

Evaluation of PubMed publications concerning dance, injury, pain and stress subjects

Evaluarea publicațiilor PubMed din perspectiva conexiunilor între dans, leziune, durere și stres

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Abstract

Background. Dance (D) represents a type of sport that can lead to injuries, pain and that is associated with stress (S).

Aims. The aim of the present research is the evaluation of research concerns for the relationship between stress and dance.

Methods. An analysis of keyword combinations, namely: "stress and dance" (S+D), "stress and dance and injury" (S+D+I), "stress and dance and pain" (S+D+P), "stress and dance and cortisol" (S+D+C), "stress and dance and anxiety" (S+D+A) and "stress and dance and professional" (S+D+PS) was evaluated.

Results. There were significant differences between the S+D and the other chosen keyword combinations, S+D+I (0.031), S+D+P (0.006), S+D+C (0.021), S+D+A (0.004) and S+D+PS (0.003).

Conclusions. 1) The largest number of publications appeared in the "stress and dance and injuries" keyword combination, which proves the importance of dance and injuries connection. 2) Research concentrates on the connection between dance and pain, the proof being their numerical location, in second place. 3) The analysis of stress elements, such as cortisol and anxiety, can be found in studies relating to dance, the emotional component being more extensively analyzed. 4) The importance of professional dance can be found in the number of publications corresponding to this keyword association, as well as in the percentage of publications including the stress and dance association.

Key words: dance, stress, injury, pain, cortisol, anxiety, professional dance

Rezumat

Premize. Dansul (D) reprezintă un tip de sport care poate conduce la leziuni, durere și care este relaționat cu stresul (S).

Obiective. Scopul lucrării prezente îl constituie evaluarea preocupărilor de cercetare pentru relația dintre stres și dans.

Metode. A fost făcută analiza pentru unele combinații de cuvinte cheie și anume: "stres și dans" (S+D), "stres și dans și leziune" (S+D+L), "stres și dans și durere" (S+D+P), "stres și dans și cortisol" (S+D+C), "stres și dans și anxietate" (S+D+A), "stres și dans și profesional" (S+D+PS).

Rezultate. Există diferențe semnificative între S+D și celelalte combinații de cuvinte cheie alese, S+D+I (0,031), S+D+P (0,006), S+D+C (0,021), S+D+A (0,004) și S+D+PS (0,003).

Concluzii. 1) Numărul cel mai mare de publicații apărut pentru combinația de cuvinte cheie „stres și dans și leziuni”, dovedește importanța legăturii între dans și leziuni. 2) Cercetările acordă atenție conexiunii dintre dans și durere, dovadă fiind situarea lor numerică, într-un mod logic, pe locul doi. 3) Elementele de analiză a stresului, cum sunt cortizolul și anxietatea, se întâlnesc în studiile referitoare la dans, componenta emoțională fiind mai intens analizată. 4) Importanța aspectului profesionist al dansului se regăsește în numărul publicațiilor corespunzător asocierii cu acest cuvânt cheie, precum și în procentul pe care acesta îl reprezintă din asocierea stres și dans.

Cuvinte cheie: dans, stres, cortizol, leziune, durere, anxietate, dans profesional.

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Introduction

Dance, one of the oldest cultural forms of emotions expression, represents a sport category (Russell JA, 2013). Injuries are a major concern among dancers, and a high frequency of their appearance is currently reported (Baker et al., 2010). Perhaps this is why pain experienced by dancers has been a research topic of continuing growth in recent years (Tajet-Foxell & Rose, 1995). Thus, while regular exercise is beneficial to health, dance, especially competitive dance, has shown a susceptibility to suffering because it is a chronic stress that can lead to significant functional consequences (Berndt, 2012). In terms of physical performance, anxiety has been profusely researched in sport psychology (Walker & Nordin-Bates, 2010).

The present article is a continuation of previous research carried out by the authors concerning the assessment of stress in situations of physical exertion (Jurcău et al., 2011; Jurcău et al., 2012a; Jurcău et al., 2012b; Jurcău et al., 2013b; Jurcău & Jurcau, 2012), injury (Jurcău et al., 2013a) and pain (Jurcău & Jurcau, 2013b) in terms of physical exertion, and the relationship between exercise and stress, based on the analysis of PubMed publications (Jurcău & Jurcau, 2013a).

Hypothesis

In terms of physical exercise, dance, especially professional and competitive dance, can be accompanied by injuries, therefore by pain, and can be associated with stress, so with anxiety.

Objectives

The aim of the present research is the evaluation of research concerning the relationship between stress and dance based on the use of several keywords.

Material and methods

The „stress and dance” (S+D) relationship was analyzed for specific keyword combinations: „stress and dance” (S+D), „stress and dance and pain” (S+D+P), „stress and dance and injury” (S+D+I), „stress and dance and cortisol” (S+D+C), „stress and dance and anxiety” (S+D+A), „stress and dance and professional” (S+D+PS). Injuries and the resulting pain are commonly found in dance, especially in professional dance. On the other hand, cortisol and anxiety are important parameters in stress evaluation.

Evaluation was conducted over a period of 53 years, between 1966-2013, and had the following elements of analysis:

a) the average number of publications per annum, for decades 1960-69, 1970-79, 1980-82, 1990-99, 2000-2009; and the number of publications per year for the years 2010, 2011, 2012 and 2013;

b) the percentage % of the total number of publications, for sub-filters and keyword combinations, for the whole 1960-2013 period, as well as for the decades and years taken into consideration.

Statistical evaluation

The results obtained were analyzed using the SPSS 13.0. statistical package. For continuous data examination,

Student’s t test was used. The differences were considered significant at a $p < 0.05$.

Results

Data collection was performed in December 2013. For all groups, data distribution was normal, according to the Kolmogorov-Smirnov test. The analysis was made for the chosen time periods.

The comparative analysis involved the keyword combinations (Table I, Fig. 1) „stress and dance” (S+D), „stress and dance and injury” (S+D+I), „stress and dance and pain” (S+D+P), „stress and dance and cortisol” (S+D+C), “stress and dance and anxiety” (S+D+A), “stress and dance and professional” (S+D+PS).

The total number of publications over 53 years (Table I), for S+D+I (126), representing 48.3% of S+D, was greater than for: S+D+P (57), 22.2% of S+D; S+D+C (10), 3.9% of S+D; S+D+A (26), 10.3% of S+D; and S+D+PS (38), 14.2% of S+D.

Table I
Total number of publications and % of N for the chosen keyword combinations

Analysis	S+D = N	S+D+I	S+D+P	S+D+C	S+D+A	S+D+PS
1960-2013	259	126	57	10	26	38
% of N	100	48.3	22.2	3.9	10.3	14.3

Differences were noted for the averages/year between S+D and the other chosen keyword combinations (Table II). These were moderately significant for S+D+I (0.031) and S+D+C (0.021); highly significant for S+D+P (0.0006), S+D+A (0.004) and S+D+PS (0.003). The dynamic analysis of the mean number of publications over 53 years (Fig. 4) shows that the maximum values were found for S+D+I, in 2011 (9); for S+D+P (7), in 2013; for S+D+C, in 2011, 2012 and 2013 (2); for S+D+A (6), in 2013; for S+D+PS, in 2012 (3) and 2013 (3). The values of the keyword combination S+D+C were low over the entire analyzed period, and between 1960-1989 no records were found.

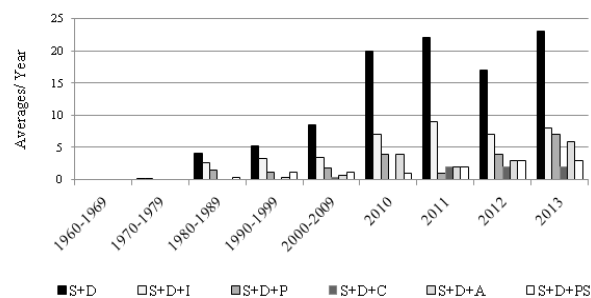


Fig. 1 – Dynamic analysis of the mean number of publications per year for the chosen keyword combinations

The analysis of the percentage (%) of S+D (=N) (Table III) for sub-filters shows that the highest % were recorded: in 1960-2013, for S+D+I (52.1%); in 2012, for S+D+C (11.7%) and S+D+PS (17.6%); in 2013, for S+D+P (30.4) and S+D+A (26%). Although the mean percentage of publications/year with S+D+I was the highest in 2012,

the % of S+D was moderate (40.9%) compared with other periods. % for S+D+I were higher than for S+D+C, S+D+P, S+D+A and S+D+PS, for all periods.

Table II
Averages/year for the chosen keyword combinations
Comparison of S+D

Time period	S+D	S+D+I	S+D+P	S+D+C	S+D+A	S+D+PS
1960-1969	0.1	0	0	0	0	0
1970-1979	0.3	0.2	0	0	0	0.1
1980-1989	4.2	2.6	1.4	0	0.1	0.5
1990-1999	5.3	3.3	1.1	0.1	0.4	1.3
2000-2009	8.5	3.5	1.8	0.4	0.8	1.2
2010	20	7	4	0	4	1
2011	22	9	1	2	2	2
2012	17	7	4	2	3	3
2013	23	8	7	2	6	3
Mean	11.13	4.44	2.24	0.71	1.83	1.34
Standard deviation	8.83	3.12	2.19	0.93	2.02	1.07
P-value		0.031	0.006	0.021	0.004	0.003

Table III

Percentage of S+D for the chosen keyword combinations

Time period	S+D	S+D+I	S+D+P	S+D+C	S+D+A	S+D+PS
1960-2009	100	52.1	23.3	2.8	7.1	16.8
2010	100	35	20	0	20	5
2011	100	40.9	4.6	9.1	9.1	9.1
2012	100	41.1	23.5	11.7	17.6	17.6
2013	100	34.8	30.4	8.7	26	13

Discussion

The comparative analysis involved the keyword combinations „stress and dance” (S+D), „stress and dance and cortisol” (S+D+C), „stress and dance and pain” (S+D+P), „stress and dance and injury” (S+D+I), “stress and dance and anxiety” (S+D+A), „stress and dance and professional” (S+D+PS).

The dynamic evolution of M, F and MF shows that between 1960-1979, so over a 20 year period, the number of studies including these sub-filters was reduced. There was no mention: for S+D+C, between 1960-89; for S+D+I, between 1960-69; for S+D+P, between 1960-79; for S+D+A, between 1960-1979; for S+D+PS, between 1960-1969. Interest began to grow: for S+D+C, starting with 1990; for S+D+I, S+D+P, S+D+A, S+D+PS, starting with 1980. The average number of publications per annum was the largest: for S+D+I, in 2011; for S+D+P, in 2013; for S+D+C, in 2011, 2012 and 2013; for S+D+A, in 2013; for S+D+PS, in 2012 and 2013. Differences between S+D and the other chosen keyword combinations were significant.

Injuries may be present during dancing. We quote below some important references:

In the case of dancesport, “common injuries affected the neck, shoulder, spine, knee, lower leg, and foot” (McCabe, 2013). In fact, “injury rates in contemporary dance are high; notably, 89% of dancers reported one or more injuries; this problem is particularly evident in the lower limb” (Baker et al., 2010). Thus, for the 42 dancers of a modern dance organization, it was proved that “the majority of new injuries occurred in younger dancers, most injuries involved overuse of the lower extremity, similar to patterns reported in ballet companies” (Bronner, 2003). In another research, it was found that for “breakers, popper/lockers,

and new schoolers, lower extremity injuries were 52% and upper extremity injuries 32% of total injuries” (Ojofeitimi, 2012). In addition, “break-dancing carries many of the risks of conventional dance and gymnastics, most injuries resulting from break-dancing are minor, such as sprains and strains, but there is great potential for dance participants to sustain severe and life-threatening conditions, such as cervical cord injuries” (Cho et al., 2009a). “The frequency of injury in break-dancers depended on the site and was as follows: wrist (69.0%), finger (61.9%), knee (61.9%), shoulder (52.4%), lumbar spine (50.0%), elbow (42.9%), cervical spine (38.1%), ankle (38.1%), foot (28.6%) and hip (16.7%). Sprain, strain and tendinitis were the most common injuries, accounting for the most cases” (Cho et al., 2009b). In the case of “dance students, professionals, and former dancers in the UK, 90% of the sample had experienced an injury (now or in the past), and the lower back and knee were among the most common sites of current pain and injury” (Thomas & Tarr, 2009). For “one hundred and forty-seven professional dancers belonging to the three major companies in Sweden”, it was found that “the low back was the site provoking most complaints (70%) followed by complaints from ankles/feet (65%) and neck (54%); there were no significant differences between the sexes” (Ramel & Moritz, 1994). It was highlighted that “competitive ballroom dancers show evidence for hypoactivity in stress systems and peripheral inflammation along with more self-reported physical complaints” (Berndt, 2012).

In the case of our research, an important percentage of S+D, 48.3%, refers to S+D+I.

Due to possible injuries, *pain* is a symptom commonly encountered in the field of dance. The association between stress, dance and pain has been little explored. We quote below some important references:

“Like sports professionals, dancers were found to have higher pain and pain tolerance thresholds than age matched controls and also reported a more acute experience of the sensory aspects of the pain” (Tajet-Foxell & Rose, 1995). In this respect, “qualitative descriptions of pain and injury indicated that dancers tend to define injury as something that stops them from dancing or from moving normally” (Thomas & Tarr, 2009). However, a research showed that in the case of “dancers in a professional ballet company, there was significantly less pain the week after the première, for the study population taken as a whole” (Ramel, 1997). It has been demonstrated that there is a “relationships between the type of pain experienced (performance pain and injury pain) and a cognitive appraisal of pain and pain coping styles in dancers”. Thus, “dancers with performance pain of either low or high severity were more likely to dance in pain than dancers experiencing injury pain”. But “dancers may not differentiate between performance pain and injury pain, or modify their appraisal and coping strategies according to the characteristics of the pain experienced” (Anderson & Hanrahan, 2008).

In the case of our research, an important percentage of S+D, 22.2%, was related to pain.

Cortisol is an important biological marker of stress. We quote below some important references:

“Higher psychological need satisfaction was associated with lower cortisol responses” (Qusted, 2011). In 2004,

West J observed that "cortisol increased in African dance and decreased in Hatha yoga" (West, 2004). Three years later, it was stated that "competitive dancing produced substantial increases in cortisol compared to a control day, not due to the physical strain of dancing and greater than those found during social-evaluative laboratory stressors" (Rohleder, 2007). However, after a few years, Berndt found that "diurnal cortisol significantly lower in ballroom dancers" (Berndt, 2012).

In the case of our research, only 3.9% of investigations that have targeted both stress and dance were related to cortisol.

Anxiety can be associated with dance, especially in situations of demonstrations or competitions. We quote below some important references:

"Higher psychological need satisfaction was associated with lower anxiety intensity" (Quested, 2011). Thus, "anxiety and performance-avoidance goals may hinder dancers' ability to cope with the physical stress associated with a dance career" (Lench, 2010). There are also situations in which dance reduces anxiety. For example, "both African dance and Hatha yoga reduced perceived stress and negative affect" (West, 2004). Similarly, in the case of "Greek traditional dances, old people's anxiety state and psychological distress decreases, and their quality of life and positive well-being improved" (Mavrovouniotis, 2009). Instead, "ballroom dancers described themselves as being more anxious and reported more physical health complaints" (Berndt, 2012). In this sense, "a study that explored ballet dancers' anxiety experiences of performance", revealed that "cognitive anxiety was more dominant than somatic anxiety, and was unanimously interpreted as debilitating to performance; somatic anxiety was more likely to be interpreted as facilitative, with the majority of dancers recognizing that a certain amount of anxiety could be beneficial to performance; principal dancers suffered from higher intensities of performance anxiety than corps de ballet members" (Walker & Nordin-Bates, 2010).

In the case of our research, only 10.3% of S+D investigations were related to anxiety.

Professional dance represents a special category of dance, illustrating the variety and importance of sportsmanship. We quote below some important references:

Professional dancers "experience high rates of musculoskeletal injuries" (Bronner, 2003). One explanation would be "the angle of turnout, that is thought to predispose professional dancers to overuse musculoskeletal injuries of the lower limb" (Cimelli & Curran, 2012). It is known that "professional dance training is a long process of physical, intellectual, and psychological preparation, through physical exercise, often beginning in childhood and continuing until retirement"; thus "classical ballet training, rehearsal, and performance often demonstrate strength at the hip joint" (Twitchett, 2009). In addition, "results suggest that supplementary strength training for hamstring and quadriceps muscles is beneficial to professional ballerinas and their dancing; weaker individuals are more likely to benefit from such regimens than their stronger counterparts, whereas increases in thigh-muscle strength do not alter selected aesthetic components" (Koutedakis

& Sharp, 2004). Another study demonstrated that "among elite Brazilian professional female ballet dancers, the lifetime prevalence of body dysmorphic disorder and eating disorders was higher than in the general population" (Nascimento, 2012). In addition, it was observed that "common injuries in professional dancers affected the neck, shoulder, spine, knee, lower leg and foot" (McCabe, 2013).

In the case of our research, 14.3% of S+D investigations were related to professional dance.

The evaluation elements for dance stress (via cortisol and anxiety), for the presence of injuries and pain in dance, as well as for professional dance, although modest numerically compared to the total stress - dance related publications, are all important through the role granted to these parameters.

Conclusions

1. The largest number of publications was found for the „stress and dance and injuries” keyword combination, demonstrating the importance of the connection between dance and injuries.
2. Research pays attention to the connection between dance and pain, which is proved by their ranking, in a logical way, on the second place.
3. The analysis of stress elements, such as cortisol and anxiety, can be found in studies relating to dance, the emotional component being more extensively analyzed.
4. The importance of professional dance can be found in the number of publications including this keyword association, as well as in the percentage of publications including the stress and dance association.

Conflicts of interest

Nothing to declare.

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