Development of the "Performance Competence Evaluation Measure"

Assessing Qualitative Aspects of Dance Performance

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Abstract

The aim of this study was to develop a measurement tool, the "Performance Competence Evaluation Measure" (PCEM), for the evaluation of qualitative aspects of dance performance. The project had two phases. In the first phase a literature review was conducted to examine 1. the previous development of similar measurement tools, 2. descriptions of dance technique and dance performance applicable to the development of a qualitative measurement tool, and 3. theoretical models from somatic practices that evaluate and assess qualitative aspects of movement and dance activity. The second phase involved the development of a system for using PCEM, and testing its validity and reliability. Three judges from the professional dance community volunteered to test PCEM with a sample of 20 subjects from low-intermediate to advanced classes at a university dance program. The subjects learned a dance combination and were videotaped performing it on two separate occasions, eight weeks apart. The judges reviewed the videos in random order. Logical validity of PCEM was established through assessment by two faculty members of the university dance department and the three judges. Intra-rater and inter-rater reliability demonstrated correlation coefficients of 0.95 and 0.94, respectively. It was concluded that PCEM can serve as a useful measurement tool for future dance science research.

While viewers are often in awe of the technical facility and prowess of dancers, it is the qualitative and emotive expression of the dancer that defines the art form. Measures of physical or motor components of dance activity have provided few positive predictors of qualitative excellence. Researchers who have attempted to measure the quality of dance performance have universally felt that the measurement systems available to them were inadequate. Whereas numerous measures of the quantitative aspects of dance performance have been designed,[1-18] only three published studies have developed and tested methods of qualitative measurement.[19-21] One is called the Aesthetic Competence Evaluation (ACE), devised by Chatfield and Byrnes.[19] The second method used criteria and scoring systems adapted from gymnastics judging.[20] The third used marking procedures adopted from various sports, such as gymnastics and figure skating.[21]

If dance researchers and educators want to measure and understand the effect of various training programs on dance performance, reliable systems for evaluating the qualitative aspects need to be developed. Until then, much of the assessment will either remain theoretical or be based solely on physical components, such as flexibility, strength, and body composition, with no consideration for how changes in those components may impact the quality of performance.

The purpose of the present study was to create a measurement tool, the "Performance Competence Evaluation Measure" (PCEM), that could evaluate qualitative aspects of dance performance. The project consisted of two phases. In the first phase a literature review was conducted to examine 1. the previous development of similar measurement tools, 2. descriptions of dance technique and dance performance applicable to the development of a qualitative measurement tool, and 3. theoretical models from somatic practices that evaluate and assess qualitative aspects of movement and dance activity. The second phase was to establish a system for using PCEM, and testing its validity and reliability.

Methods

Phase 1: Review of literature

Existing Measurement Tools of Qualitative Aspects of Dance Performance

Chatfield and Byrnes[19] developed the Aesthetic Competence Evaluation and tested it for reliability. In repeated

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Table 1 Guide for Judges

Full Body Involvement			
	Stabilized Base		
	Axial	Locomotor	Limb Energy
Level I	In off-center torso movements, little or no ability to maintain center of weight over base of support	In off-center torso movements, little or no ability to accurately transfer the center of weight from one support base to the next	Repeated signs of "dead" or unattended body segments when focus of the movement is elsewhere
Level II	In off-center torso movements, demonstrated but inconsistent ability to maintain center of weight over base of support	In off-center torso movements, demonstrated but inconsistent ability to accurately transfer the center of weight from one support base to the next	Occasional displays of "dead" or unattended body segments when focus of the movement is elsewhere
Level III	In off-center torso movements, consistent ability to maintain center of weight over base of support, resulting in great freedom of movement in the torso work	In off-center torso movements, consistent ability to accurately transfer the center of weight from one support base to the next, resulting in great freedom of movement in the torso work	No displays of "dead" or unattended body segments when focus of the movement is elsewhere, resulting in all body segments being energized, regardless of how minimal the movement is
Body Integration and Connectedness			
	Central Energy	Spine Articulation	Relationship of Body Segments
Level I	In isolated limb gestures, little or no central body energy or core support underlying the action	Lack of awareness and sensitivity to articulating various portions of the spine; poor spine sequencing	Poor alignment; appropriate relationship of body segments to each other rarely or never demonstrated in movement phrases
Level II	In isolated limb gestures, occasional but inconsistent central body energy or core support underlying the action	Occasional but inconsistent awareness and sensitivity to articulating various portions of the spine; inconsistent understanding of appropriate spine sequencing	Some alignment problems; appropriate relationship of body segments to each other only occasionally demonstrated clearly in movement phrases
Level III	In isolated limb gestures, consistent central body energy or core support underlying the action	Clear and consistent awareness and sensitivity to articulating various portions of the spine; consistent demonstration of appropriate spine sequencing	Good alignment; well-executed and consistent demonstration of the appropriate relationship of body segments to each other in movement phrases

trials the "blind" judges in this study were able accurately to determine the ranking of the dancers. High ACE scores correlated with several technical and physiological improvements, which the authors suggested may also correlate with improved dance performance. The ACE form contains descriptions of the following aspects of dance performance for dancers at five different levels of ability: 1. technique; 2. space, time, and energy (as defined in Laban analysis); 3. phrasing; and 4. presence.

Parrott designed an evaluation method adapted from the Federation for International Gymnastics Code of Points used in competition.[20] She defined five distinct categories for the evaluation of dance technique and performance: 1. alignment (i.e., sense of center, carriage of the body, and maintenance of correct position in motion); 2. clarity of movement intention (i.e., involvement of the entire body in movement and amplitude or range of motion); 3. precision of movement (i.e., balance and control, articulation of the feet, articulation of the spine, and coordination and transitions of movement); 4. expressivity of the body (i.e., use of weight, appropriate use of energy, and facial expression); and 5. musicality (i.e., articulation of rhythm and interpretation of the accompaniment). Parrott claimed that the inter-rater reliability coefficient of .56 found in her study, while relatively low, might have improved with a larger sample size. Nonetheless, further testing would be required to determine the reliability of this procedure.

The third study, by Koutedakis and colleagues,[21] included the following factors in its evaluation procedure: 1. posture and alignment, 2. use and articulation of upper body and arms, 3. use and articulation of lower body and feet, 4. total body coordination, and 5. presentation of movement. The researchers calculated a test-retest reliability coefficient of 0.89. However, this study had not yet been published when the current study was conducted, and therefore it was not used in the development of PCEM.

Descriptions of Dance Performance and Dance Technique

Chmelar and Fitt have clarified some of the elements of dance to be incorporated in a more specific and sensitive evaluation method. They defined the qualitative elements of dance as movement flow, kinesthetic com-

Table 1 Guide for Judges (*continued*)

Articulation of Body Segments			
	Lower Limb Activity	Upper Limb Activity	
Level I	Incapacity to generate thigh and leg activity without obvious, undesired movement of the pelvis; poor articulation of the femur in the hip socket, demonstrated by lack of mobility of the femur	Poor articulation of the humerus in the should joint; very limited mobility of the humerus, with no accompanying mobility of the scapula and rib cage to support humeral movement; inability to avoid undesired scapula and rib cage movement during full range humeral movement; poor scapulo-humeral rhythm	
Level II	Occasional inability to generate thigh and leg activity without obvious, undesired movement of the pelvis; restricted articulation of the femur in the hip socket, demonstrated by limited mobility of the femur	Restricted articulation of the humerus in the shoulder joint; limited mobility of the humerus, with inconsistent accompanying mobility of the scapula and rib cage to support humeral movement; occasional ability to avoid undesired scapula and rib cage movement during full range humeral movement; uneven scapulo-humeral rhythm	
Level III	Thigh and leg activity clearly differentiated from the pelvis; excellent articulation of the femur in the hip socket, resulting in the capacity to move the lower limbs with good mobility and no unnecessary pelvic movement	Clear articulation of the humerus in the shoulder joint; good mobility of the humerus, with accompanying mobility of the scapula and rib cage to support humeral movement; clear ability to avoid undesired scapula and rib cage movement during full range humeral movement; good scapulo-humeral rhythm	
Movement Skills			
	Direction Changes	Balancing	Levels, Speed, and Dynamics
Level I	Great difficulty with quick changes of direction, resulting in instability and rhythmic inaccuracy	Little success at sustaining balances in the middle of movement phrases, resulting in repeated loss of concentration on the qualitative aspects of the movement phrase	Sluggish or awkward when attempting shifts in levels, speeds, and/or dynamic qualities
Level II	Some success, but awkward with quick changes of direction, resulting in occasional losses of stability and rhythmic accuracy	Moderate ability to sustain balances in the middle of movement phrases, resulting in occasional loss of concentration on the qualitative aspects of the movement phrase	Unpredictable at achieving clear and appropriate shifts in levels, speeds, and/or dynamic qualities
Level III	Ease at achieving quick changes of direction, resulting in consistent stability and overall rhythmic accuracy	Consistent ability to sustain balances in the middle of movement phrases, resulting in consistent concentration on the qualitative aspects of the movement phrase	Well-executed shifts in levels, speeds, and dynamic qualities, creating transitions which are clear and appropriate for the given material

munication (the ability to express a range of nonverbal feelings and ideas through timing, effort, and focus), rhythmic precision, spatial integrity, range of expression, and individuality. In contrast, dance technique includes physical range of motion, such as degree of turnout; the line of the body; explosive physical capabilities, such as height of jump; endurance capabilities; dance-specific movement skills; and certain neurological aspects such as the ability to perform a series of movements in a given time frame.[22] These investigators acknowledged the lack of dance studies examining the effects of technical and training variables on performance quality and stated that until researchers design effective ways of evaluating changes in performance such studies are not possible.

Aesthetic Competence Evaluation (ACE) specifies the following factors in the description of qualitative aspects of dance performance: range of vocabulary and skills; use of space, time, and energy; phrasing, including unity, variety, and transition; and presence, concentration, and performance

sense.[19] Pokora[23] identified dramatic range and the ability to adapt to various styles as aspects of dance performance. While certain elements of technique and performance overlap, it is clear from these descriptions that it is possible to differentiate between the qualitative and technical aspects of dance.

Theoretical Models from Somatic Practices

While many of the somatic practices describe movement from a qualitative perspective, probably the clearest description and analysis with regard to dance can be found in the work of Irmgard Bartenieff.[24-26] Bartenieff based her work on that of an earlier theoretician, Rudolf Laban, founder of the Effort-Shape system of describing movement. This method examines all movement in terms of its effort, space, shape, and action of body parts.[25] Each of these areas describes a different continuum of a particular aspect of movement. For example, "effort" describes the dynamics of movement, concerning such components as flow (free or bound), weight (strong or light), time (sudden or sustained), and space (direct or indirect). Further, the work places an emphasis on connecting body parts (rather than thinking about holding one body part and moving others against it) and on relating the whole body to the space (rather than striving for greater joint range or accuracy).[26] Bartenieff claimed that dance artists can use Laban's conception of movement in the execution of their tasks by relating their own bodies to the qualities they perceive in images, and then transmitting those qualities through the dance medium.[24] Because of the clarity of the Effort-Shape system of describing movement it served as a model for many of the elements of PCEM.

Phase 2: Development of the Performance Competence Evaluation Measure (PCEM)

The Performance Competence Evaluation Measure (PCEM) is a modification of ACE. Using the ACE model, and expanding it based on the Bartenieff descriptions of movement, four categories for evaluation were developed. As represented in Table 1, these categories are: 1. full body involvement in movement, 2. body integration and connectedness in movement, 3. articulation of joints and body segments, and 4. movement skills in dance. Each of the four categories for PCEM was further broken down into subcategories. Full body involvement in movement was subdivided into axial movement, locomotor movement, and limb energy. Body integration and connectedness was subdivided into central energy, spine articulation, and relationship of body segments. Articulation of joints and body segments was divided into lower limb activity and upper limb activity. Movement skills were subdivided into direction changes, balancing, and levels, speeds, and dynamics. After selecting and refining the four categories, levels I through III were developed, representing different stages of dance training and accomplishment in the individual dancer. (Note that the system was not designed to evaluate non-dancers, but rather to distinguish between levels of dancers who already have some degree of training.) Level I in each of the four categories can be equated to a dancer of low skill levels and poor awareness. For example, in body integration and connectedness, spine articulation, level I would be described as "lack of awareness and sensitivity to articulating various portions of the spine; poor spine sequencing." At the other end of the spectrum, level III represents a highly skilled dancer with heightened body awareness.

To simplify the process of recording the analysis of each dancer a score sheet was designed (Table 2). The Guide and Score Sheet for Judges clarifies the parameters for evaluating the subjects in each category, and gives a description of each of the four categories by proficiency level. In addition to rating the subject in the four categories, each subject is given an overall proficiency rating of 1, 2, or 3 by each judge, resulting in an initial baseline score of 0, 7, or 14 points, respectively. As stated previously, the overall proficiency rating does not range from non-dancer to professional level dancer: rather, this rating covers the spectrum from low-intermediate level dancer to advanced level dancer. Scoring calibration is developed during the judges' training sessions described below. The resultant scoring is illustrated in Table 3.

Testing PCEM for Validity and Reliability

The logical validity of PCEM was established through assessment by two university dance professors (one of whom is a CMA) and three judges from the local professional dance community. The three judges were either former or current professional dancers, and all three were current teachers of dance. Logical validity, as defined by Safrit, is "…the extent to

Table 2 Score Sheet for Performance Competence Evaluation

Name of Judge_____ Date _____			
Videotape code number_____			
Overall proficiency Rating	1	2	3
Full Body involvement	1	2	3
Evaluation of use of stabilized base, and limb energy			
Body integration and connectedness	1	2	3
Evaluation of central energy, spine articulation, and inter-relationship of body segments			
Articulation of body segments	1	2	3
Evaluation of lower limb activity, and upper limb activity			
Movement Skills	1	2	3
Evaluation of direction changes, balancing, changes in levels, speeds and dynamics			

Table 3 PCEM Scoring System

Levels	Category 1	Category 2	Category 3	Category 4	Baseline points	Total point range
Level 1	1 - 3	1 - 3	1 - 3	1 - 3	0	4 - 12
Level 2	1 - 3	1 - 3	1 - 3	1 - 3	7	11 - 19
Level 3	1 - 3	1 - 3	1 - 3	1 - 3	14	18 - 26

Category 1: Full body involvement in movement; Category 2: Body integration and connectedness in movement; Category 3: Articulation of joints and body segments; Category 4: Movement skills.

which a test measures the most important components of skill necessary to perform a motor task adequately."[27] The five experts determined that PCEM satisfied this description of logical validity.

The reliability of PCEM was evaluated using the same three judges described above. The judges were asked to score the subjects, who were to be videotaped doing a contemporary dance combination on two separate occasions. Before scoring took place there were two training sessions to familiarize the judges with the components of the Guide and Score Sheet for Judges (Tables 1 and 2), and to instruct them on how to assess the effects of these components on the qualitative aspects of the subject's performance. The training sessions for judges included observation and discussion of videotapes of volunteers at various levels of training and ability executing movement phrases similar to the testing sequence. Viewing dancers of low and high caliber facilitated calibrating the scoring method. Note that the dancers for these training sessions were different than those for the study in order to ensure non-bias when the judges began evaluation of the actual test subjects. The judges practiced rating the volunteers using the guide and the score sheet.

The study received approval from the Human Subjects Committee at the Graduate School of a major university. Subjects consisted of 20 volunteers from low-intermediate through advanced modern dance technique classes. The subjects participated in an orientation session, and read and signed the consent form. Following this procedure they learned a modern dance movement sequence that incorporated various styles and dynamics. The dance sequence was learned from a videotape to ensure that all subjects received similar information. The phrase included movements such as rapid direction changes, balances, and level and dynamic changes in order to ensure that all categories on the Score Sheet were explored. The subjects were then videotaped executing three trials of the sequence, to increase statistical power of the design.[28]

Eight weeks later the subjects were again videotaped doing three trials of the same sequence. All subjects were screened before and after the eight-week period to confirm that they maintained regular involvement in activities such as modern, ballet, or jazz technique classes, rehearsals, and performances. The judges then observed the videotapes of the various subjects and the two sessions randomly arranged. By seeing all of the videotapes at one time the "blind" judges were not biased in their evaluation of the subjects' performances, as they were unable to ascertain which videotapes were from the earlier or later videotaping.

Results

Scores from both videotaping sessions were used to test for intra-rater and inter-rater reliability of the judges. To test for intra-rater reliability, the judges viewed, at random times, ten repeated trials. Table 4 shows the Cronbach coefficient alpha for each judge, for both the individual scoring categories and the weighted composite scores. Reliability coefficients are also displayed for intra-rater reliability for the three judges combined. For composite scores, the range of coefficients was .93 to .99, indicating strong intra-rater reliability.

To test for inter-rater reliability, evaluations of the same subject by the three judges were compared for all 120 test scores. The inter-rater reliability Pearson's coefficients, ranging from .82 to .94, are displayed in the last column of Table 4. Since the weighted composite scores were used for all analyses, the reliability coefficient of .94 was the most essential one.

Discussion

All except two subjects evaluated showed significant improvement in the four categories of PCEM between the first and second videotape sessions. As the dancers were involved in on-going, regular dance training

Table 4 Intra- and Inter-Rater Reliability Coefficients for Judges

Scoring Category	Intra-Rater Reliability				Inter-rater
	Judge 1	Judge 2	Judge 3	All combined	
Overall proficiency	0.92	1.0	0.90	0.94	0.91
Full body involvement	0.86	0.62	0.96	0.83	0.83
Connectedness	0.75	0.94	0.63	0.82	0.82
Articulation	0.82	0.91	0.77	0.84	0.86
Skills	0.96	0.60	0.96	0.87	0.86
Composite scores	0.93	0.99	0.93	0.95	0.94

in the eight weeks between the two videotaping sessions, it is no surprise that they improved. Since all of the videotapes were randomly mixed, it is unlikely that there was any bias in the evaluation process. If this is the case, the judges accurately assessed changes in the dancers' skills in the four categories using PCEM.

The validity and reliability of the measure suggest that increases in PCEM scores represent actual improvements in the dance performance of the subjects. That it captured significant improvements for most of the subjects in only an eight-week period indicates that PCEM may be a highly sensitive measurement tool. Additional validity tests, such as a known-group-differences test,[27] would further substantiate the value of PCEM in the assessment of some qualitative aspects of dance performance. These include full body involvement in movement, body integration and connectedness in movement, articulation of joints and body segments, and movement skills in dance.

The training sessions with the judges prior to evaluation of test subjects were crucial to the strong intra-rater and inter-rater reliability coefficients, ranging from .93 to .99 for composite scores. Training sessions for the judges are recommended for future use of PCEM and similar measures.

It would most likely be beneficial to have a larger sample pool. However, for testing purposes it seems more important to have a sample pool with a consistent level of activity—that is, a similar number and type of classes and rehearsals each week—and, as most dance researchers realize, this is a nearly impossible condition to fulfill if one is attempting to include larger numbers of dancers in a study. Nevertheless, studies involving small samples with highly varied activities are problematic for clear statistical results. Within-subjects design or methodology that mixes within-subject and between-group designs might address some aspects of this problem.[29,30]

When evaluating dance performance it is recommended that testing periods avoid high stress times, such as the end of term for student dancers. Emotional fluctuation is large, and there is no way to determine the effects of these emotional states on test results. Additionally, it is suggested that the training sessions extend over longer periods of time, particularly when addressing neuromuscular components of dynamic and aesthetic movement.

Conclusion

There is a considerable difference between the number of measurement tools available for evaluating quantitative aspects of dance performance and the number of tools for qualitative measures. However, while dancers are striking in their athletic prowess, dance is not a sport, it is an art form, and it is the qualitative and emotive expression of the dancer that defines the art form. It is important that researchers continue to develop quantitative measures along with qualitative dance performance measures (such as PCEM), in order to assess and validate the usefulness of training systems for dancers. Future advances in dance research should encompass valid and reliable measures, both quantitative and qualitative, in order to address the broad spectrum of training and performance issues.

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