

Flamenco Guitar as a risk factor for overuse syndrome.

Marques D.N.¹, Rosset-Llobet J.² Fonseca Marques M.F.³ Gurgel, I.G.D¹, Augusto, L.G.S¹

- 1- Núcleo de Estudos em Saúde Coletiva/ Centro de Pesquisas Aggeu Magalhães/ Fiocruz/ Federal University of Paraíba (Brazil)
- 2- Institut de Fisiologia i Medicina de l'Art – Terrassa, Barcelona (Spain).
- 3- Unimax – Recife (Brazil)

Abstract: The purpose of this study was to analyze the prevalence of overuse syndrome in classical and flamenco guitarists from Andalusia (Spain). Of the 64 professional guitarists who participated in the study, 75% showed symptoms of overuse syndrome. Considering the fact that classical and flamenco are two distinct styles of playing, 62.5% of the classical guitarists who took part in the study were affected by some kind of overuse syndrome, versus 87.5% of the flamenco guitarists ($p=0,021$). Among the guitarists affected by overuse syndrome, a total of 50% of the classical and 82.1% of the flamenco guitarists, reported detriment in their playing ability ($p=0,018$). The specific symptom for which there was a difference in distribution in the two groups was tension in the upper extremities, reported more frequently by the flamenco guitarists. The greater incidence of problems and the greater perception of tension among flamenco guitarists are attributed mainly to the plucking technique they use, which requires a greater effort from the extensor muscles of the fingers, as well as the need to produce a higher volume of sound due to the nature of playing in groups. *Med Probl Perform Art* 18:11-14, 2003.

Overuse syndrome is a generic term that may be applied to a group of ailments affecting many parts of the body, including the upper extremities. Although this condition is not always clearly defined, it generally appears when fibers are stretched beyond their anatomical and physiological limits¹. Although

it affects different groups of professionals whose hands undergo repetitive movement² in more or less subtle ways, overuse syndrome is also attributed to other causes, including psychological ones³⁻⁵. The confusion surrounding overuse syndrome and the lack of international consensus in defining it and determining its underlying pathology have been responsible for important limitations in the advancing knowledge about the syndrome⁶.

Existing studies show that overuse syndrome is a very frequent diagnosis made in musicians and that it may begin to inflict damage even in the early phases of instruction⁷⁻⁹. However, although some studies have analyzed the distinctive risk factors for each instrument¹⁰, no publication was found that analyzed risk in relation to specific techniques used in different musical styles of the same instrument. In this sense, the possibility that technical differences between classical and flamenco musicians might be responsible for different diseases or etiologies of these diseases had not been previously investigated.

The objectives of this study were to determine the prevalence of overuse syndrome in classical and flamenco

guitarists and to establish a relationship between the findings and the risk factors of each of the two techniques.

Materials and Methods

The 64 guitarists who participated in the study were chosen from a group of 92, who were taking part in a series of classes about prevention of overuse held at the Real Conservatorio de Cádiz (Spain). The only criteria for participation were: exclusive playing that instrument and doing so a minimum of three hours per day. The 64 guitarists who met these prerequisites and who agreed to voluntarily participate in the study were interviewed about their age, sex, number of hours of practice per day, and type of technique used (classical or flamenco guitar), the presence of syndromes related to their musical activity, the presumed causes of these syndromes, and their effects on playing the instrument.

We define as overuse syndrome any pain, functional inability or problem with motor coordination that affects the upper limbs or the neck area, and that the subject correlates with playing the instrument. We believe that these symptoms affect playing ability when the individual detects that they are capable of altering the musical performance. This can create difficulties with technique used in playing the guitar (sound, speed, rhythm, tremolo, vibrato, etc.) and also affect the fitness of the individual in studying the

instrument. The selected group was composed of 48 men (75%) and 16 women (25%) with an average age of 32.16 years (SD=8,23). Of this total, 32 (50%) were classical guitarists and 32 (50%) flamenco guitarists. The data for the two groups (classical and flamenco) were compared and analyzed, showing a statistical significance of no more than 0.05.

Results

When classical and flamenco guitar were analyzed separately, it was observed that the average age of the two types of musicians did not show a significant difference, (32.63 years and SD=8.40 for the classical guitarists; 31.69 years and SD=8.17 for the flamenco guitarists; $p=0.652$). On the other hand, significant differences were found in: (1) the average daily time dedicated to the practice of the instrument (4.01 hours and SD = 0.92 for the classical and 4.88 hours and SD = 1.43 for the flamenco guitarists; $p = 0.005$); (2) the average time the symptoms had been present (2.25 years and SD = 2.17 for the classical and 3.47 years and SD = 2.03 for the flamenco guitarists; $p = 0.024$); and (3) the sex distribution (50% of women in the group of classical and no women in the group of flamenco guitarists; $p = 0.000$).

About 75% (48) of all the guitarists reported the presence of overuse syndrome related to the practice of the instrument, 20 (65.6%) being classical guitarists and 28 (87.5%) flamenco guitarists ($p = 0.021$). In relation to the detrimental effect of

overuse syndrome on the playing of the instrument, ten (50%) classical guitarists were affected, in comparison with 23 (82.1%) flamenco guitarists ($p = 0.018$) (Table 1).

Table 1. Descriptive data of the guitarists analyzed in the study (the percentage of the effect on the execution was calculated from the guitarists who presented symptoms).

	total	With symptoms	Effect on execution
Classical	32 (50%)	20 (62.5%)	10 (50%)
Flamenco	32 (50%)	28 (87.5%)	23 (82.1%)

Table 2. Main symptoms related to the practice of the instrument reported by the guitarists with problems. Due to the fact that some of the subjects showed more than one symptom, the total percentage exceeds 100% (? indicates $p=0.031$).

Symptom	Classical	Flamenco
Dorsal and cervical pain	17 (53.1%)	17 (53.1%)
Pain in the forearm	18 (56.3%)	21 (65.6%)
Tension in the upper-extremities	18 (56.3%)	26 (81.3%) [?]
Motor dis-coordination	6 (18.8%)	8 (25.0%)
Paresthesia in the fingers	2 (6.3%)	2 (6.3%)

Also observed in this study were the symptoms (Table 2) and specific causes that the guitarists attributed to the problems concerning the activity of playing their instrument (Table 3), and their attitudes with respect to the problems (Table 4).

The results regarding the participation in sports showed that in both classical and flamenco guitarists, 13 (40.6%) in each group, practiced some sort of sport

regularly ($p=1.000$). Finally, 15 (46.9%) classical and six (18.8%) flamenco guitarists did some sort of physical preparation for playing their instrument ($p = 0.017$).

Table 3. Causes to which guitarists attribute the problems related to the practice of their instrument ($p=0.001$)

Causes	Classical	Flamenco
Increase of hours in the studio	8 (40%)	12 (42.9%)
Change of repertoire	8 (40%)	0 (0%)
Don't know	4 (20%)	16 (57.1%)
Total	20	28

Table 4. Main attitudes of guitarists regarding improvement of their symptoms. Due to the fact that some individuals took more than one attitude in relation to the problems, the percentage exceeds 100% ($p=0,000$).

Attitude	Classical	Flamenco
Rest	13 (65%)	11 (39.3%)
Change of repertoire	7 (35%)	0 (0%)
Nothing	0 (0%)	17 (60.7%)
Total	20	28

Discussion

For the great majority of the population, including the musicians themselves, the art of flamenco represents a recreational activity linked to a certain amount of technical and musical freedom, as well as to easy execution. However, if this were really the case, we would expect to find fewer problems in the upper extremities of these guitarists. For this reason, some of the results

obtained in the present study are surprising.

Unfortunately, the available statistical studies that make reference to overuse syndrome in musicians have always been conducted on classical guitarists. As a result, the literature was found to contain no information about the incidence of problems among flamenco guitarists, to support the differential findings of this study. Nevertheless, we are confident that the results of the present study are sufficiently consistent in supporting that the classical guitar and the flamenco guitar are two clearly distinct types of instruments, at least from the point of view of physical risk.

Although it is relevant to point out that the guitarists from Andalucia, if we consider the classical and flamenco guitars as one instrument, present with a high rate of problems in the upper extremities, the percentage of guitarists affected (75%) is very similar to that found in other communities of Spain, such as Catalonia (77.9%).⁹ But if, because of the remarkable differences in the way they are played, we consider the two types of guitar, classical and flamenco, to be different instruments, we can observe that flamenco guitarists present with a rate of pathology (87.5%) that is higher than that of musicians who play other kinds of instruments,^{1,7,11-14} and significantly higher than that of their colleagues in Andalucia who play classical guitar (62.5%).

The differences between classical and flamenco guitarists become greater when we consider the repercussions of these symptoms on the capacity for performance. While 50% of the classical guitarists felt a reduction in their capacity to perform, as many as 82.1% of the flamenco guitarists felt such reduction. These figures become even more significant when we consider that the loss of technical capacity among musicians of all sorts affected by overuse syndrome is around 37.4%.⁹

We cannot ignore the differences with regard to time spent playing, gender, and time for these symptoms to evolve between the two groups, nor the recognized influence of these factors on the incidence of overuse syndrome and loss of technical capability.¹⁵ Nevertheless, we do not believe that these in themselves explain the different proportions of problems observed. Therefore, according to this study, the higher the proportion of women, the less time spent playing and the shorter duration of the symptoms in the classical guitarists seem to justify a lesser importance of technique. However, we believe that the basis of the differences do correspond most precisely to difference in playing techniques.

One piece of data suggesting that there must be some technical difference between the two groups is that flamenco guitarists report tension in the upper extremities with much higher frequency than

classical guitarists (81.3% versus 56.3%). Moreover, since the other symptoms are present in exactly the same proportion, it could be argued that the damaging effect on musical execution is in some way related to the intense muscular tension reported by the flamenco guitarists.

If the two types of guitar playing are observed and compared, at least three differences can be perceived: the quality of sound, the activity of the left hand, and that of the right hand. The first difference refers to the higher volume of sound that flamenco guitarists generally produce. This seems to be related to the fact that in most cases flamenco guitarists play in ensembles, which involve, besides the guitarist, singing, clapping, foot stomping, and percussion. On the other hand, classical guitarists generally play solo or in small groups with other guitarists, demanding less effort by the hands to produce volume. In addition, when flamenco guitarists play in an ensemble, they try to accentuate the sound of their instrument, for the guitar is at a clear disadvantage with respect to the other instruments. This easily leads, sometimes unconsciously, to increasing tension in the hands, attempting to attain more volume. Many guitarists end up incorporating these high levels of tension into their daily practicing, even when they do not need to be heard above other musicians.

The differences with respect to the right hand can be summed up as:

(1) Flamenco guitarists, when plucking the strings with the fingers of the right hand use a technique known as “con apoyo” (with support) or, according to the language of the flamenco guitarists themselves, *técnica del picado* (figure 1).



Figure 1. A guitarist playing with support and with bent position of the wrist.

This playing technique requires, on the one hand, the use of the flexor muscles with much more tension than used by classical guitarists due to the fact that the finger remains pressed on the upper string after playing a note; and, on the other hand, more contraction of the extensors and stabilizers of the wrist and fingers (antagonists). This type of technique uses fundamentally flexion and extension of the proximal phalanges of the three middle fingers. This differs from the technique of classical guitarists who mainly use incomplete flexion of the

middle phalanges of the same fingers. In other words, flamenco guitarists usually generate the movement with the metacarpophalangeal joint, while the classical guitarists move using the proximal interphalangeal joints (Figure 2).

(2) In general, the flamenco guitarist uses the wrist in a flexed position. This is due, among other things, to the position in which these guitarists hold their guitars (the guitar is held over the right thigh, which is placed in the shape of a number four over the left thigh, situating the guitar further back and inclined to the right). But, above all, the flexing of the wrist is due to the need of the axis of the thumb to play almost exactly perpendicularly to the strings, to allow the playing of the notes with the support needed by the bass function that this finger normally plays; and the need to produce the desired sound (Figure 1). This flexed position of the wrist, with its high muscular tension, favors the compression of the structures of the carpal tunnel, as well as causing a clear loss of effectiveness of the extensor muscles, and generating limitations in correct flexing of the fingers. This explains why often a simple posture correction can in itself bring about significant relief of the symptoms that these patients manifest. The function of returning the finger, that is, the extension of the thumb to place it again in the execution position on the string, is carried out with the long extensor of the thumb.

When the wrist is flexed, the freedom of this muscle is reduced, generating a considerable increase in tension. Most symptoms in the tendinous region of the right hand of flamenco guitarists could be caused by this posture of the wrist.



Figure 2. A guitarrist playing without support.

(3) Flamenco guitarists often use strumming, whether with the hand or only with the index finger. In the case of the first, it implicates a repeated prono-supination of the hand and in both an accentuated effort by the finger's extensors. Although this is not an effort of the isometric kind, when carried out energetically and quickly, this movement requires the supinator to be completely free. Without this freedom, when trying to overcome the difficulty of strumming with the wrist flexed, the muscle is increasingly overexerted and under

tension. This technique is very often used by flamenco guitarists and produces a higher degree of tension in the extensor muscles.

The differences with respect to the left hand can be summed up as:

(1) The high tension in the right hand of the flamenco guitar means an increased vibration of the strings, which needs to be compensated for by higher tension in the left hand to preserve the correct sound of the strings. However, while the guitarist learns the movements of both hands independently, they are not usually able to maintain this with the amount of tension required in both hands. This leads to excessive tension in the left hand, beyond what is either necessary or desirable, exposing it to greater risk of lesion.

(2) Flamenco guitar uses *legatos* and bar chords with more frequency and is played at faster speeds.

We do not believe that all these facts can be compensated for by the lower bridge of the flamenco guitar, its lower tension, and its narrower neck; therefore, the differences found in this comparative study of classical and flamenco guitarists can best be explained as resulting from the technical differences found in between the groups.

As a final reflection, this study did not investigate whether symptoms appear in relation to a concrete musical style, but rather, that they may possibly appear as a result of the specific way of playing the guitar, that is, the instrumental technique. From this, it can be

assumed that if the flamenco guitar were played with the technical principles used in classical guitar, such high incidences of symptoms of overuse would probably be avoided.

REFERENCES

1. Lederman RJ, Calabrese LH: Overuse syndromes in instrumentalists. *Med Probl Perform Art* 1:7-11, 1986.
2. Bammer G, Blignault I: More than a pain in the arms: A review of the consequences of developing occupational overuse syndromes. *Journal of Occupational Health and Safety – Australian and New Zealand* 4:389-397, 1993.
3. Sandow M, Yellowless PM, Maddern G, Hayes MG: Research into regional pain syndrome. *Med J Austr* 146:389-390, 1987.
4. Bell DSS: Repetitive strain injury: An iatrogenic epidemic of simulated injury. *Med J Austr* 151:280, 1989.
5. Kasdan ML, Cohen JD: Upper Extremity Problems of Musicians. In Kasdan ML (ed.): *Occupational Hand and Upper Extremity Injuries and Diseases*. Philadelphia, Hanley & Belfus, 1987, pp. 77-81.
6. Lederman RJ: Neuromuscular problems in the performing arts. *Muscle & Nerve* 17:569-577, 1994.
7. Fry HJH: Overuse injury in the music school. *Music Educ J* 72:46-49, 1986.
8. Fry HJH: Overuse syndrome in musicians: prevention and management. *Lancet* 2 (8509):728-31, 1986.
9. Roset-Llobet J, Rosinés-Cubells D, Saló-Orfila JM: Identification of Risk Factors for Musicians in Catalunya (Spain). *Med Probl Perform Art* 15:167-174, 2000.

10. Brandfonbrener AG: Epidemiology of the Medical Problems of Performing Artists. In: Textbook of Performing Arts Medicine. In Sataloff RT, Brandfronbener A, Lederman R (eds.): Textbook of Performing Arts Medicine. New York, Raven Press, 1991, pp. 25-69.
11. Fry HJH: Incidence of overuse syndrome in the symphony orchestra. *Med Probl Perform Art* 1:51-55, 1986.
12. Fry, HJH: Prevalence of overuse (injury) syndrome in Australian music schools. *British Journal of Industrial Medicine*, 44:35-40, 1987.
13. Knishknowy B, Lederman RJ: Instrumental musicians with upper extremity disorders: A follow-up study. *Med Prol Perform Art*; 1:85-89, 1986.
14. Lederman RJ: Overuse syndrome in musicians. *Med J Aug* 146:390, 1987.
15. Fry HJH, Rowley G: Instrumental musicians showing technique impairment with painful overuse. *Md Med J* 41 (10):899-903, 1992.