Digital Commons @ LMU and LLS

Digital Commons@
Loyola Marymount University
and Loyola Law School

Mathematics Faculty Works

Mathematics

1-1-2012

Effects of Visual, Auditory, and Kinesthetic Imagery Interventions on Dancers' Plié Arabesques

Teresa Heiland
Loyola Marymount University

Robert Rovetti
Loyola Marymount University

Repository Citation

Heiland, Teresa and Rovetti, Robert, "Effects of Visual, Auditory, and Kinesthetic Imagery Interventions on Dancers' Plié Arabesques" (2012). *Mathematics Faculty Works*. Paper 15.
http://digitalcommons.lmu.edu/math_fac/15

This Article is brought to you for free and open access by the Mathematics at Digital Commons @ Loyola Marymount University and Loyola Law School. It has been accepted for inclusion in Mathematics Faculty Works by an authorized administrator of Digital Commons @ Loyola Marymount University and Loyola Law School. For more information, please contact digitalcommons@lmu.edu.

Journal of Imagery Research in Sport and Physical Activity

Volume 7, *Issue* 1 2012 *Article* 5

Effects of visual, auditory, and kinesthetic imagery interventions on dancers' plié arabesques

Teresa L. Heiland, *Loyola Marymount University*
Robert Rovetti, *Loyola Marymount University*
Jan Dunn, *Pilates Plus Kauai and Denver Dance Medicine Associates*

Recommended Citation:
Heiland, Teresa L.; Rovetti, Robert; and Dunn, Jan (2012) "Effects of visual, auditory, and kinesthetic imagery interventions on dancers' plié arabesques," *Journal of Imagery Research in Sport and Physical Activity*: Vol. 7: Iss. 1, Article 5.

©2012 De Gruyter. All rights reserved.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

Effects of visual, auditory, and kinesthetic imagery interventions on dancers' plié arabesques

Teresa L. Heiland, Robert Rovetti, and Jan Dunn

Abstract

The goal of this study was to examine the influence of visual, auditory, and kinesthetic delivery modes of Franklin Method images (anatomical bone rhythms, metaphorical image, and tactile aid, respectively) on the performance of college dancers' plié arabesques by assessing its influence on three measures: plié depth; maintenance of rotation; and simultaneous use of hip, knee, and ankle (Tri-fold). Eighteen participants performed a series of plié arabesques during three visits over a period of two months; at each visit, pliés were performed before and after an image intervention, and the change in mean Likert scale rating was calculated for each measure. In 130 out of 162 ratings, plié arabesque scores were higher following the image interventions. Based on t-test comparisons, the visual mode produced significant positive improvement for all three measures ($p \leq 0.001$ for each), while the kinesthetic mode produced increased ratings for the Rotation ($p=0.012$) and Tri-fold ($p=0.019$) measures. The auditory mode was associated with increased ratings in the Tri-fold measure only ($p < 0.001$). One-way ANOVA suggests no one image modality performed significantly better or worse than the others for the Rotation or Tri-fold; however, the Visual mode did have a noticeably stronger positive effect for Plié ($p = 0.003$). We also explored possible relationships between years of experience dancing and preferred learning styles (as measured by the VARK, VAK, and MIQ-R assessment tools) to performance outcomes, and observed highly varied relationships but no definitive pattern of correlations. Dancers' anecdotal comments about their perceived success with the imagery were qualitatively compared to their performance outcomes. This exploratory study suggests that Franklin Method imagery employing various delivery modalities can be successfully used to improve aspects of the Plié Arabesque, although some modalities may have a stronger effect. We offer recommendations for both the pedagogical application of Franklin Method based on aspects of technique as well as design of future studies to further explore learning styles and other personal aspects of imagery abilities.

KEYWORDS: anatomical, auditory, dance technique, dance, Franklin Method, imagery, kinesthetic, learning style, metaphorical, visual

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

Dancers have long been using imagery to enhance motor learning, reeducate and reinforce movement habits, and focus performance outcomes. Many authors have shared their imagery training systems for dance (Alexander, 1932; Bainbridge Cohen, 1979; Bartenieff, 1965; Bernard, Steinmuller, and Stricker, 2006; Clark, 1963, 1968, 1975; Dowd, 1990; Eddy, 2009; Feldenkrais, 1972; Krasnow, et al., 1997; Laban, 1948, 1950, 1966, 1984; Laban and Lawrence, 1947; Rolland, 1984; Skinner et al., 1979; Sweigard, 1978; Todd, 1937, 1953, 1977). While this rich history of imagery exploration is investigated and shared among teachers, images are likely to have been passed from teacher to student using an oral history approach that is supported by little or no research (Overby and Dunn, 2011). The beauty of the oral history method of sharing hand-me-down images provides historical viewpoints about technique, history, and style, but, from the viewpoint of dance science and evidence, it presents a weakness in dance pedagogy that can be changed. Theories that span nearly a century reveal the interest and value in employing imagery to train dancers, and yet there is a dearth of research revealing evidence of how, why, when, and with whom the images should best be applied. By understanding the efficacy of images as applied to particular dance skills, we intend to bridge epistemological evidence with the wisdom of the oral history approach to teaching dance.

A good amount of research has been conducted on the effects of imagery on the acquisition, performance, retention, and transfer of sport skills among adult athletes with various levels of imagery ability or skill levels (McKenzie and Howe, 1997). Less research has been conducted on application of imagery for physical education in K-12, as stated by Hall and Fishburne (2010), and even less research has been conducted on imagery used by dancers of any age. Research on the efficacy of dance imagery in dance pedagogy is completely new territory. It is important to note that dance differs considerably from sports in its imagery use. For example, physical and aesthetic expressivity in dance requires as much lightness, delicateness, and internal focus as it does outward attention, speed, control, and power. Due to the myriad of aesthetic qualities and skills dancers require to be expressive, technical performers, dance pedagogy imagery must likewise encompass depth and breadth. Honing image choices takes years of trial and error and winnowing, yet rarely is there documentation capturing what has seemed to work best, for whom, and why. Exploring what works for particular skills, with various age groups, and why those images seem to work best in those instances would likely assist dance teachers with pedagogical planning and teaching.

Dance researchers have mostly explored the pedagogy of imagery application through qualitative studies of teachers' and students' experiences. Minton (1991, 1996), Overby (1990), and Hanrahan (1995) examined how people create good dance images, whether or not images work, how teachers use

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

images in the classroom, and how dancers use images independently. Quantitative research by Hanrahan and Salmela (1990) of two types of imagery (local and global) applied to three different dance skills laid a foundation for associating image choice, type, image qualities, location and direction of image flow, choice of movements studied, and type of evaluation method employed. Their research revealed that a relationship exists between global imagery[1] and the *développé*[2] and that imagery does facilitate movement. Krasnow et al. (1997) discovered that imagery training in conjunction with dance conditioning produced better results over time than either did alone. Hanrahan and Vergeer (2000-01) studied imagery categories that integrate performance attitude and performance experiences of body, mind, and spirit that point to efficacy of dance imagery in facilitating movement. In a study of four Franklin Method[3] images, which are intended to increase jump height, Heiland and Rovetti (2012) discovered that each of the images expected to increase jump height did seem to support jump height, but only two images proved to be statistically significant. Ironically, the authors found that the dancers in their study (college students) preferred the least successful image, which points toward the possible need for dancers to be told when an image does or does not work for them. In an exploratory study of relationships between dancers' imagery level, imaging preferences, and learning style preferences, Bolles and Chatfield (2009) discovered differences between perceived imagery ability with the Kolb's Learning Style Inventory-3 (Kolb, 1999) and "Feel" and "See" scores with the MIQ-R (Hall and Martin, 1997) for both high and low imagers. Their research suggested imagery may be a good pedagogical tool to use with those with higher "Feel" scores on the MIQ-R.

While some research has been conducted on dance imagery and affinities, surprisingly little research has been conducted on efficacy of Franklin Method images (Franklin, 1996a, 1996b, 2002/3, 2003, 2008). Franklin's body of work is the most systematic, detailed, comprehensive, and augmented pedagogical system for employing imagery in dance training. Franklin has explicated dance imagery into clear categories suggesting relationships between images and biomechanical and anatomical principles, dance movements,

---

[1] Global imagery is a category of imagery dealing with space, whether inner or outer, that relates to the whole of something rather than a specific part.

[2] A *développé* is a dance movement in which the foot of the working leg is drawn up to the knee of the supporting leg and slowly extended to an open position to be held there with control.

[3] The Franklin Method is an approach to using the brain to improve the body's function through employing dynamic imagery, movement supported by anatomical teachings, and educational information designed to support lasting, positive change in the body and mind. It aims to teach each participant how to move the body with maximum efficiency while using the ideal combination of limbs, joints, gravity, moving parts, connective tissue, and muscles required for movement facilitation, health, and motivation (Franklin, "Introducing imagery," n.d.).

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

dynamic alignment, and conditioning. Franklin ("Introducing imagery," n.d., 2) uses a broad definition of imagery called "dynamic imagery," which "is the disciplined use of the content of your mind to influence/improve your experience/skill in any area … [to improve] concentration, acquire and practice new skills, establish confidence, develop coping strategies, performance/presentation strategies, [and improve] movement … [facilitation, health, and motivation.]" The "experience" he refers to is regarding the desired sensation that relates to a chosen, aesthetic, movement goal. Both dancers and dance scientists would tend to agree that dance technique is comprised of proper biomechanical use of the body in tandem with aesthetic ideals established by a dance culture. Lewis states, "Franklin believes external sensory images coupled with metaphor tend to work best with children, while internal, literal and kinesthetic images are effective with adults (2009, 56)." We wanted to examine how college dancers perform a specific dance skill while employing different types of Franklin images hypothesized to improve that skill. It is important to note that we are not researching the pedagogy of Franklin Method workshops, which include an introduction to Franklin's approach to applying imagery by working in a group in a circle; learning about self-awareness, concentration, dynamic imagery, proprioception, efficiency of movement; goal setting; anatomy and kinesiology; movement and imagery exploration; and conditioning, to name a few. Instead, we are researching images applied to dance movement. We also wanted to explore whether performance outcomes seem to be related to learning style, image type, or mode of delivery. Eventually, by studying a broad scope of images with a wide array of generally known dance skills, we believe we will be able to support dance pedagogy by providing teachers with scientific evidence of imagery outcomes that can be intertwined with their oral history approach to teaching.

We chose to research the *plié arabesque*[4] and how pedagogical imagery chosen to support the biomechanics and aesthetics of the *plié arabesque* effects dancers' outcomes. Dancers who study ballet, modern, and jazz techniques are usually quite familiar with the basic aesthetic characteristics and biomechanics of a *plié arabesque*. When teaching *plié arabesques*, dance teachers have the complex task of guiding a group of dancers to find optimal execution of, at least, the following five main concepts: (1) maintain outward rotation of the femur in the acetabulum so that the knee stays aligned over the foot on the standing leg; (2) while the torso and limbs reach forward and upward into the Kinesphere, maintain core support and shifting of the torso over the standing leg to allow the gesture leg enough range of motion to extend back; (3) maintain lateral foot and ankle stability while keeping toes relaxed; (4) execute

[4] A *plié arabesque* is a position of the body supported on one bent leg, while the other leg is extended behind the body with the knee straight.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

simultaneous flexion of hip, knee, and ankle joints in order to employ efficient bone rhythms of the standing leg so the movement of the gesture leg will cause the center of gravity to shift forward and up in opposition to the gesture leg (Laws and Francis, 2002); and (5) increase depth of *plié* all while relating aesthetically to music and other artistic objectives. While this is a complex task, a "large amount of kinesiological information, which could otherwise take a long time to explain discursively, can be delivered concisely" through images that help facilitate this movement (Heiland and Rovetti, 2012). By knowing which images and image categories seem to best support the *plié arabesque*, we can begin to strengthen dance pedagogy for this skill and related movements. In this study, we explore three images that are deemed to improve *plié arabesques* to learn whether they seem to support expected outcomes and how various dancers relate to them. We chose to assess the characteristics described earlier in numbers 1, 4, and 5: the dancer's dynamic alignment while maintaining rotation; simultaneous flexion of the hip, knee, and ankle joints; and the depth of *plié*.

The purpose of this study of the *plié arabesque* was threefold. The main purpose was to discover which image seemed to best support consistent alignment in rotation; equal use of hip, knee, and ankle flexion; and full use of potential depth of *plié* during *plié arabesques* for this group of dancers. Second, we wanted to compare each dancer's anecdotal comments to their performance outcomes to learn if perceived success matches measured success. Third, we wanted to discern possible relationships between biographical data (years dancing), preferred learning styles (to be detailed later), and performance outcomes when using each of the three images and their respective image categories. We hypothesized that (1) There will be a significant advantage to one of the images over the others, even though an image may support improvement of some aspects of the *plié arabesque*, but may not support improvement of all aspects of the *plié arabesque*; (2) Dancers' perceived success with images might not match outcomes; and (3) Affinities will be found between imagery outcomes and biographical data such as (a) preferred learning styles, (b) imagery ability, and (c) years of experience.

METHOD

We chose to study the *plié arabesque* because dancers are readily familiar with this essential dance skill, and it requires rather complex coordination of equal spatial pulls in each of the coronal, sagittal, and horizontal planes requiring dancers to modulate their energy use and their core stability and mobility. We chose three Franklin Method images that are hypothesized to support the *plié arabesque*. Because dancers all move differently and experience movement cues

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

differently based on, at least, their anatomy, dance training, and personal understanding of their embodied experiences, we chose to cross-reference our evaluation of the qualities of the *plié arabesque*s with learning style preferences and biographical data. We purposely chose images that are delivered using three approaches: Visual, Verbal, and Tactile, so we could examine the images, the modes of delivery and receipt, and the dancers' preferred images in relation to the performance outcomes. Although Visual, Auditory, and Kinesthetic learning styles surveys have shown variable reliability, there are at least two surveys that may help illuminate effectiveness of Visual, Auditory, and Kinesthetic imagery experiences (Coffield et al., 2004). Because much controversy exists over the accuracy of learning style screens, we screened dancers using two learning style preference questionnaires based on the Dunn and Dunn model (Dunn, Dunn, and Price, 1984), the Visual-Auditory-Kinesthetic (VAK) Learning Styles Inventory (Clark, 2004) and Visual-Aural-Read/Write-Kinesthetic (VARK) Learning Styles Inventory (Fleming and Mills, 1992). We used the Revised Movement Imagery Questionnaire (MIQ-R) (Hall and Martin, 1997)—an established imagery ability screening questionnaire—to evaluate participants' abilities to "See" (Visual imagery) and "Feel" (Kinesthetic imagery) images and possibly also shed light on dancers' affinities with imagery.

Imagery Types and Classifications Used in This Study

Kim, Singer, and Tennant (1998) describe Visual imagery as where your mind's eye actually sees you completing a task. Visual imagery is an "associative mediator that provides spatially parallel information that can mediate overt responses without necessarily being consciously experienced as a visual image (Paivio, 1971, 135-136)." Auditory imagery refers to a mental construction of an event based on what was heard (Vealey and Walter, 1993). Tactile imagery refers to the sensation of touch that was provided to guide alignment and dynamic alignment so that it ingrains the new alignment in the nervous system and the dancer can repeat the re-patterned movement alone (Franklin, 1996b).

In this study, we explored the image types from these classifications: general type of image (anatomical, metaphorical, biomechanical, kinematic, kinetic), mode of delivery (visual, verbal, tactile), mode of receipt (see, hear, feel), direct or indirect, spatial location, and, as per the MIQ-R, whether seeing or feeling seems more predominate for that image. See Table 1 for images and their respective classifications. For the Visual image (see Figure 1), which is direct, local, proximal, internal, anatomical, and kinematic, we used a three-dimensional pelvic half and femur to depict an anatomical and kinematic image of the bone rhythms of a *plié arabesque*. The half pelvis and femur used is anatomically equivalent to, or reflects the anatomical fact or movement of, the

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

dancer's own body through a Visual representation outside the dancer (Franklin, 2004, p. 97). For the Verbal image, which is indirect, local, distal, external, and metaphorical, we used the phrase, "Flowing chocolate is spreading outwardly from your standing foot as you do a *plié arabesque*" (the image of chocolate is an unpublished metaphorical image suggested by Franklin for improving the *plié arabesque*). If a participant indicated a distaste for chocolate, we used the substitute image of "flowing massage oil" instead. For simplicity, we use the word "chocolate" from here on to represent either substance. A metaphorical image, such as chocolate, bears no relation to human anatomy, but is intended to assist a movement process or coordination. For the Tactile image, which is direct, local, proximal, external, anatomical-biomechanical and kinetic, a Level 2 Franklin Method practitioner used touch to manually guide the bone rhythm relationships of the femur and pelvis on the standing leg side of each dancer (see Figure 1) (Franklin, 1996, p. 232). This direct, local, proximal, and external image is intended to be felt and experienced kinesthetically.

A multiple-baseline-across-subjects design was chosen as an appropriate method to investigate the research questions. Wollman states that effects or non-effects of imagery on motor performance can be more clearly demonstrated using single subject designs over group designs (1986).

Participants

We invited a group of 30 college dance majors to volunteer in exchange for extra credit in a dance class. Eighteen female dancers, all of whom knew how to perform a *plié arabesque*, volunteered. All participants were intermediate level dancers. Before beginning the study, participants gave informed consent and completed biographical intake forms, self-assessment and biographical survey tools, and two learning style preference questionnaires based on the Dunn and Dunn model (1984) to gain better understanding of participants' perceived, affined, learning approaches.

Procedure

On three separate visits, set apart by two-week intervals, participants were asked to stand in a comfortable rotated first position on linoleum marked with angles of rotation so that, during each visit, participants would perform using the same degree of leg rotation. Participants were asked to perform the *plié arabesque* on their less-stable standing leg, upon which we placed markers on the anterior superior iliac spine, patella, and anterior crease at the center of the ankle.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

Table 1 Classification of imagery used in this study.

Description of intervention	**BONES**: Researcher shows the anatomical bone rhythms of *plié arabesque* using a half pelvis and femur to indicate increased rotation of pelvis in sagittal/ horizontal planes and increased rotation of femur in horizontal/coronal planes during deepening of *plié* and the opposite while straightening.*	**CHOCOLATE:** Researcher verbalizes a metaphor, the image of, "Chocolate (or oil) spreading outwardly from the foot" during *plié arabesque.* *	**TACTILE**: Practitioner gives tactile aid guiding movement of bone rhythms of pelvis and femur during *plié arabesque* to indicate increased rotation of pelvis in sagittal/horizontal planes and increased rotation of femur in horizontal/coronal planes during deepening of *plié* and the opposite while straightening.*
Type of image	Anatomical[‡] & kinematic*	Metaphorical[†]	Anatomical-biomechanical* & kinetic*
Primary mode of delivery	Visual	Verbal	Tactile
Primary mode of receipt	Visual/see	Auditory/hear	Kinesthetic/feel
Direct or indirect	Direct[†]	Indirect[†]	Direct[†]
Spatial location	Local,[¶] proximal [§] and internal[§]	Local,[¶] distal,[§] and external[§]	Local,[¶] proximal,[§] and external[§]
MIQ-R survey: See or Feel**	See**	See and feel**	Feel**
Possible perceptions induced by the image intervention	Proprioceptive sensation in the hip socket of the joint kinematics. Clarity or confusion about anatomy and relationship to movement.	Proprioceptive responses may be related to smooth, flowing melted chocolate or to slippery or sticky chocolate/oil. Olfactory, gustatory, and/or somatosensory. Metaphor may or may not affine with actions needed to achieve desired movement.	Kinesthetic sensations may indicate kinematics in relation to space and, thus, kinematic function of movement. Tension or flow could arise from practitioner touching participant. Dancer may or may not experience relationship between movement and touch.

* Franklin (1996b), [†] Paivio (1971), [‡] Dowd (1990), [§] Laban Bartenieff Movement Analysis, see Hackney (2007), [¶] Hanrahan and Salmela (1990), ** Hall and Martin (1997).

Figure 1 Protocols for Visual and Tactile delivery. Left: Researcher displayed a Visual bone model and visually demonstrated movement. Right: Researcher touched participant to provide Tactile guidance, as shown.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

Mini-digital video cameras (Sony DCR-H38) were placed directly in front of the participant and at the angle of rotation so that the alignment of the knee, foot, and ankle could be captured. The front camera was placed at waist height and the side camera was placed at the hip (see Figure 2). Participants were asked to perform in ¾ meter to a metronome set at 114 bpm, with a three counts to perform the *plié arabesque* and three to return to standing on two feet. After a warm up, participants were asked to perform five *plié arabesque*s trials from which we could acquire a baseline for that day.

Figure 2 Participants performing *plié arabesques* wearing markers used for analysis.

Following the baseline trials, participants were given one of the image interventions and were asked to perform the *plié arabesque* seven more times with the intervention in mind. The order of presentation of the three images over the course of the study was randomized for each participant. The details of the image presentation are as follows: (1) The Visual image of pelvic half and femur was used to demonstrate the bone rhythms of the *plié arabesque*. Some verbal information was used to put the bones into context with the movement regarding the pelvis and femur having three-dimensional bone rhythms in opposing directions during the downward and upward cycles of the *plié*. Following the introductory information during which participants were asked to place their hands on their own femurs, a skeletal half-pelvis and femur were displayed so participants could observe the bone rhythms on the downward and upward cycles of the *plié arabesque*. (2) The Verbal chocolate image was recited by the researchers from a script, "Imagine warm melted chocolate flowing outwardly from your standing foot as you do the *plié arabesque*." (3) The Tactile bone rhythm image was delivered in silence by a level two Franklin Method practitioner, using touch with one hand placed on the thigh, rotating the femur

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

outwardly, and the second hand on the iliacus, rotating the pelvis forward and medially during the downward cycle of the *plié*; the reverse was guided on the return. After each image was presented, the participant was asked to perform seven more times while keeping the image in mind even though the image intervention was no longer presented by the researcher (See Table 1 for descriptions and classifications of images). When all three visits were complete, each participant was asked to qualitatively compare and contrast the interventions and rate them from best to worst regarding perceived success. See Figure 3 for a timeline of the protocol for the study.

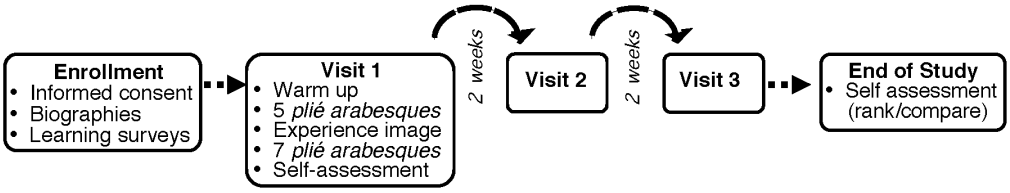

Figure 3 Timeline of the protocol for the study.

Imagery assessments

Two evaluators working independently of each other rated each *plié arabesque* on a Likert-type scale from 1 to 5 (5 being best) for the following three technical aspects of a *plié arabesque*: (1) maintaining rotation, (from here on called Rotation); (2) simultaneous use of hip, knee, and ankle joint to execute the *plié* (from here on called Tri-fold); and (3) depth of *plié* (from here on called *Plié*). It is important to note that while all three factors were rated by achievement, the *Plié* differed slightly due to limitations of anatomical structures involved in this action. *Plié* was measured purely on change in level and, hence, measures of *Plié* were not judged across participants. Likert-type ratings that differed by an interval greater than 1 were rechecked. A total of 572 *plié arabesques* were rechecked to confirm accuracy of original scores, and 340 scores (8.7% of the total) were revised.

RESULTS

Data Handling

The evaluation of participants' movement considered three categories of movement: (1) Rotation, (2) Tri-fold, and (3) *Plié*. *Plié arabesques* were performed for five trials before an image exposure, and seven times after the image exposure. Three image conditions (Visual, Verbal, and Tactile) were explored. Each trial was rated twice by two independent raters, and each rater

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

considered three categories of movement (Rotation, Tri-fold, and *Plié)*. The theoretical total number of raw rating scores is 3,888 ((5 Baseline trials + 7 Treatment trials) x 3 images x 3 movements x 18 participants x 2 raters); however, 120 rating scores from 20 separate trials were missing, resulting in an actual total number of 3,768 ratings (1,884 rated trials for each rater).

A test of inter-rater reliability was conducted by calculating Cronbach's alpha for the correlation between the two raters' raw scores for all individual ratings. Inter-rater reliability was good (Cronbach's alpha = 0.8449). A slight bias existed between the two raters, with the raw scores from Rater 1 being 0.22 greater than Rater 2 on average; however, no unusual patterns were found. Given the acceptable inter-rater reliability of the raw rating scores and the within-subject within-treatment control design, the raw ratings were first averaged over both raters and over all trials, so that for each image intervention, each subject had a single average pre-image score and a single average post-image score. Finally, the pre-intervention average was subtracted from the post-intervention average, to produce a "change in rating" for each subject and image condition. These were the values used in the statistical data analysis. There are 162 total "change in rating" values to consider (3 images x 3 movement x 18 participants).

Despite the ordinal nature of the original Likert-scale raw data, the averaging process yields an analysis dataset that is approximately normally distributed ($p = 0.45$, Anderson-Darling Test for Normality), and standard parametric statistical techniques are appropriate. Individual statistical test methods are described where used. A significance level of alpha = 0.05 was assumed. We note here that formal corrections in p-values for multiple testing were not made, and remind the reader that this was an exploratory study with a small sample size, with general overall trends being of greatest interest.

Baseline measures

At the beginning of each visit, participants performed five *plié arabesques* before being exposed to imagery, and the associated ratings may be considered baseline measurements for the respective visits. The mean rating scores before each image exposure are given in Table 2. While the pre-image rating from the first visit for each participant was indeed a naïve measurement, subsequent ratings may have been affected by prior intervention, even though two weeks had elapsed between each visit. A one-way ANOVA was conducted on the mean pre-image ratings (independently for each movement measure). No significant changes were observed (statistical results not shown), and we conclude the baselines were stable over time and may adequately serve as within-subject within-image controls.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

Table 2 Mean scores for Rotation, Tri-fold, and *Plié* measures, by imagery mode.

Measure	Imagery Mode	Mean (SE) Rating			Test for Significance	
		Pre	Post	Change	*t*	*P*
Rotation	Visual	3.378 (0.13)	3.891 (0.11)	0.513 (0.13)	3.99	0.001**
	Verbal	3.344 (0.16)	3.687 (0.14)	0.342 (0.16)	2.08	0.053
	Tactile	3.322 (0.17)	3.671 (0.16)	0.348 (0.12)	2.81	0.012*
			Test for difference among images		***F* = 0.48**	**0.622**
Tri-fold	Visual	3.089 (0.21)	3.707 (0.18)	0.618 (0.11)	5.59	<0.001**
	Verbal	3.089 (0.20)	3.520 (0.20)	0.431 (0.10)	4.46	<0.001**
	Tactile	2.678 (0.22)	3.015 (0.25)	0.337 (0.13)	2.59	0.019*
			Test for difference among images		***F* = 1.60**	**0.212**
***Plié* Depth**	Visual	2.983 (0.21)	3.558 (0.16)	0.574 (0.11)	5.38	<0.001**
	Verbal	3.083 (0.19)	3.262 (0.22)	0.179 (0.10)	1.83	0.085
	Tactile	2.861 (0.122)	3.001 (0.21)	0.139 (0.07)	1.90	0.075
			Test for difference among images		***F* = 6.60**	**0.003***

*p .< .05, **p < .01. SE = Standard Error of the Mean.
Each mean is based on rater- and trial-averaged scores for n = 18 participants
p-values are not adjusted for multiple comparisons

Effect of Imagery Mode

Table 2 and Figures 4, 5, and 6 summarize the mean ratings before and after each image for each movement measure, as well as the associated change in rating score. The results suggest that, generally, Rotation, Tri-fold, and *Plié* were all improved after image exposure (Figure 5). All images produced positive changes in average ratings, ranging from 0.139 to 0.618 higher than pre-image ratings (Figures 3 and 4). Out of 162 averaged individual ratings (3 Images x 3 Movements x 18 Participants), 130 increased after image exposure.

Student's t-test was used to assess whether the changes in ratings (Table 2) were significantly different than zero (thereby indicating that the associated image had an impact). For Rotation, the Visual and Tactile modes produced significant positive improvements (and the Verbal mode was marginally significant), with the Visual mode yielding the largest improvement effect with the mean rating being 0.513 higher after the intervention ($p = 0.001$). For the Tri-fold score, all three imagery modes seemed to produce significant increases in rating ($p < .01$), again with Visual producing the largest improvement, with the mean rating being 0.618 higher after exposure ($p < 0.001$). For the *Plié* score, only the Visual mode seemed to produce significant increases in rating, with an average increase in rating of 0.574 ($p < 0.001$). Overall, the general trend is that the Tri-fold movement measure was most responsive to imagery intervention, and the Visual mode was the most effective of the three.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

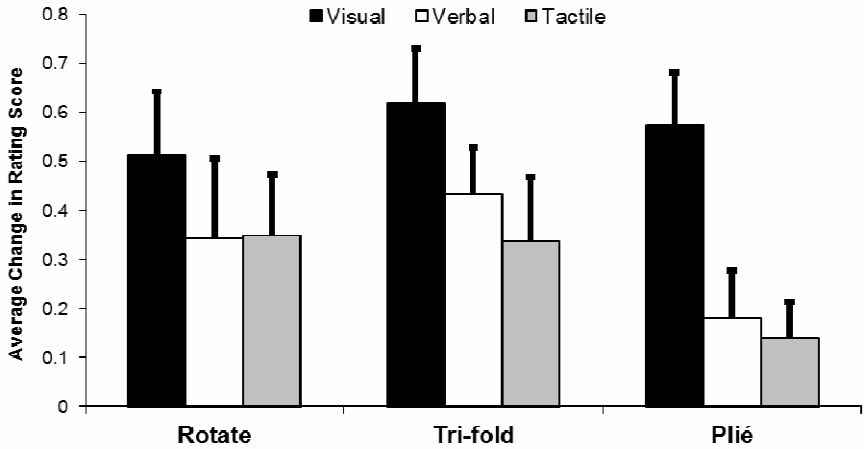

Figure 4 Mean (SE) change in rating, grouped by aspect of technique.

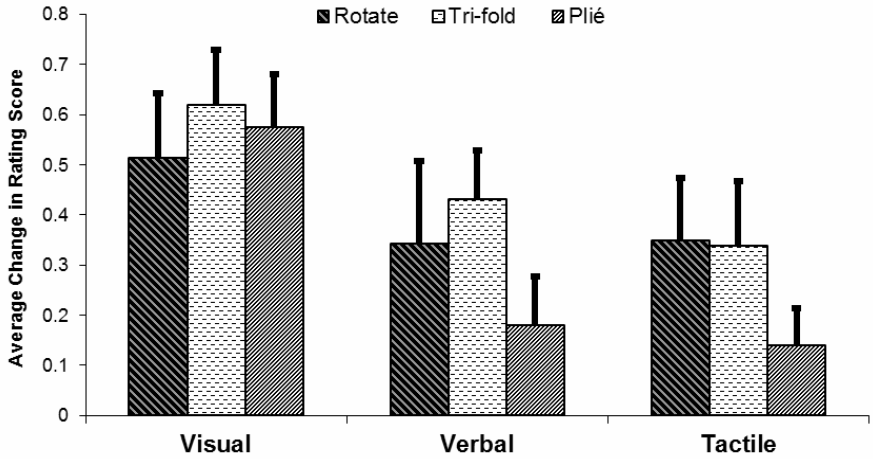

Figure 5 Mean (SE) change in rating, grouped by imagery intervention.

One-way ANOVAs within each movement aspect were performed as a secondary check on whether the three imagery modalities had a statistically significant differential effect on the change scores. The results (Table 2) suggest there are no strong differences between the modalities (i.e., no one imagery mode performed significantly better or worse than the others) for the Rotation ($p = 0.622$) or Tri-fold ($p = 0.212$) movements. (This does not mean the images did not have an effect, only that all three images had roughly the same effect). For *Plié* there was a significant difference between the three images ($p = 0.003$); as noted above, for this movement measure the Visual mode had a noticeably stronger positive effect.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

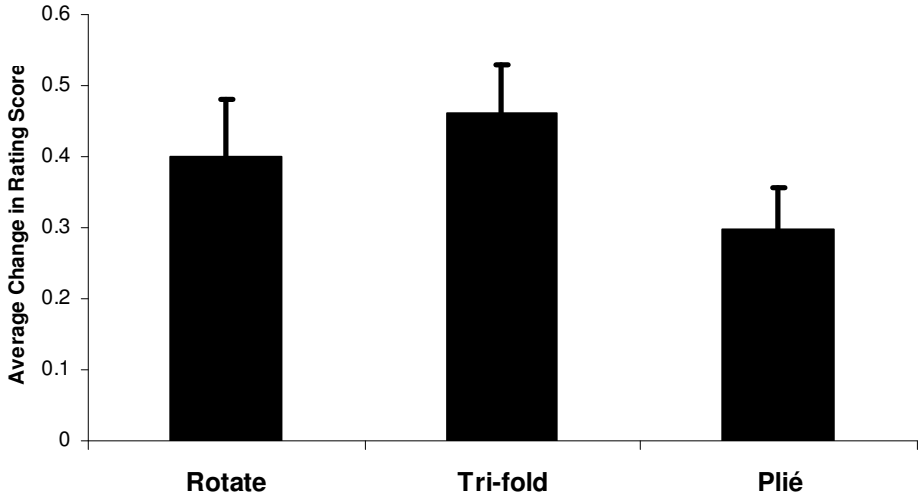

Figure 6 Mean (SE) change scores for aspects of technique, all interventions combined.

Apart from the statistical significance of these results, we make note of the sizes of the increases themselves (the "effect sizes"). Taking as an illustrative example the Rotation movement before and after the Visual modality, the mean Likert score ratings increased by roughly 0.5 (from 3.4 to 3.9 on a scale from 1 to 5). To put this in perspective, a hypothetical participant who received a rating of 4.0 before that intervention is at the 82nd percentile for her group (based on empirical ranking), but receiving that same score *after* the intervention places that participant at only the 53rd percentile. Thus the increase in score is noticeable in terms of real change in the assessed quality of that dance movement and its subsequent value to the researcher. (In general, those comparisons that yield a significant p-value are also those that have a notable effect size.)

As stated in the methodology, formal corrections for multiple comparisons were not made for this exploratory study, but we note that even a conservative Bonferroni correction would not significantly change the interpretation of the t-test outcomes in Table 2.

Correlation to learning style subscores: VAK, VARK, MIQ-R

For each modality, we tested whether the change in ratings for Rotation, Tri-fold, and *Plié* correlated with the VAK, VARK, or MIQ-R subscores, following each corresponding modality, as listed in Table C. For example, we compared the VAK and VARK Auditory subscores to the change values following the Verbal intervention, and the "See" subscores of the MIQ-R were compared to the change values for the Visual and Verbal modes.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

Spearman's rank correlation was used to assess all correlations. Table 4 lists the correlation coefficients for each relevant comparison according to the theoretical scheme in Table 3. While no single comparison can provide definitive evidence of a direct relationship, we note several trends that paint an overall picture of the relationship between image effectiveness (as measured by increase in average rating) and scores on learning style. In particular, the VARK Visual subscores appears to correlate positively with effectiveness of the Verbal delivery mode; participants who responded well to the Verbal mode also tended to score higher on the Visual portion of the VARK survey. The VARK Visual subscore also trended negatively when compared to the response to the Visual mode, although the relationship is not as strong. The VARK Kinesthetic subscores negatively correlated with various movement aspects following the Tactile mode; participants who responded well to the Tactile image tended to score lower on this portion of the VARK survey.

Table 3 Subscores from each learning style test used to correlate to mode of delivery.

Primary mode of delivery	Primary mode of receipt	Intervention subscores checked for correlation with aspects of these surveys		
		VAK	VARK	MIQ-R
Visual	Visual/See	Auditory & Visual	Auditory & Visual	See
Verbal	Auditory/Hear	Auditory & Visual	Auditory & Visual	See & Feel
Tactile	Kinesthetic/Feel	Kinesthetic	Kinesthetic	Feel

Both the "Feel" and "See" subscores of the MIQ-R survey appear to trend positively overall with the effectiveness of the Verbal (Chocolate) image. As laid out in Table 3, we expected this image to relate to aspects of Auditory and Visual learning. Indeed, a Combined MIQ-R score, generated by adding together the Feel and See subscores, showed a very strong positive relationship to the Chocolate image. As noted by Monsma et al. (2009), the two subscores are not necessarily measuring mutually exclusive concepts; a high subscore on both scales may indicate an overall high ability to respond to imagery in general.

Overall, we observed the following: Those who responded well to the Verbal (Chocolate) image appeared to score higher on the VARK Visual survey as well as the combined MIQ-R survey. There was a weak trend for participants responding well to the Visual (Bones) image to score lower on the VARK Visual and Auditory scales. Those who responded to the Tactile (Kinesthetic) image generally scored lower on the VARK Kinesthetic scale. No conclusive patterns or relationships were observed with the VAK survey.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

Table 4 Correlation coefficients between change scores and corresponding VAK, VARK, MIQ-R subscores, and years of experience, for the Rotation, Tri-fold, and *Plié* measures.

	VAK			VARK			MIQ-R			
	Visual	**Auditory**	**Kinesthetic**	**Visual**	**Auditory**	**Kinesthetic**	**See**	**Feel**	**Combined**	**Years Experience**
Visual Rotation	-0.09	0.00	--	0.00	-0.10	--	-0.04	--	--	0.09
Visual Tri-fold	-0.16	0.22	--	**-0.45 ***	-0.18	--	-0.04	--	--	-0.13
Visual *Plié*	-0.02	0.04	--	-0.26	-0.03	--	0.07	--	--	**-0.51 ****
Visual Combined	-0.26	0.09	--	-0.25	-0.14	--	-0.15	--	--	-0.08
Verbal Rotation	0.22	-0.37	--	0.34	-0.27	--	**0.42 ***	0.37	**0.59*****	-0.13
Verbal Tri-fold	0.04	0.07	--	**0.45 ***	-0.02	--	0.13	**0.42 ***	**0.45****	0.13
Verbal *Plié*	0.23	-0.08	--	**0.48 ****	-0.10	--	0.11	0.16	0.20	-0.02
Verbal Combined	0.19	-0.25	--	**0.46 ***	-0.13	--	0.40	**0.46 ***	**0.61*****	-0.13
Tactile Rotation	--	--	0.12	--	--	0.11	--	-0.05	--	0.15
Tactile Tri-fold	--	--	-0.21	--	--	**-0.39 ***	--	0.15	--	0.13
Tactile *Plié*	--	--	-0.18	--	--	**-0.48 ****	--	0.15	--	0.08
Tactile Combined	--	--	-0.14	--	--	**-0.34 *****	--	0.07	--	0.15

*p. < .10, **p < .05, ***p< .01
p-values are not adjusted for multiple comparisons

Correlation to years of experience dancing

Correlations were computed between change scores for all movements and the years of experience dancing for each participant (Table D). There was a moderate negative correlation ($r = -0.51$, $p = 0.029$) between *plié* depth and length of experience following the Visual intervention so that participants with more experience had smaller improvements following the imagery delivered and experienced visually. The remaining images did not correlate strongly with this covariate. Given the number of comparisons made, we do not conclude that length of experience correlates with the effects of the imagery.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

Comparing quantitative outcomes with qualitative data

Participants were asked to rank each image modality according to their perceived level of success; concurrently, the raters ranked the images for each participant on the basis of improvement as evidenced by the change in scores. By comparing participants' affective experiences with their performance outcomes, we expected to find affinities between the two, but more often we did not. A chi-square test of association between student rankings and rater rankings did not reveal any significant correlation ($c^2 = 1.54$, df = 4, p = 0.819).

While participants' anecdotal experiences often did not match performance outcomes, there may have been aspects of the aesthetic and physical design of the *plié arabesque* that did improve that we had not evaluated, such as aspects mentioned earlier: (2) torso and limbs reach forward and upward into the Kinesphere, maintain core support and shifting of the torso over the standing leg to allow the gesture leg enough range of motion to extend; (3) maintain lateral foot and ankle stability while keeping toes relaxed; and (4) … movement of the gesture leg will cause the center of gravity to shift forward and up in opposition to the gesture leg. We offer highlights of comparisons between quantitative and qualitative data to hypothesize that participants' perceptions upon image application may reveal experiences that may be unrelated to goals intended by the chosen images.

Visual, which offered the best performance outcomes: Nine of the 18 participants performed best when imaging with the Visual mode, but only 3 of those 9 stated that they felt their *plié arabesques* went well while imaging Bones. Robin, who ranked the Visual mode as the best, and performed best with the image, said, "I felt by actually seeing the bones in space, [this] allowed me to visualize my own bones in space. This really helped with my rotation." Four of the 9 participants that were most successful with Bones actually ranked it the worst. Janet, who performed best with the Bones intervention, said, "The bones did not help because the image seemed too minute to make a big impact on my execution. That image didn't provide me with the complete force I needed to stabilize." Karen, who performed best with the Visual mode, but ranked it worst, said, "The Bones image was interesting, but it was hard for me to do what [I saw] the bones had been doing." Two of the participants who did not perform well with Bones actually said it was their favorite.

Verbal: Five of the participants performed best when receiving the Verbal intervention, but only 2 of those 5 felt it helped them. The other 3 ranked it in second place. Surprisingly, 4 participants that performed their worst with the Verbal mode rated it best. Clearly something positive happened while imaging Chocolate, but it was not related to the three aspects of technique that the researchers studied. Peggy, who had extremely high baselines, improved even

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

more with this mode, but dropped way down for Visual and Tactile. She spoke highly of the Chocolate image, but did not care for the other images, "The chocolate imagery [was] the best … [T]he flowing chocolate image helped my muscles and joints flow and make smooth movements through my body. When my movements are smooth, I feel more stable and strong." Keisha was also accurate about her Chocolate experience. She said, "The chocolate had a negative effect on me because it caused me to have a feeling of meltiness and ooziness. I felt I would slip on it." It was her least favorite and she performed worst with it.

Tactile: Four of the participants performed best when receiving the Tactile intervention, which was ironic because they scored lower on the MIQ-R "Feel" subscore. Only 2 of the 4 stated that they felt their *plié arabesques* fared well with the Tactile image. The other 2 actually ranked it their worst. Only 1 other participant, for a total of 3, preferred the Tactile image the most. One of her Tactile sessions was her second best set of *plié arabesques* overall.

It is important to note that only Joanne and Peggy performed relatively high baseline measures, and Joanne managed to improve with all three images, but Peggy only with the Visual. The Tactile image was used during Joanne's best *plié arabesques*, with twice as much improvement with Tactile as other participants using Tactile. Joanne scored almost the same on the MIQ-R "Feel" and "See" subscores, 20 and 21 respectively, so those scores did not match her performance outcomes with images in this study. As we stated earlier, statistical analysis revealed no correlation between the MIQ-R subscore of "Feel" and the Tactile image. This relationship was corroborated by comments made by the 5 participants with higher "Feel" scores. Their qualitative experiences and their performance outcomes with the Tactile image were almost all lower than with Visual and Verbal. Samantha, who scored slightly higher on the "Feel" subscore, was not able to apply the Tactile information. She said, "The touch helped me the least because I didn't have anything to visualize." Possibly Samantha works better with "seeing" than "feeling" after all. Maybe the MIQ-R survey could be repeated a few times to test accuracy of Samantha's self-scoring. Nicole, who also scored lower on the MIQ-R "Feel" subscore actually performed best during the Tactile image, and she remarked that she had excelled with it. She said, "The touching image worked the best […] I felt more stable without any gripping in my body, and more connected to the floor."

While the MIQ-R scores did not match outcomes, the scores we applied to performance outcomes did match participants' perceptions a bit better. Overall, 7 participants ranked their perceived success with the three images in the same order that we rated their performance outcomes. Five participants ranked all 3 of the images differently than we ranked performance outcomes. Six participants matched 2 out of 3 images the same as we did. This incidental information reveals these participants' impressions of which images seemed to support them do not

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

always match their performance outcomes. We can only speculate that this discrepancy could be due to proprioceptive feedback bringing up self-judgment due to questions about unfamiliar control, or to the possibility that the 7 participants whose self-assessment matched ours may actually be better at self-assessment.

DISCUSSION

This study set out to examine which images and image categories seem to best support the *plié arabesque* with these college dancers to provide a knowledge-base that might contribute to scientific support of imagery application in dance pedagogy. We had expected that there would be a significant advantage to one of the images over the others. While all three images were statistically significant overall, the Visual (Bones) image seemed to have the most efficacy toward improvement of the *plié arabesques*. Various technical aspects of the *plié arabesque* were facilitated by each image; hence, each image could prove useful for aiming to achieve different technical goals. For Rotation, the Visual and Tactile images were most successful. For the *Plié*, only the Visual image seemed to support significant increases in ratings. For the Tri-fold action, all three images seemed to produce significant improvement, again with the Visual image facilitating the greatest improvement. The Tri-fold aspect of the *plié arabesque* responded most readily to imagery in general, so it is possible that either these participants needed more improvement in this aspect of their technique, or any of the three images can be used to improve this aspect of a *plié arabesque*.

It is important to note that the more successful images, Visual and Tactile, do share characteristic relationships. The Visual image (which is anatomical and kinematic) and the Tactile image (which is an anatomical-biomechanical and kinetic) are both anatomical and direct images that may be applied without much translation from image to movement. Meanwhile, the Verbal directive to imagine Chocolate (which is a metaphorical, indirect image received auditorily) may require a more complex translation for application to movement. We had expected that participants' perceived success with images might not match performance outcomes. We found this hypothesis to be true most of the time, but participants were more accurate with assessing their lack of improvement than their successes. The spoken metaphor of Chocolate resulted in remarkably deceiving experiences for 78% of the participants, with 60% of those who had improved believing they had gotten worse, and 100% of those who had gotten worse believing they had improved. It is possible that these dancers may experience the metaphor clearly in their minds, but may not be able to assess whether the Chocolate metaphor helped improve performance of the *plié arabesque*. It seems incongruous that participants rated the Verbal (Chocolate) image highest, and yet it was least successful of the three images. It is quite possible that some positive sensory,

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

emotional, or imagined experience was happening that was unrelated to the technical aspects being studied. As was noted earlier by Lewis, "Franklin believes external sensory images coupled with metaphor tend to work best with children, while internal, literal and kinesthetic images are effective with adults (2009, 56)." In the case of these college dancers, these findings are consistent. The sensory image of the Chocolate did not work as well with these dancers. The Internal, Anatomical, and Kinesthetic images were far more successful.

We had expected that we would find relationships between effects of imagery and biographical data such as preferred learning styles, imagery ability, and experience dancing. We did find some correlation between the Verbal image and the Visual learning style on the VARK survey. Chocolate also correlated with both the "See" and "Feel" subscores of the MIQ-R. The Bones image correlated only between *Plié* and experience. The Tactile image correlated only with the Kinesthetic learning style preference of the VARK. While this exploration was interesting, it does not lend enough quantitative or qualitative significance to offer assistance to dance teachers when choosing an image for a particular dancer based on student profiles. Also, the efficacy of learning style survey instruments has yet to be proven. Because the VARK learning style tool seems to be more affined with these college dancers' performance outcomes, the VARK seems to be the more accurate tool to use with these college dancers. A survey tool under development by Dominic Cunliffe that includes the factor of age-related learning preferences may prove useful in researching learning style preferences for dancers by age group.

The current study is not without limitations. While there can be no direct cause-effect relationships in human studies—and dancers do attend many classes that will influence their performance—images did seem to have an influence on increasing performance outcomes of dancers' *plié arabesques*. If it is true that an imagery intervention can be deemed successful if it creates a desired change or shifts toward improving an experience, then Visual (Bones) and Tactile images seem to have been successful most of the time and the Metaphor (Chocolate) image some of the time. Improvements in ratings were achieved for all three factors of technique following each image exposure. The comparisons between mean scores of the three image types revealed notable effects that met statistical significance. The outcomes of this study might never replicate in other similar populations, as all people are different and all studio and teaching-learning situations have their own qualities that effect outcomes. Any generalizations about populations outside the study should be avoided. Studies of more varied populations might reveal relationships that this study could not.

At the beginning of each visit, participants performed five *plié arabesques* before the exposure to imagery, and the associated ratings may be considered baseline measurements for the respective visits. The baseline ratings did not substantially change over the course of the three visits (approximately four

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

weeks), and the study was constructed to measure the immediate effect of image exposure given during a visit. Despite the stability of these controls, we note that this exploratory study was not specifically designed to measure long-term alterations in performance or rule out various experimental effects. We acknowledge that a follow-up study would benefit from including a no-image control group, and introducing an unfavorable image would serve as a negative control. This study looked at immediate outcomes of interventions. While a dancer's technique is malleable day-to-day due to the changing experiences of human motor activity, long-term biomechanical efficiency in dance technique would seem to be the potential goal and possible outcome of successful image applications. Future studies might examine how images affect technique over time by using a repeated measures design with a treatment group and a control group to assess how fast and how much improvement is occurring, and whether or not change is being maintained due to imagery application.

Considerations for Teaching using Imagery

This study provides a small, substantive foundation of dance imagery pedagogy. It supports groundwork that Franklin has laid for the pedagogical application of dance imagery and that Hanrahan and Salmela (1990), Krasnow et al. (1997), Hanrahan and Vergeer (2000-01), Heiland and Rovetti (2012), and Bolles and Chatfield (2009) have provided in their empirical studies. Certainly, it is impossible to study every potential image with every essential dance movement from all styles of dance, but we can provide themes based on evidence. Visual, Direct, Kinesthetic, and Anatomical image categories may be the optimal imagery categories to choose from when supporting dancers with profiles similar to those in this study. Also, these same image categories may be optimal choices for generally supporting *plié arabesques* or similar movements. We do know, however, that all three images yielded some level of improvement, and that the Visual image worked best for this group of dancers. Trying it on other college dancers, younger dancers, and professionals would be the next steps in establishing theoretical relationships.

If teachers need imagery to encourage a more uniform activation of all three joints in their students' *plié arabesques*, they can try any of the three image interventions because all three proved to be successful. If increased control over outward rotation is desired, the Visual and Tactile images will likely be more successful at offering support toward maintaining rotation, although the Verbal image did show some improvement as well (note: some participants imagined the ground to be slippery when they imagined Chocolate, and they lost control, while others felt calmer and more controlled due to the flowing quality). For dancers needing fuller use of their *pliés*, the Visual image depicting the rhythm of pelvic

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

half and femur seems to be the best tool for accessing the full range of motion into the fullest range of the *plié*. Overall, the Visual image resulted in higher ratings for all three aspects of the *plié arabesque*, so dance teachers might explore this image with students first and bring in the Chocolate and Tactile approaches later to round out approaches to learning styles. The Visual and Tactile images both require an informed instructor that understands the kinesiology of the bone rhythms of a *plié*, and the Tactile image requires some prior practice with guiding this movement. Certainly dancers can explore metaphorical images, such as Chocolate, without any assistance or instruction, and if their experiences align with the research participants, then Chocolate will help them gain more fluid use of joints and some improvement in rotation.

While it seems logical at first to match an imagery approach to a dancer's preferred learning style (for example, using a Visual image with a student that is a double major in dance and visual art), the matching of imagery choices to learning style preferences may limit a dancer's breadth of approaches to learning, and hence limit performance. For quick, short-term results, one can hypothesize that teachers might do well to offer images that match a student's learning style preference, but for more holistic, long term learning for breadth, it seems logical to offer a wide variety of images from a range of learning styles. Substantial research on learning styles surveys and dance imagery is needed to prove these conjectures. This study revealed that dance teachers would be wise to inform students when they see that particular images are, or are not, helping students improve because students self-assessments of their efficacy may be hampered due to affects of proprioception and changes in coordination.

In summary, this study looked at the changes brought about by immediate, proprioceptive awareness brought about by images and the dancers' abilities to negotiate those psychomotor experiences. It was predicted that there would be a significant advantage to one intervention over the others, yet each would display improvements in aspects of technique related to respective aspects of the images themselves. It was also predicted that participants would relate to images based on preferred learning style and self-assessment surveys conducted before the onset of the study. We learned that, while participants may respond differently to various images, it is possible that the actual skills within a dance movement can be examined and, hence, used to consider which imagery is more likely to improve dancer performance outcomes. While the scope of this study was to explore imagery among dancers, it is important to note that while none of the existing learning styles surveys have been adequately validated by prior research, the results of this study showed correlations between the VARK survey and Visual and Kinesthetic imagery effects. These correlations reveal that the VARK is possibly more accurate at predicting Visual and Kinesthetic learning style preferences, at least for dancers and images with which they are successful.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

REFERENCES

Alexander, F. (1932). *Constructive conscious control of the individual*. London: Methuen.

Bartenieff, I. (1965). *Effort-shape analysis of movement: The unity of expression and function*. Bronx, NY: Albert Einstein College of Medicine, Yeshiva University.

Bernard, A., Steinmuller, W., & Stricker, U. (2006). *Ideokinesis: A creative approach to human movement and body alignment*. Berkeley: North Atlantic Books.

Bolles, G., & Chatfield, S. J. (2009). The intersection of imagery ability, imagery use, and learning style: An exploratory study. *Journal of Dance Education*. *9*(1), 6–16.

Clark, B. (1963). *Let's enjoy sitting, standing, and walking*. Clark Manuals: Tempe, AZ.

Clark, B. (1968). *How to live in your axis—your vertical line*. Clark Manuals: Tempe, AZ.

Clark, B. (1975). *Body proportion needs depth—front to back*. Clark Manuals: Tempe, AZ.

Clark, D. R. *Learning styles and preferences: Instructional system design concept map*. (2004). Web. 1 Sept. 2007.

Coffield, F., Moseley, D., Hall, E., & Ecclestone, K. (2004). *Learning styles and pedagogy in post-16 learning. A systematic and critical review*. London: Learning and Skills Research Centre.

Cohen, B. Bainbridge (1979). *Basic muscle theory: Manual for a workshop in body/mind centering*. School for Body/Mind Centering.

Dowd, I. (1990). *Taking root to fly: Ten articles on functional anatomy*. Second Ed. New York, NY: Irene Dowd and Contact Collaborations.

Dunn, R., Dunn, K., & Price, G. E. (1984*). Learning style inventory.* Lawrence, KS, USA: Price Systems.

Eddy, M. (2009). A brief history of somatic practices and dance: Historical development of the field of somatic education and its relationship to dance. *Journal of Dance and Somatic Practices*. *1*(1), 5–27.

Feldenkrais, M. (1972). *Awareness through movement: Health exercises for personal growth*. New York: Pelican.

Fleming, N. D. & Mills, C. (1992). Not another inventory, rather a catalyst for reflection, *To Improve the Academy. 11*, 137–155.

Franklin, E. (1996a). *Dance imagery for technique and performance*. Champaign, IL: Human Kinetics.

Franklin, E. (1996b). *Dynamic alignment through imagery*. Champaign, IL: Human Kinetics.

Franklin, E. (2002, 2003). *Pelvic power*. Hightstown, NJ: Princeton Book Company.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

Franklin, E. (2003). *Conditioning for dancers*. Champaign, IL: Human Kinetics.

Franklin, E. (2008). *Applications of imagery with and without movement*. Teacher Training Certification Manual, Japan program.

Franklin, E. (no date). "Introducing imagery," *Franklin Method teacher training course, year one.* Course Binder. Boulder, CO: Institute Franklin Methode.

Hackney, P. (2007). *Making connections: Total body integration through Bartenieff Fundamentals*. New York: Taylor and Francis.

Hall, C. R., & Martin, K. A. (1997). Measuring movement imagery abilities: A revision of the movement imagery questionnaire. *Journal of Mental Imagery. 21*, 143–154.

Hall, N. D., & Fishburne, G. J. (2010). Mental imagery research in physical education, *Journal of Imagery Research in Sport and Physical Activity*. *5*(1), 3.

Hanrahan, C. (1995). Creating dance images: Basic principles for teachers. *Journal of Physical Education Recreation and Dance.* 33–39.

Hanrahan, C., & Salmela, J. (1990). Mental imagery as a facilitator in dance movement skills. *Contemporary Sports Psychology*; *Proceedings of the VI World Congress in Sport Psychology*. 131–141.

Hanrahan, C., & Vergeer, I. (2000–01). Multiple uses of mental imagery by professional modern dancers. *Imagination, Cognition and Personality. 20*(3), 231–255.

Heiland, T., & Rovetti, R. (2012). Examining effects of Franklin Method metaphorical and anatomical mental images on college dancers' jumping height. *Research in Dance Education*. DOI:10.1080/14647893.2012.712105.

Kim, J., Singer, R. N., & Tennant, L. K. (1998). Visual, auditory, and kinesthetic imagery on motor learning. *Journal of Human Movement Studies*. *34*(5), 187–210.

Kolb, D. A. (1999). *Learning style inventory, Version 3*. Boston, MA: Hay Group, Hay Resources Direct.

Krasnow, D. H., Chatfield, S. J., Barr, S., Jensen, J. L., & Dufek, J. S. (1997). Imagery and conditioning practices for dancers. *Dance Research Journal*. *29*(1), 43–64.

Laban, R. (1948). *Modern educational dance*. (Revised by L. Ullmann.). London: MacDonald & Evans.

Laban, R. (1950). *The mastery of movement on the stage*. London: MacDonald & Evans.

Laban, R. (1966). *Choreutics*. (Annotated and edited by L. Ullmann.). London: MacDonald & Evans.

Laban, R. (1984). *A vision of dynamic space*. (Compiled by Lisa Ullmann.). London and Philadelphia: Falmer Press in association with the Laban Archives.

Laban, R., & Lawrence, F. C. (1947). *Effort*. London: MacDonald and Evans.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM

Laws, K., & Francis, R. (2002). *Physics and the art of dance: Understanding movement*. Cary, NC: Oxford University Press.

Lewis, K. (2009). Imagine that! How age-appropriate imagery can enrich your teaching. *Dance Teacher*. *31*(5), 56–58.

McKenzie, A. D., & Howe, B. L. (1997). The effect of imagery on self-efficacy for a motor skill. *International Journal of Sport Psychology. 28,* 196–210.

Minton, S. (1991). Exploring the mind/body connection with imagery. *Kinesiology and Medicine for Dance. 14*(1), 68–76.

Minton, S. (1996). Assessment of the use of imagery in the dance classroom. *Impulse. 4*, 276–292.

Monsma, E. V., Short, S. E., Hall, C. R., Gregg, M. & Sullivan, P. (2009). Psychometric properties of the Revised Movement Imagery Questionnaire (MIQ-R). *Journal of Imagery Research in Sport and Physical Activity. 4*(1).

Overby, L. Y. (1990). The use of imagery by dance teachers—development and implementation of two research instruments. *Journal of Physical Education. 61*, 24–27.

Overby, L. Y., & Dunn, J. (2011). The history and research of dance imagery: Implications for Teachers. *Bulletin for Teachers*. *(3)*2, 9–11.

Paivio, A. (1971). *Imagery and verbal processes*. New York: Holt, Rhinehart, and Winston. 135–136.

Rolland, J. (1984). *Inside motion: An ideokinetic basis for movement education.* Urbana, IL: Rolland String Associates.

Skinner, J., David, B., Metcalf, S., & Wheeler, K. (1979). Notes on the Skinner Releasing Technique. *Contact Quarterly. Fall*, 8–13.

Sweigard, L. E. (1974). *Human movement potential: Its ideokinetic facilitation*. New York: Dodd, Mead & Co.

Todd, M. (1937). The thinking body: The balancing forces of dynamic man. New York, NY: Dance Horizons.

Todd, M. (1953). *The hidden you: What you are and what to do about it*? New York, NY: Dance Horizons.

Todd, M. (1977). *Early writings, 1920–1934*. Reprint. New York: Dance Horizons.

Vealey, R. S., & Walter, S. M. (1993). Imagery training for performance enhancement and personal growth, in J. M. Williams (Ed.) *Applied Sport Psychology: Personal Growth to Peak Performance*. Palo Alto, CA: Mayfield, 209–234.

Wollman, N. (1986). Research on imagery and motor performance: Three methodological suggestions. *Journal of Sport Psychology, 8*(2), 135–138.

Brought to you by | Loyola Marymount University
Authenticated | 157.242.207.65
Download Date | 2/21/14 7:24 PM