training, hindering self-ratings and their use with large samples [3,4]. As an alternative, Hakim and Grahame [3] developed a self-rating questionnaire that can be easily used as a screening tool to identify JHM. Both the Beighton score and the screening questionnaire do not assess symptoms of Joint Hypermobility Syndrome (JHS) [1,5,6] such as pain, skin alterations, dislocations, and injuries. The prevalence of joint hypermobility, estimated between 10 and 20% in the general population [3] may vary according to age, gender and ethnicity [1,4,7].

The literature has described associations between JHM and fears [8,9], distress, somatic symptoms [10–12] and even anxiety disorders [13–15]. It is likely that the association between JHM and anxiety in non-clinical samples does not follow a linear pattern; in other words, when compared

to non-hypermobility samples, the scores of fears, somatic symptoms and anxiety traits may be higher among hypermobile people, although not reaching the status of an anxiety disorder [16–18].

The first hypothesis for the association between JHM and anxiety would be the comorbidity, as an overlap between these two clinical conditions [19]. On the other hand, there is also a hypothesis that anxiety would be part of the non-articular symptoms of JHM [11,19].

Furthermore, as gender may be an important factor for both the prevalence of hypermobility and anxiety, the association between these conditions may also be different between men and women. Some studies had described these gender-related differences in different samples. In the general population [8] JHM prevalence was described in 20% of women and 7% of men; women also presented higher scores of fears, in comparison to men. In a non-clinical sample, the association between anxiety trait and JHM was described for both genders, being higher in women [16]. Gender-related differences in the association between anxiety and hypermobility were also described in a sample of French University students [20]. Lastly, several studies in clinical samples described higher association between anxiety and JHM in women, when compared to men [14,15].

In the present study, we assessed a group of Brazilian university students [4] to investigate the association between anxiety, gender and JHM, offering an original attention to evaluate this association in non-

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Mediterranean population, which has been considered a gap in the literature to date [18].

## Methods

This survey recruited 2600 students, both genders, aged 17–35 years, from two Brazilian universities (University of São Paulo – USP and University of Franca – UNIFRAN). The study was approved by the Ethics Committee of the Clinical Hospital of Ribeirão Preto Medical School – University of São Paulo, as also the department of undergraduate and research projects of both institutions. We excluded students out of age range ( $n = 53$ ), who did not want to participate ( $n = 201$ ) or did not complete the assessment instruments ( $n = 41$ ), and those under neuroleptic medication ( $n = 5$ ).

## Sociodemographic questionnaire

Designed for the study to record identification data (age, gender and area of study).

## Beck Anxiety Inventory (BAI)

Developed by Beck and Steer [21] to evaluate intensity of anxiety symptoms. The BAI was translated to Portuguese and validated in Brazil by Cunha [22]. It consists of 21 items rated on a four-point Likert scale, with a maximum score of 63 points. Items can also be aggregated into four subscales: neurophysiological (items 1, 3, 6, 8, 12, 13, 19, such as trembling and dizziness), subjective (items 4, 5, 9, 10, 14, 17, such as fear of the worst happening and fear of losing control), panic (items 7, 11, 15, 16, such as racing heart and difficulty in breathing), and autonomic symptoms (items 2, 18, 20, 21, such as blushing and sweating).

## Social Phobia Inventory (SPIN)

Created to evaluate symptoms of social anxiety disorder (SAD) based on the DSM-IV criteria by Connor et al. [23] and translated to Brazilian Portuguese and validated by Osório et al. [24]. SPIN has 17 items rated on a four-point Likert scale, with a maximum score of 68 and a cut-off score for Brazilian samples  $\geq 19$ .

## Mini SPIN

A brief version of SPIN [25], this includes three items of the original scale (6, 9, 15) that have shown high sensitivity and discriminative power for the diagnosis and screening of SAD, providing special attention to items assessing the discomfort of being observed in social contexts, one of the most specific and frequent complaints in social anxiety. The brief version was also validated in Brazil by Osório et al. [26], with a cut-off score  $\geq 6$ .

## The Five-part Questionnaire for Identifying Hypermobility

Developed by Hakim and Grahame [3], this self-rating instrument is a screening tool for JHM. It was translated to Brazilian Portuguese and validated by Moraes et al. [4] and presented good psychometric properties: for a cut-off point  $\geq 2$ , the questionnaire had a sensitivity of 70.9% (62.1–78.6; 95% CI), specificity of 77.4% (71.4–82.6), positive predictive value of 63.4% and negative predictive value of 82.8%.

## Data collection

Data were collected in a cross-sectional approach in university classrooms by three trained researchers. All participants signed the written informed consent.

## Statistical analysis

Data were analyzed using SPSS (version 15.0). The sample was divided into two groups: hypermobile subjects (JHM+) and non-hypermobile

subjects (JHM–), according to the cut-off point of the JHM screening questionnaire ( $\geq 2$ ). Variables were assessed under parametric statistics, using Chi-square test, Student's *t*-test, the Pearson correlation coefficient and the logistic regression analysis, considering  $p \leq 0.05$  as the statistically significant level. The Hosmer–Lemeshow test was used to test the goodness of fit to the logistic regression model.

## Results

The final sample comprised 2300 (88.5% of the original sample) Brazilian university students (56% female, 44% male), age ranging from 17–35 years (mean 21 years  $\pm$  3.25). Students were from diverse academic disciplines, including humanities, biological and science faculties of both universities. Females ( $n = 1285$ ) had significantly higher scores in the SPIN ( $t = 4.83, p < 0.001$ ), Mini-SPIN ( $t = 4.53, p < 0.010$ ) and BAI ( $t = 6.8, < 0.001$ ), in comparison to men ( $n = 1015$ ).

Thirty-seven percent of the total sample was classified as hypermobile ( $\geq 2$  total score), with more hypermobile women ( $n = 561$ ; 43.5%) than men ( $n = 295$ ; 29%) ( $\chi^2 = 51.42$ ;  $df = 1$ ;  $p < 0.001$ ). Hypermobile women were younger than hypermobile men (21 (3.1) vs. 22 (3.7),  $t = -3.73, p < 0.001$ ).

A logistic regression analysis showed that age did not influence JHM data ( $p = 0.83$ ). Gender, however, was an important factor (OR = 1.967, 95%CI = 1.647–2.349,  $p < 0.001$ ) to JHM, with men presenting 47% less chance to be hypermobile than women.

Based on these results, we separately analyzed anxiety data for hypermobile women and men. Table 1 shows that hypermobile women presented higher scores in the SPIN, Mini-SPIN and BAI. It also occurred in three BAI subscales (neurophysiological, autonomic and subjective symptoms of anxiety).

The correlation between anxiety scores and joint hypermobility ( $\geq 2$  score in the screening questionnaire) in hypermobile sample is shown in Table 2. Hypermobile women ( $N = 561$ ) presented weak but significant association between JHM score and the BAI total score ( $r = 0.11$ ;  $p = 0.007$ ), BAI subscales: Neurophysiological subscale ( $r = 0.08$ ;  $p = 0.051$ ), Subjective subscale ( $r = 0.09$ ;  $p = 0.03$ ), Panic subscale ( $r = 0.11$ ;  $p = 0.009$ ), and Autonomic subscale ( $r = 0.13$ ;  $p = 0.002$ ), and SPIN ( $r = 0.09$ ;  $p = 0.04$ ). No significant correlation was found with Mini-SPIN ( $r = 0.05$ ;  $p = 0.19$ ). No significant correlation has been found between anxiety scores and JHM in hypermobile men ( $N = 295$ ).

## Discussion

The study presented gender-related differences in the association between anxiety and JHM. In agreement with previous studies [7,20] JHM prevalence [4] was higher in women (43.5%) than men (29%). We also found that hypermobile women had significantly higher anxiety levels than hypermobile men. We did not observe an association between anxiety and JHM in the whole sample. We found a modest but significant positive correlation between JHM and anxiety in a sample of hypermobile Brazilian female university students, not reaching statistical significance among hypermobile men.

This study has some limitations and strengths that must be first commented on. Among the limitations, the cross-sectional design, that prevented us from knowing the direction of the association. Also, the use of a self-administered screening questionnaire, with the lack of a physical examination according to the Beighton score. It must be also

**Table 1**

Comparison between anxiety scores of hypermobile women and men.

	JHM (N = 851)	♀ JHM+ (N = 561)	♂ JHM+ (N = 295)	t	p
BAI	10.9 (9.3)	11.74 (9.76)	9.40 (7.97)	3.77	<0.001
Neurophysiological subscale	2.7 (3.2)	2.91 (3.40)	2.16 (2.84)	3.36	0.001
Autonomic subscale	2.4 (2.1)	2.58 (2.23)	2.01 (1.91)	3.89	<0.001
Panic subscale	1.5 (1.9)	1.64 (2.09)	1.38 (1.77)	1.88	0.06
Subjective subscale	4.4 (3.6)	4.67 (3.78)	3.9 (3.15)	2.81	0.005
SPIN	16.3 (11.2)	17.02 (11.6)	14.9 (10.3)	2.71	0.007
Mini-SPIN	3.3 (2.8)	3.43 (2.91)	2.91 (2.66)	2.58	0.010

JHM+: score  $\geq 2$  in the screening questionnaire.

SD: standard deviation; t = Student's *t*-test.

BAI = Beck Anxiety Inventory; SPIN = Social Phobia Inventory; Mini-SPIN = Short version of Social Phobia Inventory.

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