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Systematic Review

The effect of strength and plyometric training on functional dance performance in elite ballet and modern dancers

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Background: Ballet and modern dance are both art forms that require technique, artistry, grace and precision. Both dance forms require a degree of strength and muscular endurance for optimal performance. It is not known what value strength or plyometric training may have on functional dance performance.
Objective: To systematically review the effects of strength and/or plyometric training on functional dance performance in elite ballet and modern dancers.
Methods: A systematic review of literature indexed in the following databases: Medline, CINAHL, SportsDiscus, Physiotherapy Evidence Database (PEDro) and PubMed was conducted. The quality of the studies was graded using the PEDro Scale.
Results: Eight studies satisfied the eligibility criteria and were included in this review. The studies' population age range was 19–27 years. Methodological scores based on the PEDro scale were 4 to 6 out of 10. All of the included studies (100%) scored 4 out of 10 or higher on the PEDro scale. Strength training resulted in significant improvements in jump height ($P<0.05$) and enhanced aesthetic, performance measures ($P<0.05$). Plyometric training was found to enhance both vertical and subjective jump height ($P<0.05$). Strength or plyometric interventions did not impact lower extremity anthropometric measures such as thigh and calf girth.
Conclusion: Moderate evidence indicates that supplementary strength training interventions via traditional resistance training or whole-body vibration methods and plyometric training interventions may increase certain dance-performance measures such as jump height and general aesthetic facility without changing certain anthropometric measures in elite ballet and modern dancers.

Keywords: Ballet, Modern dance, Strength, Plyometric, Whole-body vibration training

Introduction

Both ballet and modern dance are art forms that require precision, artistry, grace, strength and power. Although the physiological requirements between dance forms may vary, all forms of ballet and modern dance are mentally and physically rigorous. Dancers in both ballet and modern dance endlessly practice and drill basic movements, combinations, variations/choreography, and partner work.

Current research indicates that both ballet and modern dancers are fit compared to sedentary controls.[1] Despite these above-average fitness levels, dancers do not always measure as physiologically robust as age-matched sports athletes.[1,2] There is also no consensus on the physiological or fitness requirements of ballet and modern dance. In a brief review, Twitchett *et al.* reported that scientific evidence examining the strength, power and agility demands of ballet and modern dance is lacking.[3]

Although most dance training requires rigorous physical exercise and has been found to enhance physiological parameters, it is not fully known if dancers would benefit from supplementary training.[1–3] Many dancers engage in various forms of supplementary training, with one of the most popular being the Pilates method.[4] Even with the popularity of Pilates training among dancers, there is a paucity of objective research measuring the efficacy of Pilates on dance performance. Some dancers engage in other forms of supplementary training such as strength and plyometric training.[2]

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Strength and plyometric training have been found to be effective in enhancing sports performance in athletes.[5,6] There is also a high level of acceptance of such training in athletic populations. Traditionally, many dancers were wary of utilising resistance training methods as it was often thought that such training would decrease the aesthetic components of dance and negatively impact a dancer's body anthropometry.[7] It was also not known what benefits one would accrue from strength or plyometric training; certain studies indicate enhancement of physiological measures with such training; However, does this training and subsequent enhancement of physiological measures enhance functional and aesthetic dance performance?[1–3]

As an art form, dance requires more than just enhancement of objective physiological measures. A physiologically robust individual who learns dance techniques may not make a truly artistic dancer and an artistic dancer might not be the most physiologically robust. Among dancers, different physiological parameters may be associated with different dance levels and rankings. Misigoj-Durakovic *et al.* reported a comparison of strength among different ranked dancers in a professional ballet company.[8] This study found that soloists tended to have increased body and muscle mass, increased grip strength and increased lower extremity transverse diameter as compared to members of the corps de ballet. The general hypothesis is that these data may reflect a greater variety of physical demands in solo ballet roles versus the more consistent corps de ballet choreography.

Despite growing evidence of the effect of strength and plyometric training on objective physiological measures in dancers, the question remains as to what effect does strength and plyometric training have on functional dance performance? The purpose of this systematic review is to analyse the effects of strength and plyometric training on functional dance performance in elite ballet and modern dancers.

Methods

Search strategy

Two independent systematic searches of scientific articles were conducted. The following databases were searched for relevant studies between January 1990 and December 2014: Medline, CINAHL, SportsDiscus, Physiotherapy Evidence Database (PEDro) and PubMed. A 25-year timeline was determined as the primary author felt that this time-frame would include recent data, yet allow a broad time-interval to be searched. The search terms were: 'ballet and strength training', 'ballet and weight training', 'ballet and resistance training', 'ballet and plyometrics', 'ballet and vibration training', 'modern dance and strength training', 'modern dance and weight training', 'modern dance and resistance training', 'modern dance and plyometrics', 'modern dance and vibration training' 'dance and strength training', 'dance and weight training', 'dance and resistance training', 'dance and plyometrics' and 'dance and vibration training'.

Study selection

Two reviewers independently performed database searches and reviewed relevant titles and abstracts. Relevant titles and abstracts were those that indicated that they examined the effect of either strength training or plyometric training intervention on functional performance in an elite ballet or modern dance population. For the purposes of this review, 'elite' was defined as professional, pre-professional or collegiate ballet or modern dancers. This definition was based on the nature, rigour and hours spent at the professional, pre-professional and/or collegiate level dance training. 'Functional performance' was considered to be aesthetic or some other measure that was integrated into and enhanced the overall dance performance such as jump height, etc. For inclusion in this review, each study had to indicate that they examined a specific functional measure, though the nature of the measure and method of assessment would be determined per each study. The authors did not state any parameters on functional assessment measures as they felt that given the artistic nature of ballet and modern dance, the individual study authors should best decide how to assess functional dance performance in their study populations.

Inclusion criteria

The inclusion criteria were randomised controlled trials that investigated the effect of at least one strength training or plyometric training intervention on ballet or modern dance performance in professional, pre-professional or collegiate dancers, published in English in peer-reviewed journals.

Methodological quality

Two reviewers independently analysed all included articles using the PEDro scale. The reliability of the PEDro scale has been found to be 'fair' to 'good' and has been found valid for measuring methodological quality of clinical trials.[9,10] The PEDro scale uses an 11-point criteria and a point is awarded for each met criterion. Criteria 2–9 measure internal validity.

Criterion 1 is a measure of a study's external validity and is completely dropped so the final score is always out of 10 criteria. Criteria 10 and 11 were developed to ensure that there is 'sufficient statistical information to make the results interpretable'.[11] A higher PEDro score indicates stronger internal validity.

To score a trial using the PEDro scale, each study is evaluated for each criterion. For each criterion met, a score of '1' is given. If a particular criterion is not met, a score of '0' is given for that criterion. The results are added and criteria one score is dropped to yield a total score out of 10.

In the event of discrepancies in PEDro scoring, a third individual was designated to ultimately decide on the score. This individual has substantial experience in conducting research studies and teaching research methods, and was therefore a reliable arbitrator.

Results

Seven hundred and thirty potential studies were identified with the two initial database searches. After removal of duplicates and ineligible studies from the abstract and citations, 14 full text articles were further analysed. The most common reason for removal was that an article was not from a peer-reviewed journal and/or the article did not objectively measure the effects of strength or plyometric training on a stated functional dance performance or the study population did not meet the 'elite' criteria. Of the full text articles from peer-reviewed journals, only eight met the full inclusion criteria for this review. Figure 1 highlights the search strategy. Table 1 is a summary of all included studies and training protocols.

Methodological analysis

Table 2 lists the PEDro scores for each trial. Three studies scored 6/10, and five studies scored 4/10. All eight studies (100%) scored 4/10 or higher on the PEDro scale, which indicates fair to good methodological quality.[9,10] All eight studies were randomised trials. None of the studies met criterion five 'blinded subjects' or six 'blinded therapists' (intervention administers) or seven 'blinded assessors'. In an exercise-based trials of these kinds, it is difficult to blind subjects, therapists (intervention administrators) and assessors. A lack of blinded subjects can lead to risk of performance bias and a lack of blinded therapists can lead to risk of detection bias.

Subjects

A total of 170 healthy dancers, with mean ages from 19 to 27 years of age per study, were included in the eight trials. The included dancers were either professional dancers, pre-professional dancers or collegiate dancers.

Experimental interventions

The eight trials explored a variety of exercise interventions. These interventions included strength training utilising free weights, weight machines such as a universal trainer or whole-body vibration training and plyometric training.

Results by study

Angioi *et al.* examined the effects of strength training, (via circuit training), and whole-body vibration training on an aesthetic competence (AC) outcome measure and standing vertical jump height in a modern dance population.[14] This group used a dance-based circuit training and whole-body vibration method twice per week, 1 hour each session, for 6 weeks. This study found that the experimental group demonstrated significant increase in vertical jump height and AC ($P<0.05$), with the control group showing decreases in both measures.

Koutedakis *et al.*, in a professional ballet population, investigated free-weight training of quadriceps and hamstrings three times per week, 50-minute sessions, for 12 weeks on quadriceps and hamstrings peak torque levels before and after a fatigue-inducing dance routine.[7] The results demonstrated that post intervention the experimental group did not exhibit a 21% decrease in quadriceps ($P<0.001$) and hamstrings ($P<0.001$) peak torques levels while the control group exhibited these peak torque decreases. This indicates that the strength training group maintained peak torque of both muscle groups after the fatigue-inducing dance regimen. Additionally, this study demonstrated more fat-free body mass ($P<0.05$) but unchanged body mass and thigh circumference ($P<0.05$). Significant changes were not seen for the control group.

The effects of 12 weeks of aerobic and strength – training for modern dance students on a selected technical-dance performance measure and select anthropometric measures were investigated by Koutedakis *et al.*[12] The strength training consisted of upper and lower body free-weight exercises three times per week for 50-minute sessions; the aerobic workout consisted of cycling or swimming or jogging for 20–40 minutes, three times per week. The exercise group demonstrated statistically significant improvement on the technical-dance performance measures ($P<0.02$) and no significant change in body-mass as measured by skin-fold thickness. The control group showed no significant change in the technical-dance performance measure.

Twitchett *et al.* investigated the effects of a one-time per week for 10 weeks intervention programme consisting of strength (via circuit training) and an aerobic programme in pre-professional ballet dancers compared to a dance-only control.[13] The functional outcome measure was a validated ballet performance proficiency test that included pre-post study video analysis by an experienced instructor using a validated outcome tool that measured certain technical and artistic characteristics of ballet. The experimental group demonstrated significant gains in particular performance proficiency measures, including a

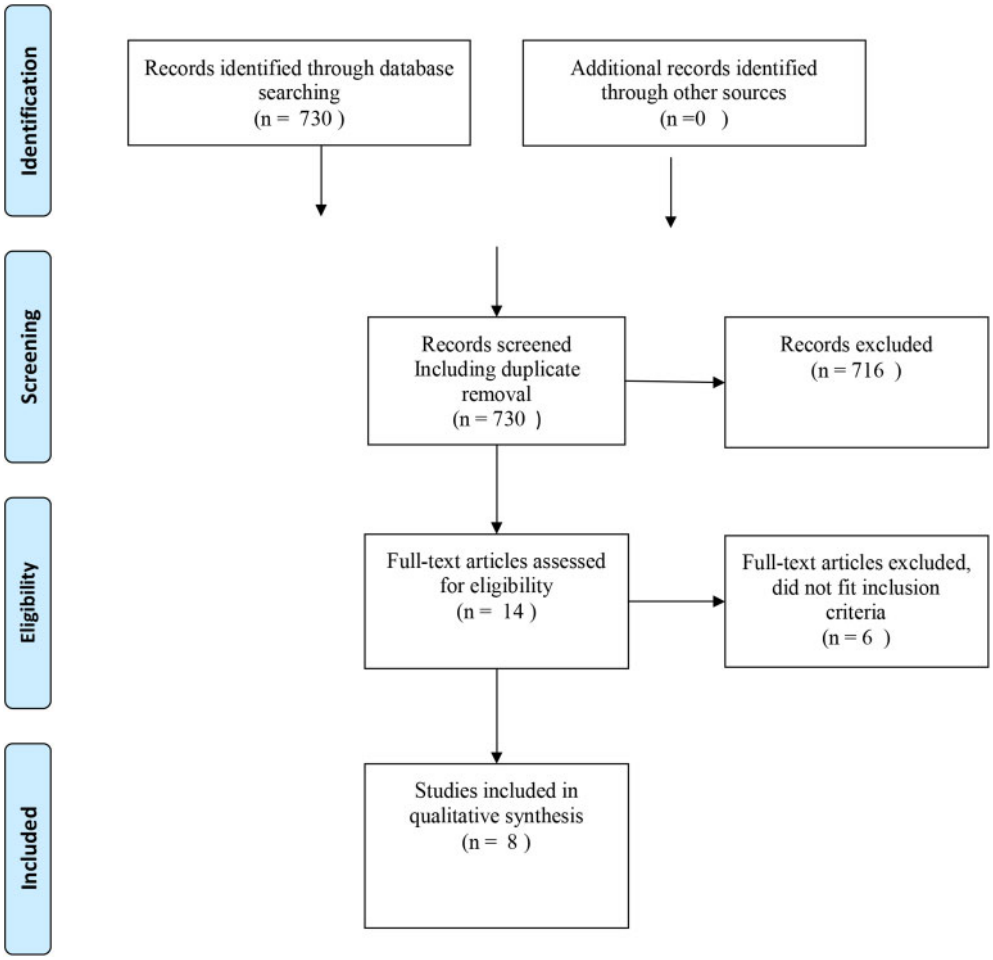

Figure 1 Database search flow diagram. Adapted from: Moher *et al.*[27]

beneficial change in total proficiency score ($P<0.05$) and sub-categories: control ($P=0.039$), skill ($P=0.043$), 'X' factor (evoking emotional response from assessor) ($P=0.033$).

The effects of 8 weeks of whole-body vibration training on vertical jump height in elite ballerinas was analysed by Annino *et al.*[15] The experimental group participated in whole-body vibration training, three times per week for 8 weeks, in addition to regular ballet training, compared to a ballet training only control group. This study demonstrated a significant improvement for vertical jump height (CMJ height) in the experimental group, ($P<0.001$) compared to the control group.

Marshall *et al.* studied the effects of 4 weeks of whole-body vibration training on vertical jump height and leg anthropometry in a group of pre-professional, conservatory trained modern dance students.[16] The groups were randomised to receive either whole-body vibration training, two times per week for 4 weeks plus regular dance training or a control group that consisted of dance training alone. A significant group over time effect was observed in the experimental group for vertical jump height when compared to the control group ($P<0.05$). No significant changes in thigh or calf girth occurred in either the experimental or control group.

Wyon *et al.* analysed the effects of whole-body vibration, two times per week for 6 weeks, on vertical jump height and lower extremity anthropometry in a group of collegiate, undergraduate dancers.[17] The whole-body vibration experimental group demonstrated significantly increased vertical jump height ($P<0.05$) compared to an unspecified control group. There were no significant changes for either group in lower extremity anthropometry.

The effects of 6 weeks of plyometric training versus traditional strength training on power and aesthetic jumping ability in collegiate dancers was examined by Brown *et al.*[18] The functional outcomes of interest were vertical jump height and an aesthetic jump assessment, which consisted of an evaluation by three dance faculty members using a standard rubric of dance technique. This study consisted of three groups: (1) plyometric group (2) traditional strength training group and (3) control group. The plyometric group utilised three sets of eight repetitions of four plyometric exercises, the traditional strength group utilised three sets of six to eight repetitions of four lower body isotonic exercises and the control group did not engage in any supplementary training; all groups continued with their normal dance training. The results indicated that

Table 1 Summary of included studies.

Author	Purpose	Subjects	Functional measure	Intervention	Result
Angioi *et al.*[14]	To investigate the effects of strength training (circuit training) and whole-body vibration (WBV) on lower body power and aesthetic performance in contemporary dancers.	14 Pre-professional and 10 professional female modern-dancers.	Lower body power measured by vertical jump, Aesthetic dance component assessment.	Experiment group: 6 weeks strength training (circuit) and WBV, dance classes.	Experiment group: statistically improved scores for both vertical jump height and the aesthetic assessment ($P<0.05$).
				Control: dance classes only w/additional two classes.	Control group: no significant changes
Annino *et al.*[15]	To assess the effects of whole-body vibration (WBV) training on counter-movement jump (CMJ) height in pre-professional ballerinas.	22 Full time, pre-professional, female ballet students.	CMJ height.	Experiment group: WBV training 3 ×/week and ballet classes, Control: Ballet class only.	Experiment group: significant increase in CMJ ($P<0.001$) and a medium effect size (0.67). Control group: no significant changes.
Brown *et al.*[18]	To examine the effects of a traditional, resistance strength programme versus a plyometric programme in collegiate dancers.	18 Collegiate, female dancers.	Vertical jump height, aesthetic jumping ability.	Experiment group: (1) lower body resistance strength exercise group plus dance. (2) Plyometrics plus dance.	Experiment group: (1) significant increase in subjective jump height ($P<0.01$) and ability to point feet ($P<0.05$). (2) Plyometric: significant increase in vertical and subjective jump height (both $P<0.05$), no significant changes between the two training groups.
				Control: dance only.	Control: no significant changes in any outcome measure.
Koutedakis *et al.*[7]	To assess the effects of 12 weeks of quadriceps and hamstring strength training on torque levels after a dance exercise and on selected anthropometric parameters.	22 Professional ballerinas.	Quadricep and Hamstring torque levels after a short, fatigue inducing dance set, fat-free body mass and thigh girth.	Experiment group: traditional strength training with focus on quadriceps and hamstrings, dance classes.	Experiment group: did not demonstrate the 22% torque loss post dance set that was seen pre-intervention, more fat-free body mass ($P<0.05$) without increase in thigh-girth ($P<0.05$).
				Control: dance only.	Control: demonstrated peak torque decreases (greater fatigue) and no significant changes of body mass.
Koutedakis *et al.*[12]	Assess 12 weeks of aerobic and resistance-strength training on selected dance performance in modern dance students.	32 Pre-professional, modern dance students (27 females, five male).	Technical dance measures (TDM), body mass.	Experiment group: upper and lower body free-weight training and cycling or jogging and dance classes.	Experiment group: significant change in TDM ($P<0.02$).
				Control: dance only.	Control: no change. Neither group showed any change in body mass.
Marshall *et al.*[16]	To measure the effects of 4 weeks of whole-body vibration (WBV) on jump performance and anthropometric measures.	17 Pre-professional, conservatory trained, female modern dancers.	CMJ height and thigh and calf girth.	Experiment group: WBV 2 ×/week for 4 weeks.	Experiment group: Significant increase in CMJ ($P<0.05$), thigh and calf girth – no change.
				Control: dance classes only.	Control: no significant increase in CMJ, thigh and calf girth-no change.
Twitchett *et al.*[13]	To examine the effects of fitness and muscular training on aesthetic ballet performance.	17 Pre-professional ballet students, (14 females, three male).	Ballet proficiency analysis pre-post.	Experiment group: aerobic and muscle strength and endurance training 1 ×/week for 10 weeks, ballet classes. Control: ballet classes only.	Significant changes between groups in ballet proficiency analysis with improvement noted in experiment group: ($P=0.03$) and sub-factors: control ($P=0.039$) and skill ($P=0.043$).
Wyon *et al.*[17]	To assess the effects of whole-body vibration (WBV) on jump height and lower extremity anthropometry in a collegiate dance population.	18 Female, university dance majors.	Vertical jump height, thigh and calf girth measures.	Experiment group: WBV 2 ×/week for 6 weeks and dance classes.	Experiment group: significant increase in vertical jump height ($P<0.05$).
				Control: dance only.	Control: no change in jump height. Neither group showed change in thigh and calf girth measures.

Table 2 PEDro scale results.

PEDro criterion	Angio *et al.*	Anino *et al.*	Brown *et al.*	Koutedakis *et al.*	Koutedakis *et al.*[13]	Marshall *et al.*	Twitchett *et al.*	Wyon *et al.*
1-Eligibility criteria specified	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2-Random allocation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3-Allocation concealed	Yes	No	No	No	No	No	No	No
4-Groups similar at baseline	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5-Blinded subjects	No	No	No	No	No	No	No	No
6-Blinded therapists	No	No	No	No	No	No	No	No
7-Blinded assessors	No	No	No	No	No	No	No	No
8-Measure key outcome 85% subjects	Yes	No	No	Yes	Yes	No	No	No
9-Intention-to-treat	No	No	No	Yes	Yes	No	No	No
10-Between group statistical comparison	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11-Point measure and variability	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PEDro score out of 10	6/10	4/10	4/10	6/10	6/10	4/10	4/10	4/10

the plyometric group significantly increased the vertical jump height measure ($P<0.05$). Both plyometric group and strength training groups demonstrated significant improvement in the subjective dance evaluation for subjective jump height (plyometric group $P<0.05$, strength group $P<0.01$) though there was no significant between group difference in subjective jump height. The strength group demonstrated significant ability to point feet while jumping ($P<0.05$). No significant changes were observed for these outcome measures in the control group.

Discussion

The purpose of this systematic review was to examine the effects of strength and plyometric training on functional dance performance in elite ballet and modern dancers. To our knowledge this is the first systematic review to examine this research topic. Angioi *et al.* conducted a systematic review that examined fitness in contemporary dance.[19] However, it did not examine the effects of strength or plyometric training or assess ballet dancers. This review included both randomised and non-randomised trials and did not assess the methodological quality of the included trials.

Several of the reviewed trials found positive effects of strength training, generally using free-weights or universal gym, on their selected performance measures.[13,14] This concurs with literature that examines the effects of strength training in other athletic populations.[5,6] Although both ballet and modern dance have unique attributes, especially when compared to sports and other athletics, it is reasonable to assume that dancers' muscles should have positive physiologic responses to strength training as seen in athletic populations. Studies that examined strength training in our review demonstrated positive effects of strength training on either vertical jump height or subjective dance performance.

Strength and resistance training has been found to increase vertical jump height in other athletic, non-dance populations. Girard *et al.* highlighted positive effects of strength training, using kettlebells, on vertical jump height in a systematic review.[20] Tricoli *et al.* recorded positive effects of traditional resistance, strength training on vertical jump height.[21] Lateral application of strength training to dance seems to bear similar results regarding vertical jump height.

In the included trials that examined strength training's effects on a subjective dance performance measures, strength training is positively associated with enhanced subjective dance performance compared to non-strength training control groups in all studies. Although strength training probably does not directly affect dance technique, it is reasonable to assume that enhanced strength may provide the dancer a stronger foundation from which to work. This may enable the dancer to focus on enhancing technique and artistry rather than focussing on ability to complete the movement.

A benefit of strength training with resistance is the multitude of methods by which the desired effect can be achieved. Free weights, weight machines, kettlebells, etc. are all generally obtainable without a lot of financial outlay and are available at fitness centres, member and university gyms. A plethora of strength training regimens exists that can easily be worked into a dancer's schedule and once basic, exercise technique is learned self-exercise via weights, kettlebells or machines is easily accomplished. Strength training with free weights, machines or kettlebells is a viable option for dancers.

Several of the included trials included whole-body vibration training with other strength training or as a stand -alone intervention.[14–18] Whole-body vibration is a method of strength training that has become popular in athletic populations despite lacking scientific evidence for its efficacy in athletes compared to traditional strength training programmes.[22,23] In support of whole-body vibration training, Blizzard *et al.* discussed the positive effects of whole-body vibration training on maintaining muscle strength and bone-density in populations on bed rest in a systematic review.[24]

In the two studies that examined strength training via free weights and whole-body vibration, positive

effects were seen in both vertical jump height and subjective dance performance.[14,15] Similar findings were observed with whole-body vibration training alone when compared to dance training-only control groups. There appears to be an objective benefit of whole-body vibration training in dance populations that is not necessarily seen in athletic populations although a trend towards improvements in certain performance measures, such as jumping, in healthy, non-athletic populations may exist.[22,23,25] A benefit of whole-body vibration training is that it does not take a lot of time and, if proper equipment is accessible, is easily added to a dance regimen. The studies in this review that included whole-body vibration training used a variety of whole-body vibration training dosages and demonstrated significant improvements in their chosen outcome measures. This indicates a variety of training methods based on a dancer's schedule time and access to appropriate equipment.

One study assessed a plyometric group.[18] This study found that plyometric training regime positively enhanced vertical jump height as well as subjective dance performance. Plyometric training has been positively associated with vertical jump height in other athletic populations and it is expected that similar physiological mechanisms are responsible for the positive effect on vertical and subjective jump height in dancers.[6,21] There are a plethora of easily learned and time-efficient plyometric regimens. Additionally, the equipment required for plyometric training such as exercise steps, boxes and free weights, medicine balls or kettlebells are generally available for private purchase or at a member or university gym.

An additional benefit of strength training for elite dancers is the potential for decreased injury rates.[2,3,26] Koutedakis *et al.* discovered a correlation between increased lower extremity torque strength and decreased lower extremity injuries.[26] Evidence from Koutedakis' and other studies suggest that strength training may be injury-preventative in elite dance populations. More specific studies are needed to validate this theory. Another general finding of interest to dancers, dance teachers, physical therapists, professional strength coaches and trainers that was not part of our initial research question is the anthropometric outcomes data. In the five studies that measured thigh/calf girth or body fat, pre-and post-intervention, there was no significant change in any anthropometric measures.[12–18] This is an important factor for dancers as many dancers have been traditionally wary of engaging in supplementary strength and plyometric training out of fear of excessive muscle hypertrophy that could change the aesthetics of body appearance, technique and general, dance artistry. This information could positively affect dancers by decreasing hesitation in engaging in supplementary strength and plyometric training. In addition to dancers, other athletic populations that use weight classifications, such as wrestlers and judo-players, may find this information beneficial although more studies would need to be conducted that specifically examine the effects of strength and plyometric training on pure body weight. This review examined the studies that included a variety of strength and plyometric training interventions. Because each study used different regimens and dosages, there is a lack of homogeneity, which can potentially weaken the external validity of the individual studies. Additionally, each study's subjects were either ballet or modern dancers. Although there are certain foundational physical demands between disciplines, such as jumping ability, the physiological and technical requirements of each dance discipline may respond differently to different strength or plyometric training methods.

Another threat to external validity is that all of the included studies had small sample sizes. With small sample sizes, there is a risk of decreased statistical power. Studies with small sample sizes also are at a greater risk for a Type II error.

Limitations

There are several limitations to this systematic review. Many systematic reviews, including this review, are at risk for retrieval bias. Studies relevant to this research question may have been missed despite the intentions and actions of the authors. Extractor bias is a possible limitation as one author was the primary extractor of discovered studies. Publication bias is always an inherent risk in systematic reviews as it is impossible to ascertain what studies may have not been published.

Conclusion

The findings of this systematic review broadly indicate that strength and plyometric training methods generally have positive effects on functional performance measures such as jump-height or subjective, aesthetic performance in elite ballet and modern dancers. Strength and plyometric regimes from trials in this systematic review did not negatively affect dancer's anthropometric measures. However, all of these trials had small sample sizes and heterogeneity of interventions. Larger randomised controlled trials, with continued focus on specific dance disciplines of ballet and modern dance, are needed to ascertain which dance disciplines will benefit from specific strength or plyometric training interventions.

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Disclaimer Statements

Contributors Joe Girard: Conceiving and designing the study, collecting data, analyzing data, interpreting the

data, writing and revising the article and reviewing final copy of manuscript. Kristina Koenig: collecting data, analyzing data, interpreting data, revising the article and reviewing final copy of the manuscript. Dave Village: Conceiving and designing the study, revising the article and reviewing final copy of the manuscript.

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Ethics approval All included studies in this review obtained ethical approval for their individual studies.

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