IADMS
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The IADMS Bulletin for Dancers and Teachers

Volume 5, Number 1, 2014

Editors-in-Chief
Gayanne Grossman, P.T., Ed.M., and Matthew Wyon, Ph.D.

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Introduction

Articles

Departments

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Letters

Letter from the Editors

Dear Dancers and Teachers,

We are pleased that so many of you find the information in the Bulletin useful. Our team is constantly updating the journal to continue sharing advances in dance science in the hope you can glean useful performance enhancement information for your studio and stage work. Along those lines you may have noticed that we have expanded our title to the IADMS Bulletin for Dancers and Teachers because our intent is that these articles are useful for everyone.

This issue is dedicated to Marliese Kimmerle, Ph.D., who is stepping down as Co-Editor. Her tireless work and expert knowledge have been instrumental in the preparation of the Bulletin. We are thankful she will continue to serve as editor for the section Abstracts from the Current Literature.

I wish to offer my personal welcome and congratulations to Matt Wyon, Ph.D. who has joined the Bulletin team as Co-Editor and on his election as IADMS Vice President/ President-Elect.

The editors, Education Committee, and the IADMS Board of Directors wish to extend a warm word of appreciation to Balanced Body and AFX for their generous support of the IADMS Bulletin for Dancers and Teachers.

We are very pleased to offer articles in this issue on the relationship between fitness and improved dancing: "Pilates technique for improving dance performance," and "Encouraging Dancers to train for upper body fitness." The abstract portion offers research that examines the initial learning processes of new skills, an exploration of training stressors in dance and how to assess them, and studies demonstrating the benefits of dance activities for adolescents as well as older adults.

We hope you will share this publication with other dancers and dance organizations. The Bulletin will remain free as an IADMS gift and public service to the dance community. If you have suggestions for additional topics or a question to be answered in the Bulletin from an IADMS expert please contact us at Bulletin@iadms.org.

Our 2014 IADMS Annual Meeting will be on October 16th-18th and A Day for Teachers on October 19th in Basel Switzerland. Please join us.

Editors:
Gayanne Grossman, P.T., Ed.M. and Matt Wyon, Ph.D.

Education Committee Activities

Education Committee Report

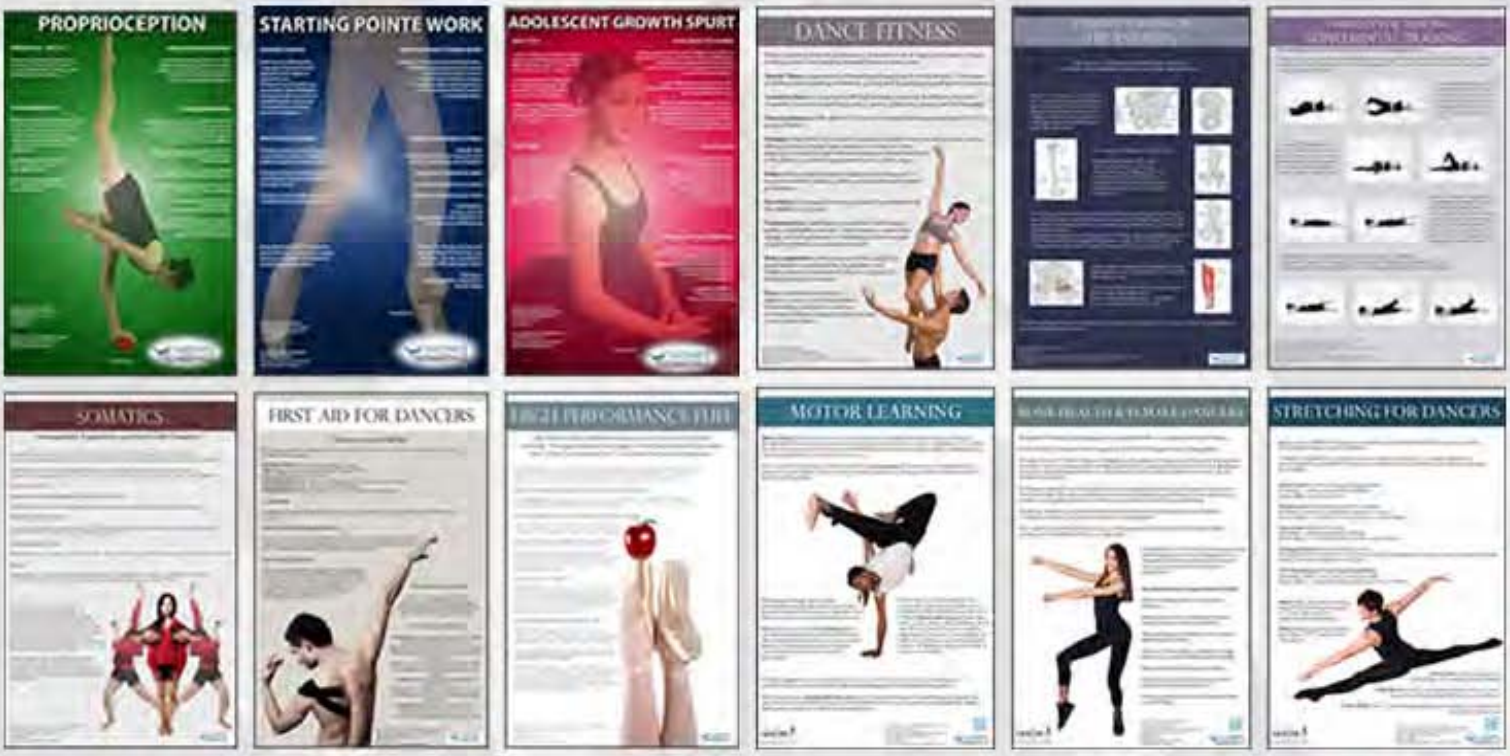
The IADMS Education Committee is comprised of individuals who research, mentor, study and teach dance all around the world at all levels. This committee is one of the most active in the IADMS organization. As chair of this ambitious committee, I have the honor of relating the good work it has undertaken. Our efforts are primarily designed to enhance teaching with an understanding and incorporation of dance science at all levels. We accomplish this in many ways , from "A Day for Teachers" during the IADMS Annual Meeting, to resource papers, IADMS posters, and The IADMS Bulletin for Dancers and Teachers. All of these resources can be accessed on the IADMS website, http://www.iadms.org.

We have also replaced the Studio Teachers Network with the Dance Education Network (DEN), currently chaired by Maggie Lorraine. One of the reasons you may be receiving this bulletin is because we have you on a distribution list from the Studio Teacher's Network. Our goal with the Dance Education Network is to increase outreach to teachers working in the field. If you know of anyone who would like to receive the bulletin, please have them contact the education committee at education@iadms.org.

Two new papers are on the IADMS Resource Paper tab of the IADMS website: Mirrors in the classroom, Help or Hindrance, written by Sally Radell and Perfectionism, written by Sanna Nordin-Bates. Please visit the IADMS website to find out more about the resource papers and other exciting initiatives from the Education Committee. Finally, if you have any questions about the IADMS Education Committee or would like to find out more about working with us, please contact us at education@iadms.org.

Margaret Wilson, Ph.D.
Education Committee Chair

DANCE MEDICINE & SCIENCE POSTERS FOR SALE



The posters draw from research and knowledge outlined in the IADMS Resource Papers (available online) and are aimed at teachers, students, and health care specialists.

Series 1 topics are Pointe Readiness, Proprioception, and Adolescent Growth Spurt.

Series 2 topics are First Aid, Somatics, and Fueling the Dancer.

Series 3 topics are Turnout for Dancers: Hip Anatomy, Turnout For Dancers: Supplemental Training, and Dance Fitness.

Series 4 topics are Motor Learning, Bone Health & Female Dancers, and Stretching For Dancers

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Fitter Dancers Dance Better
The Effects of Supplementary Fitness Training in Contemporary Dance

Manuela Angioi, M.Sc., Ph.D., Centre for Sports and Exercise Medicine, Queen Mary University of London, UK

Within the world of dance medicine and science there is ever-increasing research interest in the benefits of increased physical fitness levels in relation to both performance and injury status. Studies have observed associations between specific physical fitness components, such as muscular power and endurance, and qualitative aspects of dance performance, such as control of movement, spatial skills, accuracy of movement, technique, and dynamics.[1] Nevertheless, these observed associations do not imply causality, meaning that only carefully designed intervention studies will ensure that the observed effect (i.e., dancing better) is a consequence of the increased levels of muscular fitness. The question is: When do we use muscular power and endurance in contemporary dance? Wyon and colleagues reported that simple examples of upper body muscular endurance are in evidence during partner work, when repeatedly lifting and supporting other dancers and/or in transitional movements from floor to stand and vice versa.[2] Lower body muscular power, on the other hand, is necessary to develop elevation during the take-off phase of any type of jump.

In this study, we developed a combined circuit and vibration training designed to specifically stress the lower body's ability to produce power, and the upper body's muscular endurance as well as the general stamina (aerobic fitness). The overall aim was to ascertain if increased physical fitness levels were reflected in the aesthetic competence level of 24 female contemporary dancers (professionals and students). All 24 dancers were tested for initial levels of lower body muscular power, upper body muscular endurance, and aerobic capacity via some commonly used tests including standing vertical jump, numbers of press-ups performed in one minute, and a dance-specific aerobic fitness test. All dancers also undertook an "aesthetic competence" test, which was developed to objectively score seven aspects of contemporary performance on a scale of 1-10. These included control of movement, spatial skills, accuracy of movement; technique, dynamics, timing, and rhythmical accuracy, performance qualities, and overall performance.[1]

In the intervention group (12 dancers), each dancer undertook the combined circuit-vibration training in addition to usual dance training for six weeks; the control group simply carried on with their usual dance training. The training was organized twice a week and each training session lasted approximately one hour, comprising circuit training (CT), 10 minutes rest, and whole-body vibration training (WBV). The CT training consisted of lower and upper body exercises, organized in 10 stations. The 10 exercises included: jumps with feet in parallel position (using a jumping rope), press-ups, bicep curls, triceps extension (with free weights of 0.5 kg each), single leg squat, squats-jumps, *relevés* in first position, *grand-plié* in second position, chest press exercises (with free weights of 0.5 kg each), and plank. Dancers had to exercise for 30 seconds in each station, with 10 seconds of transition time between one station and the other, making the total time for each circuit of six minutes, 50 seconds (including the rest between each station). Dancers had to complete four circuits. The WBV training protocol used six dance-specific static positions on a vibration platform (frequency set at 35 Hz and amplitude at 2.5 mm) including: 1) *plié* with feet in first position; 2) plank (elbow flexed on the floor and feet on platform); 3) lunge (right and left leg on platform?); 4) press up, 90° bend at the elbows; 5) feet in *relevé* with knees slightly bent; and 6) hamstring position, bent over at waist, with knees slightly bent and hamstrings tensed. The training consisted of three sets lasting 40 seconds, with two minutes rest between each set.

While results of the initial tests revealed that all 24 dancers had similar levels of muscular power, endurance, aerobic capacity as well as all scoring similarly in the "aesthetic competence" test, we observed some differences following the six weeks of supplementary fitness training. Specifically, only the dancers who undertook the supplementary training showed increased levels of muscular power, endurance and aerobic capacity as well as higher score results for the performance aesthetic test. The observed increased aerobic levels were attributed to the circuit training, while the in-

creases in muscular power and endurance were considered to be a result of the combined CT and WBV training. The latter in particular has been proven to elicit both concentric and eccentric contractions,[3] hence, the enhancement of muscular power. The fact that dancers who did not undertake the fitness training did not improve in the measured fitness components, suggests that dance training is not sufficient enough to overload the energy and musculoskeletal systems and thus to produce physiological adaptations that will enhance each individual fitness component.[4] The other important aspect of the present study is the link between physical fitness and the artistic elements of dance performance. Not surprisingly, the results of aesthetic competence revealed that dancers who improved their fitness levels scored significantly higher, hence "danced better," than before undertaking the training. As previously suggested this is because dancers use their bodies as instruments of expression and most common technical skills/movements (jumps, transitory movements, etc.) used in contemporary dance require enhanced fitness levels as well as artistry.[1]

What are the implications of such findings for dance teachers? First, the present study contributes to the open debate of whether dancers would benefit from enhanced physical fitness levels equal to other anaerobic athletes. Second, by incorporating supplementary training, dance teachers can help bridge the observed fitness gap between performance preparation (class and rehearsals) and performance periods. Nevertheless, the incorporation of supplemental training into the dancers' schedules must take into account their present work load, which can already involve six to eight hours a day of exercise at varying intensities. Training sessions need to be scheduled at the end of the day to prevent fatigue from interfering with the high skill elements of dance. The selection of exercises can be tailored to the choreographic demands, if these are known in advance. The use of WBV training in particular has been shown to provide adaptation of the muscular system with minimal time cost, which is a vital advantage when the daily work time is controlled by unions and the majority of time is focused on artistic training. In conclusion, a six-week supplemental CT and WBV training had a significantly beneficial effect on both physical fitness indices and aesthetic competency for skilled contemporary dancers.

Acknowledgment

This article has been adapted from Angioi M, Metsios G, Twitchett EA, Koutedakis Y, Wyon M. Effects of supplemental training on fitness and aesthetic competence parameters in contemporary dance: a randomized controlled trial. Med Probl Perform Art. 2012 Mar;27(1):3-8.

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Pilates Technique for Improving Dancers' Performance

Tania Amorim, M.Sc., and Matthew Wyon, Ph.D., Research Centre for Sport, Exercise and Performance, University of Wolverhampton, Walsall, UK; National Institute for Dance Medicine and Science, UK

When the principal dancer, Odile, performs 32 *fouettés* in Swan Lake, it is easy to admire the accuracy, reliability and harmony of the whole movement. However, dancers are only able to perform this technical skill with the required artistic and aesthetic quality if they are sufficiently strong and flexible. This means that great performances pre-suppose a fully developed body where technique, aesthetics, and physical conditioning work together for performance.[1] Therefore, to achieve excellence dancers must learn how to be artists and athletes.

The development of physical conditioning, however, cannot compromise the dominant artistic aspects. It is exactly this issue that challenges dance teachers, choreographers and researchers and raises questions concerning what kind of conditioning workout can be included in the training process. What is the best way to improve muscular strength? How can enhanced balance and flexibility be optimally developed? In this article, the focus is on whether Pilates can be used as a tool to improve dancers' performance.

Fifteen dance students were tested initially for muscular strength. The research team evaluated how long dancers could sustain a leg raised while performing a developpé at *barre* and active flexibility (developpé height) (front, side and back, for both legs). Developpé height was measured using a camera system.[2]

After the first test, the dance students were assigned into experimental groups (EG) and control groups (CG). The EG performed mat-based Pilates exercises for 11 weeks (2 sessions a week). The training protocol began with dancers slowly performing three sets of eight repetitions of each exercise, increasing one repetition each week until 12 repetitions were reached. After participants could achieve 12 repetitions, a more advanced form of the exercise was introduced. After 11 weeks, both groups were again tested for muscular strength and active flexibility (examples of the exercises used are presented below).

All dancers who participated in the Pilates sessions increased their levels of muscular strength and flexibility. The dancers in the control group took their usual dance classes and showed no changes in muscle strength or flexibility. The Pilates sessions, by continuously engaging the abdominal, hip flexors and gluteus muscles, caused muscular adaptation, which contributed to a stronger core, leading to an increased ability to hold the position for a longer period of time (nine seconds longer, on average). According to Grossman and colleagues,[3] the ability to sustain positions is crucial to making movements more controlled, elevations higher, and pirouettes more defined.

The Pilates group saw increases in developpé height between 4-10°. Although Deighan[4] suggests that flexibility is a key element of successful dance performance, we believe that the observed gains in the range of movement were due to muscular strength increases rather than flexibility. In fact, according to Welsh,[5] dancers often show good levels of passive flexibility, but do not exhibit sufficient muscular strength to perform an active movement throughout the maximum range of motion. Thus, the improvements in flexibility may be due to a further strengthening of the abdominal muscles caused by Pilates sessions.

It is possible to conclude that Pilates training may be a useful tool for dance teachers to improve muscular strength and flexibility of their students. Teachers should be aware of the importance of conditioning outside the dance classes, not only to improve performance but also to protect dancers from injuries, and we recommend Pilates because it develops capacities crucial for performance without neglecting the artistic component. In fact, Pilates has principles very close to dance technique and uses movements very similar to certain dance technical skills. By emphasizing breathing, alignment, position and abdominal work, Pilates can support the dance class in the development of optimum dance technique. In this instance, we suggest that Pilates workout approaches the needs of dance technique, making it possible to develop dancers' physical capacities in a specific way.

Acknowledgment

This article was adapted from Amorim T, Sousa F, Santos J. Influence of Pilates training on muscle strength and

flexibility in dancers. Motriz: Revista de Educação Física. 2011;17(4):660-6.

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Encouraging Dancers to Train for Upper Body Fitness

Jatin P. Ambegaonkar, Ph.D., A.T.C., O.T., C.S.C.S., Sports Medicine Assessment, Research, & Testing (SMART) Laboratory, George Mason University, Virginia, USA

Dancing is a physically demanding activity with a high risk of injury.[1] Several dance genres have high upper body demands.[1-3] Dancing often includes falls, handstands, partner lifts, and extreme angular movements in which the upper body, head, and neck are often out of line with the lower body[1-3] (Fig. 1). Accordingly, 3% to 14 % of all dancers' injuries are to the upper body.[3]

Muscular power, strength, and endurance have an influence on the risk of injury.[4] Muscle function can be thought of as a continuum from power to strength to endurance. In this continuum, power refers to a greater force production over a shorter time period, endurance refers to a lesser force production over a longer period of time and strength refers to a moderate force production over an intermediate period of time. Increasing evidence in dance medicine and science points to the fact that muscle strength influences injury risk, and that dancers with lower muscle torque require more time off due to injury.[5]

The push-up test is an accepted measure of upper body fitness. In a recent study examining associations among physical fitness measures (including aerobic capacity, core and upper and lower body power and endurance, and joint mobility and muscular flexibility) and aesthetic competence (as measured by the Aesthetic Competence Scale), the researchers noted that push-up performance was one of the best indicators of a dancer's aesthetic competence.[2] So, we compared upper body endurance between 17 female university-level dancers and 15 active non-dancers, using the modified push-up test for females.

Participants performed the modified push-up test for females as per the American College of Sports Medicine's *Guidelines for Exercise Testing and Prescription* (Fig. 2). The maximum number of push-ups performed consecutively without rest while maintaining form was counted as the score. We found that both groups had similar upper body endurance (dancers = 22 vs. non-dancers = 20 push-ups). We also compared our findings with university-level females, and female athletes participating in sports with high upper body muscular demands.[6] The first comparison suggested that our dance participants possessed "good" upper body muscular endurance, scoring above the 90th percentile. However as compared to athletes who use their upper extremity during participation in their activity, dancers had less upper body endurance. Both lacrosse players (47)[6] and female cheerleaders performed more push-ups (24) than the dancers in our study.[5]

What does this mean for dance educators? We believe that these findings support previous observations that dance alone does not provide enough stimulus to induce physical fitness gains in dancers. Specifically, dancers often view their bodies as instruments of expression.[4] Additionally, some dancers also view physical fitness as simply the '*absence of injury*', and any fitness improvements are considered '*by-products*' of dance skill acquisition.[7] Some dancers and educators also have an unfounded fear that exercise program participation will make dancers '*muscle bound*' and negatively affect aesthetics, despite evidence to the contrary.[8]

Participation in strength and conditioning programs outside of dance is not common among dancers.[8] We saw this in our dancers too. Specifically, for 15 out of our 17 dancers, dancing was their primary physical activity (i.e., the activity that they mostly performed when physically active). Only two dancers engaged in activity other than dancing. Furthermore, this other activity was running, which has lower body demands but does not improve upper body fitness. While dancers frequently participate in exercise programs like Pilates, these often do not adhere to the overload principles emphasized in strength and conditioning programs.[9] So, participation in exercise programs such as these may not specifically improve upper body fitness, a factor that some researchers suggest may help enhance dance performance.

The benefits of strength and conditioning programs in combination with skill acquisition training are commonly acknowledged in athletics. Such training may improve upper body muscular fitness and possibly reduce upper-body injury risk. Combined with our findings, the evidence[2,5]

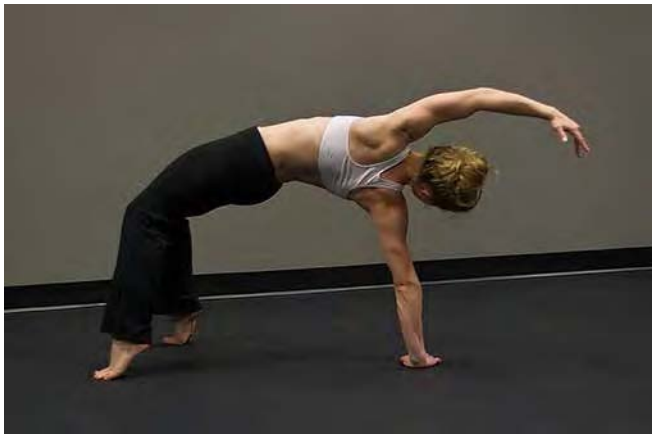

Figure 1 An example of upper body demand in dance.

suggests that several fitness components (e.g., strength, power, balance, agility) may improve performance aesthetics and decrease the risk of injury among dancers. Overall, our work suggests that dance alone may not produce upper body muscle endurance gains. So educators may want to encourage their dancers to perform upper body fitness and cross training outside of their dance practices and performances.

Acknowledgment

This article is adapted from Ambegaonkar JP, Caswell SV, Winchester JB, Caswell AM, Andre M. Upper-body muscular endurance in female university-level modern dancers: an exploratory study. J Dance Med Sci. 2012;16(2):3-7.

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Figure 2 Positioning for the modified push-up test for females. **A**, Up position and **B**, Down position.

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Abstracts from the Current Literature

Marliese Kimmerle, Ph.D.

O'Neill JR, Pate RR, Hooker SP. The contribution of dance to daily physical activity among adolescent girls. Int J Behav Nutr Phys Act. 2011;8:87.

This study examined the contributions of dance classes to total moderate-to-vigorous physical activity (MVPA) of adolescent girls. The current physical activity guidelines for youth recommend at least 60 minutes of MVPA daily as a health objective. Physical education classes, organized sports and after-school programs may contribute to that objective. A particular challenge is maintaining female physical activity during adolescence. Since dance is a highly prevalent physical activity among adolescent girls, the authors wanted to examine objectively what contribution dance classes might make to MVPA. One hundred and forty-nine girls (11-18 yrs) taking classes in 11 dance studios participated in the study. Their physical activity was measured via an accelerometer worn during all waking hours over an eight-day period. Self-report from the participants indicated days and times they participated in the dance program. On dance program days, girls averaged 28.7 minutes of MVPA versus 16.4 on non-program days. Their structured dance classes contributed 29% to their overall weekly MVPA. This study demonstrates that dance classes can make an important contribution to increasing MVPA and reducing sedentary behavior. However, the overall daily average of 25 minutes found in this study is similar to several other studies of adolescent girls, and indicates that adolescent females are falling well short of the recommended 60 minutes of daily MVPA.

Denardi RA, Corrêa UC. Effects of instructional focus on learning a classical ballet movement—the pirouette. J Dance Med Sci. 2013;17(1):18-23.

This study explored the initial learning by novices of a complex ballet skill based on an instructional focus on its component parts. Seventy-two college students with no experience in classical ballet were taught a *pirouette en dehors* from fifth position with 160 learning trials and 20 retention trials a week later. Of interest in this study is how a complex skill is learned and whether focusing the instruction on a specific body part (head, arms, trunk, knees or feet) is effective versus generalized instruction. All participants were given verbal instructions and shown a video of the general characteristics of the skill. The experimental groups were then told to concentrate their performance on a specific body part. Based on the literature, the authors expected that focusing on the head movement would be the most critical component, as it provides stabilization and balance to the vestibular system. The results showed no difference in learning between groups focused on different parts or compared to the control group. All groups showed improvement in their movement patterns, decreased their errors and maintained their performance in the retention phase. It appears that the generalized verbal instructions and videos provided were sufficient to assist beginners in coordinating the components of the skill, and that establishing this relationship may be more critical in the initial stages of learning than focusing on the individual components. The authors acknowledge that teaching the pirouette to absolute beginners is questionable pedagogic practice. The rationale was that in a motor learning study, one wants to examine the learning of a novel skill where subjects have no prior instruction or expertise. The implications of this study are that in teaching beginners or young dancers new complex skills, general instructions that promote comprehension of the overall movement coordination pattern are more effective than focusing on specific body parts.

Grove JR, Main LC, Sharp L. Stressors, recovery processes and manifestations of training distress in dance. J Dance Med Sci. 2013;17(2):70-8.

This paper review provides a comprehensive look at training distress in dance, with a well- developed model that provides an overview of training stressors, symptoms of distress and recovery processes. Training distress is the result of the physical and mental challenges of dance training that may affect the dancer's readiness to perform, and can include issues such as overtraining, staleness and burnout. These topics have been well examined in sports and in this article are applied specifically to the dance environment of professional and studio dancers. The authors describe many training stressors, such as the physical workload of training, additional fitness work and performance and the challenges of adapting to new works and new dance styles, Psychosocial stressors include environmental conditions, daily hassles, role stressors and major life events, perfectionism, a competitive environment, performance expectations, frequent traveling and weak support networks. Important components of the model are passive and active recovery processes to counteract the negative impact of these stressors. Some of these include physical and mental rest,

nutrition, massage, imagery and a variety of self-monitoring and self reflection procedures. An important contribution of this article is the identification of the symptoms of training distress when the recovery processes do not balance out the stressors. These symptoms can include perceived stress, mood disturbances and fatigue, somatic symptoms, sleep difficulties, and motivational changes. The authors suggest that regular monitoring of these symptoms is important and they review a number of assessment instruments that can be used to detect distress. Regular assessment could provide valuable information for adjustment of workloads and the training environments among vocational and professional dancers in order to optimize performance, and safeguard the dancer's physical and mental health.

Coubard OA, Duretz S, Lefebvre V, Lapalus P, Ferrufino L. Practice of contemporary dance improves cognitive flexibility in aging. Front Aging Neurosci. 2011;3:13.

Many researchers have studied the decline in cognitive functions that accompanies aging, including perception, memory, goal planning, and purposive action. In this paper, the specific focus in on attentional control, that is, the ability to maintain goal-directedness over time in the face of distractions and being able to coordinate concurrent activities. Cardiovascular and strength training programs have been shown to benefit cognitive functioning generally, and attentional control specifically, in a number of studies, but very few have examined dance activities. These few dance studies have not distinguished between the physical fitness aspects of dance training and the motor skill learning components. In this study the dance activity was contemporary dance, focusing on improvisation, which was compared to two control activities—a fall prevention training or Tai Chi Chuan. Three components of attentional control (setting attention, suppressing attention and switching attention) were examined pre and post training via paper and pencil tests. Sixteen females (65-83 yrs) made up the experimental group and participated in dance classes one hour a week for six months. Although there was no difference in setting and suppressing attention in any of the three groups, switching attention and showing cognitive flexibility improved in the contemporary dance group. The authors' explanation of the results suggest that the nature of improvisational dance facilitates movement exploration and demands high attentional control, in contrast to memorization of sequences and repetition of stereotypical motor activities in the control activities. While a variety of dance activities have shown the benefits on fitness and general cognitive functioning in an aging population, this study demonstrates that creative, problem-solving dance programs, through constant movement adaptations, may have specific benefits on cognitive flexibility with a potential helpful impact on daily life functioning.