

INJURY OCCURRENCE IN MODERN AND HIP-HOP DANCERS: A SYSTEMATIC LITERATURE REVIEW

POJAVLJANJE POŠKODB PRI PLESALCIH MODERNEGA PLESA IN HIPHOPA: SISTEMATIČNI PREGLED LITERATURE

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Review

ABSTRACT

Keywords:

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risk factors, dancers'
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Introduction: Dance-related injuries have become a field of great interest to researchers, with the most commonly reported injuries being those sustained by ballet dancers. However, there is a lack of research into injuries sustained by those who perform modern and hip-hop dance.

Methods: A systematic literature review using the MEDLINE research database was performed and a search carried out for full-text studies that investigate injuries in modern and hip-hop dance.

Results: While a total of 74 hits were obtained from various searches, only nine studies were included in the systematic literature review. Six of them examined modern dancers, two examined break dancers and one examined hip-hop dancers. The results show that hip-hop dancers (and especially break dancers) sustain more injuries in comparison to modern dancers. The most common injuries are in the lower extremities, with studies revealing that overuse injuries occur in up to 71% of cases.

Conclusions: The injury incidence rate in hip-hop dance seems to be higher compared to modern dance, chiefly because of the more demanding biomechanics involved and the dance techniques employed. Prevention management can have a positive effect on the number of injuries.

IZVLEČEK

Ključne besede:

poškodbe pri plesu,
dejavniki tveganja,
karakteristike plesalcev

Uvod: Športne poškodbe so v zadnjih letih za raziskovalce postale vedno zanimivejše področje raziskovanja. Podobno velja tudi za poškodbe, povezane s plesom. Ta se je skozi desetletja precej spremenil, oblikovali so se novi plesni stili, razširil se je tudi v tekmovalnem smislu. Večina raziskav je opravljenih pri plesalcih baleta, največkrat profesionalnih, le malo raziskav pa lahko najdemo s področja poškodb v modernem plesu in hiphopu.

Metode: Sistematični pregled literature je s pomočjo iskalnih ključnih besed potekal v spletni podatkovni zbirki MEDLINE. Iskani so bili članki s polnim besedilom, ki so raziskovali poškodbe v modernem plesu in/ali hiphopu.

Rezultati: Najdenih je bilo 74 zadetkov, od katerih je bilo po branju naslova in izvlečka v nadaljnje branje vključenih 13 člankov, po branju polnega besedila pa jih je bilo v pregled literature vključenih devet. Šest študij je raziskavo opravilo na plesalcih modernega plesa, dve na plesalcih breakdancea in le ena na plesalcih hiphopa. Večina raziskav je uporabila vprašalnik o značilnostih plesalcev, plesni karieri in poškodbah, ena študija pa je v svojo osemletno raziskavo vključila obsežni preventivni ukrep za zmanjšanje poškodb. Rezultati vključenih študij kažejo, da plesalci hiphopa (še posebno breakdancea) utrpijo več poškodb kot plesalci modernega plesa. Najpogostejše so poškodbe spodnjega uda (ligamentov in sklepov), ki mu sledijo poškodbe trupa. V večini primerov gre za preobremenitve (do 71 %), precej manj je akutnih/travmatskih poškodb.

Zaključki: Raziskave kažejo, da je incidenca poškodb v hiphopu večja kot v modernem plesu, predvsem zaradi zahtevnejše biomehanike gibanja in tehnike plesa. To velja zlasti za breakdance, pri katerem se pojavlja tudi več poškodb zgornjega dela telesa kot pri ostalih plesnih zvrsteh. Preventivni programi lahko dokazano zmanjšajo število poškodb in posledično tudi stroške, ki nastanejo zaradi zdravljenja in rehabilitacije.

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1 INTRODUCTION

While they are primarily performing artists, dancers are often also regarded as athletes. Performing dance at a high level requires sophisticated physical capacities (aerobic and anaerobic energy utilisation, muscular strength and endurance, speed, balance, coordination, agility, flexibility and motor control) allied to aesthetics (1). Professional and non-professional dancers alike are an embodiment of the achievements that can result from rigorous training and mastery of technique. As dance involves a high number of repetitions, dancers risk injury by exceeding the limits of their anatomical and physiological capabilities (2). Most dancers begin training at a young age, so there is the potential for injuries to have a significant impact on their future health (3). Injuries and health problems have resulted in financial outlays for individuals, dance companies and the health system (4). However, as an occupational group, modern and hip-hop dancers have received little attention in the health literature to date (5).

Interest in dance-related injuries has widened in recent years, with several new reviews published (3, 5-7). However, most of these reviews are of research papers that investigate ballet injuries—indeed, this dance discipline is by far the most common point of interest for researchers (8). Although similarities between different dance styles exist, there are also differences in technique and in the movements dancers incorporate into their repertoire. Since its origins in the early part of the 20th century, modern dance has seen advances in technique brought about by choreographers and dancers such as Graham, Limon, Horton, Cunningham, Nikolais/Luis and Hawkins (9). Hip-hop dance, on the other hand, is a type of freestyle dance with a shorter history than that of modern dance. It was initially performed to hip-hop music by young people in the streets (10) and has several styles, divided into Old School (e.g. breaking, popping, locking) and New School (e.g. house, krumping, street jazz) (11). Street dance styles and modern dance have increased in popularity in recent years and are becoming part of many young people's lifestyle (12). Moreover, dance schools are being set up in large numbers and are competing at national and international championships, and performing in theatres and at shows and concerts. All this requires class- and rehearsal-based training. Slovenia has approximately 2,500 registered dancers, half of them in hip-hop. Around 25% of all registered dancers compete in hip-hop and are under 15 years of age. Studies have shown that the most common modifiable risk factors for dance injuries are anthropometrics, joint range of motion, age and dance exposure (7).

Because injury occurrence in modern and hip-hop dance is not yet well-documented (but seems to play a significant role in the health status of young dancers), the aim of this literature review was threefold:

1. to investigate the epidemiology of injuries in modern and hip-hop dance in order to highlight the magnitude of the problem;
2. to summarise the findings of previous studies regarding the risk factors that lead to injuries in modern and hip-hop dance;
3. to uncover opportunities for further research on modern and hip-hop dance injuries.

2 METHODS

A systematic literature review of the MEDLINE (PubMed) research database was conducted in June 2019 in line with the recommendations of the Preferred Reporting Intensity for Systematic Reviews and Meta-Analyses (PRISMA) (13). The search for relevant articles was performed using MeSH Terms, as follows: (“wounds and injuries” [MeSH Terms] OR (“wounds” AND “injuries”) OR (“wounds and injuries” OR “injury”) AND “modern” AND “hip-hop” AND “break” AND (“dancing” [MeSH Terms] OR “dancing” OR “dance”).

2.1 Inclusion and Exclusion Criteria

This review included full-text articles written in English and German published in the last 30 years. For original articles to be included, they needed to have investigated injuries among modern, hip-hop or break dancers. Other dance styles were excluded. We disregarded case studies and reports. Research on very uncommon injuries was also excluded.

2.2 Selection of Studies

Two independent observers analysed the results to find potentially eligible studies. The articles were initially selected according to title. The abstracts were then reviewed. Studies available in full text that included key terms in the title or abstract were considered. To extend the number of hits, we also examined the references of all papers included.

3 RESULTS

A literature review search revealed 74 studies. They were evaluated in accordance with the revised title and abstracts. Thirteen studies were then taken for further review. Only nine research papers met the inclusion criteria for the systematic literature review (Figure 1).

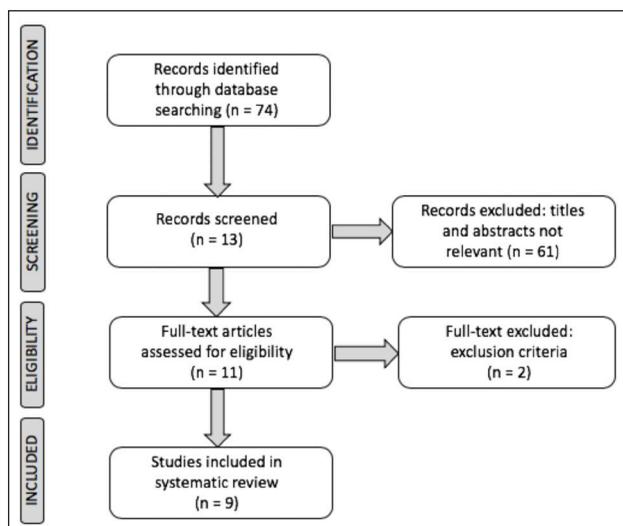


Figure 1. PRISMA diagram (flowchart of the search process).

All studies included in this literature review investigated injury occurrence among modern, hip-hop or break dancers. Six of them looked at modern dancers (14-19), two investigated injuries in break dance (20, 21) and only one paper addressed hip-hop dance (22). The research design, number of participants, main outcome measures and conclusions of all nine studies are summarised in Table 1 (prospective studies) and Table 2 (retrospective studies).

Table 1. Summary of prospective studies included in the systematic literature review.

Parameter	Research design	Participants	Main outcome measures	Conclusions
Bronner and Bauer, 2018 (14)	Prospective cohort prognostic study	Pre-professional modern dance students (n=180, F=140, M=40)	<ul style="list-style-type: none"> - Number of injuries (traumatic/overuse, medical attention and time-loss, body region, tissue category, side) - Beighton score - Technique score - Muscle tightness - Previous injuries 	Hypermobility and hypomobility, previous injuries and inferior technique/motor control were more likely to lead to injury.
Lee et al., 2017 (15)	Prospective cohort study	Pre-professional dance students (n=66, F=40, M=26)	<ul style="list-style-type: none"> - Injury prevalence - Injury characteristics (time-loss/non time-loss, acute/overuse, new/recurrent) - Injury severity - Injury incidence - Relationship between dance exposure and injury - Relationship between reported injuries and risk factors 	The number of dance exposures was more significantly associated with injury risk than hours of dance exposure.
Bronner and Wood, 2017 (17)	Prospective cohort study	Professional modern dance company dancers (n=35, F=18, M=17)	<ul style="list-style-type: none"> - Reported injury (RI): diagnosis, traumatic/overuse, body region, activity - Time-loss injury (TLI) - Complaints 	Muscle and tendon complaints affecting the neck, lower leg and low back/pelvic regions were common.
Ojofeitimi and Bronner, 2011 (19)	Retrospective-prospective cohort study	Professional modern dancers in two dance companies (n1=30, n2=12)	<ul style="list-style-type: none"> - Demographics - Injury incidence - Exposure - Injury location and diagnostic category - Injury mechanism (traumatic/overuse) and severity - Injury-related costs 	An injury prevention programme is effective in reducing injury-related costs and promoting dancers' health and well-being in a modern dance company.

F=female, M=male

Table 2. Summary of retrospective studies included in the systematic literature review.

Parameter	Research design	Participants	Main outcome measures	Conclusions
Jacobs et al., 2017 (16)	Cross-sectional study	Dancers from nine professional ballet and modern dance companies (n=260, Ba=178, Mo=82)	- Self-reported injury (SRI) - Self-estimated functional inability because of pain	The prevalence of injury is high in professional dancers. The number of years dancing and the dancer's rank are associated with injury in professional ballet dancers.
Shah et al., 2012 (18)	Self-reported retrospective study	Professional modern dancers (n=184, F=135, M=49)	Anonymous survey (demographics, forms of dance, modern dance techniques, other forms of exercise, health insurance, number of musculoskeletal injuries in the last year)	Professional modern dancers suffer from a rate of injury similar to other groups of professional dancers. No significant difference between gender and age and incidence of injury.
Ojofeitimi et al., 2012 (22)	Self-reported retrospective study	Intermediate, advanced, and expert hip-hop dancers (n=312, F=169, M=143, BD=68%, PL=21%, NS=11%)	Online survey: - Demographics - Injuries over previous five years (locations, categories, severity, mechanism)	Break dancers had a higher injury incidence compared with popping/locking and New School dancers. Hip-hop dancers report injury rates higher than other dance forms, but similar to gymnastics.
Kauther et al., 2009 (20)	Descriptive retrospective epidemiological study	Professional (n=40) and amateur (n=104) break dancers	Self-reported questionnaire: - General part (demographics, training time, length of warm-up and stretching time, other sporting activities, extent of medical treatment) - Information about injuries (50 injuries in nine anatomical regions), severity (loss of training time), overuse/traumatic injury	Break dancing must be considered a potentially high-risk dancing sport. Even when suffering from severe injuries, dancers interrupt training only for limited periods of time.
Cho et al., 2009 (21)	Descriptive retrospective epidemiological study	Professional (n=23) and amateur (n=19) break dancers	- Self-reported questionnaire - Question about injuries (ten different body parts) - Radiographs of cervical spine, lumbar spine, shoulder, elbow, wrist, hip, knee and ankle - CT and MRI if needed	Clinicians must enquire thoroughly into the nature of the activities that result in both unusual and common injuries in break dancers, and must educate them about safety. Careful screening, instruction and supervised training of break dancers will help to prevent injury.

F=female, M=male, Ba=ballet, Mo=modern, BD=break dance, PL=popping/locking, NS=New School

In four studies, the authors retrospectively examined injury occurrence, and their location, severity and correlation with demographic and dance characteristics (18, 20-22); Jacobs et al. (16) compared injuries in modern dance and ballet in a cross-sectional study; three studies were prospective cohort studies (14, 15, 17); and one study retrospectively reported injuries and then prospectively investigated the effect of comprehensive management intervention on injury incidence and cost (19).

Table 3. Summary of the main results of the studies included in the systematic literature review.

Authors	Dance style	Reporting injury period	Main results
Bronner and Bauer, 2018 (14)	Modern	4 years	Injuries/dancer: 2.32 (any I), 0.40 (TLI) Injuries/inj. dancer: 3.34 (any I), 1.59 (TLI) Injuries/1000-h: 3.28 (any I), 0.57 (TLI) Traumatic inj./1000-h: 0.49 (any I), 0.19 (TLI) Overuse inj./1000-h: 2.8 (any I), 0.37 (TLI)
Lee et al., 2017 (15)	Modern	1 year	Total injuries: 125 (86.2% dancers injured) Acute injuries: 51 (40.8%) Overuse injuries: 74 (59.2%) Number of injuries: 58 (Ba), 67 (Mo), 74 (TLI), 51 (NTLI) Injuries/1000-h: 2.27 (1.3 TLI, 0.92 NTLI, 2.11 Ba, 2.17 Mo)
Bronner and Wood, 2017 (17)	Modern	1 year	Number of injuries: 20 (any I), 10 (TLI), 11 (traumatic I), 9 (overuse I) Injuries/1000-h: 0.44 (any I), 0.22 (TLI), 0.24 (traumatic I), 0.2 (overuse I)
Ojofeitimi and Bronner, 2011 (19)	Modern	8 years	Number of injuries: 217 Injuries/inj. dancer: 2.9 Cumulative incidence: 65% Injuries/1000-h: 0.41 Injury mechanism: 71% overuse, 28% traumatic, 1% other
Jacobs et al., 2017 (16)	Ballet, modern	6 months	Point prevalence of self-reported injury: - Ba: 54.8% (47.7-62.1), Mo: 46.3% (35.5-57.1) Injured: - Ba: 17 (9.6%), Mo: 9 (11.0%) Recovering from an injury: - Ba: 38 (21.5%), Mo: 11 (13.4%) Persistent injury: - Ba: 44 (24.9%), Mo: 19 (23.2%) Not injured: - Ba: 78 (44.1%), Mo: 43 (52.4%)
Shah et al., 2012 (18)	Modern	1 year	Injured: 150 (82%) Injuries/dancer: 1.2±1.0 (M), 1.7±1.3 (F) Mechanism of injury: 57% overuse, 43% traumatic Injuries/1000-h: 0.59
Ojofeitimi et al., 2012 (22)	Hip-hop	1 year	Injuries: 738 (232 injured dancers) Time-loss injuries: 506 (205 injured dancers) Annual incidence: 237% (162% TLI) - BD: 278% (194%TLI), PL 152% (95% TLI), NS 144% (92% TLI) Injuries/inj. dancer: - BD 3.5 (2.8 TLI), PL 2.3 (1.7 TLI), NS 2.3 (1.6 TLI) Injury mechanism: 50% overuse, 42% landing, 36% twisting, 31% slipping
Kauther et al., 2009 (20)	Break dance	All career	Number of acute injuries: 1,665 (1021 amateur BD, 644 professional BD) Injuries/dancer: 11.6 (9.8 amateur BD, 16.1 professional BD) Overuse syndromes: 206 (123 amateur BD, 83 professional BD) Overuse syn./dancer: 1.4 (1.2 amateur BD, 2.1 professional BD)
Cho et al., 2009 (21)	Break dance	All career	Injuries: 193 (133 professional BD, 60 amateur BD) Injured dancers: 40 (95.2%) Injuries/dancer: 4.6 (5.78 professional BD, 3.16 amateur BD)

I=injury, TLI=time-loss injury, NTLI=non time-loss injury, Ba=ballet, Mo=modern, M=male, F=female, BD=break dance, PL=popping/locking, NS=New School

The authors of five of the studies reported numbers of acute and traumatic injuries (14, 15, 17, 19, 20), while five studies presented injuries per 1,000-hours of dance exposure (14, 15, 17-19). Jacobs et al. (16) stated injury prevalence only (Table 3).

4 DISCUSSION

The purpose of this systematic literature review was to search for studies that investigated injuries in modern and hip-hop dance. As Russell (1) points out, studies have mostly investigated injuries in ballet. It is therefore not surprising to find that only 74 records were identified when searching only for injuries in modern, hip-hop and break dance. Furthermore, after eliminating review articles, pilot studies and case reports, and excluding inappropriate full texts, only nine studies were included in our literature review.

4.1 Systematic Review Results

Six out of the nine studies included in our literature review used a survey or questionnaire to collect data on injuries. Besides general questions about personal and demographic characteristics, and the nature, type, severity, location and frequency of injuries, they asked participants about dance exposure (15), pain (16), use of protective devices (21), amount of "headspin" training time (20), experience level (22) and the modern dance techniques they had studied (18). Only Lee et al. (15) investigated injuries prospectively for one dance year, with the other five all looking at injury occurrence over the previous six months (16), 12 months (17, 21) or over the length of a career (20, 21). An analysis of the surveys shows that modern dancers suffer more from overuse injuries (45-71%) (15, 17-19), while acute, traumatic injuries are more common among break dancers (89%) (20). Jacobs et al. (16) discovered that 44.1% of ballet dancers and 52.4% of modern dancers had never been injured, while 4.2% of break dancers had never reported an injury (20). This shows that biomechanics and the techniques of break dance carry a higher risk of acute injuries and the development of overuse injuries. Both studies that investigated injury rates among break dancers revealed that professionals suffered significantly more injuries per person than amateurs (20, 21). This could be a result of the number of hours spent dancing and the dancer's career length. In modern dance, the injury incidence rate was 2.27/1,000 hours of dancing (15), while Ojofeitimi et al. (22) found different injury incidence rates for hip-hop dance according to dance style, as follows: 3.5 per break dancer, 2.3 per popping/locking dancer and 2.3 per New School dancer. A comparison between the number of time-loss injuries among modern and hip-hop dancers revealed that 59% of modern dancers sustained such injuries (15) compared to 68.5% of hip-hop dancers (22).

The anatomical distribution of injuries was similar in all dance styles. The highest percentage of injuries occurred to the lower extremities (50-70%), approximately 20% of injuries were located in the trunk (mainly the lower back) and the least-injured parts were the upper extremities and the head (15, 18, 22). Injuries to the shoulder, wrist/hand and head/cervical spine were more frequently reported in break dance than in modern and hip-hop dance (20, 21). The most common injuries were to joints and ligaments (49%) (19); 28% suffered sustained muscle or tendon strains (18) (29% of injuries (19)); and 21% of injuries involved dancers suffering from tendinitis or bursitis (18). Bronner and Bauer (14) discovered that hypermobility and hypomobility, previous injuries and poor dance-control technique contributed to injury occurrence. Fatigue and a lack of warm-up were also common risk factors for injuries (22). The literature does not contain sufficient information on risk factors in modern and hip-hop dance. However, Russell's literature review (1) does offer some perspectives in support of reducing and preventing dance-related injuries. First, he encourages researchers to conduct screening tests; second, he recommends that dancers undergo additional physical training to complement their technical dance training. He also suggests proper nutrition and rest (reduction of fatigue) for dancers. Ojofeitimi and Bronner (19) have shown that it is possible to reduce total injury incidence by 34% by implementing comprehensive preventive measures.

4.2 Research Limitations and Strengths

To our knowledge, this is the first review to compare injury occurrence between modern and hip-hop dancers. Vassallo et al. (5) reviewed injury incidence rates and characteristics across all levels of dance participation and identified a gap in the literature. This systematic literature review clearly shows that there are too few studies that investigate injuries in hip-hop dance. Through a systematic literature review, we were able to establish that injury rates in hip-hop dance were higher (and less fully investigated) than in modern (and other) dance styles. The greatest strength of this review is therefore the finding that hip-hop dancers need a special preventive training programme to reduce injury occurrence and improve quality of life.

4.3 Potential for Further Research

Since we did not find any prospective randomised controlled study that would examine the risk factors contributing to injury occurrence, there is potential for conducting such research in the near future.

5 CONCLUSIONS

This systematic literature review identified differences in injury incidence rates between modern and hip-hop dance (break dance in particular). As dance-related injuries seem to be of major concern, researchers may consider conducting further investigation into dance styles such as hip-hop, not only through self-report questionnaires but also by carrying out screening tests (23) and preventive programmes (which showed a reduction in dance-related injuries (24)), and by involving other healthcare workers.

CONFLICT OF INTEREST

The authors declare that no conflicts of interest exist.

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This work was unfunded.

ETHICAL APPROVAL

The method used in this systematic literature review involves no ethical issues. No ethical approval was therefore necessary.

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