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Individual differences in athletes' perception of expressive body movements

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ABSTRACT

Objectives: Understanding others' actions depends on the observer's individual characteristics and sensorimotor experience. Motor performance domains, such as sports and the performing arts, provide optimal situations to investigate the determinants of action perception. We investigated athletes' perceptual identification of expression intensity in body movements.
Design: A within-subjects design was used.
Method: Participants watched point-light displays (1000 ms long) depicting expressive and inexpressive dance movements. The task was to identify the dancer's intended expression intensity.
Results: The results indicate that expressive body movements can be reliably identified, with judgement accuracy correlating with self-report empathy indices, intuitive/deliberate decision-making preferences, and indices of sports training. Only years of sports training could predict perceptual identification accuracy.
Conclusions: We discuss the findings in relation to motor and cognitive–emotional contributions to action simulation. The potential of cross-domain transfer of motor expertise for boosting perceptual judgements and a hierarchical role of factors eliciting action simulation are also outlined.

1. Introduction

In performance domains such as sports and the performing arts (e.g., music, dance), body movement is the prime means to achieve optimal outcomes: For instance, ensemble dancers must adjust their bodies to perform a movement routine efficiently but also to monitor their own and the other dancers' actions. These corporeal competencies depend on both sensorimotor skills and cognitive–emotional characteristics (for reviews, see Raab, Johnson, & Heekeren, 2009; Sevdalis & Keller, 2011a, 2014; Sevdalis & Raab, 2014). We focused on investigating the role such factors play in the assessment of point-light displays of dancing performances by motorically trained individuals (i.e., athletes). Specifically, we were interested in how individual differences in sensorimotor experience as well as empathic and decision-making tendencies affect perceptual accuracy in discriminating between expressive and inexpressive body movements. Below, we first address the topics of action perception and individual differences in motor performance, and then provide a rationale for a synthesis of these topics and introduce an empirical study.

1.1. Action perception

Research across performance domains has shown that action perception is modulated by multiple factors. Accumulating evidence suggests that action observation encompasses a strong motor component (for a review, see Wilson & Knoblich, 2005). Previous experience, training, or familiarity with executing an action can be critical in the identification of observed movement features, such as action identity or accuracy: This was the case in experiments where individuals observed themselves acting (vs. observing the movements of another individual; Cañal-Bruland, Balch, & Niesert, 2015; Sevdalis & Keller, 2009, 2010, 2011b) or had incidental experience with executing the depicted action (Sevdalis & Keller, 2012). Furthermore, perceptual accuracy is boosted in cases of domain-specific, deliberately cultivated

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activities (e.g., when expert pianists recognize their own performances; Repp & Knoblich, 2004) and motor-training-based evaluations (e.g., when expert officials with experience as former athletes judge athletes; Pizzera & Raab, 2012). These studies indicate that observers are sensitive to subtle movement characteristics as a function of their own (embodied) experience.

The human body in motion can be a major research tool for understanding affective dimensions of behaviour and bodily communication (de Gelder, 2009). A number of research articles has shown that communication of basic emotions (e.g., happiness, sadness, fear) is possible when experimental participants observe bodily motions depicted as point light displays: the actions depicted in these situations ranged from simple arm movements (Pollick, Paterson, Bruderlin, & Sanford, 2001), to full body movements (Atkinson, Dittrich, Gemmell, & Young, 2004), including interpersonal dialogue (Clarke, Bradshaw, Field, Hampson, & Rose, 2005; Kaiser & Keller, 2011) and dance (Dittrich, Troscianko, Lea, & Morgan, 1996). Experimental manipulations of expressive movements and sounds are also common in music and dance performance contexts: Musicians, conductors or dancers are asked to use different levels of expression while they perform and their recordings are subsequently judged by observers (Broughton & Stevens, 2009; Dahl & Friberg, 2007; Davidson, 1993; Sevdalis and Keller, 2011b; Wöllner, 2012). More recently, researchers have been investigating individual differences in the perception of biological motion, in cases such as alexithymia (Lorey et al., 2012), personality (Kaletsch & Krüger, et al., 2014), and depressive disorders (Kaletsch & Pilgramm, et al., 2014). Thus, the human body can be a communicative tool for providing information about an individual's affective states.

1.2. Individual differences

Researchers have begun to identify contributions to action perception that extend beyond the (sensori)motor to cognitive and affective aspects (Grafton, 2009; Keysers, 2011). Differences between individuals can occur at the level of behaviour patterns or tendencies. Such tendencies may be long established or spontaneously induced. Recent evidence suggests that individuals' perceptual decisions when judging action parameters in performance contexts are modulated by empathic and decision-making tendencies (on empathy: Sevdalis & Raab, 2014; on decision making: Plessner, Betsch, & Betsch, 2008; see also Laborde, Dosseville, & Raab, 2013, for a general overview on emotion). Below we describe links between empathy and decision making when observing and/or performing actions.

Regarding empathy, research has shown that when jazz musicians were asked to identify whether recorded piano melodies were improvised or imitated, their judgement accuracy correlated positively with a self-report empathy subscale (i.e., perspective taking, Engel & Keller, 2011). When musically trained individuals were asked to observe recordings of performing ensemble musicians, individuals with higher empathy were more accurate in estimating the ensemble musicians' intended expression (Wöllner, 2012). Similar results were obtained when non-expert individuals observed dance performances depicted as point-light displays and were asked to identify the performers' intended expression intensity (expressive vs. inexpressive): Identification accuracy and empathic tendencies were positively related (Sevdalis & Keller, 2011b, 2012). Taken together, the above results suggest that empathic tendencies can contribute positively to identification of emotionally laden movements.

An additional boost to identifying emotionally laden movements can occur if an individual executes decisions in a particular mode. Skilled performance contexts are often characterized by complexity, time limitations, and stressful events. Optimal performance in such contexts is commonly associated with intuitive tendencies, for instance, a preference for making fast, heuristic-based decisions “from the gut” rather than following effortful, rule-based, and rational processes (for an overview see Plessner et al., 2008). For example, Raab and Laborde (2011) showed that players classified as intuitive decision makers made faster and better tactical choices in their game than players classified as deliberative decision makers. In this study intuition was also associated with expertise, with expert players relying more on intuitive decisions (Raab & Laborde, 2011). Yet deliberative decisions were more frequent than intuitive ones in a case study of an expert cello performance (Bangert, Fabian, Schubert, & Yeadon, 2014). In another study, facial emotional expressions such as anger, fear, and sadness were better identified when participants were given instructions to focus on each expression and deliberate on their response (as opposed to being quick; Tracy & Robins, 2008). These results suggest a complex relation between performance and intuition/deliberation tendencies, mostly dependent on expertise, situation, and task.

1.3. Rationale for synthesis

The above studies indicate that both motor and cognitive–emotional characteristics can affect performance when perceiving actions. Essentially, the recruitment of sensorimotor resources while observing actions is based on a common representational format between observed and executed actions. Individuals rely on their own sensorimotor experience when observing the properties of the actions (Herwig, Beisert, & Prinz, 2013; Prinz, 1990). For instance, while observing someone performing an action, observers can recruit some of their own sensorimotor resources as if they were performing the action themselves. This mapping of observed movements onto one's own sensorymotor system is known as *action simulation*. Action simulation prompts the investigation of the factors that evoke this simulation.

Long-term sensorimotor training has the potential to establish internal models of the body and the environment, the result of extensive experience with creating action–perception couplings (Herwig et al., 2013). Can this extended sensorimotor experience of cultivating perception–action links be useful out of the context in which it was initially established? Previous literature in the fields of motor learning and control has established the possibility of skill transfer across motor performance situations if some similarities between them exist, both in terms of movement components and cognitive processes involved (Magill & Anderson, 2014). For instance, recognizing patterns of play may transfer across team sports that process a similar structure of play (soccer, hockey, and volleyball, Smeeton, Ward, & Williams, 2004; basketball, netball, and hockey, Abernethy, Baker, & Côté, 2005). Furthermore, anticipatory skills when observing movements can transfer across domains (karate, taekwondo, and football, Rosalie & Müller, 2014). Music training skills have been also associated with enhancements in the recognition of emotions expressed by speech in expert musicians (Lima & Castro, 2011) and other auditory working memory and phonetic discrimination tasks in musically trained children (Rochette, Moussard, & Bigand, 2014). Therefore, evidence suggest that specialized training may be beneficial in a different domain than the one initially acquired (see also Sevdalis & Wöllner, 2016 for a theoretical overview).

This observation becomes particularly important if one considers the diversity in the developmental histories of individuals towards the development of expertise. In motor performance domains such as sports, music and dance, it is quite common for an individual to engage in multiple corporeal activities before