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 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.

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