PERCEPTION OF MOVEMENT AND DANCER CHARACTERISTICS FROM POINT-LIGHT DISPLAYS OF DANCE

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Dance is one type of movement that expresses emotion, however perceptions of dance movements and the corresponding trait inferences of the dancer have received no attention in the literature. This study examined how people determine dancer trait and emotion characteristics from point-light displays of dance, and whether dance experience affects differential attunements to dance movements. Dancers performed one “sad” and one “happy” dance while being filmed in point light, which is a technique used to isolate movement cues from other person information (such as race, sex, height). Experienced dancers and dance novices served as participants and judged the dances on two types of measures—movement (e.g., constricted-open) and dancer trait characteristics (e.g., happy-sad). The results revealed that all participants easily judged happy dances as happier, stronger, and more approachable, dominant, and extroverted than sad dances. However, movement judgments of happy dances were affected by experience, as experienced dancers perceived movements in the happy dances to be less free, fluid, and relaxed, but more exaggerated, than did novices. These results support ecological theory (McArthur & Baron, 1983) in that all were easily able to determine dancer traits and emotion from dances, but fine discriminations among the dance movements during fast, happy dances were typically made only by those who had dance training and were attuned to minute motion differences.

“Primary or fundamental movements....give birth to others in an unending sequence of higher expression, thoughts, and ideas.”
Isadora Duncan, in Berger (1992)

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Artistic performers from dancers to actors have long recognized the power of movement to evoke emotion. A dancer, for example, expresses several different emotions without saying anything (Levy, 1988, p. 1). In the famous ballet *The Nutcracker*, a young girl finds her doll has been broken, and the slow and unexaggerated dance she performs lets the audience know that she is sad. In another scene the young girl lets the audience know she is happy by her leaps and quick, exaggerated movements. Through the young girl’s movements she is able to convey the desired emotions to the audience. As Cheney (1989, p. 14) notes, “feelings of satisfaction, frustration, love, fear, and pain are explained through subtle changes in body movements.”

Psychologists have also been interested in how perceivers use physical appearance and movement to discern emotion and characteristics of others. Research has revealed that we focus on those static and dynamic qualities inherent in moving, social stimuli to gather information about others (e.g., Johansson, 1973; McArthur & Baron, 1983), as a person’s motion during walking, running, or cycling may provide useful information about that person’s psychological and physical propensities, characteristics, intentions, and abilities (Cutting & Proffitt, 1981). McArthur and Baron’s ecological approach holds that such perceptions are adaptive in that they allow people to more successfully interact in their social environment, by allowing quick determination about what others are like, and (at the most basic level) discernment of whom to approach and avoid. However, the particular social information obtained may be a function of a perceiver’s needs, motivations, and goals in any given situation. That is, people are differentially attuned to the social information afforded by stimuli by attending to different aspects of whatever stimuli they are perceiving (McArthur & Baron, 1983).

The ecological framework assumes that complex schematic processing is not a necessary condition for impression formation, and it focuses on the nature of the stimuli that leads to our judgments of others (cf. Berry, 1990; McArthur, 1984). Moreover, perception alone can provide information and meaning, and learning about the world does not rely on or necessarily include cognitive processes that involve adding decontextualized, meaningless information into existing cognitive structures that then provide meaning (Gibson & Spelke, 1983). The ultimate goal of perceiving is to search for affordances of stimuli that will help us negotiate our environment, regardless of whether our environment includes physical objects or other people. The information is always there, revealed through both static and dynamic qualities of stimuli, but may not be noticed until its use and necessity is manifest. For example, people come to know their physical environment better as they move through that environment, learning “contrastive relations” among objects only as these are encountered and used (Gibson & Spelke, 1983). Similarly, we come to know the people around us better when we observe and interact with them.

The tenets of the ecological theory have been tested by a number of researchers (e.g., Barclay, Cutting, & Kozlowski, 1978; Berry, Kean,
Misovich, & Baron, 1991; Berry & Misovich, 1994; Cutting & Proffitt, 1981; Kozlowski & Cutting, 1977; Montepare & Zebrowitz-McArthur, 1988) who have examined our judgments of others based solely on physical movement. Important social information provided by movement is easily detected by perceivers. That is, even abstract, complicated stimuli that are rapidly presented are readily discerned for what they are—people dancing, a person walking, and the like (McArthur & Baron, 1983). More importantly, judgments of psychological aspects of people such as their effort and “deceptive intent” are readily and confidently identified from motion alone (Berry, 1990; Runeson & Frykolm, 1983). In order to show that physical motion alone, apart from other cues such as age, sex, or race, can easily convey useful emotion and trait information, a technique that separates motion from these other cues is necessary (Wallbott, 1992). The point-light technique (Johansson, 1973) is often used to determine movement-based judgments in absence of other physical information. In the point-light procedure, people are dressed in black clothing with reflective tape attached to their major joints, and they are videotaped while a spotlight shines on them. Once the movement has been recorded, adjustments are made on a television monitor so that only the moving dots against a black background can be seen, thus isolating pure movement.

At the most basic level, perceptions of sex are revealed through point-light displays of gait (e.g., Frable, 1978; Kozlowski & Cutting, 1977; Montepare & Zebrowitz, 1993). One determinant of sex recognition is joint placement, as women can be detected by short distances between shoulders and larger distances between the pelvic bones, whereas men have a shorter distance between the pelvic bones and a larger distance between the shoulders. In addition, women walkers move at a quicker pace and their movements are more energetic. When such physical qualities are not present the sex of walkers is not discernible, as in the case of Frable’s (1978) research demonstrating that androgynous men and women who did not exhibit sex-consistent physical cues were not accurately judged by perceivers.

Perceptions of age and subsequent age-related traits and qualities have also been studied via the point-light technique. In Montepare and Zebrowitz-McArthur’s (1988) research, participants watched walkers from ages 5 to 70 and made judgments about the age, movement, and traits of these walkers. The younger walkers were perceived as happier and more powerful and dominant than the older walkers, and these traits were distinguished by the walkers’ rapid steps, larger swing of arms and hips, and the bouncing of the knees. When the walkers’ faces and bodies could be seen and were therefore salient, the judgments were still the same, confirming that movement alone allows us to discern psychological and emotional characteristics of others.

Clearly, biological and trait characteristics are easily perceived from gait. In addition, the foregoing effects are strong and are predictable when the gait of people of different cultures is examined (Montepare & Zebrowitz, 1993), and when gait is modified by different types of footwear (Walter,
Ervin, & Brownlow, 1996). However, little attention has been paid to our perceptions of others based on motion other than gait. Dance is considered to be one type of movement that expresses feelings and emotions, and perceivers can easily detect that someone is dancing (Johansson, 1973); however, trait inferences about the dancer embodied in dance movements have not been subject to empirical study. The purpose of this study was to examine how dance motions alone, irrespective of other qualities of the dancer (e.g., sex, age, costume, facial expression) and the music, convey characteristics of the traits, abilities, and emotions of the dancer. Ecological theory would predict that all people should be able to discern the emotions conveyed by a dance that is well-choreographed and competently executed. However, people who have had previous dance experience have gained information and understanding about dance, and they should be more sensitive and attuned to specific dance movements. Thus, it was hypothesized that those with dance experience would make differential judgments of dance movements.

**Method**

*Stimulus Videotape*

Two dances were choreographed by a dancer with 10 years of training. Both dances had the same numbers of kicks, turns, and leaps, although the two dances had markedly different rhythm changes (Royce, 1984). The main difference between the two dances was the rate at which the movements in the dances were executed, as the dance designated as "sad" consisted of slow, unexaggerated, sweeping, low-energy movements, and the "happy" dance included similar movements that were performed faster and were exaggerated and energetic. Each dance, lasting approximately 30 s, was individually performed by two women and two men dancers of approximately equal height (5'7" - 5'8") and dance ability.

Following the procedure employed by Montepare and Zebrowitz-McArthur (1988), the dancers were filmed using a point-light technique in which rectangular blocks of reflecting tape (1.9 cm x 3.5 cm) were cut out and placed on all the main joints of the dancers. The joints included the outsides of the shoulders and each hip, and the inside and outside of the wrists, elbows, and ankles. Dancers wore tight-fitting black clothing to which the pieces of tape were attached. Their hands, feet, and face were covered with light black cloth. The taping was done in a black box theater (where all the walls and the floor are black). A video recorder was placed approximately 12 feet away from the dancer with a spotlight directly behind, shining on the dancer. A practice taping was done to test the point-light technique by taping one of the dancers walking back and forth in front of the camera as the procedure was perfected.

After the dancers had been filmed, the tape was edited to place the eight complete dances in a random order, and a 4- to 5-second segment of blank tape was inserted between each dance. When the tape was viewed, the contrast, color, and sharpness were turned up to their highest levels
and the tint and brightness were turned almost all the way down on the television monitor, so that only bright patches of lights that looked like moving dots were seen. The volume on the monitor was turned all the way down so that the background noise and dance music was obscured.

Participants and Design

Sixty-four volunteers (32 women and 32 men college students) examined the moving dots and rated the movements and trait characteristics conveyed by the dots. Half of the participants were dance novices, having had no dance training at all, while the other half had at least one college semester of dance training and were thus deemed experienced. The result was a $2 \times 2 \times 2$ (Participant Sex x Experience Level x Dance Type: Happy, Sad) mixed design, with repeated measures on the last factor.

Dependent Measures

To examine the influence of dance type on judgments of motion and trait characteristics of the dancer, ratings of the point-light displays included two broad types of measures, all taken on 7-point bipolar scales with scale endpoints labeled with trait opposites. The movement measures were rigid-fluid, exaggerated-unexaggerated, tense-relaxed, high energy-low energy, and closed/constricted-free/open movements. The measures to assess characteristics of the dancer that were conveyed by the dance included submissive-dominant, unapproachable-approachable, sad-happy, strong-weak, and introverted-extroverted. The movement measures reflected basic characteristics of dance and the trait characteristics paralleled those used by other researchers (cf. Montepare & Zebrowitz, 1993; Walter et al., 1996).

Procedure

After the participants provided experimental consent, each received a packet of measures with complete instructions printed on the front of the packet page. Because judgment of movement could color perception of dancer trait characteristics and the reverse, half of the participants completed movement measures before trait characteristic measures; and the other half completed trait characteristic measures before movement measures, with scale order equally divided within participant sex and experience level. Specifically, participants watched the eight discrete dances and completed the movement measures or the trait measures, and then saw the tape again, making ratings not made during the first viewing. The measures were completed while the tape was playing. After the participants completed both sets of measures they were asked to turn their papers over and to write what they thought the moving dots were and to describe whatever dance experience they had.

Results

Overview

Each movement and trait characteristic measure was separately
entered into a 2 x 2 x 2 (Participant Sex x Experience x Dance Type: Happy, Sad) analysis of variance (ANOVA) with repeated measures on the last factor.\(^1\) Scheffé tests (alpha = .05) were used to calculate differences between groups. Perceptions of dance movement according to dance type and experience are located in Table 1, and judgments of the dancer's emotion and trait characteristics are located in Table 2. Only those main effects and interactions that achieved significance are discussed.

**Dance Movements**

As can be seen in Table 1, a fairly systematic pattern of relationships emerged from the ANOVAs, as a main effect for dance type was revealed for three measures (open, low energy, and exaggerated), \(F_{s}(1, 60) \geq 54.09,

### Table 1

<table>
<thead>
<tr>
<th>Dance Type</th>
<th>Open/Free(^{a,ab,abc})</th>
<th>Low Energy(^{a,ab})</th>
<th>Fluid(^{ab})</th>
<th>Relaxed(^{b,ab})</th>
<th>Unexaggerated(^{a,ab})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sad</td>
<td>3.46</td>
<td>5.30</td>
<td>4.22</td>
<td>4.13</td>
<td>3.84</td>
</tr>
<tr>
<td>Expert</td>
<td>3.77</td>
<td>4.75</td>
<td>4.76</td>
<td>4.37</td>
<td>4.38</td>
</tr>
<tr>
<td>Total</td>
<td>3.58</td>
<td>5.02</td>
<td>4.49</td>
<td>4.25</td>
<td>4.11</td>
</tr>
<tr>
<td>Happy</td>
<td>5.42</td>
<td>2.22</td>
<td>4.70</td>
<td>4.93</td>
<td>3.02</td>
</tr>
<tr>
<td>Expert</td>
<td>4.78</td>
<td>2.54</td>
<td>4.07</td>
<td>3.93</td>
<td>2.64</td>
</tr>
<tr>
<td>Total</td>
<td>5.09</td>
<td>2.43</td>
<td>4.39</td>
<td>4.43</td>
<td>2.83</td>
</tr>
</tbody>
</table>

**Note.** The label provided represents the high end of the scale. Superscripts indicated significant differences \((p < .05)\) for \(^{a}\)Dance Type, \(^{b}\)Experience Level, \(^{c}\)Participant Sex, and the interactions of these factors.

### Table 2

<table>
<thead>
<tr>
<th>Dance Type</th>
<th>Happy(^{a})</th>
<th>Approachable(^{a})</th>
<th>Dominant(^{a,abc})</th>
<th>Extroverted(^{a})</th>
<th>Weak(^{a})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sad</td>
<td>3.21</td>
<td>3.95</td>
<td>3.32</td>
<td>3.44</td>
<td>4.63</td>
</tr>
<tr>
<td>Expert</td>
<td>3.24</td>
<td>3.94</td>
<td>3.13</td>
<td>3.07</td>
<td>4.50</td>
</tr>
<tr>
<td>Total</td>
<td>3.23</td>
<td>3.95</td>
<td>3.23</td>
<td>3.26</td>
<td>4.57</td>
</tr>
<tr>
<td>Happy</td>
<td>5.67</td>
<td>4.50</td>
<td>5.43</td>
<td>5.08</td>
<td>2.57</td>
</tr>
<tr>
<td>Expert</td>
<td>5.28</td>
<td>4.18</td>
<td>5.28</td>
<td>5.17</td>
<td>2.33</td>
</tr>
<tr>
<td>Total</td>
<td>4.35</td>
<td>4.34</td>
<td>5.35</td>
<td>5.12</td>
<td>2.45</td>
</tr>
</tbody>
</table>

**Note.** The label provided represents the high end of the scale. Superscripts indicated significant differences \((p < .05)\) for \(^{a}\)Dance Type, \(^{b}\)Experience Level, \(^{c}\)Participant Sex, and the interactions of these factors.

\(^{1}\)We collapsed across sex and exemplar of dancer because neither of these variables were of interest in the present study. Moreover, examination of the data from ANOVAs that included sex of dancer as a within-participants factor revealed few differences attributable to the sex of the dancer.
all ps < .001, and the Experience x Dance Type interaction was significant for all movement measures, all Fs(1, 60) ≥ 4.22, all ps < .05.

Happy dances (M = 5.09) were seen as more open and free than were sad dances (M = 3.58), although the Scheffé test revealed that experience influenced judgments of happy dances, p < .05. Specifically, novices found happy dances to be more free and open than did those with dance experience (novice M = 5.42 and experienced M = 4.78). The Experience x Dance Type interaction was further qualified by an interaction with participant sex, F(1, 60) = 11.16, p < .001, as only women novices differentiated the openness of the happy dances (Ms = 5.83 and 4.61 for novices and experienced dancers, respectively), p < .05, but men did not (Ms = 5.00 and 4.94 for the same groups).

Sad dances (M = 5.02) were judged as less energetic (i.e., as lower in energy) than happy dances (M = 2.43), although sad dances were not perceived in the same way by those with dance experience and novices. Specifically, novices saw the sad dances (M = 5.30) as having less energy than did the experienced group (M = 4.75), p < .05, although both groups judged the energy level of the happy dance similarly (Ms = 2.22 and 2.54 for novices and dance experts, respectively).

Dance fluidity was affected by experience and dance type, F(1, 60) = 8.88, p < .005. Post-hoc group comparisons revealed that happy dances were seen as more fluid by novices (M = 4.70) than by those with experience (M = 4.07), p < .05, but that sad dances were not judged differently (Ms = 4.22 and 4.76 for novices and those with experience, respectively).

The ANOVA for the relaxed movement measure revealed a main effect for experience, F(1, 60) = 9.23, p < .005, as well as the aforementioned interaction of experience and dance type. Novices (M = 4.53) perceived the dances as more relaxed than did the experts (M = 4.15), although this difference was only significant when judgments were made of the happy dances (Ms = 4.93 and 3.93 for novices and experts, respectively), p < .05. Ratings of the sad dances were relatively similar for novices (M = 4.13) and experts (M = 4.37).

A mixed pattern of results emerged for the unexaggerated measure, as happy dances (M = 2.83) were perceived to be more exaggerated than sad dances (M = 4.11). However, novices judged the happy dances (M = 3.02) to be more unexaggerated than did those with experience (M = 2.64), p < .05, although for sad dances the experienced dancers (M = 4.28) and the novices (M = 3.84) made similar judgments.²

² The sex of dancer did impact some measures in the following ways: Novices judged the happy dances of the women as more extroverted and approachable than did experts. In contrast, the sad dances of the women were judged by experts as more relaxed and lower in energy when compared to novices. It is possible that the participants easily detected that the happy dances of the women were indeed women dancing, and novices thus made sex-role stereotypical judgments of the dance (i.e., approachable, extroverted), whereas dance experts judged according to what they knew about dance.
Means from the 2 x 2 x 2 (Participant Sex x Experience x Dance Type) ANOVAs on the five emotion characteristic measures are located in Table 2. Each yielded a significant main effect of dance type, all $F$s(1, 60) $\geq$ 3.87, all $p$s < .05. Compared to sad dances, the dancer's emotion conveyed by happy dances were judged as more happy ($M$s = 4.35 and 3.23), approachable ($M$s = 4.34 and 3.95), dominant ($M$s = 5.35 and 3.23), extroverted ($M$s = 5.12 and 3.26), and less weak ($M$s = 2.45 and 4.57), for happy and sad dances, respectively.

Only one other significant effect emerged in any of these analyses. A triple-order interaction for the dominant measure was significant, $F$(1, 60) = 3.97, $p$ < .05. Although all participants judged the happy dances to be significantly more dominant than the sad dances, a Scheffé test indicated that women novices judged the happy dances ($M$ = 4.94) as less dominant than did men novices ($M$ = 5.91), $p$ < .05.

**Discussion**

The results of this experiment revealed that characteristics of a dancer are revealed through dance movement, as people responded in ways appropriate to the choreography of the dances. In other words, all participants easily judged the dancers' traits embodied in their happy dances as happier, stronger, and more approachable, dominant, and extroverted than in sad dances. Happy dances were marked by a lack of exaggerated movement, higher energy, and free, open movements. Although all perceivers could readily detect common dancer emotions and traits from the moving dots, those attuned to dance movement (those with dance experience) were different from novices in judging most motions of the happy dances. Specifically, experienced dancers perceived movements in the happy dance to be less free, fluid, and relaxed, but more exaggerated, than did novices.

Given that the method utilized isolated motion from other characteristics, it is likely that movement alone contributed to perceptions of the dots. On the other hand, all participants easily guessed what the moving dots were, and thus it is possible that people based their judgments on emotion-stereotypic labeling, that is, a happy dancer is also approachable. However, this alternative explanation is untenable as some of the emotions associated with the happy dance were not necessarily those that are associated with happiness (strong and dominant), although some (approachable and extroverted) were. It is also unlikely that the happy dances were generally perceived as danced by women because of their fast pace and high-energy movements, and that judgments of the dance were thus a function of sex stereotypes. First, there is evidence (cf. Frable, 1978; Kozlowski & Cutting, 1977) that sex is easily identified on the basis of motion. Second, women may be perceived as approachable and extroverted, but they are not typically judged as strong and dominant, and happy dances
were ascribed all four of these qualities more often than were sad dances. Another explanation is that the happy dances may have been perceived as youthful owing to the loose, swinging, high-energy motions (cf. Montepare & Zebrowitz-McArthur, 1988; Walter et al., 1996), and such perceptions could have contributed to judgments of juvenescence, although youth is generally not equated with power. Thus, an alternative technique to the point-light display, such as quantization (Berry et al., 1991), may allow for a better examination of whether motion alone conveyed emotion characteristics embodied in dance. In addition, collection of estimations of age and sex to rule out alternative explanations would provide a better test of ecological theory.

The only systematic experience-novice differences came in judgments of motion and movement for happy dances. It is possible that the rapid motion of the happy dances did not allow novices, who were unaccustomed to watching dance and subsequently describing dance, to make fine distinctions about the fluidity, openness, and tightness of the dance. In essence, novices may have been unable to distinguish movements in something that moved so fast. These experience differences may have been a function of differential attunement to dance movements on the part of those participants who had dance expertise, or to experience with the language and terminology used by dancers to discuss dance. Those who have had dance training typically talk about dance in terms of fluidity, tenseness, and energy level, although those who do not have dance background may be less accustomed to thinking about and describing dances in these terms. Thus, those with dance training were more adept at realizing the "contrastive relations" (Gibson & Spelke, 1983) of the dynamic stimuli and knew the terminology that was appropriate to describe what they had seen. Finally, there was relative agreement among those with experience despite the fact that there was a wide range of "expertise" on the part of those with dance experience. Nonetheless, in future research better definitions of "expert" and "novice" are warranted.

The findings from this study are consistent with other research (cf. Berry & Misovich, 1994; Cutting, Proffitt, & Kozlowski, 1978; Frable, 1978; Montepare & Zebrowitz-McArthur, 1988; Walter et al., 1996) that confirms that movement alone can provide information about the traits and abilities of others. Moreover, our results provide further support for the ecological approach (McArthur & Baron, 1983), which holds that attunements to information from dynamic stimuli are powerful in helping us determine what others are like. More importantly, this work has shown that dance is indeed an art that involves the mastery of movement in the human body in an attempt to evoke emotions, to inspire feelings, and—ultimately to communicate.

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3 Quantization is a technique that creates obscured visual stimuli with a special effects generator that applies mosaic blocks on the stimuli, allowing for perception of movement while distorting fine features, such as is seen on television when a person's identity must be concealed. The quantization procedure is nonobtrusive because it does not require different clothing and use of reflective tape (Berry et al., 1991) allowing for, perhaps, more natural behavior.
References


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