

The IADMS Bulletin for Teachers

Volume 4, Number 1, 2012

Editors-in-Chief

Gayanne Grossman, P.T., Ed.M., and Marliese Kimmerle, Ph.D.

Associate Editors

Nora Barry and Kimberly Karpanty, M.F.A.

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Letter from the Editors

Dear Dance Educators,

We want to thank the many supporters of the *Bulletin*.

To our dance educators, your positive feedback and comments allow us to continue to find topics of interest from expert contributors. Please continue to write to us. We welcome your ideas and we'll answer any questions that help promote our mission of bringing state-of-the-art dance science research into the dance studio and classroom. Please send your letters via email to: media@iadms.org.

The Editors, Education Committee, and the IADMS Board of Directors wish once again to thank and express our appreciation to Ken Endelman of Balanced Body for his continued generous support of *The IADMS Bulletin for Teachers*. We welcome Progressive Health Innovations Inc. and its President & CEO Matt Ferguson as a new advertiser. Please visit their web site at www.afx-online.com.

Margaret Wilson, Ph.D. has been appointed to serve as the new chair of the Education Committee. We congratulate her and extend our sincere appreciation for all that she has done to further dance science and all she will do in service to IADMS as Chair. Margaret has generously accepted

this role so that Janet Karin can serve as Vice President/President-Elect. We wish them well in these vital roles.

This issue of *The IADMS Bulletin for Teachers* contains exciting new articles on links between fitness and artistry, the use of mirrors, and the effect of plyometric training on dance performance. The Editors thank Matthew Wyon, Sally Radell and Andrea Kozai for contributing their expertise and time.

The 2012 A Day for Teachers will be held Sunday, October 28th at the Novotel Singapore, on Clarke Quay, from 9 am – 3 pm. The day will investigate psychological and physical disciplines of importance to dance class. Our thanks go to Virginia Wilmerding for organizing this interesting day of educational programming. We hope you can join us. For information and registration, visit www.iadms.org. Details are posted on the IADMS website.

If you have not explored the website beyond the *Bulletin*, please make sure you look for the new posters and recent resource papers.

Editors:

Gayanne Grossman, P.T., Ed.M., and Marliese Kimmerle, Ph.D.

Education Committee Activities

Greetings from the Chair of the IADMS Education Committee

The IADMS Education committee is comprised of individuals who research, mentor, study and teach dance all around the world. From Israel to Japan, and across the UK and US, this committee is one of the most active in the IADMS organization. As a new chair of this ambitious committee, I have the honor of relating the good work that the individuals on this committee have undertaken, efforts designed to enhance teaching and an understanding 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, posters, and *The IADMS Bulletin for Teachers*, all of which can be accessed on the IADMS website, to the Safe and Effective Dance Practice qualification. We also have a Studio Teachers’ Network who do outreach for the IADMS organization by recruiting new members from studio teachers around the world.

Ginny Wilmerding, former IADMS president, and program committee chair for the 2012 IADMS meeting, has organized “A Day for Teachers” which will take place during the Singapore Annual Meeting. The purpose of this year’s annual “A Day for Teachers” is to explore the psychological and physical essentials of disciplines that many dancers use to complement dance technique class. Morning lectures will begin with the psychological impact of these disciplines to enhance wellness. Lectures on the anatomy and reality of breathing, kinetic considerations, motor control and motor learning for rehabilitation in training will round out the morning program. After lunch, movement sessions will provide practical application of the morning’s lectures in three systems that are often a part of a dancer’s wellness training. The aim is to improve the quality of life of the dancer and dance teacher.

Two new papers are on the IADMS Resource Paper tab of the IADMS website: *Hip Anatomy and Factors Affecting Turnout* and *Turnout for Dancers: Supplemental training*. Written by Ginny Wilmerding and Donna Krasnow, these articles are full of important anatomical information on external rotation and supplemental exercises to create the correct neuromuscular patterns for using turnout.

Poster series 4 will be launched at the Annual Meeting in Singapore, and will be based on bone health and female dancers, stretching for dancers and motor learning. In addition, posters from the first three series are still available and can be purchased from the IADMS website.

The Studio Teachers’ Network grows each year, with new members this year from Colorado, Pennsylvania, Minnesota, North Carolina and California in the US and from Australia, Holland, England, the Philippines and New Zealand. Members of the Studio Teachers’ Network and Teachers’ Liaison are discussing outreach programming for the competition dance community.

I am pleased to report that the Trinity College London/ IADMS event, *Certificate in Safe and Effective Dance Practice Course Provider’s (SEDP)*, held last October in Washington DC was a huge success. As the Certificate continues to develop and attract interest in the UK, requests to increase its scope and potential worldwide are being voiced. Twenty-two delegates from several countries attended the course providers meeting before the 21st IADMS Annual Meeting and discussed how the Certificate might be developed in the future. The most valuable outcome was the creation of a group of individuals interested in becoming some of the first Course Providers in the US.

Recognition of the importance of safe practitioners to enhance the scope of teaching in all dance forms remains the primary aim of this joint qualification. Through the introduction of safe dance practice knowledge into University modules, encouragement of Continuing Professional Development for individuals, and through the development of registered centers of Course Providers, we hope to disseminate essential knowledge into the wider dance community, in as many countries as possible. We also hope to make the SEDP Course Provider’s Day a regular event at the IADMS Annual Meetings in the future.

Please visit the IADMS website to find out more about this and other exciting initiatives from the Education Committee.

Margaret Wilson
Education Committee Chair



“Dancing is like dreaming with your feet!” ~Constanze
...but too often injuries turn dreams of dancing in to nightmares.

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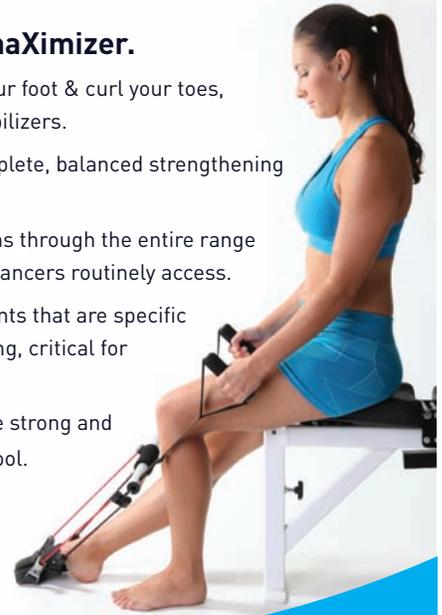
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The posters draw from research and knowledge outlined in the IADMS Resource Papers (available online) and are aimed at teachers, students and health care specialists.

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.

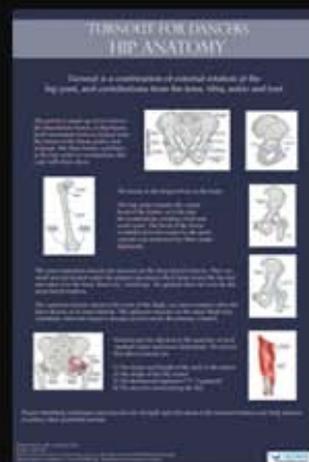
The posters:

- are large, full color with beautiful photographs (24 inches x 36 inches/ 61 centimeters x 91.4 centimeters).
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Purchase of three or more posters includes enrollment in the IADMS Studio Teachers' Network.

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Single posters:
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Supplemental Physical Fitness Training Can Improve the Artistic Elements of Dance Performance

Matthew Wyon, Ph.D.

Professor in Dance Science, Research Centre for Sport Exercise and Performance, University of Wolverhampton, National Institute of Dance Medicine and Science, UK

Over the last 25 years the exercise sciences have studied dance from a biopsychosocial perspective rather than an artistic one. The early studies by Cohen et al and Schantz and Astrand^{1,2} noted that ballet had a greater emphasis on anaerobic fitness and that the dancers' aerobic fitness levels were similar to sedentary or moderately trained individuals. Later research on contemporary dance appeared to tell a similar story, though contemporary dancers had slightly greater aerobic fitness.³ Dance UK's two "Fit to Dance" reports^{4,5} also noted that dancers perceived fatigue as one of the main causes of injury, which should not be a surprise as the previously mentioned research on the cardiorespiratory demands of dance showed dancers performing at or near their maximum physical abilities. Dance is a high skill exercise form that requires a very high level of coordination and precision not really seen in sport, especially when exercising at these intensities. Generally, as the physical intensity increases, the ability to carry out intricate movements decreases. Dancers appear to be able to circumvent this trend to a degree. This has a potentially negative consequence, in that a loss of alignment due to fatigue when exercising at these intensities can increase the chance of injury.

The link between physical fitness and performance has been demonstrated in sport, where winners have been able to perform at a lower relative intensity than their rivals.⁶ The purpose of the present studies was to examine whether there was a similar relationship in dance, with dancers able to improve the artistic elements of dance performance by improving their underlying physical fitness—resulting in dancers having more "energy" to put towards the artistic elements of dance performance. The participants for all the studies were either in their final year of pre-professional training or professional dancers. It is very important to always examine who the participants were in research projects, as sedentary populations adapt differently than trained populations when interventions are imposed upon them. The underlying characteristics (fitness and anthropometric) may vary hugely and the adaptations seen in less skilled

groups may not transfer to more skilled groups.

The first study examined the physical demands of dance performance using video analysis. Video analysis provides a gross exploration of the underlying demands of dance performance with the basic categories of exercise intensity, discrete skills, and changes in direction. The exercise intensity category ranges from "rest" to "very hard" (where the participant is undergoing very hard work e.g. run pace, static holds above shoulder height, multiple high jumps landing on one leg). Discrete skills include activities such as lifts and jumps. Changes in direction focuses on acute changes in direction and movement to and from the floor. The data from 48 ballet and 45 contemporary performances indicated that the two genres are as significantly different in the underlying physical demands placed on their performers as the artistic aspects of the choreography.^{7,8} Ballet was characterised by longer periods at "rest" and at "high" to "very high" exercise intensities, while contemporary dance featured more continuous moderate exercise intensities. These differences have implications for the energy systems utilised during performance, with ballet potentially stressing the anaerobic system more than contemporary dance. Ballet also noted higher rates in discrete skills for jumps (5 jumps·min⁻¹) and lifts (2 lifts·min⁻¹) than contemporary dance.

The next study examined the relationship between a wide range of physical fitness parameters and artistic ability. For the latter, each participant had to dance a set solo (ballet or contemporary), which was marked by two experienced dance examiners for each genre. The participants then underwent a battery of fitness tests including anthropometric (body fat, weight, height) measurements, aerobic fitness, power, muscular endurance and flexibility following the guidelines set out by the British Association of Sport and Exercise Science.⁹ Within the limitations of the chosen solos, the physical fitness attributes that best predicted artistic competency in contemporary dance were upper body muscular endurance and lower body power (jumps)¹⁰; while in ballet, jump height and active



range of movement (développé) were the best indicators of artistic competence. The limitation of the study was that the relationship between the fitness attributes and dance was specific to these two dance pieces and can't truly be generalised to other choreography.

The final study used professional dancers and final year vocational school dancers in a performance group. Again each group (ballet and contemporary) performed a solo-piece before and after a 6 week training period and carried out the same fitness test battery as in the first study (above). Half of each cohort acted as an intervention group and the rest as controls. The control group carried out their usual daily routine and an extra dance class to mimic the extra exercise time of the intervention group. The intervention consisted of circuit and whole body vibration training (above).

The circuit training exercises chosen focused on upper and lower body exercises (such as press-ups, lunges, bench dips), as well as development of the aerobic energy system for contemporary dancers, and both the anaerobic and aerobic energy systems for ballet. Each group also carried out exercises that focused on developing active and passive flexibility. The intervention was just one 1-hour session per week for the ballet cohort and 2 x 1-hour for the contemporary. The differences in the intervention times were solely due to the accessibility and schedules of the two groups. This limited intervention was decided on as the participants were already doing 5-7 hours dancing a day,

on average, and we speculated that more sessions were likely to cause overtraining and would also interfere with their present schedules too much. The participants' two dance solos (pre and post intervention) were videoed and then randomised prior to marking by the dance experts. Results showed that all dancers who were part of the intervention group improved their artistic marks significantly more than the control group's artistic marks.¹¹

So the suppositions^{3,12-14} that had been made about a link between dance artistry and physical fitness seem to have foundation. The information gleaned from the video analysis will allow performance and role specific interventions to be designed. The project has also shown that as long as supplemental training is focused, benefits can be achieved in a short period of time, which is vital within the training and rehearsal schedules of today's dancers.

The project has been summarised in a two volume series and the highlighted references below:

Twitchett E. Do increases in physical fitness affect dance aesthetics. In Wyon M, Koutedakis Y, Metsios G (eds): *Volume 1: Classical Ballet*. Saarbrucken, Germany: VDM Verlag Dr. Muller. 2010, p. 217.

Angioi M. Do increases in physical fitness affect aesthetic components in dance. In Wyon M, Koutedakis Y, Metsios G (eds): *Volume 2: Contemporary Dance*. Saarbrucken, Germany: VDM Verlag Dr. Müller 2010, p. 160.

References

1. Cohen JL, Segal KR, McArdle WD. Heart rate response to ballet stage performance. *The Physician and Sportsmedicine*. 1982;10(11):120-33.
2. Schantz P, Astrand P-O. Physiological characteristics of classical ballet. *Med Sci Sports Exerc*. 1984;16(5):472-6.
3. Koutedakis Y, Jamurtas A. The dancer as a performing athlete: physiological considerations. *Sports Med*. 2004;34(10):651-61.
4. Brinson P, Dick F. *Fit to Dance?* London: Calouste Gulbenkian Foundation, 1996.
5. Laws H. *Fit to Dance 2 - Report of the Second National Inquiry into Dancers' Health and Injury in the UK*. London: Newgate Press, 2005.
6. Bentley D, McNaughton L, Thompson D, Vleck V, Batterham A. Peak power output, the lactate threshold, and time trial performance in cyclists. *Med Sci Sports Exerc*. 2001;33(12):2077-81.
7. Twitchett E, Angioi M, Koutedakis Y, Wyon M. Video analysis of classical ballet performance. *J Dance Med Sci*. 2009;13(4):124-8.
8. Wyon M, Twitchett E, Angioi M, Clarke F, Metsios G, Koutedakis Y. Time motion and video analysis of classical ballet and contemporary dance performance. *Int J Sports Med*. 2011;32(11):851-5.
9. Wyon MA. Testing the aesthetic athlete. In: Winter E, Jones A, Davison R, Bromley P, Mercer T, (eds). *Sport and Exercise Physiology Testing Guidelines: British Association of Sport and Exercise Science Testing Guidelines*. London and New York: Routledge, Taylor and Francis Group, 2007, pp. 249-62.

10. Angioi M, Twitchett E, Metsios G, Koutedakis Y, Wyon M. Association between selected physical fitness parameters and aesthetic competence in contemporary dance. *J Dance Med Sci.* 2009;13(4):115-23.
11. Twitchett E, Angioi M, Koutedakis Y, Wyon M. Do increases in selected fitness parameters affect the aesthetic aspects of classical ballet performance. *Med Probl Perform Artists.* 2011;26(1):35-8.
12. Allen N, Wyon M. Dance medicine: athlete or artist. *SportEx Medicine.* 2008;35:6-9.
13. Wyon MA, Abt G, Redding E, Head A, Sharp NCC. Oxygen uptake during modern dance class, rehearsal and performance. *J Strength Cond Res.* 2004;18(3):646-9.
14. Wyon MA, Redding E. The physiological monitoring of cardiorespiratory adaptations during rehearsal and performance of contemporary dance. *J Strength Cond Res.* 2005;19(3):611-4.

Body Image and Mirror Use in the Ballet Class

Sally A. Radell, M.F.A., M.A., Emory University, Atlanta, Georgia, USA

Mirrors have long been used as teaching tools in ballet instruction and have proven to be a potent element in affecting perceptual attitudes toward body image. Body image is the perception, thoughts, and feelings we have about our bodies.¹ A dancer's personal vision of her body image is an important part of her psychological health and well-being and can help or hinder her dance performance in the studio.²

Several dance studies have shown that heightened self-consciousness can contribute to the development of negative body image.^{3,4} Mirrors have the ability to entice individuals to see themselves externally as objects, and imagine how others view them in comparison to other dancers. This heightened self-consciousness may have a positive or negative psychological influence on the dancer, depending upon other individual and classroom factors such as technical difficulty of the dance phrase, experience level of the dancer, and degree of stress experienced when learning a phrase. Overall, researchers have concluded that mirror reflections of self, teacher, and other students affected students' body image and level of distraction.

In a series of studies, Radell and colleagues set out to answer the following questions about mirror use: 1) How does the use of the mirror in dance class affect a student's body image? 2) Does the technical level of a dancer affect how a dancer perceives his or her body image when using a mirror? 3) What are dance students' preferences and opinions regarding the use of mirrors in the studio?

In a 2002 study, Radell and associates⁵ compared changes in body image of women college ballet dancers who trained in front of mirrors with ballet dancers who trained without mirrors. The study used the Cash Multidimensional Body Self-Relations Questionnaire (MBSRQ)⁶ to measure changes in a dancer's body image. For dancers

taught without mirrors, there was a significant increase in satisfaction with the appearance of different parts of their bodies. The dancers taught with mirrors, on the other hand, experienced significant dissatisfaction with the appearance of their body parts. In summary, these results show that the use of mirrors in the ballet studio may negatively affect dancers' body image.

In a subsequent 2004 study, Radell and colleagues² looked at the relationship between level of performance of dancers and their use or non-use of a mirror in the classroom. Technical performance skills were assessed using the Radell Evaluation Scale for Dance Technique (RESDT) which involved a videotaped evaluation process of dancers performing two phrases at the beginning and end of the semester. Two ballet teachers independently viewed the videotapes to evaluate the dancers' rhythmic accuracy, ease and flow of movement, and mastery of steps and alignment, and rated the students' skill level on a scale of 1-5. For analysis purposes, students whose scores averaged three or higher were categorized as "high performers," and those who averaged less than three were "low performers." These teachers had no knowledge during the evaluation process of which dancers were from the mirrored or non-mirrored class. They reported that higher skilled students performing without mirrors experienced a significant increase in body image scores, while similar higher performing students taught with mirrors had decreased body image scores. Overall, it appears that the effect of mirrors on dancers' body image may be dependent on varying factors such as performance skill level, comparison of self to others, and level of material taught. The effect is fluid in nature, with various factors overlapping and potentially influencing each other.

Current Study

The purpose of the current study was to further explore the dynamics of the interaction between body image and the mirror by using a research design that included the body image questionnaire (MBSRQ) and the Radell Qualitative

Adapted from: Radell SA, Adame DD, Cole SP, Blumenkehl NJ. The impact of mirrors on body image and performance in high and low performing female students. *J Dance Med Sci.* 2011;15(3):108-15. With Permission.

Questionnaire(RQQ).² This qualitative questionnaire was used to assess dancers' perceptions of dancing with and without mirrors, and to elicit additional perceptions of the ballet experience that may have influenced the dancers' class participation and affected their perception of their body image. In addition, technical performance skills were assessed to identify students as either high or low performers.

This study utilized two classes of twenty-three females enrolled in beginning ballet classes. One group was taught using mirrors, and the second group was taught without mirrors. Both classes were taught the same movement material by the same instructor. Students completed the Body Image Questionnaire during the first and last classes of a 14-week semester. In addition they completed the qualitative questionnaire on the last day of the course. The questionnaire was designed to gain further insight into how the use or non-use of the mirror affected each dancer's body image, grasp of concepts presented, and enjoyment of the class. Sample questions included: "Was your body image affected by not having (or having) a mirror in the classroom?" "Did the absence (or presence) of a mirror in the classroom affect your enjoyment of this class?" "Did the absence (or presence) of a mirror affect your grasp of the concepts taught?" and "Do you prefer having class taught without (or with) a mirror?"

Results from the Radell Qualitative Questionnaire (RQQ)

The student's own perceptions of mirror use from the qualitative questionnaire ranged widely. The following points include both summarized responses and individual quotes from students in the mirror class:

- 85.7% of dancers commented that the use of mirrors influenced their understanding of the concepts taught.
- 90.5% of dancers preferred having class taught with mirrors.
- Many students felt the mirror helped them see their alignment, thus aiding them in correcting it.
- Some students reported that the mirror helped them understand movement concepts better.
- Two dancers acknowledged that they used the mirror to compare themselves with others in the studio, including the instructor.
- Four dancers reported that the mirror made them feel badly about their body image, or that it led them to the perception that they were fat.
- "Sometimes you don't want to always look in the mirror.... It's [use of mirror] essential for ballet to see if one is improving and doing everything properly."
- "It was fun seeing myself look like a ballerina."
- "A mirror shows what I can't see or feel."

The following are both summarized responses and individual quotes from students in the non-mirror class, which were more varied:

- 55% of the dancers reported that the absence of mirrors

- influenced their understanding of the concepts taught.
- 47.6% of dancers preferred having class taught without a mirror.
- Several students acknowledged that visual feedback would have allowed them to see themselves dance, and thus correct their mistakes or evaluate their alignment and progress.
- One student (who had studied dance previously with a mirror), commented that the mirror would have helped her with "grace and flow."
- Two students reported they had no preference regarding the use of the mirror in class.
- Several students remarked that the absence of a mirror allowed them to "feel" the movement in their body.
- "I was looking forward to dancing in front of a mirror. However, it [lack of a mirror] does offer more freedom for expression and enjoyment during the class because I'm not self-conscious."
- Several students commented that mirrors can be distracting, and there was less self-criticism and stress in the studio without mirrors.
- "If I were serious about learning ballet, I would want a mirror."
- "I'd rather not look at my body. The instructor's comments were probably more accurate than my own critiques."
- Several students commented that while they preferred a non-mirrored environment, an occasional use of one would be helpful.

It is clear that the student's experience in a mirror versus non-mirror class is different and varies between individuals.

Results from Body Image Questionnaire (MBSRQ)

Three findings of particular interest are presented here and are discussed in terms of the students' technical performance levels and perceptions of mirror versus non-mirror use.

High performing dancers in the non-mirrored class made significant increases in body image satisfaction, as compared to those in the mirrored class who noted smaller increases.

These findings corroborate our previous work,^{2,5} which found that students performing without mirrors experienced increased satisfaction with body appearance. Therefore, it could be that dancing without the mirror, for the high performers, encourages them to be less self-critical and thus feel more satisfied with their bodies. There were some comments from the non-mirror class (by students who had used mirrors in previous dance classes) that reinforced the negative aspects of using a mirror. These students indicated that mirrors can be distracting, and there was less self-criticism and stress in the studio without mirrors.

Satisfaction with overall appearance decreased for high performing dancers in the mirrored class.

Perhaps the mirror drew attention to the high perform-

ers' sense of awareness, or self-consciousness, to the extent that they became critical of their body image. This finding is reinforced by several comments from students in the mirror class, including an acknowledgement from some that they used the mirror to compare themselves physically with others in the studio. Several other students stated explicitly that the mirror made them feel badly about their bodies.

Low performing students in the mirror class decreased in how much they worried about their weight and significantly increased in how satisfied they felt with their appearance. Low performers in the non-mirror class, on the other hand, reported significant increases in how much they worried about their weight.

These results are inconsistent with our previous studies,^{2,5} and may perhaps be understood within the context of the learning process investigated by Kimmerle and Côté-Laurence,⁷ who found that learning among dancers is based on dance experience. Beginning dancers, for example, have a less developed ability to perceive, retain, and self-correct dance information than students with more experience in the dance studio. Because low performers had yet to sharpen their skills enough to perceive the full spectrum of their dance capabilities, they may have been less self-critical than higher level performers, and thus more satisfied with their overall appearance. The more experienced dancers have developed their abilities to observe, evaluate, and constructively use the “kinesthetic feedback” provided by their bodies, thus fine-tuning their performance over time. When they gaze into the mirror, higher performing dancers may become more critical of their performance than the lower performing students, who have a less developed ability to evaluate themselves technically.

Indeed, the less cultivated ability of the low performers to detect their technical mistakes,⁷ coupled with perceived expectations about the mirror, may have influenced them to find the study of ballet incomplete without mirrors. The mirror may have induced them to perceive themselves as “living” the full ballet experience, and thus reinforced their illusion of the “perfect” ballet class, enabling them to feel more at ease with their bodies. Conversely, the absence of the mirror may have induced the feeling that the ballet experience was incomplete, resulting in negative body image. This perception was reinforced by comments from students in the mirror class, including: “It was fun seeing myself look like a ballerina,” and “...It's [use of mirror] essential for ballet to see if one is improving and doing everything properly.” Comments from students in the non-mirror class indicated that the quintessential ballet experience would have enhanced their skills of “grace and flow,” furthermore, “If I was serious about learning ballet, I would want a mirror.” This last comment clearly reflects the belief that the truly serious and legitimate ballet experience necessitates the use of mirrors.

Summary and Conclusions

To summarize, there were differences between students at higher performing levels and those at lower levels. As high

performing students in the mirror setting were likely more able to detect errors in technique, they perhaps tended to become more self-critical because they could compare themselves to the other dancers in the studio. In this regard, we note that the mirror tends to serve as a negative influence, especially for higher performers, because comparison of the self to others may promote heightened self-consciousness and thus negative self-evaluation, which can be psychologically unfavorable for dancers.

Lower performing students, who perhaps had not yet developed a technical or critical eye,⁷ reported a different experience with and without mirrors than did higher performers. The low performers with mirrors tended to decrease in how much they worried about their weight and showed significant increases in satisfaction with overall appearance, while the low performers without the mirror reported increases in how much they worried about their weight. Perhaps the use of the mirror positively reinforces the low performers' previous understanding of what constitutes the consummate ballet studio experience, and thereby helps them feel more comfortable with their weight.

Students accustomed to being taught with mirrors reported the mirror was useful for checking alignment and aided self-correction. However, several students acknowledged that mirrors can promote self-criticism and distraction. Perhaps this is because the use of the mirror can potentially distract them from fully trusting their kinesthetic feedback. The students who did not use a mirror did not overwhelmingly miss it; roughly half of them preferred not having a mirror.

The mirror can be an effective tool in the ballet classroom. It provides several benefits, including allowing a student to evaluate his or her technical growth and the ability to see the activities in the classroom from more perspectives, which can aid in the learning process. However, it is also a potent tool which can play a pivotal role in affecting how each dancer feels about his or her body image. Many overlapping factors come into play which influence the effect a mirror has on a dancer's body image, including skill level, years of training, level of material taught, comparison of self to others, degree of stress when learning a phrase, or previous expectations of or experience in the ballet art form. It seems clear that mirrors are useful for some aspects of dance training but detrimental to others.

Dance educators should be judicious in recognizing and utilizing the benefits and understanding the disadvantages mirrors pose in the classroom and learn to use them knowledgeably and selectively. This awareness can result in selective ways to improve the teaching environment so that dance students may improve their body image and overall well-being. Following this paper is a handout that provides some guidelines for teachers to consider when instructing students in the dance technique classroom.

References

1. Grogan S. *Body Image: Understanding Body Dissatisfaction in Men, Women and Children*. New York: Routledge, 2007.

2. Radell SA, Adame DD, Cole SP. The impact of mirrors on body image and classroom performance in female college ballet dancers. *J Dance Med Sci.* 2004;8(2):47-52.
3. Dearborn K, Harring K, Young C, O'Rourke E. Mirror and phrase difficulty influence dancer attention and body satisfaction. *J Dance Educ.* 2006;6(4):116-23.
4. Green J. Somatic authority and the myth of the ideal body in dance education. *Dance Res J.* 1999;31(2):80-100.
5. Radell SA, Adame DD, Cole SP. Effect of teaching with mirrors on body image and locus of control in women college ballet dancers. *Percept Mot Skills.* 2002;95:1239-47.
6. Thompson JK, Penner LA, Altabe MN. Procedures, problems, and progress in the assessment of body images. *In: Cash TF, Pruzinsky T (eds.): Body Images: Development, Deviance, and Change.* New York: Guilford, 1990, pp. 21-48.
7. Kimmerle M, Côté-Laurence P. *Teaching Dance Skills.* Andover, New Jersey: J. Michael Ryan Publishing, 2003, p.17.

IADMS Education Committee

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Considerations for Mirror Use in Teaching Dance

- Most students want to use the mirror in class and in fact, view it as a critical tool for the study of dance. Present the mirror as one of many teaching tools that can be used but note it is not necessary for optimum training.
- The mirror is potent. The image students see of themselves in the mirror and the feedback it provides can frequently overpower the kinesthetic feedback students feel in their body and are learning to interpret. Overuse of the mirror can delay students' development in learning to utilize kinesthetic feedback. Emphasize the long-term value in being able to use kinesthetic feedback.
- Be specific in instructing students how to constructively use the mirror. Give them limited time frames so as to avoid a lingering gaze that can go on too long and lead to negative self-evaluation.
- As a teacher, work to be sensitive to negative body image issues provoked by mirrors in some students. Use the mirror sparingly by either closing curtains over the mirror or having students face away from the mirror.
- Work to integrate other methods of movement information into classes, including the use of verbal imagery and other somatic approaches, so the mirror is not framed as the primary mode of information gathering for a student.
- As dance teachers, we need to understand the background and needs of our student population, be clear about the goals of our classes, deepen our understanding of the benefits and disadvantages of the mirror as a learning tool, and use the mirror selectively and strategically to support this process.



Supplementary Muscular Fitness Training for Dancers

Andrea Kozai, B.S., C.S.C.S., Founder, Virtuoso Fitness, Pittsburgh, Pennsylvania, USA

Dancers today face choreographic demands that stretch the boundaries of both artistry and the physical body. To cope with the increasing demands on technique, virtuosity, and versatility, many dancers are looking outside the traditional technique class for ways to improve their physical fitness. Simultaneously, the scientific literature is investigating everything from baseline fitness levels among dancers to specific training interventions to improve results. However, the dancers themselves are often under-educated regarding appropriate methods to enhance fitness.

Physical fitness can be divided into several components: cardiovascular fitness; neuromuscular coordination; flexibility; body composition; muscular endurance (repeated muscle contraction over a period of time, such as a series of *relevés*); muscular strength (creating a high degree of force once, such as lifting a partner); and muscular power (creating force very quickly, such as in *grand battements* or jumps). While technique class alone can be very good for developing the kinds of neuromuscular coordination, muscular endurance, and flexibility needed for dance, it rarely stresses the other components of physical fitness enough to elicit improvements. Research has found that class is generally conducted at a lower intensity than rehearsal, and neither class nor rehearsals reach the physiological intensity of performance.¹ This means that class and rehearsal don't provide enough overload (stressing the body beyond that to which it is accustomed) to prepare the dancer for performance. This can lead to dancers simply trying to "get through" the performance physically, leaving little energy for artistic interpretation.

Moreover, a high proportion of injuries occur when a dancer is fatigued. Increasing fitness may delay the onset of fatigue, thus providing some measure of protection.

Supplementary conditioning can fill the intensity gap between class, rehearsal, and performance. Supplementary conditioning can mean a number of things--Pilates and yoga, running and strength training. It does not necessarily have to happen outside the dance classroom, as programs have been developed to combine the two.² Because so many options exist, it can be difficult to choose the most appropriate. Moreover, some dancers are reluctant to engage in any training that they perceive might compromise aesthetic quality. They fear strength training in particular may lead to bulky muscles and lost flexibility. However, there is little evidence to support this notion.

In an effort to understand the effects of conditioning geared towards improving muscular strength and muscular power, we conducted a study comparing two training protocols for the lower body. We wanted to know if either protocol would improve objective measures of strength and power, as well as whether supplementary training could improve a subjective measure of jumping ability. Additionally, we wanted to know if these kinds of training changed the dancer's body weight or body fat percentage, from which we could determine if there were any changes in muscle mass.

We chose to compare two types of lower-body training commonly used among athletes: traditional strength training on weight machines, and "plyometric" training, which is a type of conditioning that uses explosive jumps. Traditional strength training involves pushing or pulling an external resistance, such as weights attached to a pulley. Plyometric training involves first stretching a muscle (such as the calves in a *plié*), then explosively contracting the same muscle (such as jumping out of the *plié*). The pre-stretch allows a more forceful contraction, but only if the contraction occurs very quickly after the stretch. We chose these two types of training because strength and power are key components of jumping in dance.

Adapted from: Brown AC, Wells TJ, Schade ML, Smith DL, Fehling PC. Effects of plyometric training versus traditional weight training on strength, power, and aesthetic jumping ability in female collegiate dancers. *J Dance Med Sci.* 2007;11(2):38-44. With Permission.

Methods

To study how supplemental strength and power training affected dancers, we designed an intervention study. We recruited 18 female intermediate/advanced university-level dancers and split them into three groups. Two of the groups were “experimental” groups; one of these was the plyometric group, and the other was the weight-training group. The third set of dancers was our “control” group, meaning they participated in no extra physical activity outside of their normal dance classes and rehearsals.

We tested each of the subjects twice, once before the intervention period and once after, and we tested a number of objective variables. Maximal strength was tested on three machines: knee extension (quadriceps); knee flexion (hamstrings); and leg press (combination of gluteals, hamstrings, and quadriceps). Muscular power was tested in two ways: vertical jump height, and lower-body power as measured via a maximal 30-second sprint on a stationary bicycle. We measured body weight and percentage of body fat. A subjective *petit allegro* dance evaluation was also administered, which evaluated jump height, ability to point the feet while jumping, *ballon*, and overall jumping ability. The test was judged by experienced dance faculty.

The experimental groups, in addition to their regular dance schedules, participated in six weeks of supplemental training. Both groups trained twice a week for about 45 minutes each session. Both groups followed a progressive training plan, meaning that as time went on and improvement was seen, the exercises got harder. The plyometric group performed four different jump-training exercises: “drop jumps,” which involved stepping off a box then explosively jumping straight up; “step-ups,” consisting of placing one foot on top of a box and exploding straight up for 8 repetitions, then switching legs and repeating; “box jumps,” which simply meant jumping onto a box, stepping off and repeating, and “froggies,” or performing several horizontal long jumps in a row. The program was progressed by increasing the box height and the intensity at which the dancers executed the jumps. The weight-training group performed four lower-body exercises on weight machines, targeting the gluteals, hamstrings, quadriceps, and calf muscles. Progression was achieved by increasing the amount of weight lifted.

Results

We evaluated the results to see if there were any changes following the supplemental training, and if so, if the groups responded differently. Both experimental groups showed improvement. The plyometric group and the weight-training group both increased their maximal leg press strength and their perceived jump height on the subjective dance evaluation. However, there was no difference between the two groups on the magnitude of either change. The leg press measured the strength of the hips and thighs, which can translate to squatting movements and jumps. Indeed, both groups showed a perceived increase in their *petit allegro* jump height. Relatedly, the plyometric group increased

their objective vertical jump height, showing that their leg muscles could more powerfully propel them upwards.

The weight-training group improved their lower-body power on the stationary bike, their hamstring strength, and their perceived ability to point their feet in the air on the subjective dance test. The stationary bike test showed that this group was better equipped to sustain powerful movement over a 30-second period following the training intervention. Their improvement in pointing their feet while jumping was likely due to the strengthening of their calf muscles during their training, showing that strength improvements can assist technique development.

There were no significant changes in either body weight or percent body fat in any group. This indicates that neither program caused any aesthetically deleterious gains in muscle mass. Most strength gains during the first month of training are from improved neural patterning. Additionally, hypertrophy (an increase in muscle size) generally occurs through training at a lower intensity and higher volume than the programs we used. A number of intervention studies for dancers have similarly found that supplemental training need not create a bodybuilder-type frame, but can rather enhance the abilities of dancers while maintaining their aesthetic principles.³⁻⁵

Interestingly, neither experimental group improved in the subjective measures of *ballon* or overall jumping ability. It is likely that while strength or power training can be useful for improving some aspects of jumping, technical improvements such as *ballon* and creating an aesthetically pleasing jump, are best developed through rigorous dance instruction.

Finally, the control group did not show changes on any of the strength, power, anthropometric, or dance measures. This indicates that six weeks of dance classes and rehearsals alone was not enough to improve strength, power, or jumping ability in high-level university dancers.

Suggestions for Teachers

The results of this study indicate that training outside the dance technique class is not only beneficial, but perhaps essential to furthering strength and power in highly-developed dancers. Teachers can use this information to recognize the scope of technique class, and make recommendations to students who need further fitness development. Here are a few suggestions:

1. Supplemental training should occur at an intensity that is higher than the typical technique class. A scale of perceived exertion from one through ten may be useful. For instance, if the dancer feels she is working at a six or seven during the most strenuous part of technique class, she should undertake supplemental training at least at an eight.
2. The type of supplemental conditioning should be geared towards the dancer's weaknesses. If the dancer has difficulty with slower movements, she may lack strength. If she needs work moving more quickly, she should train for power.

3. Strength-building exercises can be included by pairing dancers up and asking them to provide manual resistance for each other. Please see the suggested reading list for specific ideas.
4. Plyometric-type exercises can be incorporated into class by asking dancers to complete several jumps in sequence while focusing on explosiveness instead of technique. Images such as “exploding like a rocket ship” or “reaching for the stars” may be useful. Beware using these techniques with dancers of little training, however. Explosive movements must be integrated gradually to allow the muscles to adapt to the high forces they produce.
5. Supplemental conditioning should take place well before any scheduled performances. The higher intensities can temporarily cause fatigue, and the body requires time and rest to adapt. Roughly two weeks should separate the end of a conditioning program and the beginning of a performance period.

Summary

While physical fitness is not the only requirement of a great dancer, it is a crucial component. Improvements in fitness give the dancer a wider base from which to operate, rendering her more versatile. Moreover, when dancers don't have to be concerned with the physical demands of the dance, they can be free to bring their full artistry to the forefront. This study showed that six supplemental strength and power training was able to improve muscular fitness measures

in dancers without compromising aesthetic components.

References

1. Wyon MA, Abt G, Redding E, Head A, Sharp NC. Oxygen uptake during modern dance class, rehearsal, and performance. *J Strength Cond Res.* 2004;18(3):646-9.
2. Vetter RE, Dorgo S. Effects of partner's improvisational resistance training on dancers' muscular strength. *J Strength Cond Res.* 2009;23(3):718-28.
3. Twitchett EA, Angioi M, Koutedakis Y, Wyon M. Do increases in selected fitness parameters affect the aesthetic aspects of classical ballet performance? *Med Probl Perform Art.* 2011;26(1):35-8.
4. Stalder MA, Noble BJ, Wilkinson JG. The effects of supplemental weight training for ballet dancers. *J App Sport Sci Res.* 1990;4(3):95-102.
5. Koutedakis Y, Hukam H, Metsios G, Nevill A, Giakas G, Jamurtas A, Myszkewycz L. The effects of three months of aerobic and strength training on selected performance- and fitness-related parameters in modern dance students. *J Strength Cond Res.* 2007;21(3):808-12.

Additional Suggested Readings

1. Irvine S, Redding E, Rafferty S. Dance Fitness. International Association for Dance Medicine and Science, Resource Papers. 2011. Available at: <http://www.iadms.org/display-common.cfm?an=1&subarticlenbr=186>
2. Rafferty, S. Considerations for integrating fitness into dance training. *J Dance Med Sci.* 2010;14(2):45-9.

Abstracts from the Current Literature

Gayanne Grossman, P.T., Ed.M., and Marliese Kimmerle, Ph.D.

Ducher G, Kukuljan S, Hill B, Garnham AP, Nowson CA, Kimlin MG, and Cook J. Vitamin D status and musculoskeletal health in adolescent male ballet dancers: a pilot study. *J Dance Med Sci*; 2011;15(3):99-107.

These investigators explored vitamin D levels in adolescent male ballet dancers. Sun exposure increases vitamin D levels and the investigators questioned if people who participate in an indoor activity such as dance would have lower levels. The authors also questioned if dancers have lower levels because vitamin D is stored in adipose (fatty) tissue and dancers have lower body fat. The article carefully explains the benefits of vitamin D, which include brain development, effects on the cardiovascular and immune systems, blood sugar homeostasis (the body's equilibrium), and bone health. The investigators explain that vitamin D "regulates calcium levels in the body; thus, an insufficiency could be detrimental to the growing skeleton." They expected about 30% of young male ballet dancers would have levels below those recommended even though they live in sunny Australia. Eighteen subjects were enrolled in the research project and sixteen were ultimately tested during July (winter) when sun exposure was lowest. The authors found a large percentage of the subjects to be low in vitamin D—nine subjects were either deficient or insufficient and seven (less than half) had normal vitamin D levels. No correlation was found between percentage of body fat and vitamin D levels, nor was there a link between vitamin D levels and stress fractures. The authors emphasized that the study did not have many subjects and more research is needed. Ultimately the authors concluded that more than half of their subjects had below normal levels of vitamin D and were at risk due to lack of sunshine. The authors cited research from Paris, the Middle East, Tasmania and New Zealand that found vitamin D levels are low in athletic and non-athletic males during the winter months. The authors recommend that additional research should address the relationship between vitamin D and a dancer's health.

Walker IJ, Nordin-Bates SM, and Redding E. A mixed methods investigation of dropout among talented young dancers: findings from the UK Centres for Advanced Training. *J Dance Med Sci*. 2012;16(2):65-73.

The authors questioned why young talented dancers in an elite training program drop out. They described research which explored why athletes drop out, because there is a lack of such research for the dance population. They found a variety of reasons that teenage athletes drop out, including feeling there is too much pressure from coaches, disliking their coach, not expecting success, and not having enough fun. The authors said the most "consistent results from descriptive studies indicate that time conflicts and having other interests are the most frequently cited reasons for sport dropout." Additional research in sport looked at motivation and compliance and noted that dropout rates seem higher when the athlete specializes in a single sport at a young age. The authors note that more research into dance dropout needs to be done. The authors interviewed dance students between ages 12 and 18 years of age who had dropped out of Centres for Advanced Training (CATs) in the United Kingdom. Interviews ranged from 17 to 45 minutes and researchers concluded that there was no one particular type of student who was likely to be at risk of dropping out. Dancers stated a variety of personal reasons such as lost passion and feelings of incompetency. Some felt the time spent was too great because of other issues like "college stuff," schoolwork, friends and family. The authors go on to explain in great detail each of these reasons and others. Many dancers continued to dance after dropout but at a different intensity. The authors report, "Enhancing the quality of the experience should be the goal, so that benefits are gained from training regardless of the eventual outcome." This article is an important read for teachers of young students.

Holt KM, Welsh TM, Speights J. A within-subject analysis of the effects of remote cueing on pelvic alignment in dancers. *J Dance Med Sci.* 2011;15(1):15-22.

Maintaining correct pelvic alignment during dynamic dance movements is a challenge for most dancers. Identifying what ideal pelvic placement is, measuring it both standing and moving, and attempting an intervention to change alignment are also challenging for both researchers and teachers. A number of studies have attempted a variety of feedback techniques to change alignment closer to an ideal. One of these intervention studies by Deckert and colleagues was included in the IADMS Bulletin for Teachers 2009:1(1). In the present study, instead of using only a verbal feedback intervention, the authors designed a remote cueing technique, consisting of a pager sewn into a front hip pocket that could be activated when the dancer was misaligned. Two dancers in a professional training university program participated. Videotape recording was used for the assessment and training sessions. Their pelvic alignment was evaluated standing in parallel and turnout, as well as in a series of five ballet bar combinations. Their ideal pelvic placement was determined by experienced technique teachers. Cue training began by having an assistant properly align the dancer, having the dancer relax into their normal position, activating the pager, providing verbal feedback cues and asking the dancer to find the correct alignment. The same pager cue was given as the dancer performed the combinations whenever she was misaligned, including a final combination without pager activation, to assess if the dancer was responding to the training. Training was carried out twice a week over eight weeks. Results indicated that, using this individualized training approach, pelvic alignment improved to the level determined to be ideal for each dancer. The dancers were also asked about their experience in open-ended questionnaires. They reported a change in their alignment awareness which they attributed to the cue training. This would appear to be supported by the dancers' ability to make adjustments during the final combination without pager activation. Further study is clearly needed to determine if this type of cue training or simple verbal cueing in training sessions can transfer to awareness of correct alignment during a technique class.

Ambegaonkar JP, Caswell SV, Winchester JB, Aswell AA, Andre MJ. Upper-body muscular endurance in female university-level modern dancers: a pilot study. *J Dance Med Sci.* 2012;16(1):3-7.

Numerous research studies have documented the physical demands of dance and established that dancers are athletes. With the awareness of the muscular and cardiovascular demands placed on dancers, it has been recognized that technique classes alone are not sufficient to train the dancer for these demands and it has been recommended that additional physical training take place outside of the classroom. We have included a few of these studies in past articles and reviews in the IADMS Bulletin for Teachers, including the Wyon and Kozai articles in this issue.

The authors of this study compared upper-body muscular endurance of 17 female university-level modern dancers to 15 physically active non-dancers, using a modified push-up test. They suggest that falls, handstands and unusual partner lifts in modern dance place more demands on the upper-body musculature than in ballet, and that dancers may be more at risk for upper-body injuries. The question was whether these increased demands were reflected in increased upper-body muscular endurance. Results showed no significant difference in the number of push-ups performed by the two groups, even though the dancers were physically active for a greater amount of time per day and more often per week than the non-dancers. Comparing both groups to population norms for university females, it was found that both groups scored above the 90th percentile (19 to 21 pushups). However, when compared to norms for a variety of university athletes the dancers scored lower. Although the sample of modern dancers was five times more physically active than the non-dancers, it appears this increased dance activity was not sufficient to make muscular endurance gains. For most of the dancers in this study, dancing was their only physical activity. The authors recommend that participation in additional alternative exercise programs is necessary for improving many physical attributes, such as muscular endurance, and may help to prevent injury. They recommend that dance educators encourage dancers to perform cross-training and strengthening of their upper body outside of their dance activities.



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