Short Communication

Learning to like it: Aesthetic perception of bodies, movements and choreographic structure

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ARTICLE INFO

ABSTRACT

Appreciating human movement can be a powerful aesthetic experience. We have used apparent biological motion to investigate the aesthetic effects of three levels of movement representation: body postures, movement transitions and choreographic structure. Symmetrical (ABCDCBA) and asymmetrical (ABCDBCA) sequences of apparent movement were created from static postures, and were presented in an artificial grammar learning paradigm. Additionally, "good" continuation of apparent movements was manipulated by changing the number of movement path reversals within a sequence. In an initial exposure phase, one group of participants saw only symmetrical sequences, while another group saw only asymmetrical sequences. In a subsequent test phase, both groups rated all sequences on an aesthetic evaluation scale. We found that posture, movement, and choreographic structure all influenced aesthetic ratings. Separate ratings for the static body postures presented individually showed that both groups preferred a posture that maximized spatial symmetry. Ratings for the experimental sequences showed that both groups gave higher ratings to symmetrical sequences with "good" continuation and lower ratings to sequences with many path reversals. Further, participants who had been initially familiarized with asymmetrical sequences showed increased liking for asymmetrical sequences, suggesting a structural mere exposure effect. Aesthetic preferences thus depend on body postures, apparent movement continuation and choreographic structure. We propose a hierarchical model of aesthetic perception of human movement with distinct processing levels for body postures, movements and choreographic structure.

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1. Introduction

What makes a beautiful movement? Historically, experimental aesthetics has largely focused on static visual stimuli (such as paintings) and music (Nieminen, Istok, Brattico, Tervaniemi, & Huotilainen, 2011; Palmer, Schloss, & Sammartino, 2013). Only few attempts have been made to study aesthetic perception of dance – or more general – the aesthetics of human movement (Calvo-Merino, Jola, Glaser, & Haggard, 2008; Calvo-Merino, Urgesi, Orgs, Aglioti, & Haggard, 2010; Cross, Kirsch, Ticini, & Schutz-Bosbach, 2011; Jola, Abedian-Amiri, Kuppuswamy, Pollick, & Grosbras, 2012).

Here we propose a hierarchical model of aesthetic perception of human movement that includes three dissociable levels of movement representation (Fig. 1), body postures, movements, and choreographic structure. Similar hierarchical models have been successfully applied to both language (Chomsky, 1980), music perception (Koelsch, 2011) and the visual arts (Leder, Belke, Oeberst, & Augustin, 2004). Like in other stimulus domains, our model emphasizes the relations between single items (i.e., postures and movements in the case of dance, notes in the case of music) and organization of those items into

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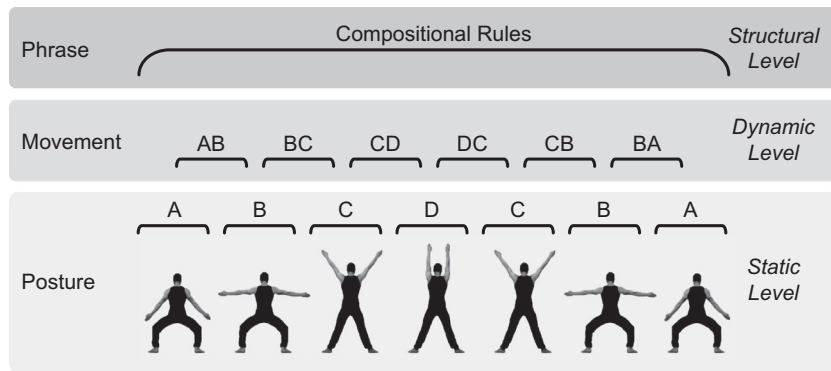
Fig. 1. A hierarchical model of aesthetic perception of human movement with three distinct processing stages for body postures, movements and choreographic structure. The lowest level is a 'vocabulary' of body postures. Next, transitions between successive body postures produce more or less fluent movements. At the structural level, patterns of several movements can be built into phrases applying compositional rules. The compositional rule shown here involves mirror-symmetry of the movement phrase, but other patterns such as repetition may work similarly.

larger "Gestalt" units, which we call phrases. Importantly, body postures and movements are specific to dance whereas choreographic organization of postures and movements into dance phrases can be linked to grammatical organization of language (Fitch & Friederici, 2012) and music (Lerdahl & Jackendoff, 1983; Rohrmeier, 2011) as similar structural rules can be applied to all of these inputs (Bod, 2002).

The *static level* comprises a "vocabulary" of body postures, which themselves elicit characteristic aesthetic responses (Calvo-Merino et al., 2010). Spatial symmetry is a powerful predictor of aesthetic preference and attractiveness for visual patterns (McManus, 1980; Ramachandran & Hirstein, 1999; Tinio & Leder, 2009; Wagemans, 1997), body parts, and facial features (Di Dio, Macaluso, & Rizzolatti, 2007; Rhodes, 2006; Thornhill & Gangestad, 1994). Further, aesthetic perception of bodies depends on feasibility of any implied motion (Cross, Mackie, Wolford, & Hamilton, 2010), body size (Cazzato, Siega, & Urgesi, 2012) and posture geometry. For example vertical ballet postures are preferred to more horizontal postures (Daprati, Iosa, & Haggard, 2009).

Next, the *dynamic level* comprises movements, considered as transitions from one posture to another. Aesthetic evaluation at this level might depend on factors such as speed, movement direction and effort (Laban, 1980), but the influence of these dimensions has not been systematically assessed experimentally. Existing work on the aesthetics of movement has largely focused on the influence of motor expertise and familiarity. Cross et al. (2011) report an inverse relationship between the ability to perform a movement and preference. Movements that were rated low for feasibility were preferred to movements, which scored higher on feasibility. Interestingly, fluency accounts of aesthetic experience (see later) would predict the opposite: familiar and feasible movements should be preferred to unfamiliar movements, as greater familiarity with a movement is associated with increased processing fluency (Beilock & Holt, 2007; Calvo-Merino, Glaser, Grezes, Passingham, & Haggard, 2005; Orgs, Dombrowski, Heil, & Jansen-Osmann, 2008; Topolinski, 2010).

We have recently developed a novel stimulus class, which can be used to investigate the aesthetic impact of observed movement. Paradoxically, the key step involves replacing actual movement with apparent movement implied by pairs of static postures. The mind generates genuine percepts of movement from successive presentation of two body postures. We showed that apparent movements are phenomenally rich, since they influence other aspects of experience such as temporal duration, despite involving apparent rather than real motion (Orgs, Bestmann, Schuur, & Haggard, 2011; Orgs & Haggard, 2011; Shiffrar & Freyd, 1990, 1993). We further found a strong effect of path reversals. Adjacent postures that proceed along a continuous implied path produce a simple predictable movement with "good" continuation; sequences of non-adjacent postures produce both changes in implied movement direction as well as implied movement dynamics (Orgs et al., 2011). Importantly, we hypothesize that "good" continuation may be an important influence on aesthetic judgement of movement, in loose analogy to "good" continuation of musical phrases (Balch, 1981) and curved contours in static visual objects (Bar & Neta, 2006).

Finally, at a *structural level*, individual movements can be arranged into longer phrases, following compositional rules (Opacic, Stevens, & Tillmann, 2009; Schiffer & Schubotz, 2011). Sequential symmetry (Arnheim, 1988) is frequently used in the composition of dynamic art works such as music (Balch, 1981; Kuhn & Dienes, 2005; Rohrmeier & Koelsch, 2012; Rohrmeier, Rebuschat, & Cross, 2011; Wilson, 1986) and poetry (Jiang et al., 2012). Interestingly, human movement in dance is composed in space *and* time (Loeb, 1986), and therefore principally allows to study aesthetic processing of both spatial and sequential symmetry. A prominent example of the application of compositional rules to movement can be found in the work of choreographer William Forsythe (see www.synchronousobjects.osu.edu).

One of the most robust effects in experimental aesthetics is the effect of mere exposure: Greater familiarity with a stimulus can increase (Zajonc, 1968) or decrease (Berlyne, 1970) perceived pleasantness for the same stimulus. This effect also depends strongly on stimulus complexity: Simple stimuli tend to decline in likeability after extensive familiarization, whereas "mere exposure" increases preferences for more complex stimuli (Heyduk, 1975); for a review see (Reber, Schwarz, & Winkielman, 2004). We might therefore expect all three levels, body postures, movements and phrases to depend strongly