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Los Angeles

Social Perception of Body Motion

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy in Psychology

by

Pamala N. Dayley

2026

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2026

ABSTRACT OF THE DISSERTATION

Social Perception of Body Motion

by

Pamala N. Dayley

Doctor of Philosophy in Psychology

University of California, Los Angeles, 2026

Professor Kerri L. Johnson, Chair

In everyday social interactions, humans rely on visual cues to form impressions, evaluate, and recognize others. Both bodies and faces serve as uniquely rich sources of information for these processes. While face perception has been extensively researched, the study of other visual stimuli, including bodies, has been comparatively limited. Therefore, face perception research serves as a foundation for studying other visual stimuli. Due to recent technological advances, studying bodies is more plausible than ever before. Moreover, while decades of research have centered on assessing individual targets, the prevalence of group settings in our natural social encounters underscores the importance of extending social cognitive research to encompass group perception. Recognizing these dual needs, my dissertation (1) provides a comprehensive review of the body perception literature to identify key areas necessitating further exploration and (2) addresses some of the identified gaps by establishing a publicly accessible database of biological motion (point light display) stimuli for scientific researchers and experimentally

testing the impact of body motion on individual and group target perception. Through these efforts, my dissertation advances our understanding of both individual and group social cognition by bridging crucial gaps in existing research.

The dissertation of Pamala N. Dayley is approved.

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2026

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Chapter 1

A Comprehensive Review of Body Perception

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Chapter 1 Abstract

The following chapter aims to provide a comprehensive review of social cognitive research on body perception, highlighting key similarities and differences compared to face perception. Beginning with an exploration of body perception, this review analyzes the underlying visual processing mechanisms, relevant theoretical frameworks, and downstream consequences (e.g., recognition, categorical judgments, and evaluations) of body perception. Notably, particular attention is given to the role of biological motion in shaping body perception. Additionally, the chapter identifies critical similarities and distinctions between body and face perception, shedding light on shared mechanisms and unique characteristics. Finally, this review highlights gaps in the existing literature and offers suggestions for future research by describing contemporary research theories and methodologies that extend beyond traditional person perception to encompass "people" perception.

Keywords: body perception, face perception, biological motion, ensemble perception

Introduction

In everyday social interactions, humans rely on visual cues to form impressions of, evaluate, and recognize others. As social beings, the ability to interpret static and dynamic information conveyed by a person's body and face is a skill vital for survival, specifically helping to discern friend from foe. To date, research on the perception of faces is extensive, whereas research on the perception of bodies is comparatively limited. Due to the overlap in visual processing of bodies and faces, researchers have begun testing body perception using well-established face perception techniques. The following chapter will provide a comprehensive review of existing social cognitive research on body perception, but given the shared techniques and methodologies of face and body processing research, the chapter will synthesize relevant face perception research where necessary. However, a comprehensive review of the face perception literature is beyond the scope of this chapter. Importantly, the end of this chapter will draw direct comparisons between body and face perception by discussing key similarities and differences between the two.

While there are diverse approaches to researching body and face perception, this review will primarily adopt a social-cognitive perspective. Social cognition refers to the mental processes involved in perceiving, interpreting, and understanding social information from the environment. It encompasses a wide range of cognitive processes, including perception, attention, memory, judgment, and decision-making (Fiske & Taylor, 1991). Within social cognition exists an area of research that explores the interplay of vision and social perception known as “Social Vision.” In particular, scholars in this field examine individuals' capacities to precisely detect the mental and emotional states of others, comprehend their desires and

intentions, and even identify stable personality traits from visual cues (Adams et al., 2010; Balcetis & Lassiter, 2010; Johnson & Adams, 2013).

Body perception is a subdiscipline of social cognition and social vision that refers to the cognitive process by which individuals perceive, recognize, and make inferences about others using information gleaned from the body (de Gelder, 2006). This multifaceted field of research includes the perception of body size, shape, posture, movement, and sensations such as touch and proprioception (i.e., awareness of the body's position and movement in space). An intriguing aspect unique to body perception research is the study of biological motion, body motion, or body language. Biological motion perception is a visual process through which humans perceive motion to infer the identity and actions of other humans, animals, or robots. This process allows us to recognize and understand the activities and states of biological entities through motion alone (Blake & Shiffrar, 2007; Troje, 2008; Voos et al., 2013). Body perception plays a critical role in many human experiences, including self-awareness, body image, motor control, social interaction, and emotion regulation.

Similarly, face perception is the cognitive process by which individuals recognize, interpret, and make inferences from human faces using facial features like the eyes, nose, and mouth, and integrating them into holistic representations. These features and representations of the face facilitate the recognition and interpretation of emotions, identity, and social cues (Hugenberg & Wilson, 2013; Young & Bruce, 2013). The study of face perception has a rich historical backdrop within social and visual sciences, dating back to the late 19th century (e.g., Haslam & Pedersen, 1966; Helmholtz, 1878; Langfeld, 1918; Sherif, 1935; Washburn, 1897). Recently, face perception research has expanded quickly; this widespread adoption is attributed to face perception’s profound implications for a myriad of research questions.

Despite its role in Social Cognition, body perception remains significantly understudied compared to face perception. A brief search on APA PsychInfo underscores this point: a search for "face perception" or "face recognition" yielded over 32,000 results when limited to peer-reviewed studies involving human participants. In contrast, a search for "body perception" or "body recognition" under the same parameters returned only 25,000 results. While this discrepancy may not initially appear significant, a closer look reveals that a large portion of these results focus on one's own body perception (i.e., not perceiving others). While important, these articles often take a clinical approach, diverging from the scope of this review. Removing keywords including “self,” “own,” or "diet” from the body perception and recognition search reduces the results to 15,000, further emphasizing the field's focus on face perception over body perception. The following chapter represents a pioneering effort to address this gap. By bridging the body and face perception literature, numerous future directions for body perception research will be revealed.

Body Perception

The human visual system has evolved to promote survival, enabling perceivers to identify and recognize a person amidst visual noise. Accurately identifying a person equips us for subsequent interactions, ensuring we do not overlook vital social engagements (e.g., fostering social bonds and cooperating with community members) or jeopardize our safety. To guide these judgments, perceivers rely on any visual information available to them. Humans are predisposed to prioritize face perception due to the face’s critical role in social communication (Jack & Schyns, 2015). Facial features convey both structurally invariant information (e.g., race) as well as situationally variable information (e.g., emotion; Hugenberg & Wilson, 2013). The basic components of a face provide a wealth of visual cues related to identity and social categories

including age, gender, sex, race, and ethnicity. Additionally, the face, and more specifically, facial expressions, are an informant of current states including emotions, intentions, and even physical health. Importantly, these features and signals bypass the need for verbal communication. Studies have shown when perceivers can see a face, they are highly skilled at recognizing faces and extracting social information from them, even from very brief exposures (Bruce & Young, 1986; Freeman & Johnson, 2016).

Although the face provides a wealth of information to observers, there are often instances where a perceiver encounters an unknown individual and is unable to see their face. In such moments, it is still necessary for the perceiver to assess the target and infer intentions, so instead, they will instinctively rely on body cues. There are three primary reasons why the body is the next target of perception when the face cannot be seen: bodies are larger and can be seen from greater distances, bodies can be seen from more angles than faces, and body language is often regulated less carefully than facial expressions and therefore can be a more honest representation of current states.

Take, for example, sitting in an auditorium while listening to a speaker or performer. When the speaker is close enough to make out details and is facing the audience, the perceiver will more often attend to the target's face. However, if these conditions are not met, the observer will instead attend to the target's body. More specifically, if a perceiver sits near the front of the stage, they will have greater chances of viewing the speaker's face and will instinctively do so. If instead, the perceiver sits in the back of the room, the ability to see the speaker's face will be reduced and the observers will be more likely to pay attention to the speaker's body or overall person. Additionally, if an audience member sits at center stage, they will have the greatest chance of always being able to see the performer's face, whereas an audience member who sits

to the side of the stage is more likely to only see the profile of the performer and in some cases may not be able to see their face at all. Comparatively, while the face can only be seen from the front and sides, limiting it to roughly 180° visual perspective, the body can be seen from 360°. Regardless of where you sit (up close, far away, directly in front of, to the side of, or even behind), you will always have as good of or a greater chance of seeing the target's body compared to their face.

Finally, body language is often a more honest presentation of emotional state or intention. People commonly regulate their facial expressions, but tend to exhibit less restraint in controlling their body language. In many cases, this makes body language a more genuine indicator of inner states (Ambady & Rosenthal, 1998). For instance, someone might smile politely while having their arms crossed tensely. The contradiction of actions may reveal the person's inner discomfort or anxiety.

These three characteristics (being seen from greater physical distances, having more visual vantage points, and potentially providing more transparent representations of emotional states) provide a foundation to begin exploring the visual processing mechanisms involved in body perception and subsequent, downstream judgments informed by body perception. The following sections will describe existing literature in these areas.

Visual Processing of Bodies

Central to person perception is configural processing. Configural processing emphasizes the holistic analysis of overall configurations rather than isolated features (Farah et al., 1998). Configural processing allows us to perceive entities as a unified whole by considering the spatial relationships among features. This holistic approach is believed to underpin our recognition

abilities. In contrast to configural processing, featural processing (also known as ‘componential processing’, ‘piecemeal processing’, and ‘analytic processing’) is the encoding of individual features of a stimulus. Configural processing focuses on the spatial arrangement of features, whereas featural processing attends to the specific characteristics of each feature instead of the overall configuration.

To best illustrate the difference between these two types of processing, consider how we identify familiar and unfamiliar individuals. When identifying a familiar person, such as a close friend or family member, configural processing allows us to recognize them based on the overall arrangement and movement of their body, even if individual features or specific movements are partially obscured. In contrast, when discriminating between unfamiliar individuals with similar body types, featural processing may be employed to focus on specific differences in body characteristics, such as the size of their shoulders or the motion of their hips when walking.

Scholars have dedicated considerable efforts to investigating featural and configural processing for body perception. Featural processing in body perception typically involves the analysis and interpretation of individual components or attributes of the body, such as body shape, size, proportions, and specific body parts. For example, research has demonstrated individuals' acute sensitivity to variations in body shape and size from a young age (Slaughter et al., 2002). This ability enables perceivers to discern subtle differences among bodies thereby facilitating body recognition (Gervais et al., 2012; Seitz, 2002; Tovée & Cornelissen, 2001). However, body perception research has more intensively focused on configural and holistic processing.

Moving beyond the processing of individual body features, holistic body processing involves the integration of multiple features to form a coherent representation of the entire body. Holistic processing allows perceivers to rapidly and accurately interpret and recognize bodies (Bonemei et al., 2018; Hock et al., 2016). Notably, Harris and colleagues (2016) examined the holistic processing of bodies using a novel stereoscopic depth technique. This method allowed them to generate images of bodies and body parts that appeared as if they were positioned either behind or in front of a set of stripes. This paradigm exposes holistic processing via amodal completion (i.e., the ability to see an entire object despite parts of it being covered by another object in front of it). This completion technique enables perceivers to process the stimuli as a unified whole, highlighting holistic processing. Conversely, when stimuli are unable to undergo completion and are processed solely as their features, it indicates featural processing. The researchers found that recognition of body parts was better in the context of a whole body that was amodally completed (behind the stripes), whereas recognition significantly declined when the same bodies were presented in front of the stripes or presented as parts. These findings suggest that bodies are predominantly processed holistically.

Another innovative approach to investigating the mechanisms underlying body perception is through the examination of the composite effect, as demonstrated by Willems and colleagues (2014). Employing a composite face-effect paradigm, the researchers created stimuli using a computer-generated model exhibiting various postures. These images were segmented both horizontally (top-bottom body halves) and vertically (left-right body halves). Each half was then paired with corresponding or differing posture halves, with variations in alignment. Participants needed to discern if certain halves of two models matched, irrespective of the other body parts. For example, participants may have been given instructions such as, “Ignoring the

bottom halves, are the top halves of these two models the same?" The findings revealed that alignment significantly influenced task difficulty. Specifically, when body parts were aligned, the task became more challenging. However, misalignment increased task performance. This supports the claim that the composite effect extends to bodies, which further emphasizes holistic processing in body perception.

Finally, to further test the holistic processing of bodies, researchers have applied inversion techniques to body recognition tests. A seminal paper by Reed and colleagues (2003) investigated the body-inversion effect. Participants were shown images of upright and inverted bodies and asked to identify whether the bodies were familiar or unfamiliar. The results revealed that recognition accuracy was significantly impaired for inverted bodies compared to upright bodies. These findings indicate that holistic processing plays a crucial role in body perception. These findings have been replicated and extended (Marzoli et al., 2017; Reed et al., 2006; Yovel et al., 2010; Zhang et al., 2019). In sum, it appears that body perception predominantly relies on holistic processing, though it also incorporates featural processing in specific contexts.

Categorical and Evaluative Judgments of Bodies

Body perception research explores perceivers' abilities to categorize bodies into meaningful groups and the subsequent impact on evaluations of the target. Perceivers categorize others' bodies based on various attributes, including gender (Cao et al., 2008; Gaetano et al., 2014), race (Johnson & Wilson, 2019; Rodway et al., 2019), emotion (Bjornsdottir et al., 2017; Garber-Barron & Si, 2012), weight (Hu et al., 2018), and socioeconomic status (McDermott & Pettijohn, 2011). These categorizations significantly influence subsequent evaluations of the target, such as judgments of attractiveness, humanization, and threat.

Body shape is a critical source of information for body categorizations and evaluations. One of the earliest experiments to test the importance of body shape for evaluative social judgments was conducted by Devendra Singh (1993). Singh manipulated body shape by varying the waist-to-hip ratio (WHR) of line-drawn female targets and found that observers consistently judged women with low WHRs as more attractive than those with high WHRs. Interestingly, the WHR also has implications for other social judgments. This cue informs sex category judgments (Johnson & Tassinary, 2005). Perceivers exhibit biases in gender categorization, exhibiting a tendency to judge bodies as men more frequently and quickly (Johnson et al., 2012). WHRs are also used to infer a target's sexual attitudes. Low WHR women are perceived as more sexually unrestricted (Paganini et al., 2023). The impact of body shape on social judgments extends beyond the WHR. The presence of adipose tissue (i.e., body fat) is associated with negative social evaluations (Hu et al., 2018), interpersonal discrimination (Crandall et al., 2001), and dehumanization (Sim et al., 2022).

Biological Motion

A stationary body inherently conveys significant information, such as race, gender, and physical fitness. The aforementioned research studies have all relied on static images of bodies. However, due to the body's size and distinctive abilities, the discussion of body motion becomes particularly significant in understanding how we perceive others. The study of the kinematics of living organisms is known as "biological motion" or "biomechanics".

In 1973, Gunnar Johansson explained biological motion to be "motion patterns characteristic of living organisms in locomotion" (p.1). Since then, researchers have supported and extended his definition of biological motion to be the movements characteristic of living

organisms in motion, including both whole-body motion and partial movements such as those made by the hands, head, and eyes (Blake, 1993; Thompson & Parasuraman, 2012). Biological motion holds a unique place in human perception compared to other types of motion. Even when biological motion is presented among random noise, humans can accurately detect it (Billino et al., 2009; Decety & Grèzes, 1999; Giese & Poggio, 2003). This suggests that the human visual system is finely tuned to identify relevant biological information.

When "biological motion" was adopted into social cognitive research, the definition and approach to understanding this topic shifted to better fit the focuses and limitations of the area. Currently, social cognitive research incorporates biological motion by more specifically investigating biological motion perception. In this field of research, biological motion perception is the visual process through which humans infer the identity and actions of humans, animals, or robots by observing their movements, thus allowing us to recognize and understand the states or activities in which a biological entity is engaged (Blake & Shiffrar, 2007; Troje, 2008; Voos et al., 2013). Beyond current states, body motion also offers insights into future actions. Perceivers can predict the outcome of different body motions (Abernethy et al., 2008; Grezes et al., 2004; Knoblich & Flach, 2001; Shim et al., 2005). For example, soccer players can accurately predict the direction of an opponent's kick (Cañal-Bruland et al., 2010). The following sections will expand on the current research of perceiving biological motion in human bodies.

Technological Advancements and Methodologies of Biological Motion

Predating Johansson, Étienne-Jules Marey's (1894) work in animal locomotion advanced the study of movement. Using innovative technologies such as chronophotography and the sphygmograph, Marey developed graphing machines, dynamometric devices, and high-speed

optical arrays. His most notable invention is the chronophotographic gun. This device sequentially captures multiple images on a single photographic plate. This enabled him to break down complex movements into individual frames for detailed analysis (Sipe, 2020). Marey laid the foundation for modern cinematography and motion analysis techniques.

While Marey's technological advancements were pivotal to the study of motion broadly, Johansson revolutionized this technology. In 1975, Johansson revealed his groundbreaking technique for the study of human motion perception, currently referred to as point-light displays (PLDs). To create the PLDs, Johansson attached small, illuminated markers to key points on the body including the head and joints. The markers emitted light that was, in turn, detected by cameras in a darkened room. By tracking the movement of these markers, Johansson created sparse, yet remarkably detailed, representations of human movement. The PLDs stripped away extraneous visual information, thus producing a stimulus that simply showcased the body's movement. Since then, motion capture technologies (MOCAP) have revolutionized the visual sciences by enabling researchers to capture and analyze human movement, including gestures and walking gait.

A primary advantage of MOCAP is its ability to capture naturalistic movement patterns with great accuracy. MOCAP technologies have been instrumental in the development of virtual environments and interactive simulations. This allows users to engage in realistic and immersive experiences that simulate real-world interactions and movements (e.g., Bailenson et al., 2004; Pan & Hamilton, 2018). However, generating stimuli for biological motion perception poses a complex challenge (Thornton, 2006; see Dekeyser et al., 2002 for a review).

Cognitive Representations of Human Motion

Key findings of biological motion perception reveal how cognitive representations are impacted by biological motion. One prominent aspect of biological motion perception is the formation of prototypes, which in this case, are idealized representations of human movement patterns (Cutting, 1978a). These prototypes serve as cognitive templates that aid in the recognition and interpretation of biological motion (Troje & Westhoff, 2006). Individuals develop prototypical representations of various actions, such as walking and emotional expressions, through exposure to a variety of human movements (Loula et al., 2005). Research further suggests that prototypes play a crucial role in guiding attention and perceptual processing towards salient motion cues, enhancing sensitivity to relevant social information conveyed through human movement (Pollick et al., 2005b). Cognitive prototypes are an underlying mechanism in the perceptual and cognitive processes involved in perceiving biological motion.

Categorical Judgments of Human Motion

Research has demonstrated that individuals are adept at making categorical judgments based on biological motion cues. The first judgment that should be noted is the unique ability of perceivers to differentiate human motion from other motion. Research shows that children orient to biological motion over nonbiological motion (Bardi et al., 2011; Bouquet et al., 2007; Fox & McDaniel, 1982; Kuhlmeier et al., 2010; Simion et al., 2008). This preference for, and orientation towards, biological motion later manifests as the ability to distinguish between human and non-human movement patterns (Bertenthal & Pinto, 1994; Blake & Shiffrar, 2007; Dittrich, 1993; Thornton & Vuong, 2004; Vignolo et al., 2017; Wang et al., 2010).

Secondly, perceivers can also discern subtle cues such as walking or heading direction from biological motion stimuli (Bardi et al., 2015; Davila et al., 2014; Troje & Westhoff, 2006;

Verfaillie, 2000). Perceiving walking direction is necessary to understand social interactions, predict others' intentions, and navigate social situations (Cutting & Kozlowski, 1977; Troje & Westhoff, 2006). Additionally, perceiving walking direction allows individuals to anticipate potential threats or opportunities (Adams et al., 2006; Miller et al., 2010). The categorical judgments of motion, such as distinguishing between human and non-human movement and determining the direction of motion, represent fundamental perceptual processes that occur during biological motion perception. Nevertheless, there are numerous additional categorical judgments of relevance.

Beyond these two basic categorical judgments, biological motion perception extends to discerning more nuanced characteristics such as gender (Cutting, 1978b), emotion (Atkinson et al., 2004; Dittrich et al., 1996; Pollick et al., 2005b), sexual orientation (Ambady et al., 1999; Johnson et al., 2007; Lick et al., 2013), age (Galusca et al., 2022; Montepare & Zebrowitz, 1988; 1998), and personality (Hu et al, 2018). Among these, gender is one of the most extensively researched aspects of biological motion perception. Studies consistently reveal that individuals, including children, can accurately infer the gender of unfamiliar individuals based solely on body motion cues (Cutting, 1978b; Cutting et al., 1978; McDonnell et al., 2009; Pollick et al., 2005a; Tsang et al., 2018). Remarkably, this ability occurs almost instantaneously. For instance, Barclay and colleagues (1978) demonstrated that perceivers can reliably identify gender in point-light displays within two-step cycles. Two-step cycles last an average of 2.7 seconds but typically require at least 1.6 seconds.

Researchers have devoted considerable attention to delineating the specific body motion cues underlying gender perception. In a seminal study by Cutting (1978b), it was demonstrated that perceivers could discern gender based on the motion patterns of real human targets,

prompting Cutting's further investigation of the cues that perceivers use to determine gender. Subsequently, Cutting (1978a) assessed the distinctive biomechanical characteristics of male and female joints, particularly the shoulders and hips, focusing on "torque" (i.e., a twisting force that causes rotation). Analyzing PLDs of real humans, he observed that males exhibited higher relative torsion than females. Utilizing these findings, Cutting generated synthetic PLD walkers focusing on the manipulation of torque. Supporting his previous work, Cutting found that perceivers made gender judgments based on variations in shoulder and hip movements, such that walkers with greater torque were more frequently categorized as males.

Researchers have also tested other factors that impact gender categorization such as view angle (Mather & Murdoch, 1994), other body parts (e.g., head, back, chest, thighs; Yu et al., 2009), and body shape parameters (e.g., waist-to-hip ratio; Johnson & Tassinary, 2005). While these findings offer valuable insights, they are subject to gender biases and individual differences (Hiris et al., 2022; Johnson et al., 2012).

In broader psychological research, the associations between gender and emotion have been extensively tested. Among other judgments, emotion perception is influenced by gender perception. While perceivers are adept at discerning emotion from biological motion (Ahmed et al., 2019; Aviezer et al., 2012a; Clarke et al., 2005; Noroozi et al., 2018; Ogren et al., 2019; Pollick et al., 2001), negative, outward emotions are often associated with men, and positive and inward emotions are associated with women (Becker et al., 2007; Becker, 2017; Hess et al., 2009). This knowledge has profoundly influenced studies examining gender and emotion perception in biological motion.

Researchers have argued that accurate detection of emotion is facilitated by velocity differences in emotional expression. For example, anger is characterized by increased velocity and sadness by slower movements (Chouchourelou et al., 2006; Paterson et al., 2001). However, it has also been argued that gendered stereotypes of emotion also facilitate this ability. For instance, Johnson and colleagues (2011) controlled for the velocity of PLD stimuli, and found that perceivers remained accurate at identifying emotion. They also revealed that observers' accuracy in perceiving emotion varied based on both the emotional state and gender category of the target, elucidating the reciprocal relationship between gender and emotion perception in biological motion. More specifically, depictions of anger were assumed to be men and depictions of sadness were perceived as women, regardless of the target's actual gender. Since these findings align with societal gender norms and stereotypes, they suggest that preconceptions may significantly influence how we perceive emotion from bodies.

Evaluations of Human Motion

As previously mentioned, the ability to discern and interpret biological motion is indispensable for survival, profoundly shaping our perceptions of others; are they allies or adversaries? Consequently, this influences our subsequent behavior toward the perceived target—are we inclined to approach or avoid? Rooted in human evolution, biological motion perception underlies a distinct advantage: the ability to make rapid and accurate assessments of potential threats or opportunities in the environment. In line with the evolutionary benefits of biological motion perception are theories concerning self-preservation and the propagation of genetic material.

Three such theories, self-preservation theory, inclusive fitness theory, and sexual selection theory, seamlessly align with biological motion perception. Self-preservation theory describes the innate drive to safeguard one's well-being and encompasses a variety of behaviors and physiological responses aimed at ensuring one's survival (Baumeister & Leary, 2017). Inclusive fitness refers to an individual's reproductive success. Inclusive fitness takes into account not only an individual's direct offspring but also the reproductive success of genetically related individuals (Hamilton, 1964). It suggests that behaviors promoting the survival and reproduction of relatives who share genetic material can be favored by natural selection (Hamilton, 1964). Sexual selection explains the evolutionary pressures related to mate competition and the development of traits that increase an individual's reproductive success or attractiveness (Darwin, 1888). With this in mind, it can be argued that perceptions and evaluations of biological motion are intricately linked to these theories because, like biological motion perception, these concepts all serve to bolster our survival strategies. The implications of these theories will be discussed as they relate to the study of biological motion perception below.

As posited by self-preservation theory, humans instinctively use cues from unfamiliar individuals to ensure their survival. Perceptions of biological motion aid in assessing the size and strength of potential threats (Jokisch & Troje, 2003; McCarty et al., 2013; Veto et al., 2017). For instance, research suggests that observers often perceive the biological motion of men as faster, larger, and more erratic (McCarty et al., 2013). However, it's important to note an overarching size effect on how biological motion is perceived. Studies show that compared to inverted PLDs non-biological motion, or static images, upright human PLDs are typically perceived as larger, while objects near them are judged to be smaller (Veto et al., 2017). Comparatively, researchers have also tested perceptions of vulnerability as a function of biological motion. Gunns and

colleagues (2002) found that PLDs displaying a shorter stride length, smaller range of arm motion, and slower speed were rated as easier to attack compared to PLDs displaying a longer stride length, larger range of arm motion, and faster speed.

In accordance with the self-preservation theory, a reciprocal relationship exists between evaluations of others and the immediate environment. When individuals perceive someone as threatening, they inherently feel less secure. Conversely, when they feel less secure, individuals tend to perceive others as more threatening. Specifically, perceivers are more likely to engage in self-protective behavior and categorize unknown others as out-group members when confronted with threatening situations (Miller et al., 2010), but display a bias in perceiving the movement of in-group members more accurately than that of out-group members (Dittrich et al., 1996).

Perceivers also use biological motion to decipher the intentions of others, helping to differentiate helpful from threatening actions (Barrett et al., 2005; Manera et al., 2011). Perceivers often leverage cues from a target's current emotional state to form these judgments. For instance, individuals expressing anger are particularly conspicuous in visual detection, likely due to the perceived threat they pose (Ikeda & Watanabe, 2009; Satchell et al., 2021). In two experiments, Adams and colleagues (2006) investigated the accuracy of perceivers in identifying angry targets that were either brought closer to or moved further away from the observer. The researchers used facial photographs depicting anger and fear to convey the target's emotion. Although point-light displays (PLDs) were not employed, the perception of movement was simulated by promptly substituting the initial face presentation with an identical one of either reduced or increased size. Subsequently, participants were tasked with indicating whether the target was approaching or receding, as well as the direction of their movement. The study revealed that perceivers exhibited quicker and more accurate detection of approaching angry faces.

Another manifestation of threat is illness. Observers can discern signs of illness, such as inflammation, through biological motion (Hansson et al., 2023; Lasselin et al., 2020; Sundelin et al., 2015). Perceptions of health hold implications for providing support to others. Individuals are more inclined to support those deemed healthy (Kramer et al., 2010).

In alignment with the sexual selection theory, perceptions of body motion have been found to significantly influence evaluations of attractiveness (Johnson & Tassinary, 2007; Morrison et al., 2018; Shropshire et al., in prep) and mating behavior (Fink et al., 2015). However, as with many evaluations, attractiveness is inherently subjective, rendering it susceptible to external factors. Specifically, Klüver and colleagues (2016) observed how factors related to the perceiver impact assessments of attractiveness. Their findings revealed that PLDs are deemed more attractive when observers perceive them as closer to their mental "prototype." Additionally, these assessments are subject to influences from factors associated with the target and manipulations thereof. For instance, PLDs of women wearing high heels are rated as more attractive than those wearing flats (Morris et al., 2013).

More specifically, the sexual selection theory argues that individuals engage in performative acts to enhance their perceived attractiveness, thus also suggesting that perceivers are sensitive to or aware of these variations. Research in this area has primarily focused on the effects of ovulation on perceptions and evaluations of attractiveness. First, studies have investigated whether women's gaits vary according to their menstrual and ovulation cycles, and if men detect these changes. Evidence suggests that the menstrual cycle does indeed influence women's body movements, and men are sensitive to such variations (Fink et al., 2012; Provost et al., 2008a). Attraction measures serve as a gauge of this sensitivity, with men reporting women's gaits as more attractive during peak fertility (Fink et al., 2012).

Second, researchers have also explored the impact of menstrual and ovulation cycles on women's perceptions of men. Generally, increased fertility in women corresponds to increased attraction to masculine displays of body motion (Cappelle & Fink, 2013; Provost et al., 2008b). It has been argued that these preferences stem from the "intensity" of men's movements. While not exclusive to humans, Byers and colleagues (2010) note that across many species, females' mate choice often hinges on perceived motor performance, with males displaying rapid, acrobatic, and energetic movements being preferred. Interestingly, research also indicates that female observers report a decreased preference for PLDs of women when they themselves are at peak fertility. These findings related to the dynamics of mate competition (i.e., competition among women for a potential mate; van der Zwan & Herbert, 2012).

Bodies and Faces

Up to this point, this review has largely explored the body perception literature independent from the face perception literature. This section will explicitly note key similarities and differences between body and face perception. Additionally, given that it is unusual to see only a face or only a body in natural contexts, this section will also discuss research examining the symbiotic relationship between the body and face and their effects on perceptions and evaluations.

A foundational similarity between body and face perception is that bodies and faces have an inextricable effect on social communication and cognition. Both bodies and faces serve as potent channels for conveying visual cues that individuals rely on to shape their perceptions, evaluations, and recognition of others. While the modes through which these cues are conveyed are different between bodies and faces, they serve a collective and singular purpose. Whether

through bodily gestures or facial expressions, these cues provide information that can be utilized to infer various social categories, including race, gender, age, emotion, socio-economic status, and sexual orientation. They also enable individuals to formulate evaluative judgments regarding attributes such as attractiveness, humanness, intelligence, threat, and warmth. In sum, the information gleaned from both faces and bodies is necessary for navigating all social interactions.

More specifically, due to their comparable abstract configural properties, there are parallels in the processing mechanisms of bodies and faces. Typically, both bodies and faces comprise a set of discernible parts — such as the arms, legs, and torso for bodies, and eyes, nose, and mouth for faces — that maintain consistent spatial relationships and overall arrangement. Simply put, there is relatively low variability in the configuration of facial features, such as the eyes, nose, and mouth, and body parts, including the head, torso, and limbs, across individuals. Bodies and faces also typically have vertical symmetry when viewed from the front. These shared configural properties significantly influence how bodies and faces are perceived and processed. Using holistic processing, perceivers can quickly and accurately extract meaningful information from bodies and faces, which in turn facilitates rapid and nuanced social evaluations.

Additionally, the perception of bodies and faces is subject to several shared limitations, encompassing both perceiver-related and target-related factors. As for perceiver-related influences, biases play a significant role in shaping perceptions of bodies and faces. For instance, favorable in-group and unfavorable out-group biases impact perceptions of bodies and faces. More specifically, racial and gender group membership has been shown to influence the recognition of faces (Prunty et al., 2023) and bodies (Tuminello & Davidson, 2011). Furthermore, stimuli-related factors impact both body and face perception similarly. A notable

factor that disrupts processing faces (Farah et al., 1995; Searcy & Bartlett, 1996; Valentine, 1988) and bodies (Marzoli et al., 2017; Reed et al., 2003; Sumi, 1984) is inversion. This shared susceptibility underscores the interrelated nature of body and face perception.

Although perceptions of bodies and faces have numerous similarities, they differ in many ways. Bodies and faces serve as sources of visual cues crucial for identification and recognition, yet they convey such information through distinct means. Both incorporate static and dynamic cues, but they rely on these communication methods to varying extents. Arguably, faces rely more on static cues, if not equally balancing both dynamic and static cues. Alternatively, bodies predominantly communicate through gestures and motion. Another notable contrast between bodies and faces lies in the increased size of bodies and the unique vantage points they offer.

Bodies and faces are generally processed holistically, but featural and configural processing have different roles for each of them. Faces are characterized by their high degree of configural processing (e.g., integrating spatial relationships between facial features to perceive holistic facial configurations). In contrast, body perception may more heavily rely on featural processing (e.g., analyzing individual body parts and their general configuration. It is clear that configural and featural information both contribute to face and body perception. However, the weighting of these cues may differ depending on the task. Configural processing often dominates in tasks that require rapid identification. We may leverage configural processing when we try to spot a familiar face in a crowd. Configural information provides an efficient way for us to distinguish between the faces in the group. Comparatively, featural processing may take priority in tasks that require analyzing subtle facial expressions or body movements. Featural processing allows us to focus on individual features which provides us with a more detailed assessment of emotional states or intentions.

Also, the context of the stimulus influences the weighting of configural and featural cues. For example, configural processing may be more prominent when viewing a static image of a body or face, as individuals tend to perceive the overall structure and arrangement of features. However, featural processing may become more salient when viewing dynamic displays, as attention focuses on the specific movements.

In addition to examining the similarities and differences of body and face perception, researchers have tested the effects of bodies and faces on each other and their combined effects on perception. Perceivers utilize bodily and facial cues to categorize individuals into basic social groups, yet facial features can also provide insights into specific body characteristics. For instance, individuals can infer aspects like body shape, weight, and height solely from facial cues (Coetzee et al., 2010; Holzleitner et al., 2014; Re et al., 2012, 2013; Schneider et al., 2013). Additionally, perceptions of bodies influence judgments of faces, such that the interpretation of facial expressions can be significantly affected by accompanying body language. Meeren and colleagues (2005) and Van den Stock and colleagues (2007) utilized face-body compound images featuring congruent (e.g., happy-happy) or incongruent (e.g., happy-fearful) emotional expressions to assess participants' recognition of the expressed facial emotion. Their findings revealed a strong influence of emotional body language on facial expressions. Perceivers exhibited heightened speed and accuracy for congruent pairings. For example, perceivers were faster and more accurate at recognizing a happy face on a happy body, compared to when the same happy face was presented on a fearful body.

Furthermore, despite the extensive research devoted to understanding body and face perception separately, there remains a notable scarcity of studies investigating the perception of

the entire person—comprising both the face and body. However, a handful of studies have been conducted to begin investigating this topic.

First, Aviezer and colleagues (2012b) conducted a series of studies by manipulating the composite face task to investigate whether faces and bodies are perceived as distinct parts or holistically. To do so, they presented participants with congruent or incongruent face and body expressions, either aligned or misaligned with each other. Participants were tasked with identifying the emotion conveyed by the face. The results revealed that disrupting the alignment of the face and body significantly impaired facial emotion recognition. Participants exhibited the highest accuracy in facial emotion recognition when the face and body were aligned and expressed congruent emotions, whereas recognition performance was poorest when the face and body were aligned but expressed incongruent emotions. Interestingly, recognition accuracy was notably reduced (though not to the lowest) when faces and bodies expressed congruent emotions but were misaligned. The authors suggest that this indicates a fracture in the perception of the gestalt, akin to how holistic perception of the face is disrupted when its upper and lower parts are misaligned.

Second, using a similar face-body composite task, Willis and colleagues (2011) tested the effects of congruent and incongruent emotional expressions on approachability outcomes. The authors found that judgments of whole face-body composites are driven largely by the valence of the facial expression, although the extent to which a facial expression influences approachability is moderated by the presence of an angry body expression. These findings suggest that the presence of a threat, whether it is displayed in the face or the body, plays an important role in influencing an individual's perceived approachability.

Finally, Alicke and colleagues (1986) employed a face-body composite task to explore the impact of both facial and bodily features on evaluations of attractiveness. Using pre-rated faces and bodies categorized into varying levels of attractiveness (low, medium, and high), they paired all levels of faces with bodies to create new composite images for evaluation. Their findings highlight the influence of facial and bodily attributes on the overall assessment of attractiveness. Individually, the face and body exerted unique effects on attractiveness ratings, but collectively contributed to participants' perceptions of attractiveness. In sum, these three papers highlight the intricate interplay between facial and bodily cues in shaping perceptions and evaluations.

Conclusion

The static and dynamic cues of bodies and faces underlie numerous cognitive processes that facilitate and enable us to engage in everyday interactions. The significance of these cues is demonstrated by the unique and extensive bodies of literature dedicated to understanding their complexities. However, the intersection of these cues with other important fields of research remains largely unexplored. Below are suggestions for future research directions largely focused on the intersection of face and body perception with rising research topics.

Person or People Perception: Future Directions for Body and Face Perception

Human interactions regularly extend beyond individual encounters to encompass group settings. We often find ourselves in groups (in schools, concerts, grocery stores). Importantly, emergent social information, such as panic, can be uniquely conveyed through crowd behavior (Helbing et al., 2000). Understanding group perception holds paramount importance due to the pervasive nature of social groupings in human interactions. While much research in social

cognition, social vision, face perception, and body perception has focused on understanding perceptions of individual targets, the investigation of group perception emerges as a critical area of inquiry.

Ensemble perception is the ability to extract information from a group without focusing on individual elements (Alvarez, 2011; Alzahabi & Cain, 2021; Utochkin, et al., 2023). Ensemble perception operates at a level beyond the recognition of single objects or individuals in order to provide a broader understanding of the group's collective properties (Alt & Phillips, 2022; Haberman & Whitney, 2012; Phillips et al., 2014; Whitney & Yamanashi Leib, 2018; Whitney et al., 2014).

With this in mind, it is important to note what characteristics distinguish a group from a set of individuals. The concept of entitativity offers insight into what makes a group coalesce into a distinct entity rather than remaining a mere collection of individuals. Entitativity encompasses the perceived sense of oneness or cohesion within a group, which can manifest as either real and stable or transient and ephemeral (Hamilton et al., 2002; Hamilton & Hewstone, 2007; Rydell et al., 2007; Yzerbyt et al., 2004). Drawing from Campbell's (1958) framework, researchers have identified several properties that contribute to a group's entitativity, including perceived importance, similarity among members, and shared purpose.

This phenomenon allows perceivers to quickly and accurately summarize a group's characteristics with remarkable efficiency. Perceivers can extract information about a group's characteristics, including emotion (Elias et al., 2017; Goldenberg et al., 2020), gender (Alt et al., 2019; Whitney & Yamanashi Leib, 2018), race (Thornton et al, 2014; Yang & Dunham, 2019), and group affiliation (Goodale et al., 2018). These perceptual insights inform evaluations of

attractiveness (Dittes, 1959; Lei et al., 2020; van Osch et al., 2015), humanness (Waytz & Young, 2012), and trustworthiness (Alt et al., 2019).

The intersections of face perception, body perception, biological motion, and ensemble perception present numerous avenues for novel investigations. Particularly, researchers should explore the intersection of body motion within groups. Recent studies by Sweeny and colleagues (2013) have revealed that perceivers utilize ensemble perception to comprehend group behavior. Their findings demonstrate that observers swiftly integrate information from multiple PLDs to estimate the walking direction of a crowd. Hence, future research endeavors should extend this inquiry to examine perceivers' abilities to utilize body motion cues to extract and aggregate group characteristics, such as average gender and emotion. Research should continue exploring how factors such as speed and motion synchrony influence evaluations of threat, belonging, warmth, and competence.

In conclusion, group perception represents a burgeoning area of research within Social Vision. The unique insights offered by the intersection of this with face and body perception will unequivocally impact social cognitive research. By elucidating the processes by which individuals perceive and evaluate groups of faces and or bodies, researchers can deepen our understanding of social dynamics and inform interventions aimed at promoting positive group interactions.

Chapter 2

UCLA Point-Light Display Database:

A Stimulus Set of Point-Light Display Walking Motions

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Chapter 2 Abstract

Similar to face-based perceptions, bodies provide critical information that perceivers use to gain insights and make evaluations of others. Despite the importance of body perception, research in this field is limited. An obvious setback to studying body perception is the finite number of body-related stimulus databases. Based on previous video captures of point light displays (e.g. Johansson, 1973; 1975; 1977; Marey, 1894), we provide a novel set of stimuli that include body motion independent of superficial aspects of appearance. The UCLA Point-Light Display Database is a collection of over 700 point-light display videos of UCLA undergraduate students' walking gaits, demographic information for each participant, and saliva assay information. The UCLA Point-Light Display Databases will be a useful tool for researchers seeking to study body motion.

Keywords: biological motion, point light display, body perception, database

Introduction

The social cognition literature has seen a recent and rapid production of research focused on face-based perceptions which now dominates the field. The steady increase in publications investigating face-related perceptions is arguably due to two reasons. First, face stimuli are readily and widely available. With over fifty databases dedicated to face stimuli, finding a suitable stimulus set has become increasingly easy. Various databases include standardized, laboratory-controlled portraits of faces (e.g., Chen et al., 2021; DeBruine & Jones, 2017; Ma et al., 2015; Tottenham et al., 2009), real-world photographs of faces (e.g., Bainbridge et al., 2013; Huang et al., 2008; Karkkainen & Joo, 2021), and synthetic, computer-generated faces (e.g., Hays et al., 2020; Oh et al., 2019). Second, the face is the most informative and emotive part of the human body. Due to this, it is common for perceivers to instinctively look at the face before other areas of the body, especially when attempting to understand or predict a target's emotion and intention (Bruce & Young, 2012). Therefore, this research is critical for understanding person perception, yet, in many everyday situations, perceivers cannot see the faces of unknown others.

In these cases, perceivers instead rely on information they can glean from the target's body. While the perception of faces and bodies involves similar cognitive mechanisms including holistic processing (Harris et al., 2016), numerous factors distinguish the two. Unique to body perception, targets (i.e., bodies) have an increased physical size. This enables perceivers to see the target and therefore make judgments about the target from greater physical distances whereas, with face perception, a target's face must be in closer physical proximity for the perceiver to discern information from the face. Additionally, because of the increased physical size body cues can be seen from an increased number of vantage points that exceed those

available for face perception. Specifically, it is possible to view a target's body when standing behind them, but this is not possible for face perception. Furthermore, body perception is unique from face perception such that bodies may be a more legitimate source of information. Since humans communicate non-verbally, and targets of perception are aware of this, targets are prone to monitor and control non-verbal cues. However, targets do not monitor their facial and body cues equally. Rather targets control their facial expressions more extensively than their body motions, thus allowing their true states to "leak" more from cues of the body than the face (Ambady & Rosenthal, 1998). Considering these distinctions between face and body perception, it is paramount that researchers investigate perceptions of the human body to the extent that perceptions of the face have been researched. The limited but key findings of body perception work can be broadly sorted into three categories: postural, social categorizations, and evaluative judgments.

Researchers have argued that body language, or body expressions, are the most constant form of emotional expression over the evolution of the human species and that because of their historical relevance to survival and their continued use in social interaction, body expressions are among the most important and informative expressions of emotion (de Gelder, 2006). One critical area of body language research focuses on posture. Perceivers use a target's posture to make a variety of downstream evaluations. These evaluations are often heavily influenced by whether the target has an open or closed posture, whether they have the same or different posture as the perceiver, and whether their body posture is congruent or incongruent with other emotional markers (e.g., facial and vocal expressions).

Many key characteristic judgments are made based on whether a target has an open (body turned outwards; with arms or legs uncrossed) or closed (body turned towards itself; with arms

and legs close to the body or crossed) posture. For example, targets with an open posture are rated higher on empathy, dominance, and competence (Küster et al., 2019). Additionally, rapport increases when targets have an open posture (Trout & Rosenfeld, 1980). Furthermore, a posture that is similar or different to the perceiver influences the judgments of the target. For example, targets are rated as higher on attractiveness when in the same posture (sitting or standing) as the perceiver (Bertamini et al., 2013). This literature is supported by research focused on postural mimicry (i.e., copying the posture of a social partner) which suggests that a social partner is rated higher on various characteristics when they mimic the participant in part due to the mimicry-liking link (e.g., Chartrand & Bargh, 1999).

The perception of body posture is particularly important with respect to facial expressions. Importantly, perceivers rely on information from both the face and body to inform emotion recognition. This is easily done when the face and body present congruent emotional expressions. However, when the body and face present incongruent emotional information, emotion recognition is biased toward the body expression (Aviezer et al., 2012a; de Gelder, 2006; Meeren et al., 2005). This literature largely relies on static images, but Nelson and Mondlock (2017) note the importance of motion in face and body emotion recognition. The authors instructed adults and children to identify facial expressions when a full target (head and body) was displaying congruent and incongruent emotional expressions. Despite being explicitly told to attend to the facial expression, and having eye-tracking data to support that perceivers were looking at the target's face, the authors found that for expressions of sadness, anger, and fear, participants most accurately identified the facial expression when it was paired with a congruent body expression, regardless of whether the target was static or dynamic. However, recognition was impaired when the facial expression was incongruent with the body expression,

and this effect was exacerbated for dynamic targets. Therefore, these authors and others have found that bodies have an inextricable influence on emotion recognition even in the presence of facial and vocal emotional expressions (Van den Stock et al., 2007).

In addition to posture, perceivers also rely on body shape and body motion to inform various social categorizations such as gender (Cutting, 1978a; Cutting, Proffitt, & Kozlowski, 1978; Hiris et al., 2022; Johnson & Tassinary, 2005; Pollick et al., 2005a), sexual orientation (Johnson et al., 2007; Lick et al., 2013), race (Miller et al., 2010), age (Galusca et al., 2022; Montepare & Zebrowitz, 1988; 1998), and emotion (Chouchourelou et al., 2006; de Gelder, 2006; Johnson et al., 2011; Pichon et al., 2009). Beyond social categorizations, body shape and body motion also influence downstream evaluative judgments of the target. For example, body shape and motion influence evaluations of attractiveness (Johnson & Tassinary, 2007; Singh, 1993), trustworthiness (Bernotat et al., 2021; Koppensteiner et al., 2016), threat (McElvaney et al., 2021), and strength (McCarty et al., 2013). In summary, body perception is important as it relates to understanding visual perception.

Despite its clear importance in social perception, conducting body perception research is unequivocally more time-consuming than face perception research. Body perception researchers are faced with the laborious task of finding or creating a database dedicated to bodies. Unlike the face stimuli databases, there are only a few existing body stimuli databases. Among the limited databases, the majority include only static full-body images of real people (Connor et al., 2020; 2022) or computer-generated bodies (de Gelder & Van den Stock, 2011). An even more limited number of databases include body motion in videos (see e.g., Keefe et al., 2014). However, among all of these databases, the stimuli include visual characteristics that provide cues of demographic information about the target. Based on previous video captures of point light

displays (e.g., Johansson, 1973; Johansson, 1977; Marey, 1894), we provide a novel set of stimuli that included body motion independent of superficial aspects of appearance. The UCLA Point-Light Display Database is a collection of over 700 point-light display videos of UCLA undergraduate students' walking gaits, demographic information for each participant, and saliva assay information.

Overview of Current Research

We sought to provide a database of body motion stimuli that would facilitate future body perception research by expanding the available body stimuli datasets. To do so, we collected point-light display video captures of real people in a standardized laboratory space. We present the UCLA Point-Light Display Database.

Method

Recruitment

Eighty-eight undergraduate students (33 men, 51 women, 4 unidentified; M_{age} = 20.7, *SD* = 4.6) were recruited from the University of California, Los Angeles (UCLA). They participated in the study in exchange for course credit or $10. All participants were informed that the videos collected would be published for use in future research along with basic demographic information. All participants consented to release this information and to participate in the study.

Measures and Procedures

Body Measurements

To begin, general measurements were taken for each participant including their height (cm), waist circumference (cm), hip circumference (cm), and weight (lbs). Using a dynamometer, we measured participants' handgrip and chest strength. Finally, all participants

provided a saliva sample. After these items were collected, participants changed into standardized, tight-fit athletic clothing including shorts, a shirt, and a headband. Markers were then attached to 15 key points on the body (i.e., one on each foot, one on each knee, two on the hips, one on the center lower back, one on the center upper back, one on each shoulder, one on each elbow, one on each wrist, and one on the back of the head; see Figure 1).

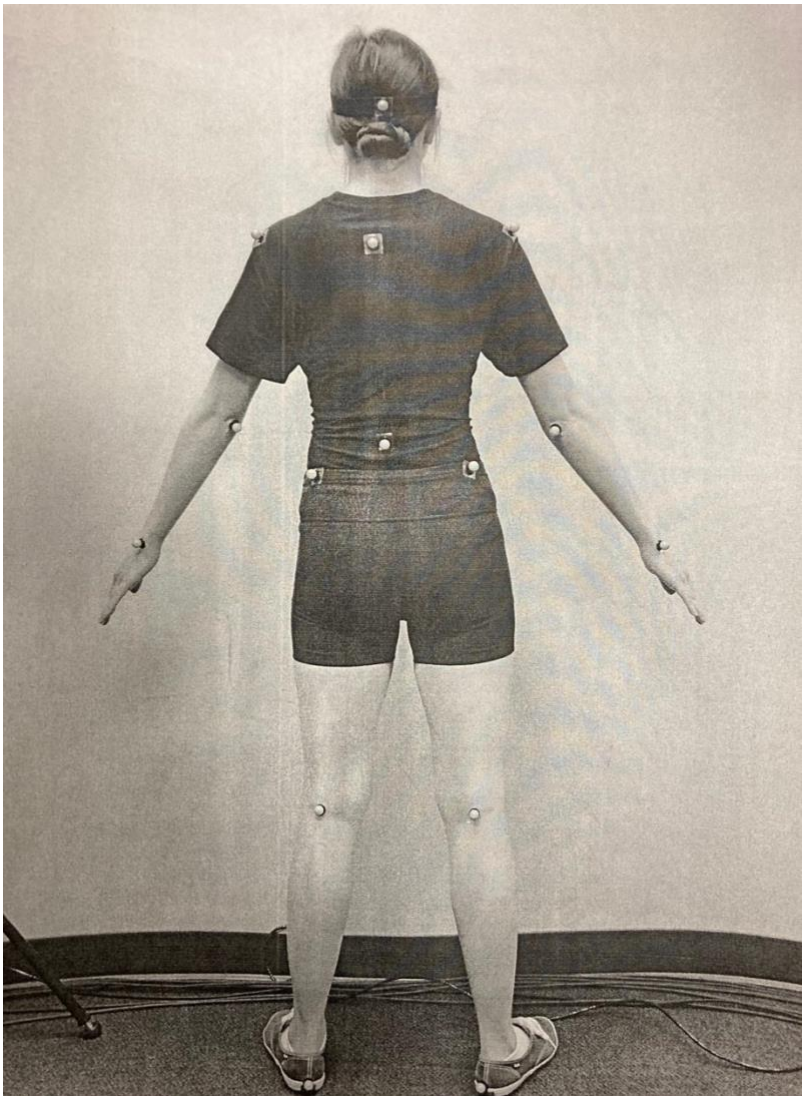


Figure 1. Positioning of markers for PLD generation

Body Motion Capture

Point-light displays were recorded using a Vicon motion capture system ("Vicon Motus" version 9.2). There were six cameras mounted on tripods, recording the various movements of each participant. See Figure 2 for a static photo of a PLD once it is rendered.

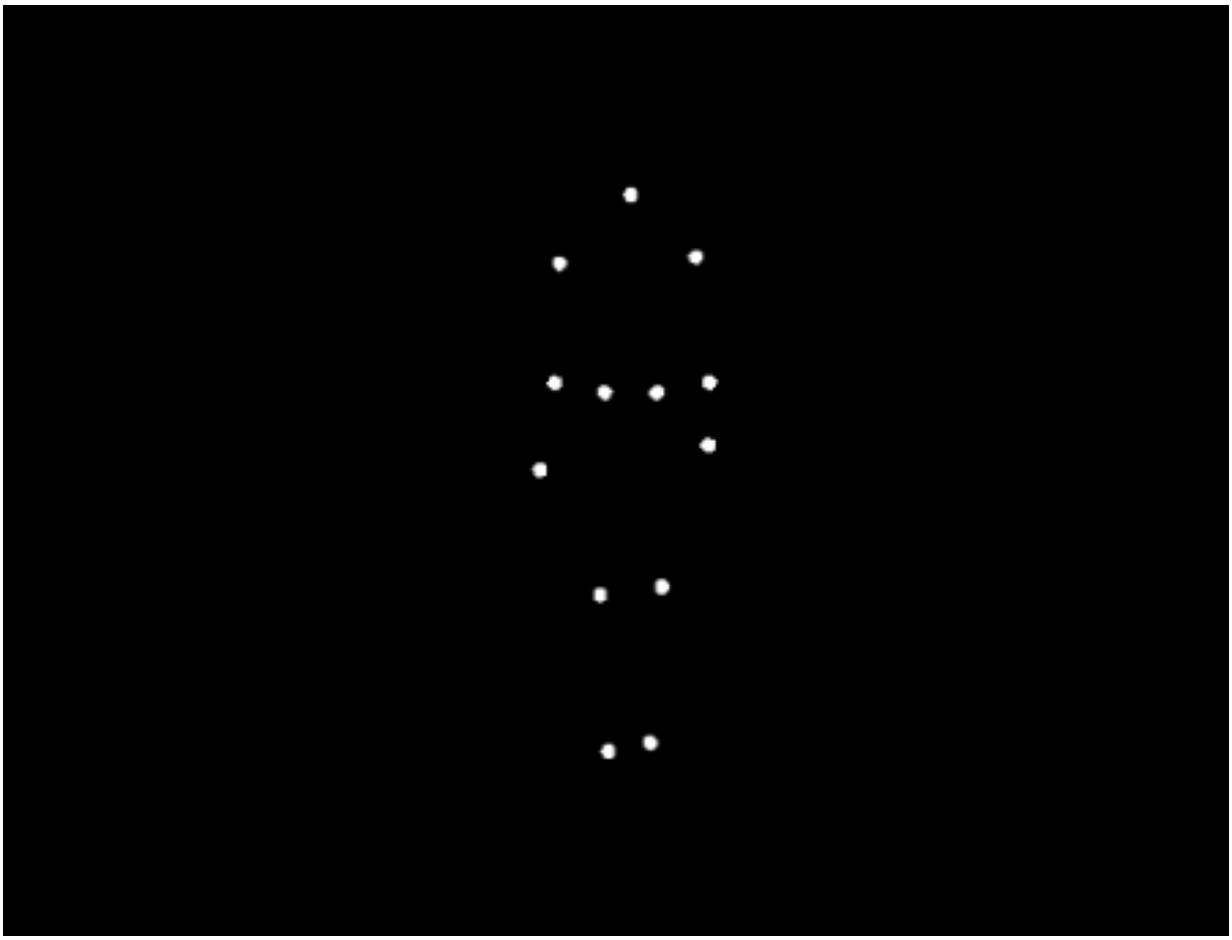


Figure 2. Static image of PLD

To begin the body motion capture portion of the study, participants first stood on the treadmill motionless to calibrate the system. Once the system had been calibrated, 11 one-minute treadmill walks with varying instructions were recorded. First, participants were asked to walk at a natural walking speed on the treadmill (e.g., "Please find what you consider a normal walking speed for you.") A one-minute recording was collected without indicating to the participant that a recording was in progress. Next, participants were asked to increase the speed they chose by

three-tenths of a mile per hour; a slightly faster pace was included to reduce participant self-monitoring of their walking motion. Again, a one-minute recording was collected without indicating to the participant that a recording was in progress.

Subsequently, recordings were collected for an attractive walk (e.g., "the next recording will be shown to undergraduate men and women who will evaluate your sexual attractiveness"), gender-typical walk (e.g. "walk in a manner that highlights that you are [insert participant gender]"), gender atypical walk (e.g. "walk in a manner that someone who only sees your body motion may believe that you are actually [insert other gender]"), ethnic typical walk (e.g. "walk as a typical person of your ethnicity would"). The order of these instructed walks was randomized for each participant.

Finally, five emotional walks were recorded for each participant (angry, happy, proud, sad, and shameful). Before each emotion walk, participants wrote about an experience that made them feel the particular emotion (e.g., "Please write about an episode that made you angry"). Participants also rated the intensity of emotion on a 1 (not at all) to 9 (extremely) Likert scale based on when the event took place (e.g., "At the time that this event took place, how intensely did you feel anger?") and the intensity of the emotion thinking about it at the time of data collection (e.g., "How intensely does just thinking about this make you feel angry now?"). The presentation of these emotional exercises was randomized for each participant.

Demographics and Scales

After completing the body motion captures, participants filled out a demographics questionnaire. Demographic questions included the participant's sex, age, race, and their father's and mother's races. Participants also filled out the Ten-Item Personality Inventory (TIPI), to assess the big-five personality dimensions (i.e., extraversion, agreeableness, conscientiousness,

emotional stability, and openness to experiences) (Gosling et al., 2003). We added two 1-item measures to also assess warmth and competence (Fiske et al., 2007). Finally, participants responded to a variation of the Kinsey scale to indicate their sexual orientation, behaviors, and attractions (Kinsey et al., 1948; 1998).

In addition to the point-light display videos, the database also includes a data sheet with each participant's corresponding sex, ethnicity, father's ethnicity, mother's ethnicity, age, weight (lbs), height (cm), grip strength, chest strength, hip length (cm), waist length (cm), sexual orientation, sexual behaviors, sexual attractions, personality scores (extraversion, agreeableness, conscientiousness, emotional stability, and openness to experiences), warmth, competence, the intensity of emotion for each emotional walk (happy, angry, shame, pride, and angry), and the treadmill speed in which they performed each walk.

Results

A variety of research studies and experiments have been conducted using these point-light displays to investigate perceivers' abilities to accurately identify the target's sex, sexual orientation, and emotion. Beyond these categorizations, research using these PLDs has examined downstream evaluations including attractiveness and competence. These videos have been presented to infants and adult perceivers. An overview of these studies is listed below.

Infant Perceivers

Tsang and colleagues (2018) examined children's (ages 6-15 months) abilities to categorize and recognize PLDs as familiar. Importantly, before the PLDs were used, 15 naive undergraduate students viewed and later categorized them as female or male. Participants were successful at identifying $M = 7.93$ out of 10 female PLDs ($SD = 2.34$) and $M = 8.07$ out of 10

male PLDs (*SD* = 1.16), suggesting that the sex of the PLDs is readily apparent to adult perceivers. In Study 1, the 20 PLDs previously categorized by adult observers were individually presented to 66 infants across three age groups (M_{age} = 6.5 months, *SD* = 1.1, range = 3.5–8.3, *n* = 22, 10 female; M_{age} = 10.0 months, *SD* = 0.7, range = 8.8–11.5, *n* = 22, 13 female; M_{age} = 14.5 months, *SD* = 1.2, range = 12.0–16.6, *n* = 22, 13 female). Infants were first habituated (i.e., "a decline in looking times across a block of four trials that summed to less than 50% of looking times during the first four trials." (p. 341)) to either female or male PLDs across no more than 12 trials. For this phase, nine PLDs from each sex were randomly selected for presentation. If more than nine trials were necessary for habituation, then previously seen PLDs were re-used. The final PLD of the set of ten was used in the testing phase as the familiar stimulus. Immediately after habituation, six test trials (i.e., three female and three male) were conducted. The trials were pseudorandomized, individual presentations (i.e., no more than two consecutive presentations of each sex) of familiar and novel PLDs, in which the infant's looking time was assessed for each trial.

A 2 (Infant Gender) X 3 (Age Group) X 2 (Habituation Stimulus: male PLD or female PLD) X 2 (Test Display: familiar or novel) X 3 (Trial: first, second, or third) mixed analysis of variance (ANOVA) with post habituation looking time as the dependent variable yielded two significant interactions. First, between infant gender and test display (familiar versus novel), $F(1, 54) = 6.24$, $p = .016$, $\eta_p^2 = .10$. Simple effects revealed longer looking times at familiar test PLDs specifically for male infants $F(1, 29) = 7.73$, $p = .009$, $\eta_p^2 = .21$, while female infants did not significantly differ in their looking time for familiar or novel PLDs, $F(1, 35) = 1.38$, *ns*. The second significant interaction was between habituation stimulus (female or male PLDs) and test display, $F(1, 61) = 6.16$, $p = .016$, $\eta_p^2 = .10$. Simple effects revealed longer looking times at

familiar test PLDs when habituated to male PLDs, $F(1, 34) = 7.85$, $p = .008$, $\eta_p^2 = .19$, but equal looking times between familiar and novel PLD's when habituated to female PLD's, $F(1,35) = 1.38$, *ns*.

In Study 2, the PLDs used in Study 1, were presented side-by-side to 42 infants across three age groups (M_{age} = 5.5 months, *SD* = 1.0, range = 4.2–7.1, *n* = 15, 9 female; M_{age} = 10.1 months, *SD* = 1.8, range = 7.5–12.6, *n* = 13, 7 female; M_{age} = 14.7 months, *SD* = 1.5, range = 12.9–17.9, *n* = 14, 6 female). Using an EyeLink 1000 eye tracker, the infants saw 24 pairs of PLDs (one female and one male per trial). The authors found a significant main effect of infant gender with male infants having longer looking times, $F(1, 36) = 4.25$, $p = .046$, $\eta_p^2 = .11$, and a significant main effect of PLD sex with a preference for male PLDs across all infants $F(1, 36) = 7.92$, $p = .008$, $\eta_p^2 = .18$, thus replicating findings from Study 1. The authors conclude that these findings appear to be a result of different motion patterns between male and female PLDS (i.e., higher speed and greater motion of male PLDs).

Ogren and colleagues (2019) investigated the impact of emotional body movements on infants' looking time across three studies. In Study 1, the authors presented 18 PLDs of varying emotional expressions (6 angry, 6 happy, and 6 sad) paired side-by-side with a neutral expression PLD to 26 infants (M_{age} = 14.66 months, *SD* = 2.04, range = 11.11-17.56, 15 female). These 36 PLDs were selected as the most accurately identifiable of each given emotional expression from a larger pool evaluated by 91 adult participants. Using an EyeLink 1000 eye tracker, the authors recorded infant looking time for each pair of PLDs. The authors found that infants spent more time looking at angry (*M*=.50, *SD*=.11) versus neutral PLDs (*M*=.37, *SD*=.08), $t(25)=3.89$, $p = .001$, 95% CI [.06, .20], and happy (*M*=.51, *SD*=.09) versus neutral PLDs (*M*=.36, *SD*=.07), $t(25)=4.96$, $p < .001$, 95% CI [.09, .21], but spent more time looking at neutral (*M*=.46, *SD*=.11)

vs sad PLDs (*M*=.36, *SD*=.09), *t*(25)=−2.87, *p* =.008, 95% CI [−.17, −.03]. The authors note that the preference demonstrated by the infants might be motivated by the total motion of the videos and therefore would test this in Study 2.

Study 2 used the same methodological design as Study 1, but when the PLDs were inverted before being presented to 26 infants (M_{age} = 15.04 months, *SD* = 2.44, range = 10.45-20.30 months, 14 female). Results of Study 2 were similar to Study 1 such that infants looked more at the angry PLDs (*M* = .50, *SD* = .09) than the neutral PLDs (*M* = .37, *SD* = .09), *t*(25) = 3.81, *p* = .001, 95% CI [.06, .19] and looked more at the happy PLDs (*M* = .46, *SD* = .09) than the neutral PLDs (*M* = .37, *SD* = .09), *t*(25) = 2.72, *p* = .012, 95% CI [.02, .16]. Again, infants did not discriminate between the neutral PLDs (*M* = .46, *SD* = .10) and the sad PLDs (*M* = .38, *SD* = .09), *t*(25) = 2.24, *p* = .034, 95% CI [−.14, −.01]. Study 2 replicates the results of Study 1, further suggesting that infants' discrimination of the stimuli is likely driven by a total motion preference. To test the direct comparisons of each emotional expression, the authors conducted a third study.

The paradigm for Study 3 directly followed Studies 1 and 2 but presented all pairings of angry, happy, and sad PLDs with each other in both upright and inverted orientations. The PLD pairs were presented to 26 infants (M_{age} = 15.29 months, *SD* = 2.23, range = 11.07-18.40, 14 female). The authors found that for upright PLDs, infants spent more time looking at angry (*M* =.58, *SD*=.17) versus sad PLDs (*M* = .35, *SD* = .17), *t*(25)= 3.52, *p* = .002, 95% CI [.10, .37] as well as happy (*M* = .54, *SD* = .13) versus sad PLDs (*M* = .39, *SD* = .13), *t*(25) = 3.03, *p* = .006, 95% CI [.05, .26]. There was no significant difference in looking time for angry (*M* = .47, *SD* = .15) and happy PLDs (*M* = .46, *SD* = .16), *t*(25) =.20, *p* =.841, 95% CI [−.11, .13]. Similarly, the authors found for inverted PLDS, infants spent more time looking at angry (*M* = .55, *SD* = .15)

than sad PLDs (M = .37, SD = .14), $t(25) = 3.30$, p = .003, 95% CI [.07, .29] as well as happy (M = .57, SD = .17) versus sad PLDs (M = .36, SD = .16), $t(25) = 3.19$, p =.004, 95% CI [.07, .34]. Again, there was no significant difference angry (M = .52, SD = .12) and happy PLDs (M = .40, SD = .13) PLDs, $t(25) = 2.35$, p =.027, 95% CI [.01, .21]. In sum, these three studies suggest that infants (10-20 months) show preferences for faster biological motion as compared to slower biological motion.

Evaluative Judgments

Attractiveness

Shropshire, Benitez, and Johnson (in prep) used 50 of the PLDs to investigate the effect of body motion on perceivers' judgments of attractiveness. Importantly across all of their studies (N = 429), the authors found that perceivers were accurate in detecting the sex of a PLD (p's < .001) and also gendered the PLD, such that female targets were judged to be more feminine and male targets were judged to be more masculine (p's < .001). In Study 1 (n=198), the authors initially tested the relationship between biological motion and attractiveness by having participants evaluate the gender and attractiveness of 20 PLDs (10 female and 10 male) walking naturally. They found that female PLDs were evaluated as more attractive than male PLDs, B = .29, SE = .09, $t(29.96) = 3.31$, p = .002, 95% CIs [.12, .46] and that as ratings of femininity increased so did average ratings of attractiveness, B = .12, SE = .03, $t(32.80) = 4.50$, $p < .001$, 95% CIs [.07, .17]. Interestingly, a significant interaction revealed that when male PLDs were judged as more feminine, they were also rated as more attractive, B = .06, SE = .03, $t(59.81)$ = 2.31, p = .02, 95% CIs [.01, .12].

In Study 2 (n = 71), the authors used 20 new PLDS walking with gender-typical gait in addition to the 20 natural walking PLDS previously used. Again, participants evaluated the

PLDs' gender and attractiveness. The authors replicated results from Study 1 and uniquely found that overall, gender-typical gaits were evaluated as more attractive than natural gaits, $B = .45$, $SE = .09$, $t(23.80) = 5.22$, $p < .001$, 95% CIs [.28, .62]. However, when split for the sex of PLDs, only female PLDs were rated as more attractive when they walked using a gender-typical gait instead of a natural gait $B = .68$, $SE = .11$, $t(34.27) = 6.25$, $p < .001$, 95% CIs [.47, .89]; there was no difference for male PLDs, $B = .20$, $SE = .11$, $t(31.30) = 1.92$, $p = .06$, 95% CIs [-.005, .41].

In Studies 3a ($n = 74$) and 3b ($n = 86$), the authors tested the differences in perceived attractiveness for natural gaits, gender-typical gaits, and intentionally attractive gaits (i.e., instructed that their walk motion would be evaluated by others for attractiveness). Again, the authors replicated results from Study 1 such that in Study 3a, PLDs categorized as women were judged to be marginally more attractive than PLDs categorized as men, $B = .41$, $SE = .16$, $t(17.39) = 2.60$, $p = .02$, 95% CIs [.10, .72], and significantly more attractive than PLDs categorized as men in Study 3b, $B = .50$, $SE = .16$, $t(12.36) = 3.02$, $p = .01$, 95% CIs [.17, .82]. Additionally, ratings of attractiveness increased as perceived femininity increased for both studies, Bs = .19 and .18, SEs = .05 and .07, ts(13.63 and 11.31) = 3.96 and 2.78, ps < .001 and = .02, 95% CIs [.10, .29 and .05, .31].

To further test their findings that as femininity increased so did ratings of attractiveness, particularly for men, the authors addressed a methodological constraint. For Study 3a and all previous studies, the authors used a counterbalanced block design in which judgments of sex, gender, and attractiveness were made separate from one another. However, in Study 3b the authors presented all judgment responses in the same block. Study 3b replicated the effect that for female PLDs an increase in perceived femininity predicted an increase in their attractiveness

ratings, B = .46, SE = .04, t(35.56) = 10.63, p < .001, 95% CIs [.37, .54]. However, the effect for male PLDs was reversed such that when male PLDs were rated as more masculine they were also rated as more attractive, B = -.12, SE = .04, t(32.71) = -2.78, p = .009, 95% CIs [-.20, -.03]. These results clarify that there is a preference for women and feminine cues, but that the preference for feminine cues does not extend to male PLDs when evaluations of gender and femininity are conjoint.

The authors found support for their hypothesis that intentionally attempting to appear more attractive would be done so by walking similarly to the gender-typical gait. Specifically, results showed that attractiveness varied as a function of walk type such that attractive and gender-typical gaits were rated as more attractive than natural gaits, Study 3a: Bs = .47 and .57, SEs = .18 and .16, ts(9.74 and 10.74) = 2.60 and 3.55, ps = .03 and .004, 95% CIs [.13, .82 and .27, .88]; Study 3b: Bs = .24 and .27, SEs = .10 and .09, ts(10.71 and 10.90) = 2.36 and 2.98, ps = .04 and .01, 95% CIs [.04, .44 and.09, .45]; but importantly, attractive and gender-typical gaits did not differ significantly from one another, Bs = -.10 and -.03, SEs = .14 and .11, ts(9.13 and 9.08) = -.74 and -.29, ps = .48 and .78, 95% CIs [-.38, .18 and -.26, .19]. Thus, deliberate attempts to appear attractive and gender-typical walk motions were both rated as more attractive than natural gaits but were rated as equally attractive. In sum, these studies suggest that perceivers can reliably detect the sex of a PLD based on their walk motion, perceivers rate female PLDs as more attractive, and PLDs displaying a gender-typical gait or an intentionally attractive gait are favored equally but are preferred in comparison to a natural gait regardless of target gender.

Competence

Across six studies (N = 1,199), Deska, Hugenberg, and Johnson, (in prep) used 24 PLDs (12 male and 12 female) to systematically test the impact of movement speed on mind attributions. Across all studies, the authors found that faster-speed PLDs were evaluated higher on various mental capacity measures compared to natural-speed PLDs. In Study 1 (n = 180), participants viewed the 24 PLDs (half of which were at a natural speed and the other half being a faster pace) one at a time and after each presentation evaluated the PLD on the 10-item Mind Attribution Scale (Kozak et al., 2006). This study revealed a main effect of movement speed such that targets with faster movement speed (M = 5.19, SD = 1.17) were ascribed greater mental sophistication than natural speed targets (M = 5.13, SD = 1.20), $F(1, 179) = 14.59$, $p < .001$, 95% CI [0.03, 0.10], $\eta_p^2 = .08$. Additionally, there was a main effect of the sex of the PLD revealing that female PLDs (M = 5.18, SD = 1.19) were ascribed greater mental sophistication than male PLDs (M = 5.14, SD = 1.19), $F(1, 179) = 4.02$, $p = .046$, 95% CI [0.00, 0.09], $\eta_p^2 = .02$. Finally, results showed a main effect of mind dimension, $F(2, 358) = 50.44$, $p < .001$, $\eta_p^2 = .22$, in which PLDs were ascribed more emotional capacity (M = 5.32, SD = 1.30) than intentional capacity (M = 5.26, SD = 1.25) overall, $t(179) = 1.98$, $p = .049$, 95% [0.00, 0.12], d = 0.15, and, in turn, more intention than cognition (M = 4.91, SD = 1.14), $t(179) = 7.97$, $p < .001$, 95% [0.26, 0.44], d = 0.59.

Studies 2 (n = 205) and 3 (n = 203) specifically investigated attributions of thinking speed for fast versus natural-paced PLDs. The procedure for these studies was identical to the first study, except for the evaluative measure presented after the PLDs. For Study 2, participants were asked “How quickly is this person able to think?” and for Study 3, “How intelligent is this person?”. In Study 2, the authors found a significant main effect of movement speed indicating that participants rated faster speed targets (M = 4.58, SD = 0.70) as quicker thinkers than natural

speed targets (M = 4.20, SD = 0.86), F(1, 204) = 119.38, p < .001, 95% CI [0.32, 0.46], η_p^2= .37. Results also revealed a significant main effect of the sex of the PLD in which female PLDs (M = 4.54, SD = 0.74) were rated as quicker thinkers than male PLD's (M = 4.24, SD = 0.86), F(1, 204) = 52.34, p < .001, 95% CI [0.22, 0.38], η_p^2= .20. Results from Study 3 supported and extended previous findings showing that faster speed PLDs (M = 4.32, SD = 0.80) were rated as more intelligent than natural speed PLDs (M = 4.21, SD = 0.76), F(1, 202) = 11.73, p = .001, 95% CI [0.05, 0.18], η_p^2= .06.

Next, the authors used the same paradigm in Study 4 (n = 208) to test the effects of movement speed on perceptions of a target's ability to act on the world around them. After each trial, participants were asked to evaluate the PLD on the Mind Attribution Scale and the question "How much physical capacity does this person have to act on the world?". Notably, they found that faster speed PLDs (M = 5.01, SD = 1.00) were evaluated as having greater physical action potential than natural speed PLDs (M = 4.82, SD = 1.06), F(1, 207) = 44.76, p < .001, η_p^2= .18. To further extended previous findings, Study 5 (n = 202) assessed perceived guilt across differing types of crime including assault and embezzlement. The authors found that faster-speed PLDs (M = 3.35, SD = 1.13) were evaluated as guiltier than natural-speed PLDs (M = 3.25, SD = 1.11), F(1, 201) = 9.75, p = .002, η_p^2= .05. Finally, in Study 6 (n = 201) the authors tested the effects of movement speed on mind attributions and a target's employability for physical versus sedentary jobs. Specifically, participants evaluated the PLDs on the Mind Attribution scale and on how much they deemed each target hirable for eight various jobs (four physical and four stationary). Results showed that faster speed PLDs (M = 4.58, SD = 1.02) were rated higher on employability than natural speed PLDs (M = 4.51, SD = 1.03), F(1, 200) = 10.91, p = .001, η_p^2=

.05. Overall, the PLDs were assessed as being more hirable for stationary jobs (M = 4.66, SD = 1.06) rather than physical jobs (M = 4.44, SD = 1.03), $F(1, 200) = 42.97$, $p < .001$, $\eta_p^2 = .18$.

Across these six studies, the authors found support that faster-speed PLDs are perceived as more mentally sophisticated, having a greater thinking speed, more intelligent, more hirable, having greater physical action capacity, and guiltier of committing a crime than natural speed targets.

The studies described above utilize the UCLA Point-Light Display Database to investigate perceivers' abilities to accurately determine social categorizations of targets based only on body motion. It has been demonstrated that perceivers are indeed accurate in identifying these social categorizations and such categorizations have an influence on later evaluations (e.g., attractiveness and competence) of the target. Taken together, these studies demonstrate the importance of this database and provide a foundation for future research investigating the perception of biological body motion.

General Discussion

The face perception literature is expansive, yet ever-growing. As a fundamental part of social interaction and social perception, it is paramount that researchers continue to investigate face perception. However, social perception relies on more than face perception. Body perception is equally important, but dramatically understudied in comparison. We contend that the lack of research related to body perception is largely due to the insufficient number of high-quality body databases available to researchers. Expanding the pool of body stimuli will enable researchers to produce generalizable and replicable results in this field of research and encourage researchers to empirically test the effect and relationship of body motion and related topics as

was previously done for the face perception literature. To fill the specific void of stimuli for body motion, we present the UCLA Point-Light Display Database, a collection of over 700 point-light display videos of UCLA undergraduate students' walking gaits in addition to demographic information and saliva assay information.

A variety of research experiments have been conducted already using the UCLA Point-Light Display Database. When presented to infants, Tsang and colleagues (2018) found that infants spent more time looking at familiar PLDs when habituated to male PLDs, $F(1, 34) = 7.85$, $p = .008$, N2p = .19, but there was no difference in looking time for familiar and novel PLD's when infants were habituated to female PLD's, $F(1,35) = 1.38$, *ns*. The authors contend that the increased looking time is likely due to differences in the biological motion of male and female targets such that male PLDs display higher speed and greater quantities of motion. Additionally, Ogren and colleagues (2019) found differences in the looking time of infants when presented with different emotionally expressive PLDs. Specifically, they report that infants spent more time looking at angry (M=.50, SD=.11) versus neutral PLDs (M=.37, SD=.08), $t(25)=3.89$, p =.001, 95% CI [.06, .20], and happy (M=.51, SD=.09) versus neutral PLDs (M=.36, SD=.07), $t(25)=4.96$, $p < .001$, 95% CI [.09, .21], but spent more time looking at neutral (M=.46, SD=.11) vs sad PLDs (M=.36, SD=.09), $t(25)=-2.87$, p =.008, 95% CI [−.17, −.03]. They replicate these general results with upright and inverted video orientations. Notably, there was no significant difference in looking time for angry and happy PLDs regardless of whether they were upright, $t(25)=.20$, p =.841, 95% CI [−.11, .13], or inverted, $t(25)=2.35$, p =.027, 95% CI [.01, .21]. Similar to Tsang and colleagues (2018), Ogren and colleagues (2019) argue that these findings suggest that infants (10-20 months) show preferences for faster biological motion as compared to slower biological motion.

When presented to adult perceivers, researchers have established replicable patterns of evaluative judgments associated with body motion. First, Shropshire, Benitez, and Johnson (in prep) found that perceivers can reliably detect the sex of a PLD, female PLDs are rated as more attractive, and both male and female PLDs displaying a gender-typical gait or an intentionally attractive gait are favored equally but are preferred in comparison to a natural gait. Second, Deska, Hugenberg, and Johnson, (in prep) tested the impact of walking speed on perceived intelligence and found that faster-speed PLDs are perceived as more mentally sophisticated, having a greater thinking speed, more intelligent, more hirable, having greater physical action capacity, and guiltier of committing a crime than natural speed targets. Collectively, these findings test perceivers' abilities to accurately determine social categorizations from body motion and the effect of body motion on social evaluations such as attractiveness and competence.

As the first of its kind, the UCLA Point-Light Display Database provides stimuli for testing the effects of body motion on human perception, however, there are important considerations researchers should be aware of. First, the default video display resolution is 480p. While 480p presents appropriately for most standard monitor and screen sizes, it should be noted that with increased screen size, this resolution may not be ideal for larger screens such as televisions. Given the nature of the point light display video structure, presenting these videos at a standard definition resolution (rather than a high-definition (HD)) ensures access and proper presentation of the stimuli regardless of the researcher's available computer hardware. Additionally, the standard definition resolution reduces the amount of storage space the videos will require on a local computer. In sum, these videos should run and appear appropriately on standard computer hardware making their resolution ideal for most researchers.

In conclusion, the UCLA Point-Light Display Database is available for free online for all academic researchers. We hope this methodological contribution will advance research related to biological motion, body perception, and social cognition.

Chapter 3

Walking Stereotypes: How Gendered Walking Gaits Shape Perceptions of Power and Status

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Chapter 3 Abstract

Across three studies, I investigated the effect of body motion on perceptions of power and status, with a particular focus on the mediating role of gender-focused evaluations. The experiments systematically tested direct manipulations of gender typicality, as well as the influence of gendered emotion stereotypes in male and female point-light displays (PLDs). Beginning in Study 1, participants evaluated male and female PLDs walking naturally (i.e., unprompted) on evaluations of perceived gender, masculinity, gender typicality, power, status, and liking. Perceived masculinity was associated with lower evaluations of power and status and partially explained the relationship between perceived gender and these downstream evaluations, whereas greater perceived gender typicality predicted more favorable evaluations. Next, in Study 2, participants saw male and female PLDs walking a gender-typical gait (i.e., prompted to walk) or a gender-atypical gait (i.e., prompted to walk) and evaluated them on the same outcome measures as Study 1. The overall pattern replicated Study 1, with greater perceived masculinity predicting less favorable evaluations and greater perceived gender typicality predicting more favorable evaluations. Finally, Study 3 examined the influence of gender stereotypes associated with emotion by using PLDs walking with either a happy or angry gait. Although findings varied across outcomes, they provided additional evidence that perceptions of gender typicality may play an important role in shaping social evaluations. Collectively, these studies advance the scientific understanding of how body motion impacts judgments of others. Importantly, these studies provide preliminary evidence that gendered impressions from body motion carry important social meaning.

Keywords: body perception, biological motion, gender, power, status

Introduction

The human visual system is adept at interpreting social and visual cues, which are crucial for promoting survival (e.g., Dunbar, 2003; Mobbs et al., 2015; Neuberg et al., 2011). Even when visual information is occluded, simplified into basic parts, or presented briefly, humans can still perceive social cues and use them to make inferences. For example, when an image of a face is presented for as little as 100ms, perceivers are able to accurately make categorical judgments of race, gender, sex, and age, as well as make split-second social evaluations of the target on the basis of attractiveness, trustworthiness, and competence (Freeman & Johnson, 2016; Olivola & Todorov, 2010; Todorov et al., 2009; Willis & Todorov, 2006). Likewise, when presented with a point light display (PLD), a stimulus made by recording body motion and then extracting all superficial aspects of body appearance so that only the motion itself is presented to subjects, perceivers can use body motion to accurately assess characteristics such as gender or sex (Cutting, 1978b), emotion (Atkinson et al., 2004; Dittrich et al., 1996; Pollick, et al., 2005b), sexual orientation (Ambady et al., 1999; Johnson et al., 2007; Lick et al., 2013), and age (Galusca et al., 2022; Montepare & Zebrowitz, 1988; 1998). Furthermore, perceivers can use isolated biological motion to inform judgements of personality (Hu et al., 2018), attractiveness (Fink et al., 2015; Johnson & Tassinary, 2007; Morrison et al., 2018; Shropshire et al., in prep), and threat potential (Barrett et al., 2005; Manera et al., 2011). The latter is theorized as an evolutionarily adaptive skill that aids in self-preservation (Thornton et al., 1998).

Biological motion, the kinematics of living organisms, plays a crucial role in judgments of unfamiliar individuals (Jokisch & Troje, 2003; McCarty et al., 2013; Veto et al., 2017). Perceivers use biological motion to infer the intentions of others, such as by distinguishing helpful from threatening actions (Barrett et al., 2005; Manera et al., 2011). Threatening

individuals are often visually prioritized and more visually salient (Adams et al., 2006; Bannerman et al., 2009; Ikeda & Watanabe, 2009; Satchell et al., 2021). This process is important because it allows for rapid identification and response to potential dangers. This prioritization helps individuals to quickly assess threats in their environment, thereby enhancing their chances of survival by enabling swift defensive or evasive actions (Adams & Kveraga, 2015; Bracha, 2004; Krusemark & Li, 2011). However, processing and interpreting biological motion is subject to biases. For instance, observers often perceive the biological motion of men to be faster, larger, and more erratic (McCarty et al., 2013). Additionally, group membership introduces bias such that perceivers tend to be more accurate at perceiving the movement of in-group members, but when faced with a threatening situation, they are then more likely to categorize an unknown other as an outgroup member (Miller et al., 2010). Ultimately, research indicates the visual processing of biological motion prioritizes the safety of the perceiver, while ensuring that vital social connections (i.e., connecting with others who may aid one's own survival) are not overlooked.

Given that humans are social beings, it is not only necessary to be aware of physical formidability (i.e., the physical force, control, or dominance one possesses) but also to be aware of social formidability (i.e., the social power, influence, and status one possesses within a social hierarchy). If individuals are not aware of social formidability, they may miss opportunities to acquire valuable social resources and make professional advancements. Neglecting to pursue relationships or consider social capital can have detrimental effects on health and mental well-being. Research indicates that overlooking these components is associated with worse physical health outcomes (Eisenberger & Cole, 2012) as well as worse mental health outcomes (Meyer-Lindenberg & Tost, 2012), such as increased stress (Yeh & Inose, 2003), higher levels of

depression (Brown & Harris, 2012; Sherbourne et al., 1995), and lower self-esteem (Harris & Orth, 2020; Williams & Galliher, 2006). Additionally, these individuals often experience decreased professional outcomes, including lower academic achievement (Almeida et al., 2021; Ullah & Wilson, 2007), fewer job promotions (Burt, 1992; Day & McDonald, 2010), lower salaries (Matsunaga, 2015), and lower job satisfaction (Cernas-Ortiz & Wai-Kwan, 2021; Flap & Völker, 2001; Hurlbert, 1991). These findings highlight the importance of recognizing and cultivating social relationships and networks, as they play a crucial role in both personal and professional success.

Akin to how perceivers make judgments about physical formidability, humans evaluate social formidability by assessing social hierarchies through concepts like power and status (Magee & Galinsky, 2008). Power and status have historically been used as interchangeable constructs; however, recent debates have called this theoretical approach into question. Considerable support has since arisen for having clear distinctions between power and status as differentiable constructs. These arguments focus on the different sources that give rise to power and status, their unique abilities to explain variability in data, and differing effects on individual behavior and social dynamics (Blader & Chen, 2014; Fiske & Berdahl, 2007; Magee & Galinsky, 2008). As described by Yu and colleagues (2019), power is "an actor's asymmetric control over socially valued resources" whereas status is the "respect and admiration an actor has in the eyes of others" (p. 84). Similarly, Magee and Galinsky (2008) suggest that "power, related to one's control over valued resources, transforms individual psychology such that the powerful think and act in ways that lead to the retention and acquisition of power" and "status, related to the respect one has in the eyes of others, generates expectations for behavior and opportunities for advancement that favor those with a prior status advantage" (p.351-352). Similar distinctions

have been established by numerous other researchers (Blader and Chen, 2014; Fiske & Bai, 2020; Fiske & Berdahl, 2007; Fragale et al., 2011), all agreeing on the presence of two uniquely separate constructs: power, which serves as an individual's control over resources, and status, which is the way that individual is viewed and respected by others. While one is independent in nature, only requiring an individual and their abilities to obtain possessions, the other is inherently social, requiring an observer to make an evaluation of another person. Though these two constructs undoubtably influence each other, these distinctions allow researchers to better understand and investigate the separate impacts of power and status in social and organizational contexts.

Considering power and status as distinct concepts allows us to recognize circumstances where one exists without the other. For example, it is conceivable for an individual to possess significant power yet hold a low status. Within a hierarchical organization, this scenario might manifest as a new hire immediately being given access to confidential resources. This scenario is typically viewed unfavorably, as onlookers may perceive the individual as unworthy of their power and criticize them for appearing ill-suited to wield such authority. Furthermore, because individuals with power have access to resources, they are less dependent than others without power, which often leads them to pursue their own goals, care less about others, and be less concerned about social constraints (Anderson & Brion, 2014; Galinsky et al., 2008, Guinote, 2007; Keltner et al., 2003; van Kleef et al., 2008; Whitson et al., 2013). Conversely, one can maintain high status but have little power. This scenario can be illustrated by a figurehead or ceremonial leader with symbolic duties but no real decision-making authority. These situations are also viewed unfavorably, as they might leave the individual with limited bargaining power or feelings of dependence. Additionally, individuals with high status are often more aware of their

social environment and by extension more concerned about others (Blader & Chen, 2012; Blader et al., 2016; Fiske & Berdahl, 2007; Fragale et al., 2011; Magee & Galinsky, 2008; Willer, 2009). Despite these distinctions, power and status often overlap and can be causally related; power can lead to high status when recognized and respected, and status can lead to power as respected individuals are trusted with resources, enhancing their power (Dubois et al., 2015; Hays & Bendersky, 2015; Thye, 2000). While the two often go hand-in-hand, meaningful distinctions between the constructs should not be ignored.

While power and status serve vital roles in the social lives of human beings, there has been little research on what social cues perceivers use to infer these constructs. One possible mechanism may be through the perception of body motion. Separately, physical formidability has been tested through body motion perception, where observers assess the strength, size, and potential threat of others based on their movements (Barrett et al., 2005; Johnson & Tassinary, 2005; Jokisch & Troje, 2003; Manera et al., 2011; McCarty et al., 2013; Veto et al., 2017). These evaluations have been shown to be accurate, indicating that humans possess a keen ability to judge physical prowess through dynamic cues. However, social formidability, including power and status, has not been extensively studied using body motion perception. In addressing this gap in the literature, it is essential to also consider other social factors, such as gender, in these assessments to gain a more comprehensive understanding of social formidability.

It can be simply stated that the primary difference between power and status is a distinction between resources and respect. Having power is a matter of having control over resources while having status is about being afforded respect from others (Blader & Chen, 2014; Fiske & Bai, 2020; Fiske & Berdahl, 2007; Fragale et al., 2011). Interestingly, it appears that aspects of perceived gender function based on similar distinctions. In particular, perceptions of

masculinity are often closely linked to the display of dominance through power and physical strength (Cornwall & Lindisfarne, 2016; De Visser & McDonnell, 2013). In many societies, masculinity is associated with the ability to acquire and control resources, which can include wealth, financial assets, and valued items (Eagly & Steffen, 1984; Williams et al., 2010). This connection stems from traditional roles that prioritize men's roles as providers and protectors, reinforcing the idea that masculinity is demonstrated through tangible achievements and control over valuable assets (Shelton & Joh, 1996; Zhu & Chang, 2019).

On the other hand, gender typicality is more concerned with conforming to societal norms and expectations, which often leads to respect and acceptance within a given community (Bem, 1974; Bigler, 1999; Egan & Perry, 2001; Patterson, 2012). For men and women alike, adhering to gender-typical behaviors and traits means fulfilling roles that society deems appropriate for their gender. For men, this might mean exhibiting traits like assertiveness and strength, while for women, it could involve displaying nurturing and empathetic behaviors (Eagly & Steffens, 1984; Ellemers, 2018; Haines et al., 2016). When individuals conform to these norms, they are more likely to be respected and accepted by their peers and broader society, as they are seen as upholding the values and expectations of their gender roles, while those who do not conform to these norms are often subject to prejudice and discrimination (Eagly & Koenig, 2007; Lick & Johnson, 2014; Lick et al., 2014). Thus, while perceptions of masculinity are tied to the acquisition and display of resources, gender typicality revolves around earning respect through adherence to societal norms. Both constructs play significant roles in shaping how individuals are perceived and valued within their social contexts, but they operate through different mechanisms: one through material and power-based achievements, and the other through conformity to social expectations. Similar to the distinction of power and status,

masculinity often focuses on an individual and their abilities to obtain possessions, while gender typicality is inherently social, requiring an observer to make an evaluation of another person.

Despite the differences in outcomes that occur based on one's masculinity and gender typicality, these constructs share a critical similarity. They both depend on social hierarchies (Fagenson, 1990; Foels & Pappas, 2004; Lahavot & Lambert, 2007; Lick & Johnson, 2014; Wilson & Liu, 2003). In 1995, R. W. Connell described masculinity as "the practices through which men and women engage that place in gender, and the effects of these practices in bodily experiences, personality and culture" (p. 71). Connell also described the concept of hegemonic masculinity, which he explained to be "the configuration of gender practice… which guarantees (or is taken to guarantee) the dominant position of men and the subordination of women" (p.77). In other words, hegemonic masculinity is when a society sets up the ability to perform gender in such a way that men are always guaranteed the dominant position over women. In this way, men and masculinity then become the prototype or standard for evaluations of power.

Similarly, due to cultural, social, and institutional structures and norms, distinctions between gender typicality and gender atypicality have positioned gender typicality as being dominant or preferred. As of 2020, over a dozen countries have made it illegal to portray a gender other than the one an individual was assigned at birth with punishments including fines and even corporal punishment (Wareham, 2020). Gender typicality refers to behaviors, traits, and roles that align with societal norms and expectations for a given gender (Cook et al., 2019; Egan & Perry, 2001; Green et al., 2018; Nielson et al., 2020). When these norms are widespread and enforced, they can contribute to hegemonic gender norms by promoting certain traits as ideal and marginalizing those that do not conform. Gender atypicality, however, involves behaviors, traits, and roles that do not conform to societal expectations for a given gender. Individuals who exhibit

gender-atypical characteristics may face social resistance or discrimination due to hegemonic gender norms that prioritize and valorize typical traits and roles (Fagot, 1977; 1985; Gordon & Meyer, 2007; Parrott, 2009). To this end, following gender norms and presenting in a gender typical way is often necessary to earn respect and prestige.

Perceptions of masculinity and femininity as well as gender typicality and atypicality are often set to societal defaults that unfairly disadvantage both men and women, albeit in different ways. Perceivers are prone to favor cultural "defaults" constructed on androcentric and heterocentric assumptions, making the social default a heterosexual man (Bailey et al., 2019; Bem, 1993; Klysing, 2023; Purdie-Vaughns & Eibach, 2008; Van der Toorn et al., 2020). Although individuals of any gender can present in a gender-typical manner and be perceived positively for certain traits, the default for gender is skewed towards men which directly disadvantages women. This bias implies that when women conform to gender-typical behaviors, they align with feminine traits which are often undervalued compared to masculine traits. Conversely, when women exhibit masculine behaviors to align with higher-valued traits, they are perceived as gender atypical, which can result in social penalties (e.g., Price Waterhouse v. Ann Hopkins; Hopkins, 2004; Roberts, 2021). This double bind underscores the systemic inequality embedded in gender norms, where adherence to traditional roles limits women's perceived value, and deviation from these roles subjects them to scrutiny.

Gender stereotypes broadly dictate societal expectations for masculinity and femininity, shaping how individuals are perceived and expected to behave based on their gender (Ellemers, 2018; Haines et al., 2016; Hoffman, 1990). Masculinity is often associated with traits such as strength, assertiveness, independence, and competitiveness. Men are expected to be leaders, providers, and protectors, embodying roles that emphasize power, control, and rationality. In

contrast, femininity is linked to traits like gentleness, empathy, nurturing, and cooperation. Women are expected to be caregivers, emotional supporters, and homemakers, fulfilling roles that prioritize relationships, sensitivity, and compassion (Eagly & Steffen, 1984; Heilman, 2012). These stereotypes reinforce rigid gender roles, limiting the range of acceptable behaviors and traits for both men and women (Boldry, et al., 2001; Hess et al., 2000; Prentice & Carranza, 2002).

One area in particular that is limited by rigid gender roles is emotionality. Gender stereotypes associated with emotion are pervasive and often dictate how individuals are expected to express their feelings based on their gender (Brody, 1997; Fischbach et al., 2015; Hutson-Comeaux & Kelly, 2002; Plant et al., 2000). Women are typically stereotyped as being more emotionally expressive, nurturing, and empathetic. They are often expected to display emotions such as sadness, joy, and affection openly. These traits are considered consistent with traditional feminine roles of caregiving and emotional support. In contrast, men are often stereotyped as being stoic, emotionally reserved, and less likely to express vulnerability. Traits such as anger and aggression are more socially acceptable for men, aligning with traditional views of masculinity that emphasize strength and control. These stereotypes can be limiting and harmful, particularly for men. These stereotypes are known to negatively impact men's mental health leading to higher rates of depression and suicide by penalizing men for seeking emotional support or displaying vulnerability to their social network (Carlton et al., 2020; Cleary, 2012; Möller-Leimkühler, 2003; River & Flood, 2021; Scholz et al., 2017).

Research investigating the relationship between body motion perception, evaluations of power and status, and gender stereotypes is crucial as it can illuminate how body motion alone influences one's power and status. Understanding these dynamics can provide insights into the

subtle, non-verbal cues that contribute to social hierarchies. By examining how different types of body movements are interpreted through the lens of gender stereotypes, we can better understand the biases that affect leadership opportunities and social influence. Specifically, this research would aid in understanding concepts such as the glass ceiling effect (i.e., the invisible barriers that prevent women and other marginalized groups from advancing to higher-level positions in their careers, despite having the qualifications and abilities to do so; Cotter et al., 2001), the labyrinth of leadership (i.e., the complex and challenging path women must navigate to achieve leadership roles, characterized by obstacles, barriers, and dead ends; Eagly & Carli, 2018), and the lavender ceiling effect (i.e., obstacles and barriers faced by LGBTQ+ individuals in the workplace, which limit their career advancement and access to leadership positions; Gedro, 2010; Pope, 2005; Smith, 2013).

A more comprehensive understanding of workplace bias should include consideration of the negative reactions, or backlash, to female agency and authority. This issue has significant implications for gender equality, as it undermines women at every career stage (Alt et al., 2024; McLaughlin et al., 2012; Rudman, 1998). Additionally, it impacts organizations by contributing to the higher rates of job dissatisfaction and turnover among female managers compared to their male counterparts (Phelan et al., 2008; Rudman & Phelan, 2008). Investigating the relationship between body motion perception, evaluations of power and status, and gender stereotypes could inform strategies for mitigating bias in professional and social settings, thereby promoting a more equitable environment where individuals are evaluated based on their merits rather than unconscious stereotypes. Furthermore, a nuanced understanding of this effect could help reduce discrimination cases. In 2023, the Equal Employment Opportunity Commission reported a 10% increase in discrimination charges compared to the previous year, securing more than $665

million in settlements for victims of discrimination (US Equal Employment Opportunity Commission, 2024).

Despite the importance of examining body motion perception, evaluations of power and status, and gender stereotypes in tandem, little research has been done on the subject at present. The following studies provide a foundation for filling this gap. Across three studies, I investigated the effect of body motion on perceptions of power and status, with a particular focus on the mediating role of gender-focused evaluations. I predicted that masculinity would be a stronger mediator for the relationship between target gender and evaluations of power, while gender typicality would be a stronger mediator for the relationship between target gender and evaluations of status. Collectively, these studies aim to advance our understanding of how perceivers use body motion as a cue for gender and how these inferences shape downstream evaluations of power and status.

Chapter 3 Study 1

Method

Participants

Using the UCLA Communications SONA pool, I recruited 131 participants (94 women, 26 men, 1 non-binary).

Stimuli

Forty-six PLDs from the UCLA Point Light Display Database were used (Dayley, Johnson, Benitez, in prep). The PLDs were evenly divided by gender (23 men, 23 women). All PLDs were of the person's natural walking gait (i.e., participants walking at a comfortable, self-chosen pace with no other instructions).

Procedure

After reading and signing a consent form, participants were instructed to watch a video on the screen and respond to subsequent questions. I used a within-subjects design across four blocks in the study. In each block, all 46 PLDs were randomly and individually presented for four seconds, followed by the appropriate block measures detailed below.

The first block of questions was held constant so that all participants answered gender related questions first. The following three blocks were randomized for each participant. In the first block, after each PLD participants indicated what gender they perceived the PLD to be (0 = female and 1 = male) and provided a rating of the PLD on a femininity and masculinity scale (1- Feminine to 7 – Masculine), as well as a rating of the PLD's gender typicality (1- Not at all typical to 7 – Very typical). Since gender typicality is a less common term, a definition of the term was also provided (i.e., "gender typicality is the extent to which an individual is seen as being a typical member of their gender group, with skills, interests, and behaviors that are similar to those of the same gender"). Importantly, the gender categorization task was always the first question presented to participants, but the order of the masculinity/femininity and gender typicality measures was counterbalanced across participants. This procedure was designed to replicate participants' cognitive processes. To make evaluative judgments related to gender, a perceiver first needs to make a categorical judgment, establishing a reference point (i.e., man or woman) for all subsequent assessments.

In another block, participants rated the targets on a six-item ($\alpha = 0.95$) Perceived Power scale (Yu et al., 2019; see Appendix A). This scale is measured on a 7-point Likert scale (1 - Strongly disagree to 7 – Strongly agree). Items include statements such as "They have control

over many other people" and "They control a lot of resources." Items in the scale will be presented in a randomized order for each participant.

In a separate block, participants rated the target on a six-item ($\alpha = 0.91$) Perceived Status scale (Yu et al., 2019; see Appendix B). This scale is measured on a 7-point Likert scale (1 - Strongly disagree to 7 – Strongly agree). Items include statements such as "Others often seek their opinion because they respect them" and "They are admired by others because they are seen as competent." Items in the scale will once again be presented in a randomized order for each participant.

In a final block, participants responded to a single-item liking measure, in which they indicated how much they agreed with the statement "I like this person" on a 7-point Likert scale (1 - Strongly disagree to 7 – Strongly agree). At the end of the study, participants completed a demographics questionnaire.

Results

Given the hierarchical nature of this experiment, the data was analyzed using multi-level modeling for repeated measures data. Level-one units were the individual trial-level observations, while each participant served as the level-two grouping factor.

To justify the use of multilevel modeling, an unconditional (empty) model was estimated for each variable using the lmerTest package with Kenward-Roger degrees of freedom approximation. The results supported the use of multilevel modeling for all variables. The inter-class correlations (ICCs) indicated that between 5.5% and 14.9% of the total variance in each variable was attributable to stable between-participant differences: perceived gender (ICC = .055), typicality (ICC = .125), masculinity (ICC = .075), power (ICC = .082), status (ICC =

.110), and liking (ICC = .149). Likelihood ratio tests comparing each multilevel model to a single-level model confirmed that between-cluster variance was significant for all variables (*p*s < .001), providing sufficient justification for multilevel modeling across all analyses.

Perceived gender, masculinity, and typicality were grand-mean centered within clusters (CWC) using the rockchalk package. This procedure yielded a within-person component (*genderResp.cwc*, *mascResp.cwc*, *typResp.cwc*) capturing trial-level deviations from each participant's mean response, and a between-person component (*genderResp.meanj*, *mascResp.meanj*, *typResp.meanj*) representing each participant's mean across all trials. Manipulated variables (i.e., target's actual gender) were not centered, as the ICC of the manipulated predictor was expected to be approximately zero given the balanced within-participant design.

Prior to the primary analyses, participants' gender perception was evaluated using signal detection theory (SDT) to determine whether they could reliably discriminate male from female targets, and to assess whether any response bias was present. In line with standard SDT methodology, male targets were treated as the signal (present = 1, absent = 0) and responding "male" was treated as the detection response. Sensitivity (d') and response criterion (c) were computed for each participant. On average, participants demonstrated moderate and reliable discriminability (d' = 0.970, SD = 0.468), which was significantly greater than zero ($t(120)$ = 22.781, $p < .001$), indicating that participants could meaningfully distinguish male from female target PLDs. However, the response criterion was also significantly different from zero (c = 0.296, SD = 0.447, $t(120)$ = 7.296, $p < .001$), indicating a conservative bias in which participants required more evidence before labeling a target as male. These results confirm that participants

had reliable perceptual sensitivity to target gender, while also demonstrating a tendency to default toward female responses in ambiguous cases.

The relationship of power and status was also tested. A correlation decomposed into within-person (r = 0.32, 95% CI [0.300, 0.348], $p < .001$) and between-person (r = 0.63, 95% CI [0.504, 0.724], $p < .001$) components revealed that within the same participant, stimuli rated higher on power are only modestly rated higher on status, but there is a consistent rater-level tendency such that participants who tend to rate targets higher on power also tend to rate them higher on status. These findings support that while power and status are correlated, they are capturing distinct constructs.

Three random-slope multilevel models were fit predicting perceived power, status, and liking from three within-person centered predictors: gender response (genderResp.cwc), masculinity rating (mascResp.cwc), and typicality rating (typResp.cwc), with uncorrelated random intercepts and slopes across participants (N = 121, n = 5,445), estimated via REML with Kenward-Roger degrees of freedom. Likelihood ratio tests confirmed that the random slopes specification fit significantly better than random intercepts alone, $p < .001$, justifying the use of random slopes for all three outcome models.

Power

The average power rating across participants was 4.14 (SE = 0.04, $t(120) = 93.27$, $p < .001$). All three within-person predictors were statistically significant. Controlling for masculinity and typicality, gender response was negatively associated with power, $b = -0.17$, SE = 0.06, $t(156.73) = -3.01$, $p = .003$. Masculinity rating was also negatively associated with power, $b = -0.08$, SE = 0.02, $t(162.44) = -3.88$, $p < .001$. Typicality rating was positively associated with power, b = 0.10, SE = 0.02, $t(105.73) = 5.92$, $p < .001$, such that on trials where

targets were rated as more typical than the participant's average, they were also rated as more powerful. Random effects indicated participant-level variability in baseline power ratings (intercept variance = 0.19) and in the slopes for gender response (variance = 0.06), masculinity (variance = 0.02), and typicality (variance = 0.01). The total model explained 13.9% of the variance in power (R^2fvm = .139), with between-person mean differences accounting for the largest share (R^2m = .085), followed by slope variation (R^2v = .032) and the fixed effects (R^2fl = .022).

Status

The average status rating was 4.37 (SE = 0.04, $t(120) = 98.03$, $p < .001$). The pattern of fixed effects mirrored the power model. Controlling for masculinity and typicality, gender response was negatively associated with status, $B = -0.21$, $SE = 0.06$, $t(148.25) = -3.64$, $p < .001$. Masculinity rating was also negatively associated with status, $B = -0.08$, $SE = 0.02$, $t(147.05) = -4.25$, $p < .001$. Typicality rating was positively associated with status, $B = 0.08$, $SE = 0.01$, $t(102.84) = 5.76$, $p < .001$. Between-person variability in baseline status ratings was similar to the power model (intercept variance = 0.21), with the largest individual variability in the gender response slope (variance = 0.14), and smaller variability in the masculinity (variance = 0.02) and typicality (variance = 0.003) slopes. The total model explained 17.9% of variance in status (R^2fvm = .179), with between-person mean differences as the dominant source (R^2m = .111), followed by slope variation (R^2v = .041) and fixed effects (R^2fl = .027).

Liking

The average liking rating was 4.10 (SE = 0.06, $t(120) = 70.90$, $p < .001$). The pattern diverged from the power and status models in one key respect: gender response was not a significant predictor of liking, $B = -0.08$, $SE = 0.06$, $t(151.65) = -1.31$, $p = .191$. Masculinity

rating was negatively associated with liking, $B = -0.06$, $SE = 0.02$, $t(157.76) = -3.11$, $p = .002$, and typicality was positively associated with liking, $B = 0.08$, $SE = 0.02$, $t(105.12) = 4.85$, $p < .001$. Between-person variability in baseline liking ratings was notably larger than in the other two models (intercept variance = 0.36), suggesting greater individual differences in how much participants liked targets overall. The total model explained 19.6% of variance in liking ($R^2fvm = .196$), with between-person mean differences accounting for the largest share ($R^2m = .150$), and smaller contributions from slope variation ($R^2v = .034$) and fixed effects ($R^2fl = .011$).

Cluster-robust standard errors were computed for all models to test if violations of model assumptions influenced conclusions. Results indicated that robust standard errors were practically identical to the model-based standard errors across all models, and all significant coefficients remained significant (ps < .001). These findings suggest that the prior conclusions are not sensitive to violations of independence or homoscedasticity.

Mediation Models

To examine whether the effect of perceived gender on outcomes was mediated by perceived masculinity or perceived typicality, four 1-1-1 multilevel mediation models with random slopes were estimated using Blimp Studio (Version 3.2.2). The indirect effect (ab) was computed as the product of the mean path a and mean path b coefficients plus their covariance ($ab = \bar{\alpha} \times \bar{\beta} + \text{Cov}(\alpha j, \beta j)$), following the recommendation of Bauer et al. (2006) for cross-level mediation with random slopes. Significance was evaluated using 95% posterior confidence intervals based on 20,000 MCMC iterations (10,000 burn-in). Results for these mediations are summarized below.

The relationship between perceived gender and evaluations of power was partially mediated by perceived masculinity. As Figure 3 illustrates, the 95% credible interval excluded

zero for the a-path between perceived gender and perceived masculinity (b = 2.36, 95% CrI [1.974, 2.798]), as well as for the b-path between perceived masculinity and perceived power (b = -0.06, 95% CrI [-0.111, -0.018]). The indirect effect of perceived gender on power through perceived masculinity was also credibly different from zero (ab = −0.15, 95% CrI [−0.234, −0.042]). This finding suggests that when targets were perceived as men, they were also perceived as more masculine, which in turn was associated with lower power ratings. The direct effect of perceived gender on power remained credibly different from zero (b = −0.29, 95% CrI [−0.470, −0.106]). These findings indicate that at the within-person level, higher perceived masculinity accounted for part of the negative association between perceived gender and power ratings.

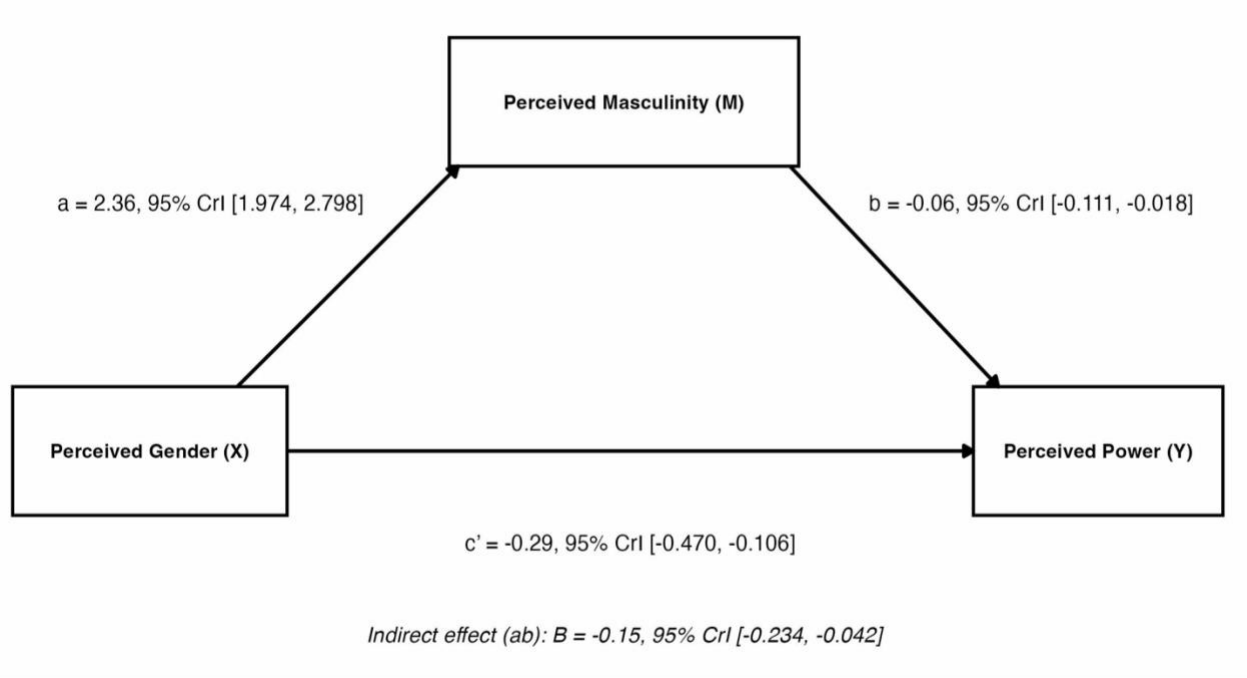


Figure 3. Chapter 3 Study 1 Gender, Masculinity, and Power Mediation Model Results

Following a similar pattern of results, the relationship between perceived gender and evaluations of status was partially mediated by perceived masculinity. As depicted in Figure 4,

the 95% credible interval excluded zero for the a-path between perceived gender and perceived masculinity (b = 2.27, 95% CrI [1.966, 2.614]). However, the credible interval for the b-path between perceived masculinity and perceived status included 0, suggesting a non-significant relationship (b = -0.03, 95% CrI [-0.062, 0.002]). The indirect effect of perceived gender on status through perceived masculinity was credibly different from zero (ab = −0.14, 95% CrI [−0.249, −0.009]). These results indicate that when targets were perceived as men, they were also perceived as more masculine, which in turn was associated with lower status ratings. The direct effect of perceived gender on status remained credibly different from zero (b = −0.27, 95% CrI [−0.454, −0.093]). Similar to the previous model, these findings indicate that at the within-person level, higher perceived masculinity accounted for part of the negative association between perceived gender and status ratings.

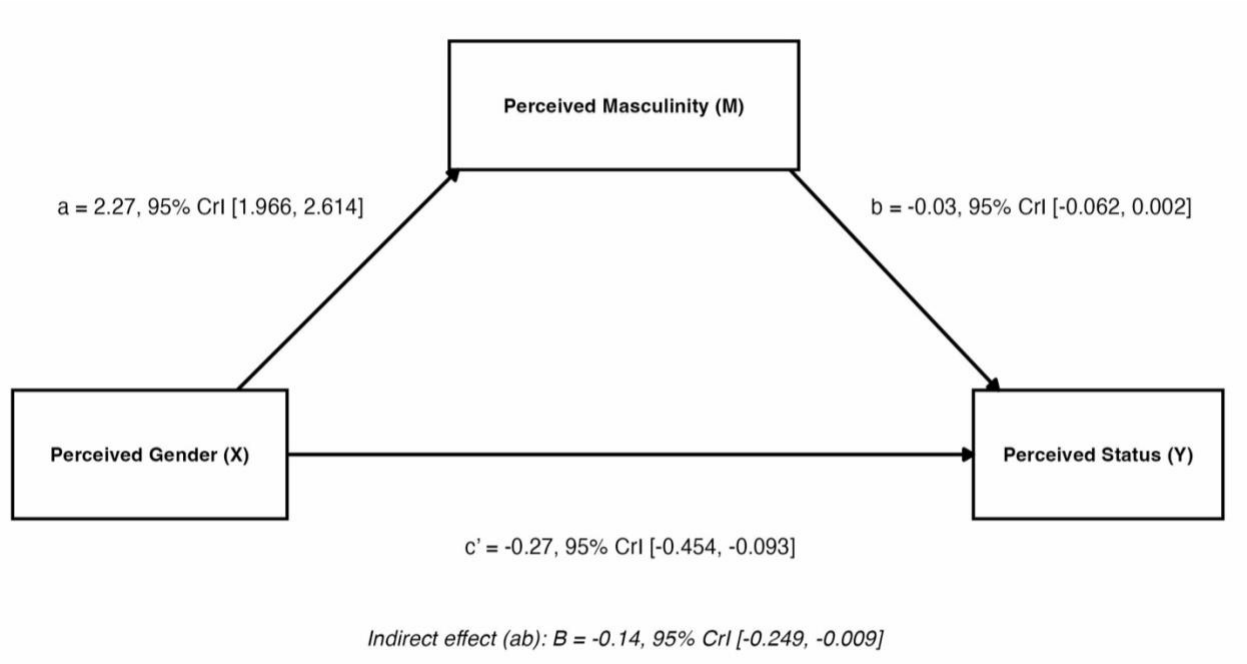


Figure 4. Chapter 3 Study 1 Gender, Masculinity, and Status Mediation Model Results

Unlike the previous models, perceived typicality did not mediate the relationship between perceived gender and evaluations of power or status. As illustrated in Figures 5 and 6, the indirect effects were not credibly different from zero for power (*ab* = 0.32, 95% CrI [−0.102, 0.758]) or status (*ab* = 0.28, 95% CrI [−0.082, 0.661]). This null mediation was driven by a non-significant a-path in both models, likely reflecting the absence of a typicality manipulation in the study design.

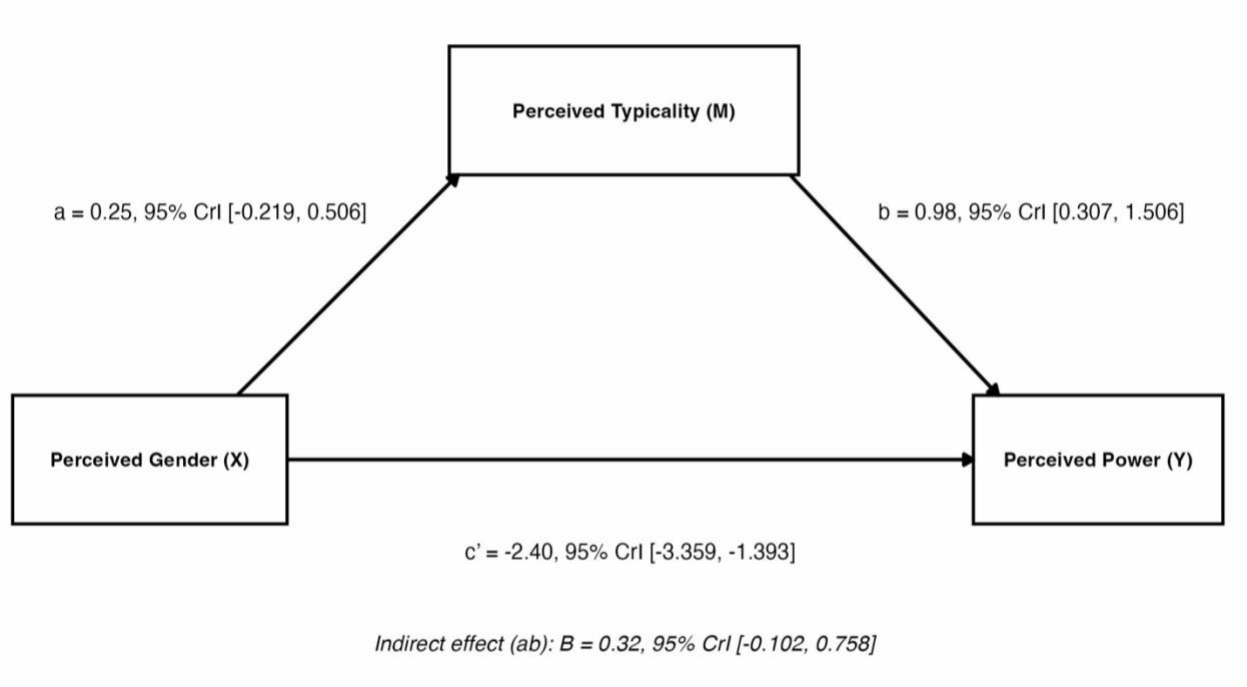


Figure 5. Chapter 3 Study 1 Gender, Typicality, and Power Mediation Model Results

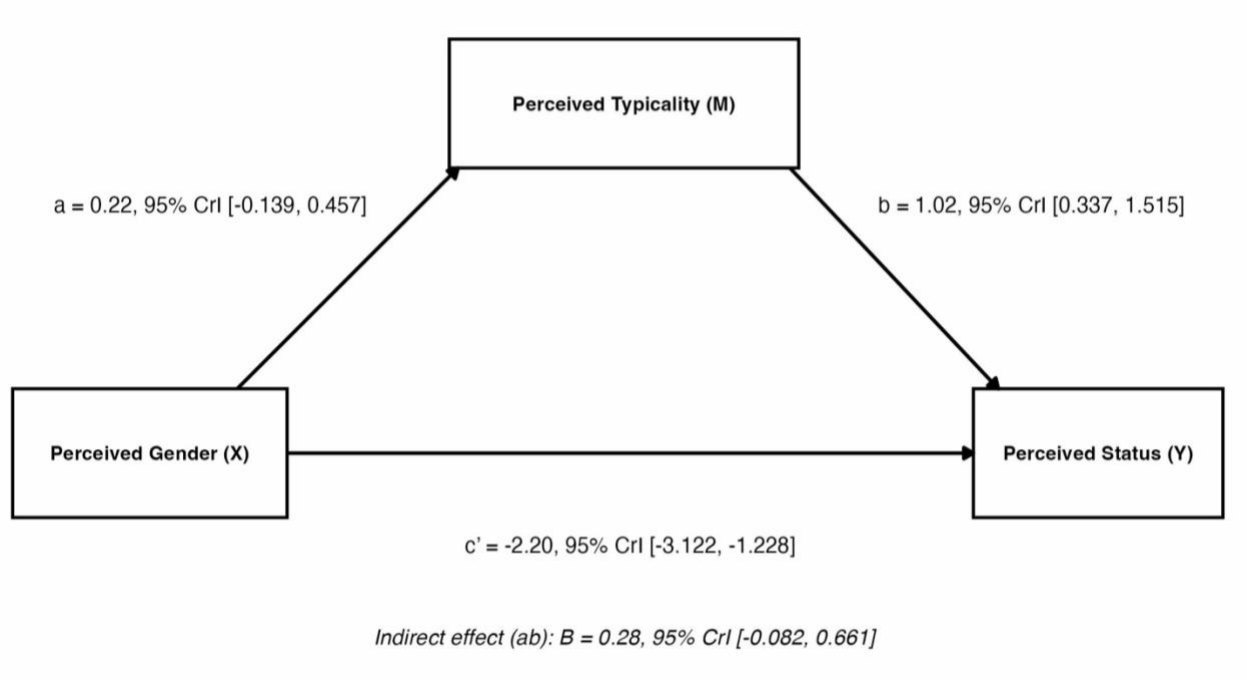


Figure 6. Chapter 3 Study 1 Gender, Typicality, and Status Mediation Model Results

Taken together, the mediation results indicate that perceived masculinity, but not perceived gender typicality, mediated the relationship between perceived gender and outcome ratings. It is unsurprising that gender typicality did not have a significant effect, given that the study did not include an experimental manipulation of gender typicality. The significant negative indirect effect through masculinity suggests that trials in which targets were perceived as more masculine were also associated with lower ratings of power and status. These findings run counter to theoretical expectations. One possible explanation for this is that the sample consisted primarily of women (94 women, 26 men) from UCLA, which may have influenced perceptions of masculinity and evaluations of the targets. Future research using more balanced samples and explicit manipulations of gender typicality will be important for determining the robustness of these effects.

Chapter 3 Study 2

Method

Participants

Using the UCLA Psychology SONA pool, I recruited 118 participants (85 women, 29 men, 4 non-binary).

Stimuli

A total of 92 PLDs from the UCLA Point Light Display Database were used for Study 2 (Dayley, Johnson, Benitez, in prep). The PLDs were chosen based on the 46 gender split PLDs from Study 1. However, PLDs either depicted the gender-typical (i.e., "walk in a manner that highlights that you are [insert participant gender]") or gender-atypical (i.e., "walk in a manner that someone who only sees your body motion may believe that you are actually [insert other gender]") walking gait of the target.

Procedure

Study 2 used the same general procedure as Study 1. However, Study 2 employed a mixed-model design in which participants saw 46 PLDs of the same gender (i.e., either randomly assigned to a male or female condition). There were two walking gaits (gender-typical and gender-atypical) per PLD for a total of 46 trials per block.

Results

Given the hierarchical nature of this experiment, the data was analyzed using multi-level modeling for repeated measures data. Level-one units were the individual trial-level observations, while each participant served as the level-two grouping factor.

To justify the use of multilevel modeling, an unconditional (empty) model was estimated for each variable using the lmerTest package with Kenward-Roger degrees of freedom approximation. The results supported the use of multilevel modeling for all variables. The inter-class correlations (ICCs) indicated that between 5.6% and 12.5% of the total variance in each variable was attributable to stable between-participant differences: perceived gender (ICC = .056), typicality (ICC = .125), masculinity (ICC = .056), power (ICC = .099), status (ICC = .112), and liking (ICC = .092). Likelihood ratio tests comparing each multilevel model to a single-level model confirmed that between-cluster variance was significant for all variables (ps < .001), providing sufficient justification for multilevel modeling across all analyses.

Centering decisions directly followed those laid out in Study 1, with perceived judgments being centered into a within-person component (*genderResp.cwc*, *mascResp.cwc*, *typResp.cwc*) and a between-person component (*genderResp.meanj*, *mascResp.meanj*, *typResp.meanj*), wheras the manipulated variable, target's gender typicality, was not centered, as the ICC of the manipulated predictor was expected to be approximately zero.

Next, participants' gender and gender typicality perception were evaluated using signal detection theory (SDT) to determine whether they could reliably identify the gender of the targets, discriminate between gender-typical and gender-atypical targets, and to test for any response biases. For these separate analyses, male targets and typical targets were treated as the signal (present = 1, absent = 0), and responding "male" or "typical" was treated as the detection response. Sensitivity (d') and response criterion (c) were computed for each analysis.

Since gender was manipulated between subjects, such that each participant viewed targets of only one gender, individual-level d' could not be computed for gender detection. At the group level, participants showed above-chance sensitivity to target gender (d' = 0.195), with accuracy

of 61.2% for participants viewing female targets and 46.4% for participants viewing male targets. The positive response criterion (c = 0.187) indicates a bias toward responding "female ". This pattern is consistent with Study 1.

Participants rated gender typicality on a scale of 1-7 (1- Not at all typical to 7 – Very typical). With this in mind, responses of 5-7 were classified as "typical" (59.2% of responses), 1–3 as "atypical" (21.7% of responses), and ratings of 4 (the midpoint; 19.0% of responses) were excluded as ambiguous. Participants showed significantly above-chance sensitivity to the gender typicality of targets (d' = 0.128, SD = 0.473), which was significantly greater than zero, $t(117)$ = 2.95, p = .002. Sensitivity did not differ significantly between participants who viewed female or male targets, $t(109.71)$ = 1.07, p = .289, suggesting comparable typicality detection across gender conditions. The negative response criterion (c = −0.670, SD = 0.604) was significantly different from zero, $t(117)$ = −12.05, p < .001, indicating a bias toward evaluating targets as gender typical.

Following the statistical analysis steps from Study 1, I again tested the relationship of power and status and found support for the Study 1 results. The correlation was decomposed into within-person (r = 0.40, 95% CI [0.379, 0.424], p < .001) and between-person (r = 0.70, 95% CI [0.595, 0.783], p < .001) components. These results suggest that power and status are correlated but continue to capture distinct constructs.

Three random-slope multilevel models were fit predicting perceived power, status, and liking from three within-person centered predictors: gender response (genderResp.cwc), masculinity rating (mascResp.cwc), and typicality rating (typResp.cwc), with uncorrelated random intercepts and slopes across participants (N =118, n =5,428), estimated via REML with Kenward-Roger degrees of freedom. Likelihood ratio tests confirmed that the random slopes

specification fit significantly better than random intercepts alone, $p < .001$, justifying the use of random slopes for all three outcome models.

Power

The average power rating across participants was 3.91 ($SE = 0.05$, $t(116.98) = 79.82$, $p < .001$). All three within-person predictors were statistically significant, which replicates findings from Study 1. Perceived gender was negatively associated with power, $b = -0.23$, $SE = 0.06$, $t(150.08) = -3.81$, $p < .001$. Masculinity rating was also negatively associated with power, $b = -0.07$, $SE = 0.02$, $t(155.88) = -3.24$, $p = .001$. The only variable positively associated with power was gender typicality, $b = 0.14$, $SE = 0.02$, $t(107.80) = 7.40$, $p < .001$. Between-person variability in baseline power ratings was moderate (intercept variance = 0.24), with meaningful individual variability in the gender response slope (variance = 0.10) and smaller variability in the masculinity (variance = 0.02) and typicality (variance = 0.02) slopes. The total model explained 17.3% of variance in power ($R^2fvm = .173$), with between-person mean differences accounting for the largest share ($R^2m = .100$), followed by slope variation ($R^2v = .041$) and the fixed effects ($R^2f = .031$).

Status

The average status rating was 4.29 ($SE = 0.04$, $t(115.55) = 92.73$, $p < .001$). Similar to Study 1, the pattern of fixed effects mirrored the power model. Perceived gender was negatively associated with status, $b = -0.30$, $SE = 0.05$, $t(159.21) = -5.79$, $p < .001$. Masculinity rating was also negatively associated with status, $b = -0.07$, $SE = 0.02$, $t(163.43) = -3.96$, $p < .001$. Following previous data patterns, gender typicality was positively associated with status, $b = 0.11$, $SE = 0.02$, $t(103.38) = 7.33$, $p < .001$. Between-person variability in baseline status ratings was similar to the power model (intercept variance = 0.21), with the largest individual variability

in the gender response slope (variance = 0.06), and smaller variability in the masculinity (variance = 0.008) and typicality (variance = 0.008) slopes. The total model explained 17.8% of variance in status (R^2fvm = .178), with between-person mean differences as the dominant source (R^2m = .113), followed by fixed effects (R^2f = .039) and slope variation (R^2v = .026).

Liking

The average liking rating was 4.22 (SE = 0.05, t(114.599) = 88.64, p < .001). Unlike Study1, perceived gender, masculinity rating, and gender typicality all significantly predicted liking. Perceived gender was negatively associated with liking, b = −0.24, SE = 0.05, t(142.14) = −4.30, p < .001. Masculinity rating was also negatively associated with liking, b = −0.06, SE = 0.02, t(157.90) = −2.93, p = .003. Ratings of gender typicality were positively associated with liking, b = 0.12, SE = 0.01, t(104.19) = 6.76, p < .001. Between-person variability in baseline liking ratings was similar to the other two models (intercept variance = 0.22), with the largest individual variability in the gender response slope (variance = 0.03), and smaller variability in the masculinity (variance = 0.02) and typicality (variance = 0.01) slopes. The total model explained 16.0% of variance in liking (R^2fvm = .160), with between-person mean differences accounting for the largest share (R^2m = .094), and smaller contributions from slope variation (R^2v = .038) and fixed effects (R^2f = .028).

Cluster-robust standard errors (CR2) were computed for all three models to test whether violations of model assumptions influenced conclusions. Robust SEs were practically identical to model-based standard errors across all predictors and all models, with differences of no more than 0.002 in any single estimate. All significant coefficients remained significant under robust estimation (all ps < .007), and no previously non-significant coefficients became significant. Residual plots indicated approximately normal within-cluster residuals across all three models,

with only minor deviations in the tails. These findings suggest that the prior conclusions are not sensitive to violations of independence or homoscedasticity.

Mediation Models

As done in Study 1, four 1-1-1 multilevel mediation models with random slopes were estimated using Blimp Studio (Version 3.2.2). The indirect effect (*ab*) was computed as the product of the mean path *a* and mean path *b* coefficients plus their covariance ($ab = \bar{\alpha} \times \bar{\beta} + \text{Cov}(\alpha_j, \beta_j)$), following the recommendation of Bauer et al. (2006) for cross-level mediation with random slopes. Significance was evaluated using 95% posterior confidence intervals based on 20,000 MCMC iterations (10,000 burn-in). Results for these mediations are summarized below.

Across the four models, the mediators, masculinity and perceived gender typicality, did not mediate the relationships between perceived gender and ratings of power and status. First, as illustrated in Figure 7, masculinity did not mediate the relationship between perceived gender and evaluations of power (a*b* = 0.00, 95% CrI [−0.129, 0.232]). Next, as depicted in Figure 8, masculinity did not mediate the relationship between perceived gender and evaluations of status (*ab* = -0.09, 95% CrI [−0.218, 0.706]). Third, as visualized in Figure 9, gender typicality did not mediate the relationship between perceived gender and evaluations of power (*ab* = -0.49, 95% CrI [−1.382, 0.276]). Finally, as illustrated in Figure 10, gender typicality did not mediate the relationship between perceived gender and evaluations of status (*ab* = -0.04, 95% CrI [−0.219, 0.089]).

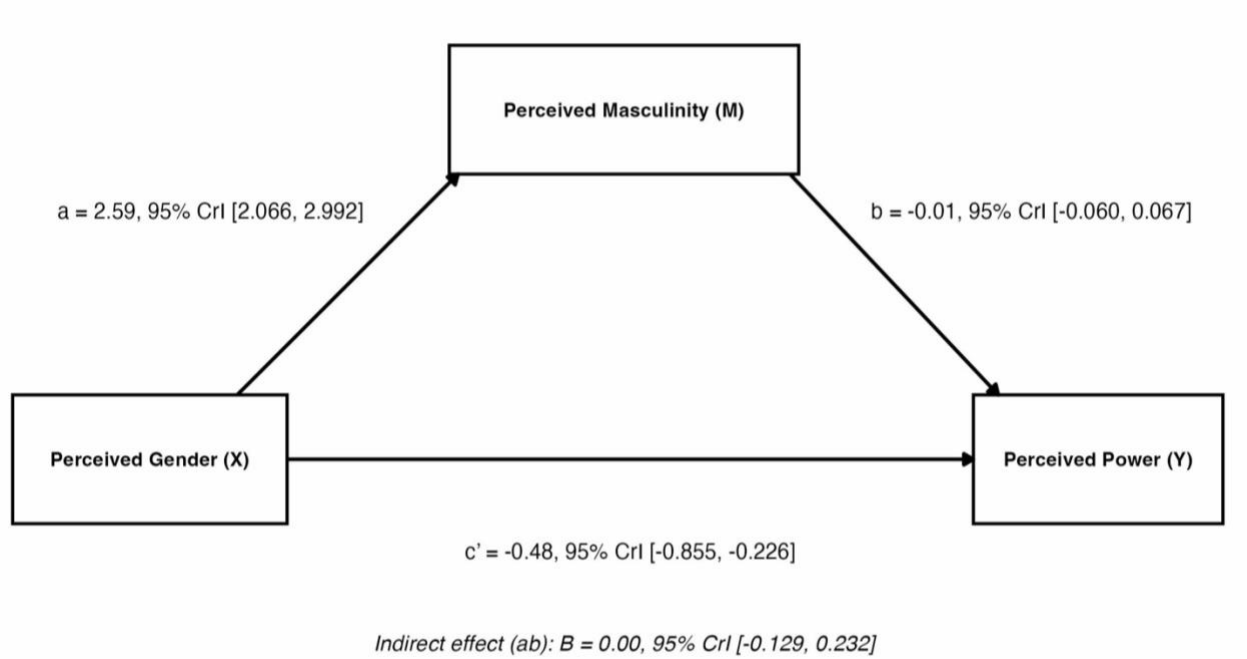


Figure 7. Chapter 3 Study 2 Gender, Masculinity, and Power Mediation Model Results

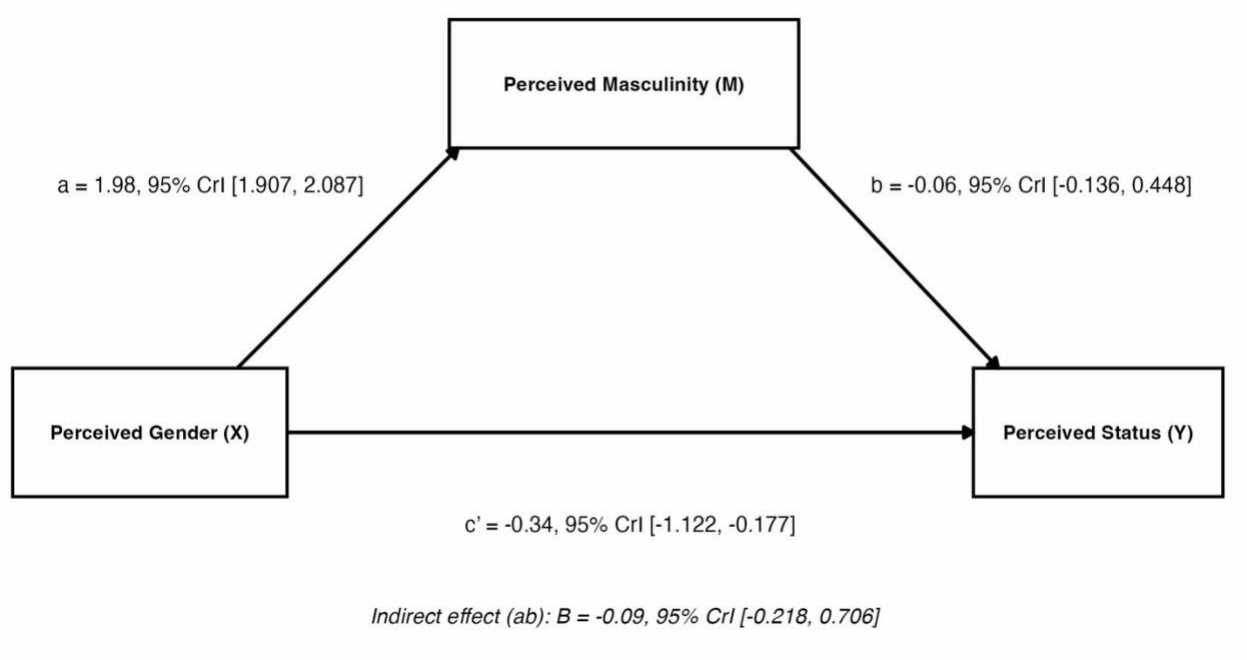


Figure 8. Chapter 3 Study 2 Gender, Masculinity, and Status Mediation Model Results

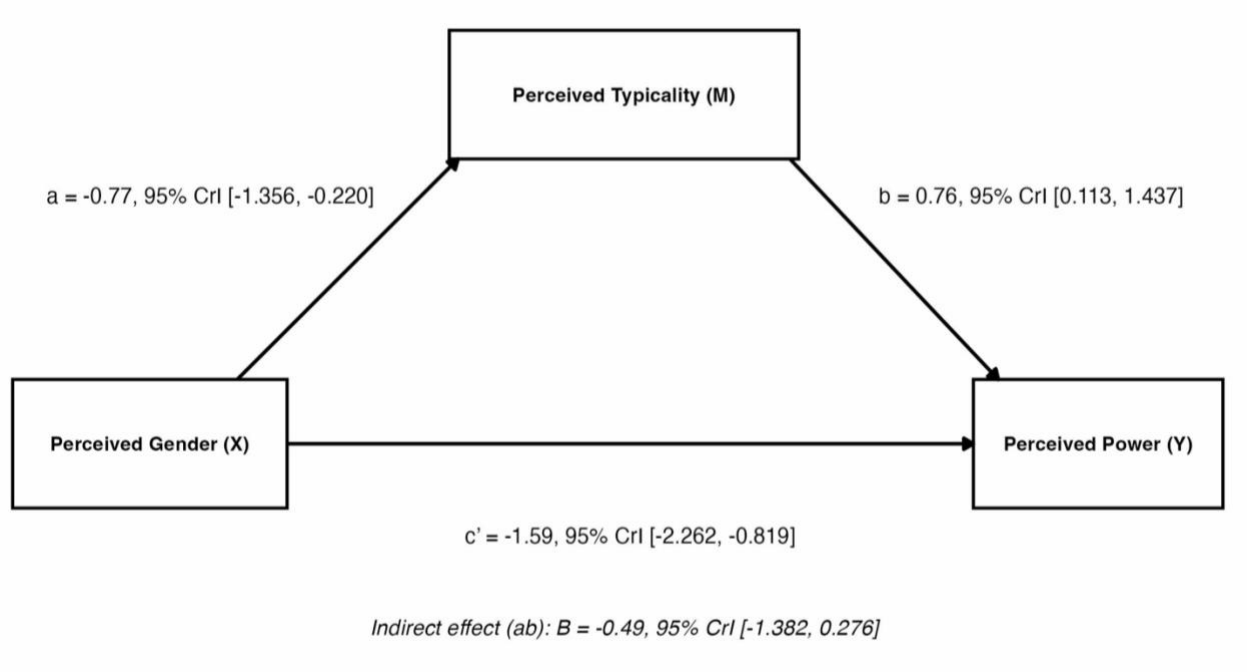


Figure 9. Chapter 3 Study 2 Gender, Typicality, and Power Mediation Model Results

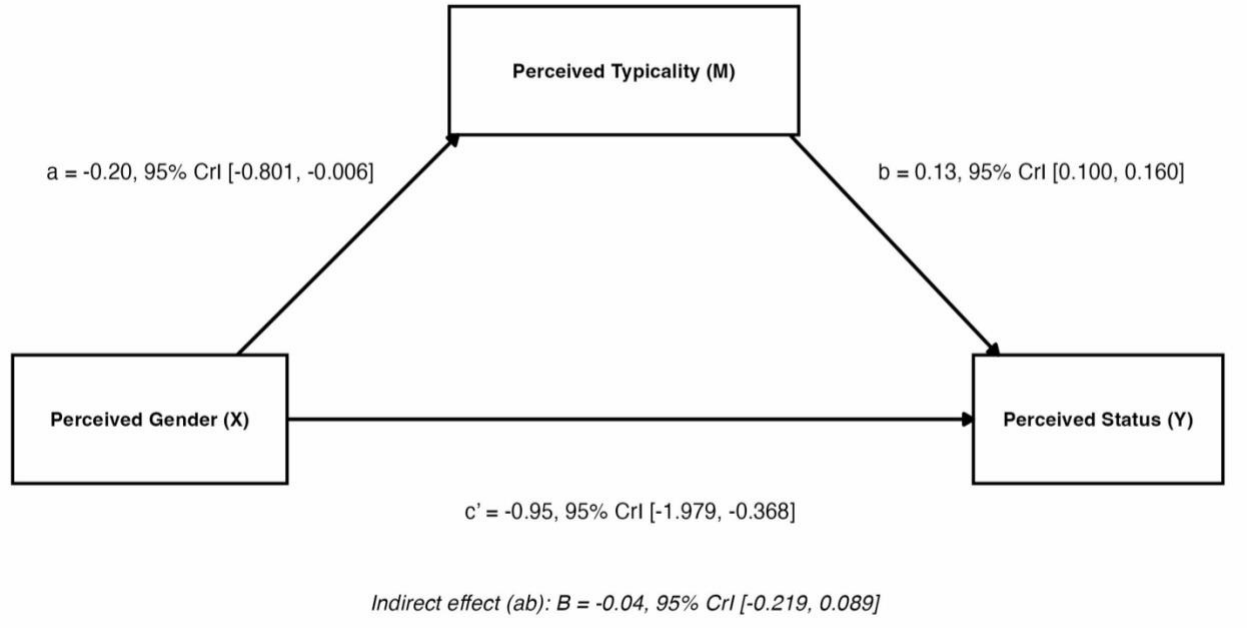


Figure 10. Chapter 3 Study 2 Gender, Typicality, and Status Mediation Model Results

These null mediation results may be partially explained by the weaker gender detection observed in Study 2 relative to Study 1 ($d' = 0.20$ vs. $d' = 0.97$). In Study 2, gender was

manipulated between subjects, and participants viewed both gender-typical and gender-atypical targets. Due to the manipulation of gender typicality, the perceived gender signal may have been too noisy to reliably drive downstream masculinity or typicality perceptions. In other words, if participants could not reliably distinguish target gender, there is little basis for gender perception to propagate through the proposed mediators to outcome ratings. Future research using within-subjects designs will be important for establishing whether these mediation pathways emerge under conditions of clearer gender perception.

Chapter 3 Study 3

Method

Participants

Using the UCLA Psychology SONA pool, I recruited 79 participants (56 women, 23 men).

Stimuli

A total of 120 PLDs from the UCLA Point Light Display Database were used for Study 3 (Dayley, Johnson, Benitez, in prep). More specifically, 20 male and 20 female PLDs, each with an angry, happy, and sad walking gait, were used. The same PLD had to have all three emotional walking gaits to be selected. However, due to a technical glitch, *only male PLDs were presented.*

Procedure

Study 3 used the same general procedure as Studies 1 and 2. While Study 3 was programmed as a mixed-model design in which participants should have seen either male or female PLDs across all three emotion expressions, the program only displayed male PLDs, making it a fully within-subjects design. As such, participants in this study saw 20 male PLDs

each with three walking gaits (angry, happy, and sad) per PLD for a total of 60 trials per block. All trials were randomized across the four blocks. Additionally, to capture the perceived emotion of the PLDs, a single-item emotion measure (i.e., What emotion is the person displaying?) was added to the first block of questions. To respond to this question, participants were given three options corresponding to three values on their keyboard (i.e., 1 = Angry, 5 = Happy, 0 = Sad). The order of this question in the block was counterbalanced with the previous measures of perceived masculinity and perceived gender typicality.

Results

As done for Studies 1 and 2, the present dataset was analyzed using multi-level modeling for repeated measures data. Level-one units were the individual trial-level observations, while each participant served as the level-two grouping factor.

To justify the use of multilevel modeling, an unconditional (empty) model was estimated for each variable using the lmerTest package with Kenward-Roger degrees of freedom approximation. The results supported the use of multilevel modeling for all variables. The inter-class correlations (ICCs) indicated that between 1.3% and 17.6% of the total variance in each variable was attributable to stable between-participant differences: perceived gender (ICC = .083), typicality (ICC = .176), masculinity (ICC = .126), power (ICC = .063), status (ICC = .066), liking (ICC = .110), and emotion (ICC = .013). Likelihood ratio tests comparing each multilevel model to a single-level model confirmed that between-cluster variance was significant for all variables (ps < .001), providing sufficient justification for multilevel modeling across all analyses.

Perceived gender, masculinity, gender typicality, and emotion were grand-mean centered within clusters (CWC) using the rockchalk package. This procedure yielded a within-person

component (*genderResp.cwc*, *mascResp.cwc*, *typResp.cwc, emotionResp.cwc*) capturing trial-level deviations from each participant's mean response, and a between-person component (*genderResp.meanj*, *mascResp.meanj*, *typResp.meanj, emotionResp.meanj*) representing each participant's mean across all trials. Manipulated variables (i.e., target's emotional expression) were not centered, as the ICC of the manipulated predictor was expected to be approximately zero given the balanced within-participant design.

Participants' emotion perception was evaluated using signal detection theory (SDT) to determine whether they could reliably discriminate between emotional walking gaits and to test for any response biases. Participants evaluated emotion categorically by indicating which of three options was the best fit (i.e., angry, happy, or sad). As such, I ran pairwise comparisons for each emotion pairing, including happy-angry, happy-sad, and angry-sad. For these three analyses, the first emotion listed in the coding scheme (e.g., happy in the happy-angry pairing) was treated as the signal (present = 1, absent = 0), and responding with the second emotion in the pairing (e.g., angry in the happy-angry pairing) was treated as the detection response. Sensitivity (d') and response criterion (c) were computed for each analysis.

Participants showed significantly above-chance sensitivity when discriminating between happy and angry PLDS (d' = 0.313, SD = 0.413, $t(78) = 6.75$, $p < .001$), happy and sad PLDs (d' = 1.05, SD = 0.460, $t(78) = 20.36$, $p < .001$), and angry and sad PLDs (d' = 0.811, SD = 0.512, $t(78) = 14.08$, $p < .001$). When evaluating happy versus angry PLDs, participants showed no significant response bias in reporting the PLD as happy or angry, as supported by a non-significant response criterion (c = -0.024, SD = 0.264, $t(78) = -0.813$, $p = .42$). However, a positive response criterion for happy-sad (c = 0.346, SD = 0.305, $t(78) = 10.08$, $p < .001$) and angry-sad (c = 0.676, SD = 0.251, $t(78) = 23.96$, $p < .001$) pairings were both significant. This

suggests a conservative bias toward not labeling PLDs as happy or angry, or said differently, suggests a response bias favoring sad judgments over happy or angry judgments.

As done in the previous studies, I tested the relationship of power and status. Once again, I found support that power and status are correlated but capture distinct constructs by assessing the within-person (r = 0.29, 95% CI [0.2259, 0.311], $p < .001$) and between-person (r = 0.48, 95% CI [0.286, 0.632], $p < .001$) components in the correlation.

Two random-slope multilevel models were fit, predicting perceived power and status from four within-person centered predictors: gender response (genderResp.cwc), masculinity rating (mascResp.cwc), typicality rating (typResp.cwc), and emotion (*emotionResp.cwc*) with uncorrelated random intercepts and slopes across participants (N =79, n =4,740), estimated via REML with Kenward-Roger degrees of freedom. Likelihood ratio tests confirmed that the random slopes specification fit significantly better than random intercepts alone, $p < .001$, justifying the use of random slopes for all three outcome models. However, the full random-slope specification was not supported for the model predicting liking. An inspection of the random effects indicated that the random slope for masculinity ratings had an estimated variance of zero. This random slope was removed from the model.

Power

The average power rating across participants was 4.24 (SE = 0.05, t(130.74) = 80.12, $p <$ .001). There was a significant main effect of perceived emotion on perceived power. Relative to male PLDs perceived as happy, male PLDs perceived as sad were rated as significantly lower in power, (b = −0.68, SE = 0.05, t(4680.06) = −13.83, $p < .001$). Male PLDs perceived as angry were rated marginally higher in perceived power than male PLDs perceived as happy, though

this effect did not reach conventional significance, (b = 0.09, SE = 0.05, t(4678.44) = 1.83, p = .067).

Perceived gender, masculinity, and typicality also significantly predicted power ratings, such when targets were correctly perceived as men, (b = 0.20, SE = 0.09, t(459.18) = 2.19, p = .029), with higher perceived typicality, (b = 0.06, SE = 0.03, t(225.55) = 2.27, p = .024), were associated with greater perceived power. However, perceived masculinity was not a significant predictor, (b = −0.01, SE = 0.03, t(427.40) = −0.45, p = .653).

There were no significant interactions between perceived emotion and gender, masculinity, or typicality (all ps > .21), indicating that the effect of emotion on perceived power did not vary as a function of these judgments.

Between-person variability in baseline power ratings was modest (intercept variance = 0.14), with some individual variability in the gender response slope (variance = 0.07) and negligible variability in the masculinity (variance = 0.001) and typicality (variance = 0.01) slopes. The total model explained 14.1% of variance in power (R^2fvm = .141), with fixed effects accounting for the largest share (R^2f = .064), followed closely by between-person mean differences (R^2m = .060), and slope variation contributing the least (R^2v = .017).

Status

The average status rating was 4.62 (SE = 0.05, t(125.38) = 93.58, p < .001). There was a significant main effect of perceived emotion on perceived status. Relative to male PLDs perceived as happy, male PLDs perceived as angry were rated as significantly lower in status (b = −0.16, SE = 0.05, t(4681.97) = −3.36, p < .001), and male PLDs perceived as sad were rated as substantially lower in status (b = −0.91, SE = 0.04, t(4682.00) = −20.55, p < .001).

Replicating previous findings, perceived gender typicality significantly predicted status ratings, such that targets perceived as more gender-typical were associated with higher perceived status (b = 0.06, SE = 0.02, t(264.95) = 2.64, p = .009). Additionally, higher evaluations of perceived masculinity were associated with *lower* perceived status ($b = -0.06$, SE = 0.03, $t(375.86) = -2.19$, $p = .029$). Perceived gender was not a significant predictor of status ($b = -0.09$, SE = 0.08, $t(461.50) = -1.14$, $p = .255$).

Importantly, several interactions between perceived emotion and perceptual judgments emerged. The effect of angry (vs. happy) expressions on status was moderated by perceived typicality ($b = 0.12$, $SE = 0.03$, $t(4412.15) = 3.54$, $p < .001$), such that the negative effect of anger on status was attenuated as targets were perceived as more typical. Given that all stimuli were male PLDs, this interaction suggests that when male targets were perceived as more gender-typical, anger expressions were less strongly associated with reductions in perceived status. In contrast, when male targets were perceived as less gender typical, anger was more strongly associated with lower status evaluations.

Additionally, the effect of angry (vs. happy) expressions was moderated by perceived gender ($b = 0.25$, $SE = 0.12$, $t(4595.66) = 2.07$, $p = .039$). While all PLDs were male PLDs, when a participant perceived a PLD as being a man instead of a woman, anger expressions were less strongly associated with reductions in perceived status, whereas if a PLD was incorrectly believed to be a woman, anger was more strongly associated with lower status evaluations. No other emotion-by-perception interactions reached significance (all ps > .22), including all interactions involving sad expressions.

Between-person variability in baseline status ratings was modest (intercept variance = 0.12), with some individual variability in the gender response slope (variance = 0.04) and

negligible variability in the masculinity (variance = 0.006) and typicality (variance = 0.003) slopes. The total model explained 17.9% of variance in status (R^2fvm = .179), with fixed effects accounting for the largest share (R^2f = .101), followed by between-person mean differences (R^2m = .065), and slope variation contributing the least (R^2v = .013).

Liking

As noted earlier, preliminary models that included random slopes for perceived gender, masculinity, and gender typicality had difficulty converging, showed negligible slope variance, and produced singular fit warnings. Therefore, the final model for liking was simplified to only include random slopes for perceived gender and gender typicality. Unlike previous models, these effects are estimated at the population level, while accounting for between-participant differences in overall rating tendencies.

The average liking rating was 4.44 (SE = 0.06, $t(119.01) = 69.21$, $p < .001$). There was a significant main effect of perceived emotion on liking. Relative to male PLDs perceived as happy, male PLDs perceived as angry were rated as significantly less liked ($b = -0.11$, $SE = 0.05$, $t(4606.30) = -2.36$, $p = .018$), and male PLDs perceived as sad were also rated as less liked ($b = -0.58$, $SE = 0.05$, $t(4653.78) = -11.93$, $p < .001$).

Replicating the pattern observed for status, perceived gender typicality was marginally associated with higher liking ratings, such that targets perceived as more gender-typical tended to be liked more, although this effect did not reach significance ($b = 0.05$, $SE = 0.03$, $t(380.40) = 1.67$, $p = .097$). In contrast, perceived masculinity was associated with lower liking ratings ($b = -0.09$, $SE = 0.03$, $t(4597.02) = -3.09$, $p = .002$), whereas perceived gender was not a significant predictor of liking ($b = -0.06$, $SE = 0.10$, $t(664.90) = -0.60$, $p = .548$).

There was limited evidence that the effects of emotion on liking were moderated by perceptual judgments. The only effect approaching significance was a trend-level interaction between perceived gender and sad (vs. happy) expressions *(b* = 0.20, SE = 0.12, *t*(4668.99) = 1.67, *p* = .095). However, no other emotion-by-perception interactions reached significance (all *p*s > .25).

There was evidence that the effects of emotion on liking were moderated by perceptual judgments. Specifically, the negative effect of anger (vs. happiness) on liking was attenuated as perceived masculinity increased (*b* = 0.10, *SE* = 0.04, *t*(4654.28) = 2.42, *p* = .015). Simple slopes indicated that greater perceived masculinity was associated with lower liking for PLDs perceived as happy (*b* = −0.09, *SE* = 0.03, *z* = −3.09, *p* = .002), whereas perceived masculinity was unrelated to liking for PLDs perceived as angry (*b* = 0.01, *SE* = 0.03, *z* = 0.26, *p* = .793). Said differently, the negative association between perceived masculinity and liking was evident only when targets were perceived as happy.

In addition, the difference in liking between angry and happy expressions (*b* = 0.32, *SE* = 0.12, *t*(4620.84) = 2.56, *p* = .010) was moderated by perceived gender. Simple slopes showed that perceived gender was unrelated to liking for PLDs perceived as happy (*b* = −0.06, *SE* = 0.10, *z* = −0.60, *p* = .548), but PLDs perceived as men received higher liking ratings than those perceived as women when they were perceived as angry (*b* = 0.26, *SE* = 0.09, *z* = 2.78, *p* = .006).

Similarly, the difference between sad and happy expressions (*b* = 0.31, *SE* = 0.13, *t*(4661.85) = 2.44, *p* = .015) was moderated by perceived gender. Again, perceived gender was unrelated to liking for PLDs perceived as happy (*b* = −0.06, *SE* = 0.10, *z* = −0.60, *p* = .548). However, PLDs perceived as men were rated as more likable than those perceived as women when they were perceived as sad (*b* = 0.25, *SE* = 0.10, *z* = 2.62, *p* = .009).

Between-person variability in baseline liking ratings was moderate (intercept variance = 0.23), with some individual variability in the gender response slope (variance = 0.10) and small variability in the typicality slope (variance = 0.008). The total model explained 17.0% of the variance in liking (R^2fvm = .170), with between-person mean differences accounting for the largest share (R^2m = .110), followed by fixed effects (R^2f = .044), and slope variation contributing the least (R^2v = .017).

Cluster-robust standard errors (CR2) were computed for all three models to test whether violations of model assumptions influenced conclusions. For most predictors, robust SEs were similar to model-based SEs and importantly, no changes in significance were observed: all coefficients that were significant under model-based estimation remained significant under robust estimation (all ps $\leq .049$), and no previously non-significant coefficients became significant.

Within-cluster residuals were approximately normally distributed across all three models (skewness range: −0.14 to 0.03; excess kurtosis range: −0.36 to −0.04). Between-cluster random effects were also approximately normal for the power and status models, though the power model's random intercept exhibited moderate negative skew (skewness = −0.53) and the status model's gender slope also showed moderate negative skew (skewness = −0.62). More notably, the liking model's random intercepts showed non-normality (skewness = 2.48, excess kurtosis = 10.21), likely reflecting the influence of a small number of extreme participants (unusually high or low intercept estimates). As expected, distributional statistics for the masculinity random slope in the liking model could not be computed because its estimated variance was zero, consistent with the singular fit reported previously. Together, these findings suggest that conclusions from the power and status models are not substantially sensitive to violations of

normality, independence, or homoscedasticity. The non-normality in the liking model's random intercepts warrants some caution in interpreting between-person estimates from that model.

Mediation Models

As done previously, four 1-1-1 multilevel mediation models with random slopes were estimated using Blimp Studio (Version 3.2.2). The indirect effect (*ab*) was computed as the product of the mean path *a* and mean path *b* coefficients plus their covariance ($ab = \bar{\alpha} \times \bar{\beta} + \text{Cov}(\alpha j, \beta j)$), following the recommendation of Bauer et al. (2006) for cross-level mediation with random slopes. Significance was evaluated using 95% posterior confidence intervals based on 20,000 MCMC iterations (10,000 burn-in). Results for these mediations are summarized below.

The relationship between perceived gender and evaluations of power was not significantly mediated by perceived masculinity. As Figure 11 illustrates, although the 95% credible interval excluded zero for the a-path between perceived gender and perceived masculinity ($b = -2.09$, 95% CrI [−2.283, −1.865]), indicating that targets perceived as men were also perceived as more masculine, the b-path between perceived masculinity and perceived power did not credibly differ from zero ($b = 0.01$, 95% CrI [−0.232, 0.167]). Accordingly, the indirect effect of perceived gender on power through perceived masculinity was not credibly different from zero ($ab = -0.02$, 95% CrI [−0.407, 0.469]). The direct effect of perceived gender on power was not credibly different from zero ($b = 0.26$, 95% CrI [-0.208, 0.691]).

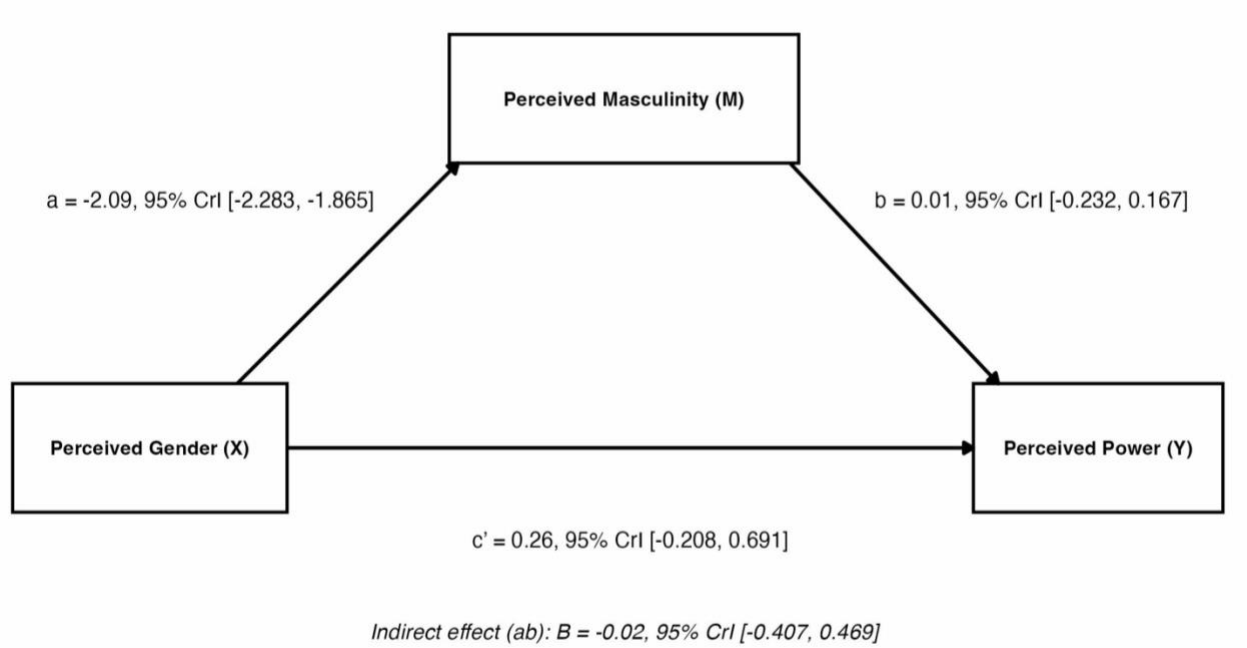


Figure 11. Chapter 3 Study 3 Gender, Masculinity, and Power Mediation Model Results

Similarly, the relationship between perceived gender and evaluations of power was not significantly mediated by perceived masculinity. As depicted in Figure 12, although the a-path was credibly different from zero (b = −2.33, 95% CrI [−2.957, −1.866]), the b-path between perceived masculinity and perceived status did not credibly differ from zero (b = 0.01, 95% CrI [−0.025, 0.058]), and the indirect effect was not credibly different from zero (ab = −0.01, 95% CrI [−0.156, 0.087]). The direct effect of perceived gender on status was credibly different from zero (b = 0.16, 95% CrI [0.032, 0.384).

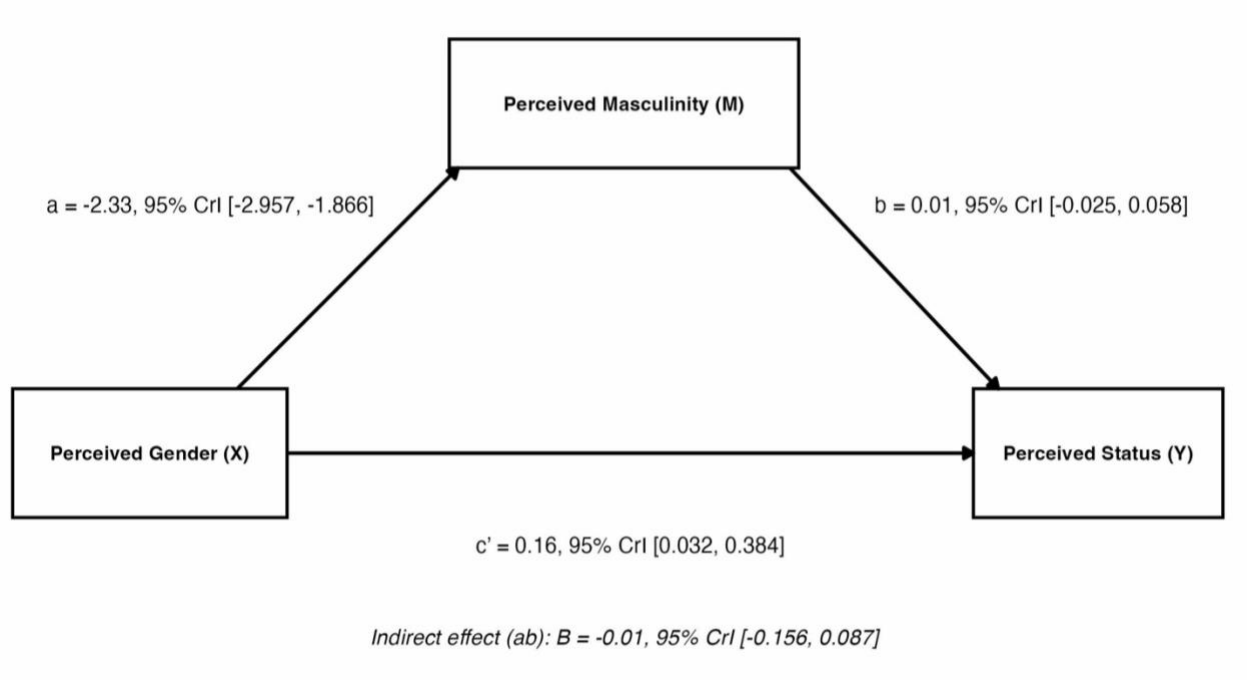


Figure 12. Chapter 3 Study 3 Gender, Masculinity, and Status Mediation Model Results

The relationship between perceived gender and evaluations of status was significantly mediated by perceived typicality. As shown in Figure 13, the 95% credible interval excluded zero for the a-path between perceived gender and perceived typicality (b = −0.84, 95% CrI [−2.395, −0.388]), as well as for the b-path between perceived typicality and perceived power (b = 0.13, 95% CrI [0.091, 0.333]). The indirect effect of perceived gender on power through perceived typicality was also credibly different from zero (ab = −0.31, 95% CrI [−0.800, −0.090]). These findings indicate that at the within-person level, perceived gender typicality accounted for part of the association between perceived gender and power ratings. The direct effect of perceived gender on power was also credibly different from zero (b = -0.31, 95% CrI [0.613, 3.352]).

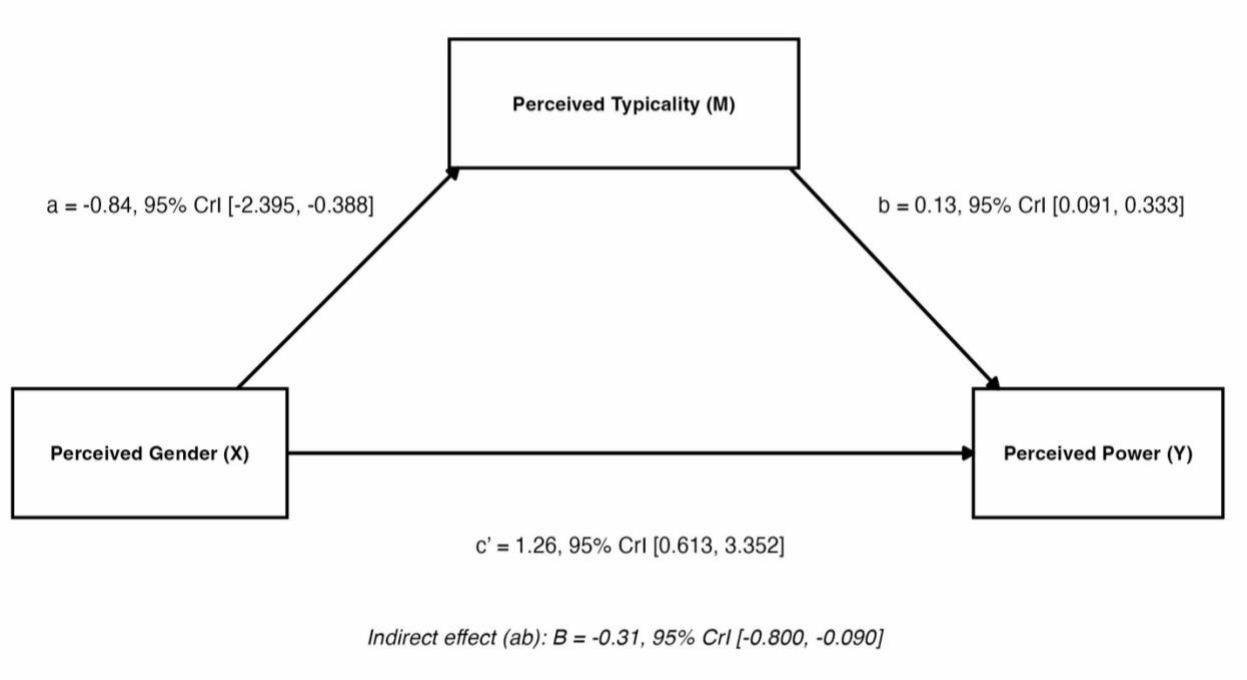


Figure 13. Chapter 3 Study 3 Gender, Typicality, and Power Mediation Model Results

Finally, the relationship between perceived gender and evaluations of status was significantly mediated by perceived typicality. This effect is illustrated in Figure 14. The 95% credible interval excluded zero for both the a-path (b = −1.60, 95% CrI [−4.221, −0.679]) and the b-path between perceived typicality and perceived status (b = 0.15, 95% CrI [0.107, 0.263]). The indirect effect of perceived gender on status through perceived typicality was credibly different from zero (ab = −0.40, 95% CrI [−0.849, −0.093]). The direct effect of perceived gender on status also remained credibly different from zero (b = 1.17, 95% CrI [0.617, 3.724]). Taken together, these findings indicate that, in contrast to the previous study, perceived typicality, rather than perceived masculinity, accounted for part of the within-person association between perceived gender and both power and status ratings.

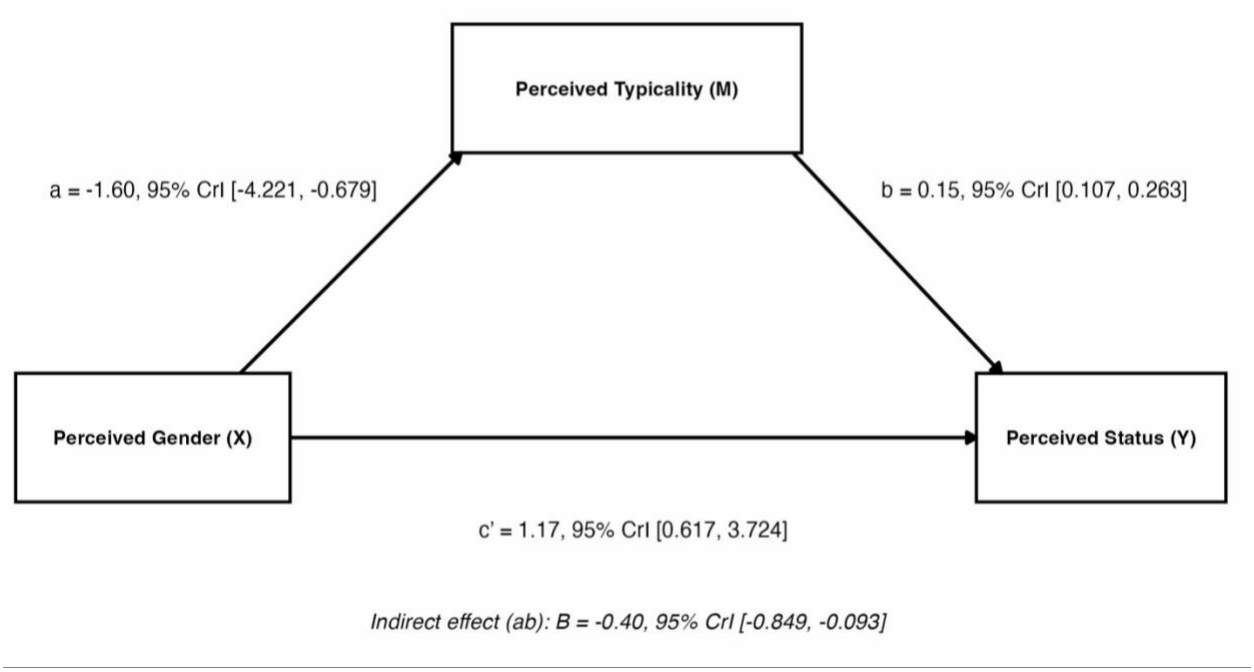


Figure 14. Chapter 3 Study 3 Gender, Typicality, and Status Mediation Model Results

General Discussion

Across three experimentally controlled studies, the present research examined how observers use body motion cues to form social evaluations of others. Specifically, these studies investigated whether perceptions of gender, masculinity, and gender typicality derived from body motion predict evaluations of power, status, liking, and emotional expression. Collectively, the findings provide preliminary evidence that gendered impressions from body motion carry important social meaning, although the pattern of effects was not entirely consistent across studies. Overall, evaluations of masculinity and gender typicality emerged as more consistent predictors of social evaluations than perceived gender itself, suggesting that how gender is expressed through movement may be more consequential.

Although the specific pattern of findings varied across studies, several themes emerged consistently. First, perceptions of gender expression, particularly masculinity and gender

typicality, were generally more predictive of evaluations than perceived gender itself. Across Studies 1 and 2, targets perceived as more gender typical were consistently evaluated as higher in power, status, and liking. In contrast, targets perceived as more masculine were more frequently associated with less favorable evaluations, particularly for status and liking. Study 3 showed a similar pattern despite being limited to male targets: gender typicality positively predicted power and status, and perceived masculinity continued to predict lower status.

A second consistent finding was that the social consequences of masculinity differed depending on the perceived gender of the target. Across the first two studies, masculinity was associated with lower evaluations, primarily when targets were perceived as men. Comparable increases in masculinity had weaker effects for targets perceived as women. In Study 1, this interaction emerged for status and liking, such that greater perceived masculinity predicted lower evaluations primarily for men. Study 2 replicated this pattern across power, status, and liking, indicating that masculine movement cues were evaluated less favorably when displayed by perceived men than by perceived women. Although Study 3 could not examine this interaction because analyses were restricted to male targets, these converging findings suggest that observers may apply different evaluative standards to masculine movement depending on the target's perceived gender. Rather than simply responding to masculinity itself, observers may evaluate masculinity in relation to whether it aligns with expectations for the target's gender. However, given the variability across studies, these conclusions should be considered preliminary and warrant further investigation.

Despite these recurring patterns, the findings also highlight the complexity of movement-based social perception. Not all effects were replicated across studies, and relationships among perceived gender, masculinity, gender typicality, and social evaluations varied across studies.

For example, mediation effects were observed only in Study 1, and the predictors of power differed somewhat from those of status and liking. These inconsistencies suggest that the influence of body motion on social evaluations is likely nuanced and shaped by additional factors that were not examined in the present studies.

Several limitations should be considered when interpreting these findings. First, all three studies relied primarily on undergraduate participants recruited from communication and psychology courses at UCLA, with women comprising the majority of the sample. As a result, these findings may reflect the norms and attitudes of this particular population and may not generalize to broader or more diverse samples. Second, the perceived gender judgment may have been susceptible to response error because the response labels displayed on the screen (0 = woman, 1 = man) did not correspond to the physical arrangement of the number keys on a standard keyboard, where the "1" key is located on the left and the "0" key on the far right. This mismatch may have introduced confusion, particularly because the subsequent masculinity rating used a 1–7 scale in which higher values corresponded to greater perceived masculinity, making rightward key presses consistently map onto higher masculinity but not onto perceived gender. Third, the programming error in Study 3 restricted analyses to male targets, preventing a full examination of whether the observed patterns generalize across perceived gender. This limitation also makes it difficult to determine whether differences between Study 3 and the earlier studies reflect true theoretical differences or methodological constraints.

Future research should address these limitations by recruiting more diverse and representative samples to determine whether these patterns replicate across different populations. In addition, future studies should correct the programming issue in Study 3 to allow evaluations of both male and female point-light displays. Doing so would provide a stronger test of whether

the interaction between perceived gender and masculinity consistently emerges across social judgments. More broadly, future work should continue investigating how body motion contributes to gender perception and whether these movement-based impressions influence downstream judgments in educational, healthcare, and business contexts.

Chapter 4

From Individuals to Groups: Gender Stereotypes, Power, and Status in Group Body Movements

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Chapter 4 Abstract

Across three studies, I investigated the effect of body motion on perceptions of power and status, with a particular focus on the mediating role of gender-focused evaluations. Importantly, this chapter explored these effects in the context of group perception. I examined whether gender-related evaluations explained the relationship between perceived gender and judgments of power and status derived from body motion. Specifically, the analyses tested whether perceived masculinity and perceived gender typicality mediated the association between perceived gender and evaluations of power and status using participant-centered multilevel mediation models. Perceived gender significantly predicted both perceived masculinity and perceived gender typicality, indicating that observers reliably inferred gender-related characteristics from body motion. However, neither perceived masculinity nor perceived gender typicality significantly predicted evaluations of power or status after controlling for perceived gender. While these results did not provide support for the predicted relationships, they provide a basis for future research to continue testing the thresholds and capacities for motion perception.

Keywords: body perception, ensemble perception, biological motion, gender, power, status

Introduction

As noted in Chapter 3, the human visual system is survival oriented and thus is adept at interpreting social and visual cues, even when cues are limited (Dunbar, 2003; Freeman & Johnson, 2016; Mobbs et al., 2015; Neuberg et al., 2011; Olivola & Todorov, 2010; Todorov et al., 2009; Willis & Todorov, 2006). This capability allows perceivers to make rapid judgments about race, gender, age, attractiveness, and threat potential, often based on minimal visual information (Ambady et al., 1999; Atkinson et al., 2004; Barrett et al., 2005; Cutting, 1978b; Fink et al., 2015; Hu et al., 2018; Manera et al., 2011; Montepare & Zebrowitz, 1988). Biological motion, in particular, plays a significant role in these assessments, influencing how individuals perceive the intentions and characteristics of others (Barrett et al., 2005; Jokisch & Troje, 2003; Manera et al., 2011; McCarty et al., 2013; Veto et al., 2017). The ability to quickly and accurately process biological motion and other visual cues is not only essential for individual survival but also for navigating complex social environments. As social beings, humans must also be privy to the social hierarchies that exist and therefore are often required to make perceptual based judgments of other's power and status. Researchers define power as relating to control over resources, while status involves the respect and admiration one receives from others (Blader & Chen, 2014; Fiske & Bai, 2020; Fiske & Berdahl, 2007; Fragale et al., 2011; Magee & Galinsky, 2008; Yu et al., 2019). These constructs are distinct yet interconnected, and their perception is influenced by various factors, including gender stereotypes. Chapter 3 investigates the relationship between an individual's body motion, gender stereotypes, and evaluations of power and status. Chapter 4 will extend this research by investigating how perceptions of body motion in groups impacts these same factors.

As social beings, humans rely heavily on group contexts to form companionship, develop individual identities, and ensure safety. We frequently find ourselves participating in group activities and observing others within group settings. Despite the fundamental role that groups play in human interactions, research in social and cognitive sciences has traditionally examined perceptions of individuals rather than groups. However, there has been a recent shift towards ensemble-focused research. Ensemble perception refers to the cognitive ability to extract and aggregate information about a group, enabling us to perceive the group as a whole without focusing on its individual members (Alvarez, 2011; Alzahabi & Cain, 2021; Utochkin et al., 2023). Given the pervasive nature of group interactions in our everyday lives, this emerging field of research is crucial for understanding how people process social information and make judgments in real-world settings.

Current research demonstrates that through ensemble perception, perceivers make rapid and accurate judgments about a group's collective attributes, providing a holistic understanding of the group as a unified entity (Alt & Phillips, 2022; Haberman & Whitney, 2012; Phillips et al., 2014; Whitney & Yamanashi Leib, 2018; Whitney et al., 2014). For instance, perceivers are attuned to the composition of social groups, quickly identifying the ratios of different social categories including gender (Alt et al., 2019; Haberman & Whitney, 2012; Whitney & Yamanashi Leib, 2018) and race (Thornton et al., 2014; Yang & Dunham, 2019). Additionally, perceivers can aggregate more nuanced social signals, such as emotional expressions (Elias et al., 2017; Goldenberg et al., 2020; Haberman & Whitney, 2012; Tan et al., 2017), eye gaze direction (Sweeny & Whitney, 2014), and walking direction (Sweeny et al., 2013). This ability to rapidly categorize and summarize group characteristics has practical implications for how observers evaluate groups based on judgments of attractiveness (Dittes, 1959; Lei et al., 2020; van Osch et

al., 2015), belonging (Goodale et al., 2018), humanness (Waytz & Young, 2012), threat (Alt et al., 2019), and trustworthiness (Alt et al., 2019; Chwe & Freeman, 2023). These findings underscore the complexity and importance of investigating the mechanisms behind ensemble perception and its impact on how perceivers navigate social settings.

Ensemble perception not only expedites cognitive processes to facilitate understanding groups as a whole, but group perception also affords critical social and survival information that cannot be provided by an individual. For example, emergent social information, such as panic, is uniquely conveyed through crowd behavior (Helbing et al., 2000). The ability to recognize and respond to group-based emotional cues is critical in emergency situations, enhancing both individual and collective safety. Furthermore, group characteristics, such as synchrony (i.e., when group members move or act in unison), can signal greater power and cohesion. Research indicates that groups displaying high levels of synchrony are often perceived as more powerful and influential, suggesting that coordinated behavior is a key indicator of cooperation and collective strength (Wiltermuth & Heath, 2009). These perceptual abilities enable individuals to adapt to rapidly changing environments, making sense of complex social cues and adjusting their behavior accordingly.

Beyond immediate survival benefits, groups provide valuable information that arises from their internal structure and dynamics. Hierarchies are intrinsic to groups and often become most apparent and meaningful in a collective context. Specifically, judgments about power and status are most effectively made within group settings, not only for understanding the position of individual members within the group but also for assessing the power and status of the group as a whole. Observers often rely on social cues and collective behavior to infer who holds authority and how power is distributed within a group. For assessing individuals, this may include

observing who takes the lead in discussions, who dominates decision-making processes, and who receives the most attention and respect from other group members. Similarly, perceivers can use group-level cues to assess the overall power of a group, which might be interpreted as the sum of the power held by its individual members or as a function of the group's level of unity and cooperation. Understanding group power dynamics is particularly useful in organizational settings, where recognizing the hierarchy can help individuals navigate the workplace, identify key decision-makers, and align their behavior with those in positions of authority to achieve personal and professional goals. In general, social groups, awareness of the hierarchy can guide individuals in selecting allies, avoiding conflicts, and understanding group norms and expectations.

To advance our understanding of the relationship between gender, power, and status, it is essential to investigate these concepts within group settings. Despite the significant role that body motion perception plays in group interactions, there is limited research on this topic, particularly regarding how it relates to gender stereotypes and evaluations of power and status. The proposed studies aim to fill this gap by using existing point-light display (PLD) stimuli representing both men and women to create controlled group scenarios. These PLD groups will be used to test how gender stereotypes influence perceptions of masculinity, gender typicality, power, and status. Building on the methodologies proposed in Chapter 3, these studies will not only expand our scientific understanding of the intersection between gender, power, and status but will also explore these relationships within the framework of group perception. These experiments will provide insights into the biases and invisible barriers faced by women, LGBTQ+ individuals, and other minority groups in public and workplace settings, highlighting the subtle yet profound impact of group dynamics on social evaluation and interaction.

Chapter 4 Study 1

Method

Participants

I recruited 119 participants from Prolific (www.prolific.co) who were paid $5.00 for participation in a 30-minute study (Age: *M* = 36.3 years, *SD* = 11.6 years; Sex: 57 female, 60 male, 2 non-binary; Race: 55.5% White, 18.5% Black, 13.4% Asian, 8.4% Latino/Latin American, 4.2% biracial/other).

Stimuli

Forty-six PLDs from the UCLA Point Light Display Database were used (Dayley, Johnson, Benitez, in prep). The PLDs were evenly divided by gender (23 men, 23 women). All PLDs were of the person's natural walking gait (i.e., participants walking at a comfortable, self-chosen pace with no other instructions). HTML code was created to randomly generate 3x4 ensemble arrays (e.g., Figure 15). The arrays varied in their gender ratio composition of women to men across five categories: 0:12, 3:9, 6:6, 9:3, and 12:0. For instance, in the 0:12 ratio, all of the PLDs would be men. In the study, five arrays were generated for every ratio, resulting in a total of 25 arrays.

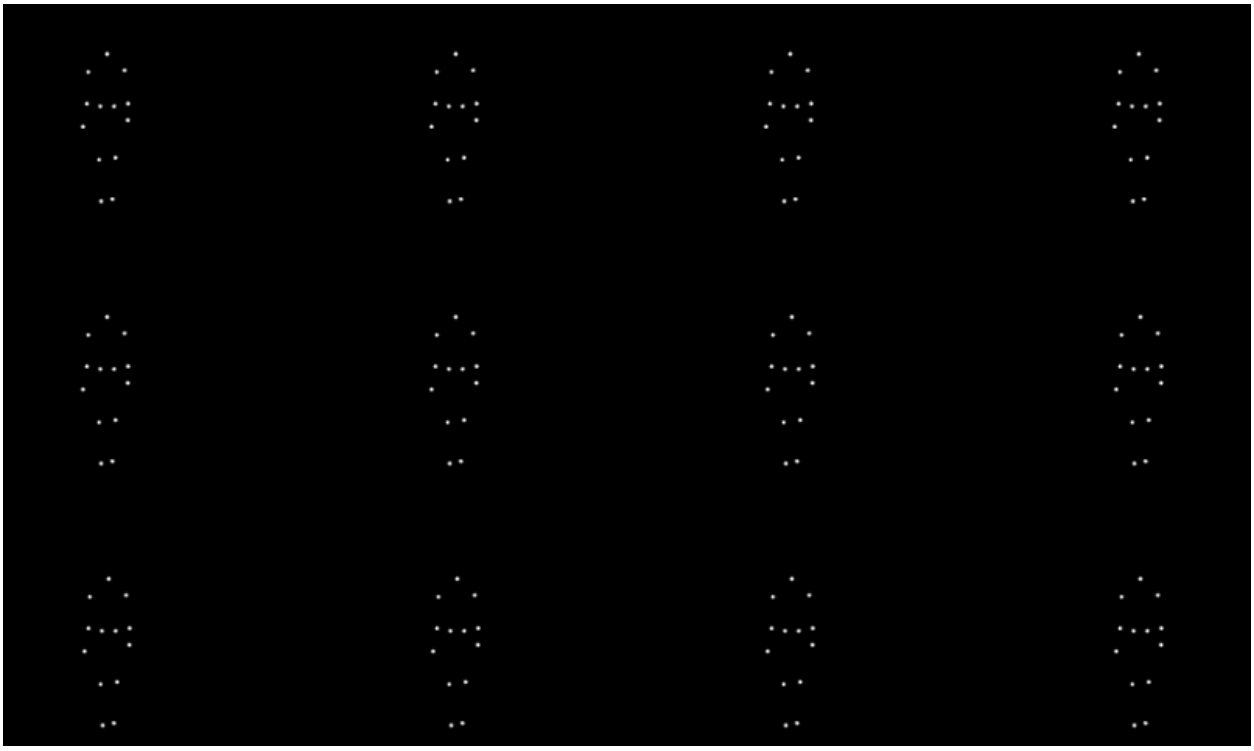


Figure 15. Static image of PLD ensemble

Procedure

Due to the load of resources carried in this experiment, all participants were required to complete the study on a desktop computer. Participation was encouraged only if participants had a computer capable of reliably playing videos. Participants were instructed to watch a video on the screen and respond to subsequent questions. I used a within-subjects design across four blocks in the study. In each block, 25 trials (i.e., five trials by five ratios) were randomly presented for four seconds, followed by the appropriate block measures detailed below.

The first block of questions was held constant so that all participants answered gender related questions first. The following three blocks were randomized for each participant. In the first block, after each PLD ensemble, participants indicated what they perceived the gender ratio of the group. Participants responded using an alphabetic scale with visual representation of each

possible gender ratio (A = 12 women to M = 12 men; see Figure 4). Afterward, participants provided a rating of the ensemble on a femininity and masculinity scale (1- Feminine to 7 – Masculine), as well as a rating of the group's overall gender typicality (1- Not at all typical to 7 – Very typical). Since gender typicality is a less common term, a definition of the term was also provided (i.e., "gender typicality is the extent to which an individual is seen as being a typical member of their gender group, with skills, interests, and behaviors that are similar to those of the same gender"). Importantly, the gender categorization task was always the first question presented to participants, but the order of the masculinity/femininity and gender typicality measures was counterbalanced across participants. This procedure was designed to replicate participants' cognitive processes. To make evaluative judgments related to gender, a perceiver first needs to make a categorical judgment, establishing a reference point (i.e., man or woman) for all subsequent assessments.

In another block, participants rated the PLD ensembles on a six-item ($\alpha = 0.95$) Perceived Power scale (Yu et al., 2019; see Appendix A). This scale is measured on a 7-point Likert scale (1 - Strongly disagree to 7 – Strongly agree). Items include statements such as "They have control over many other people" and "They control a lot of resources." Items in the scale will be presented in a randomized order for each participant.

In a separate block, participants rated the target on a six-item ($\alpha = 0.91$) Perceived Status scale (Yu et al., 2019; see Appendix B). This scale is measured on a 7-point Likert scale (1 - Strongly disagree to 7 – Strongly agree). Items include statements such as "Others often seek their opinion because they respect them" and "They are admired by others because they are seen as competent." Items in the scale will once again be presented in a randomized order for each participant.

In a final block, participants responded to a single-item liking measure, in which they indicated how much they agreed with the statement “I like this group” on a 7-point Likert scale (1 - Strongly disagree to 7 – Strongly agree). At the end of the study, participants completed a demographics questionnaire. Finally, participants rated the overall video quality on a scale from 1 (Poor) to 5 (Excellent) throughout the study.

Results

Given the hierarchical nature of this experiment, the data was analyzed using multi-level modeling for repeated measures data. Level-one units were the individual trial-level observations, while each participant served as the level-two grouping factor.

To justify the use of multilevel modeling, an unconditional (empty) model was estimated for each variable using the lmerTest package with Kenward-Roger degrees of freedom approximation. The results supported the use of multilevel modeling for all variables. The inter-class correlations (ICCs) indicated that between 16.5% and 34.3% of the total variance in each variable was attributable to stable between-participant differences: perceived gender (ICC = .223), typicality (ICC = .326), masculinity (ICC = .165), power (ICC = .343), status (ICC = .336), and liking (ICC = .295). Likelihood ratio tests comparing each multilevel model to a single-level model confirmed that between-cluster variance was significant for all variables ($ps < .001$), providing sufficient justification for multilevel modeling across all analyses.

Perceived gender ratio, masculinity, and typicality were grand-mean centered within clusters (CWC) using the rockchalk package. This procedure yielded a within-person component (*genderResp.cwc*, *mascResp.cwc*, *typResp.cwc*) capturing trial-level deviations from each participant's mean response, and a between-person component (*genderResp.meanj*, *mascResp.meanj*, *typResp.meanj*) representing each participant's mean

across all trials. Manipulated variables (i.e., ensemble gender ratio) were not centered, as the ICC of the manipulated predictor was expected to be approximately zero given the balanced within-participant design.

Prior to the primary analyses, participants' estimates of the number of men in each group were regressed onto the actual number of men present. The results indicated a significant positive association. As the actual number of men increased, so did the perceived number of men ($b = 0.20$, $p < .001$). However, this effect was modest. Given the 0–12 response scale, each additional male in the group was associated with an increase of approximately 0.20 units in estimated number of men, corresponding to an overall increase of about 2.4 units across the full range of group composition. These findings suggest that participants were somewhat sensitive to variation in the gender composition of PLD ensembles, although this sensitivity was relatively weak.

The relationship of power and status was also tested. The within-person correlation was small but significant ($r = .14$, 95% CI [.106, .179], $p < .001$), indicating that, within participants, stimuli rated higher on power also tended to be rated slightly higher on status. In contrast, the between-person correlation was moderate ($r = .43$, 95% CI [.267, .563], $p < .001$), indicating that participants who tended to give higher power ratings also tended to give higher status ratings overall. Consistent with prior validation of the scales, these findings provide additional evidence that the power and status measures assess related but distinct constructs.

Power

The average perceived power rating was 4.15 (SE = 0.08, t(125.57) = 52.35, p < .001). Neither perceived masculinity (b = −0.007, SE = 0.03, t(193.00) = −0.29, p = .776) nor perceived gender (b = 0.014, SE = 0.01, t(213.24) = 1.04, p = .301) was associated with perceived power.

Perceived gender typicality showed a small but significant positive association with power (b = 0.040, SE = 0.02, t(2274.65) = 1.97, p = .048), such that as the group was perceived as being more gender-typical, the ensemble was rated as slightly higher in power. Neither interaction model was significant. The interaction between perceived gender and perceived gender typicality was not significant (b = −0.002, SE = 0.007, t(2555.99) = −0.29, p = .774), as was the interaction between perceived gender and perceived masculinity (b = −0.006, SE = 0.005, t(2538.69) = −1.25, p = .211).

Between-person variability in baseline power ratings was substantial (intercept variance = 0.67), with modest variability in the slopes for perceived gender (variance = 0.003) and perceived masculinity (variance = 0.01), indicating relatively small but non-zero individual differences in these effects across participants. The total model explained 36.9% of the variance in power (R^2fvm = .369), with between-person mean differences accounting for the largest share (R^2m = .344), followed by slope variation (R^2v = .023) and fixed effects accounting for minimal variance (R^2f = .002).

Status

The average perceived status rating was 4.51 (SE = 0.07, t(125.81) = 64.46, p < .001). None of the perceptual judgments (perceived gender, masculinity, or gender typicality) significantly predicted status (all ps > .43), and there was no evidence of moderation by perceived gender (all ps > .77).

Between-person variability in baseline status ratings was substantial (intercept variance = 0.52), with modest variability in the slopes for perceived masculinity (variance = 0.01), perceived gender (variance = 0.003), and perceived gender typicality (variance = 0.003), indicating relatively small but non-zero individual differences in these effects across participants.

The model explained 37.0% of the variance in status ($R^2fvm = .370$), with between-person mean differences accounting for the largest share ($R^2m = .340$), followed by slope variation ($R^2v = .029$) and fixed effects accounting for minimal variance ($R^2f = .001$).

Liking

The average liking rating was 4.63 (SE = 0.07, $t(127.61) = 62.18$, $p < .001$). None of the perceptual judgments (perceived gender, masculinity, or gender typicality) significantly predicted liking and there was no evidence that these associations varied as a function of perceived gender (all *ps* > .27). There was a marginal negative association between perceived gender and liking ($b = -0.024$, SE = 0.01, $t(203.32) = -1.79$, $p = .076$), such that when groups were perceived as having more men, the group tended to receive slightly lower liking ratings.

Between-person variability in baseline liking ratings was substantial (intercept variance = 0.58), with modest variability in the slopes for perceived gender (variance = 0.001), perceived masculinity (variance = 0.01), and perceived gender typicality (variance = 0.02), indicating relatively small but non-zero individual differences in these effects across participants. The model explained 32.8% of the variance in liking ($R^2fvm = .328$), with between-person mean differences accounting for the largest share ($R^2m = .296$), followed by slope variation ($R^2v = .031$) and fixed effects accounting for minimal variance ($R^2f = .001$).

Cluster-robust standard errors were computed for all models to test if violations of model assumptions influenced conclusions. Results indicated that robust standard errors were highly similar to the model-based standard errors across all models, with no meaningful changes in the pattern of statistical significance. The marginally significant effect of perceived gender on liking moved further from significance under the robust specification. These findings suggest that the prior conclusions are not sensitive to violations of independence or homoscedasticity.

Mediation Models

To examine whether the effect of perceived gender on outcomes was mediated by perceived masculinity or perceived gender typicality, four 1–1–1 multilevel mediation models with random slopes were initially estimated using Blimp Studio (Version 3.2.2). The indirect effect (ab) was computed as the product of the mean a and b paths, incorporating their covariance ($ab = \bar{\alpha} \times \bar{\beta} + Cov(\alpha j, \beta j)$), following Bauer et al. (2006). Statistical inference was based on 95% posterior credible intervals derived from 20,000 MCMC iterations (10,000 burn-in). However, preliminary models indicated severe convergence. Effective sample sizes were extremely low for several key parameters (e.g., αj intercept $N\text{eff} \approx 1.61$; residual variance $N\text{eff} \approx 8.32$), indicating poor chain mixing and unstable posterior estimation. In addition, Potential Scale Reduction (PSR) values never reached sufficient levels (< 1.10), suggesting that convergence had not been achieved, even after extending estimation to 60,000 iterations with a 30,000-iteration burn-in.

Given these issues, the analytic strategy was revised. All four mediation models were re-estimated using centered within-cluster (CWC) multilevel linear models fit with *lmer*, with indirect effect significance evaluated using a 1,000-iteration cluster-level bootstrap. This approach retained the theoretically appropriate 1–1–1 mediation structure while avoiding the estimation instability encountered with the MCMC approach.

Results from the revised analyses provided no evidence that perceived masculinity or perceived gender typicality mediated the relationship between the number of male targets and evaluations of power or status (see Figures 16-19). For both the power and status models, groups containing more male targets were perceived as significantly more masculine ($a = 0.11$, 95% CI [0.091, 0.125], $p < .001$). However, perceived masculinity was unrelated to both perceived power

(b = −0.01, 95% CI [−0.050, 0.030], p = .629) and perceived status (b = 0.01, 95% CI [−0.028, 0.047], p = .617). Consequently, neither indirect effect through perceived masculinity was significant (power: ab = 0.00, 95% bootstrap CI [−0.005, 0.003], p = .612; status: ab = 0.00, 95% bootstrap CI [−0.002, 0.00]5, p = .618).

Similarly, the number of male targets was associated with slightly higher ratings of perceived gender typicality (a = 0.02, 95% CI [0.008, 0.032], p = .001), although this effect was considerably smaller than the corresponding effect for perceived masculinity. Perceived gender typicality was not significantly associated with either perceived power (b = 0.03, 95% CI [−0.007, 0.068], p = .115) or perceived status (b = 0.01, 95% CI [−0.029, 0.043], p = .722). Accordingly, neither indirect effect through perceived gender typicality reached significance (power: ab = 0.00, 95% bootstrap CI [−0.00, 0.002], p = .088; status: ab = 0.00, 95% bootstrap CI [−0.00,1 0.001], p = .732). Across all four models, the direct effect of the number of male targets remained significant after accounting for the mediators (power: b = 0.03, 95% CI [0.024, 0.044], p < .001; status: b = 0.02–0.03, 95% CIs excluding zero, ps < .001).

These results demonstrate that perceived masculinity and perceived gender typicality did not explain the relationship between group gender composition and evaluations of power or status. Although group composition reliably influenced perceptions of masculinity and, to a lesser extent, perceived gender typicality, neither of these judgments accounted for the observed relationships with power or status. Because gender typicality was not directly manipulated in the present study, it remains unclear whether stronger or more systematic variation in gender typicality would influence these evaluations. Study 2 addressed this question by directly manipulating gender typicality.

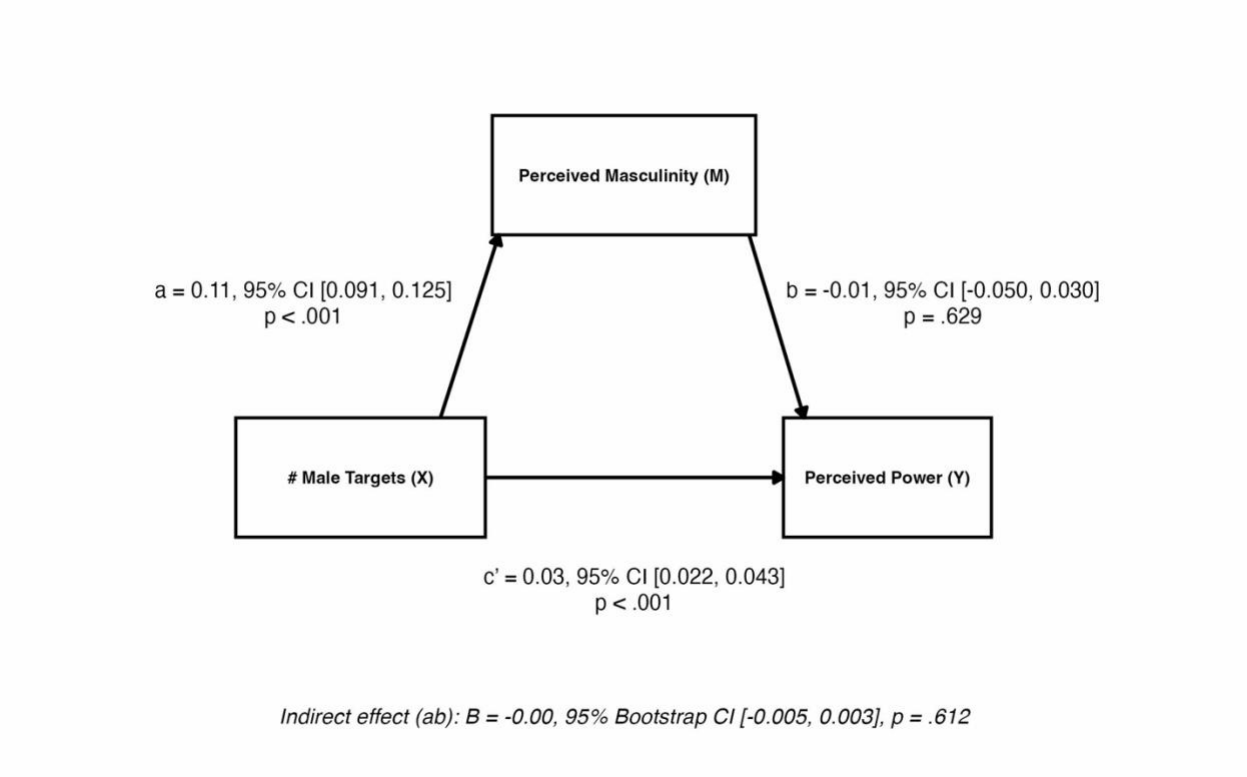


Figure 16. Chapter 4 Study 1 Number of Men in the Group, Masculinity, and Power Mediation Model Results

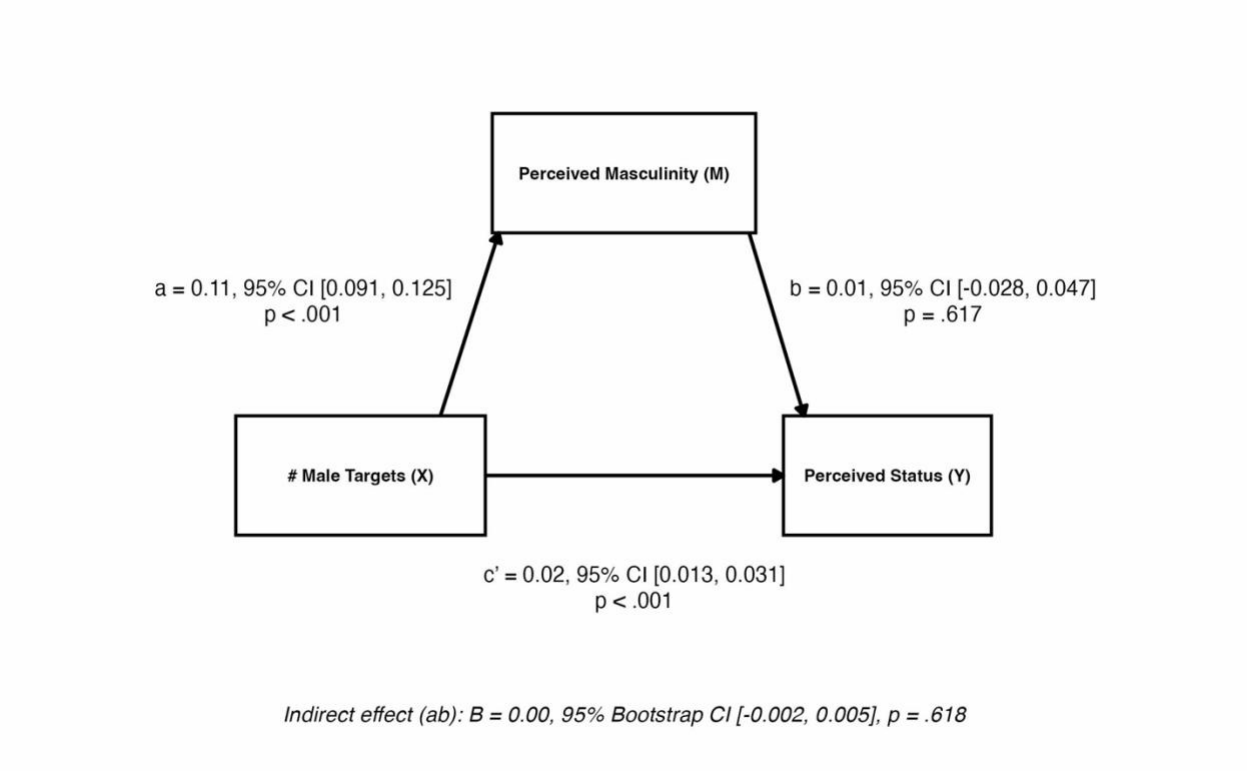


Figure 17. Chapter 4 Study 1 Number of Men in the Group, Masculinity, and Status Mediation Model Results

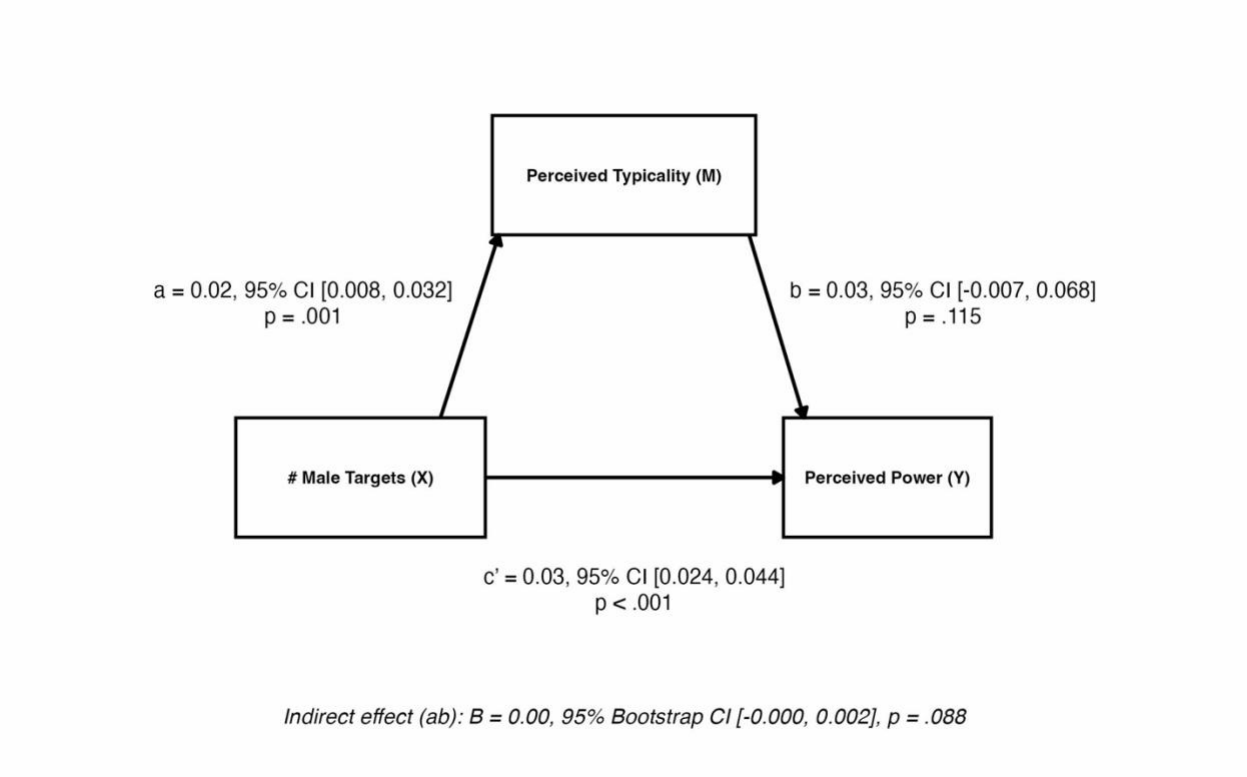


Figure 18. Chapter 4 Study 1 Number of Men in the Group, Typicality, and Power Mediation Model Results

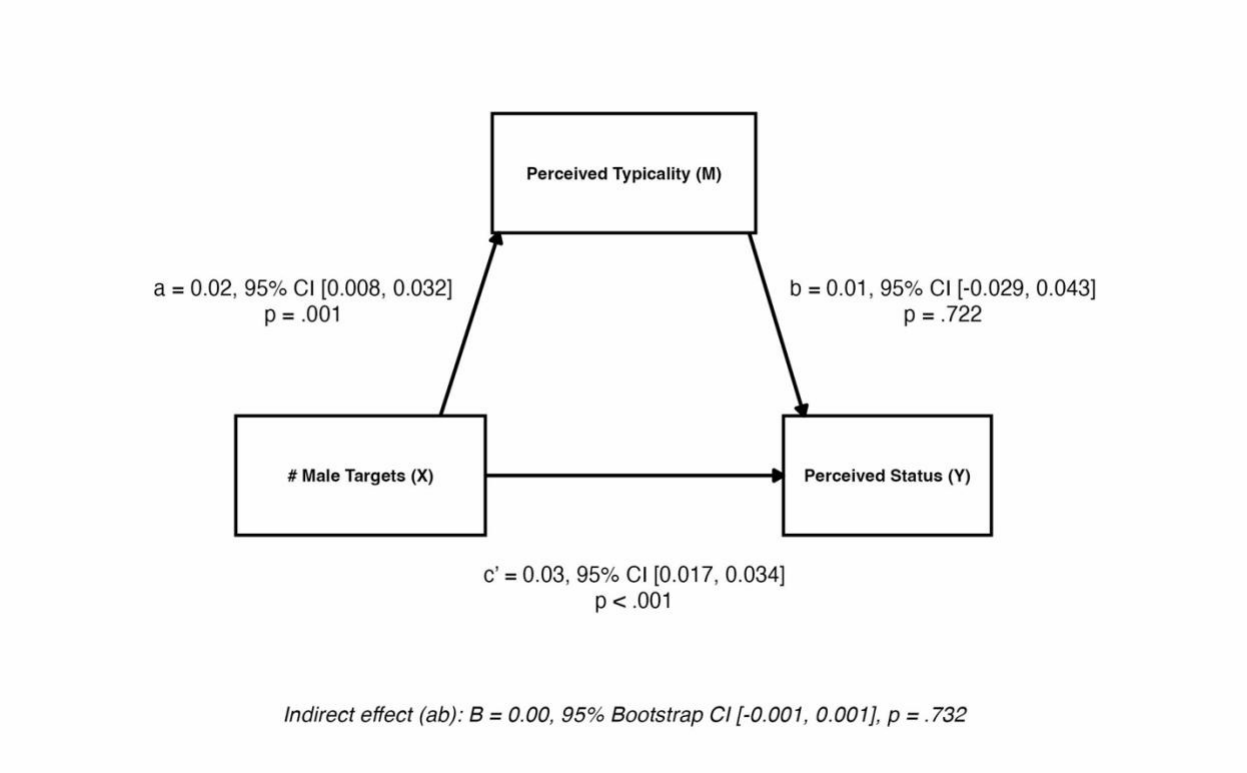


Figure 19. Chapter 4 Study 1 Number of Men in the Group, Typicality, and Status Mediation Model Results

Chapter 4 Study 2

Method

Participants

I recruited 122 participants from Prolific (**www.prolific.co**) who were paid $5.00 for participation in a 30-minute study (Age: *M* = 38.0 years, *SD* = 13.1 years; Sex: 60 female, 62 male; Race: 53.28% White, 19.67% Black, 13.11% Asian, 9.02% Latino/Latin American, 4.92% biracial/other).

Stimuli

A total of 92 PLDs from the UCLA Point Light Display Database were used for Study 2 (Dayley, Johnson, Benitez, in prep). The PLDs were chosen based on the 46 gender split PLDs from Study 1. However, PLDs either depicted the gender-typical (i.e., "walk in a manner that highlights that you are [insert participant gender]") or gender-atypical (i.e., "walk in a manner that someone who only sees your body motion may believe that you are actually [insert other gender]") walking gait of the target. HTML code was created to randomly generate 3x4 ensemble arrays using selected PLDs. The arrays held constant the gender of the group (i.e., either all male PLDs or all female PLDs), but varied in the ratio of gender typicality (typical vs atypical) across five categories: 0:12, 3:9, 6:6, 9:3, and 12:0. For instance, in the 0:12 ratio, all of the PLDs would be gender typical. In the study, five arrays were generated for every ratio, resulting in a total of 25 arrays.

Procedure

Study 2 used the same general procedure as Study 1. However, Study 2 employed a mixed-model design in which participants saw 25 PLDs ensembles of the same gender (i.e., either randomly assigned to a male or female condition). Again, the ratio of the PLDs varied in the gender typicality of the group (atypical: typical; 0:12, 3:9, 6:6, 9:3, and 12:0).

Results

Given the hierarchical nature of this experiment, the data was analyzed using multi-level modeling for repeated measures data. Level-one units were the individual trial-level observations, while each participant served as the level-two grouping factor.

To justify the use of multilevel modeling, an unconditional (empty) model was estimated for each variable using the lmerTest package with Kenward-Roger degrees of freedom

approximation. The results supported the use of multilevel modeling for all variables. The inter-class correlations (ICCs) indicated that between 23.3% and 37.5% of the total variance in each variable was attributable to stable between-participant differences: perceived gender (ICC = .298), typicality (ICC = .375), masculinity (ICC = .233), power (ICC = .370), status (ICC = .340), and liking (ICC = .309). Likelihood ratio tests comparing each multilevel model to a single-level model confirmed that between-cluster variance was significant for all variables (ps < .001), providing sufficient justification for multilevel modeling across all analyses.

Perceived gender ratio, masculinity, and typicality were grand-mean centered within clusters (CWC) using the rockchalk package. This procedure yielded a within-person component (*genderResp.cwc*, *mascResp.cwc*, *typResp.cwc*) capturing trial-level deviations from each participant's mean response, and a between-person component (*genderResp.meanj*, *mascResp.meanj*, *typResp.meanj*) representing each participant's mean across all trials. Manipulated variables (i.e., ensemble gender ratio) were not centered, as the ICC of the manipulated predictor was expected to be approximately zero given the balanced within-participant design.

The relationship of power and status was also tested. The within-person correlation was small but significant (r = .08, 95% CI [.047, .117], p < .001), indicating that, within the same participant, stimuli rated higher on power also tended to be rated slightly higher on status. In contrast, the between-person correlation was strong (r = .74, 95% CI [.645, .810], p < .001), indicating that participants who tended to give higher power ratings also tended to give higher status ratings overall. Consistent with prior validation of the scales, these findings provide additional evidence that the power and status measures assess related but distinct constructs.

A random-slope multilevel model was fit, predicting perceived power, status, and liking from four within-person centered predictors: gender response (genderResp.cwc), masculinity rating (mascResp.cwc), typicality rating (typResp.cwc), and emotion (*emotionResp.cwc*) with uncorrelated random intercepts and slopes across participants estimated via REML with Kenward-Roger degrees of freedom. Likelihood ratio tests confirmed that the model with random slopes specification fit better for the status model. However, the full random-slope specification was not supported for the model predicting power and liking. An inspection of the random effects indicated that the random slope for perceived gender ratio had an estimated variance of zero. This random slope was removed from both models.

Power

The average perceived power rating was 4.12 (SE = 0.08, t(128.51) = 49.96, $p < .001$). Neither perceived masculinity ($b = -0.003$, SE = 0.03, t(273.11) = −0.13, p = .898) nor perceived gender typicality (b = 0.004, SE = 0.02, t(100.68) = 0.17, p = .863) was associated with perceived power. There was a marginal effect of perceived gender (b = 0.023, SE = 0.01, t(2542.69) = 1.95, p = .051), such that targets perceived as more male tended to receive slightly higher power ratings.

There was limited evidence that the association between perceptual judgments and perceived power varied as a function of perceived gender. The interaction between perceived gender and perceived gender typicality approached significance (b = 0.011, SE = 0.006, t(2700.47) = 1.82, p = .068), suggesting that the positive association between gender typicality and perceived power may have been somewhat stronger for targets perceived as men than for those perceived as women. However, the interaction between perceived gender and perceived masculinity was not significant ($b = -0.003$, SE = 0.005, t(2523.64) = −0.62, p = .533).

Between-person variability in baseline power ratings was substantial (intercept variance = 0.76), with modest variability in the slopes for perceived masculinity (variance = 0.02) and perceived gender typicality (variance = 0.01), indicating that the effects of these perceptual judgments varied somewhat across participants. The total model explained 40.0% of the variance in power (R^2fvm = .400), with between-person mean differences accounting for the largest share (R^2m = .369), followed by slope variation (R^2v = .028) and the fixed effects accounting for minimal variance (R^2fl = .003).

Status

The average perceived status rating was 4.36 (SE = 0.08, $t(129.46) = 57.92$, $p < .001$). Neither perceived masculinity ($b = -0.012$, $SE = 0.02$, $t(233.00) = -0.49$, $p = .626$) nor perceived gender ($b = 0.002$, $SE = 0.01$, $t(168.72) = 0.14$, $p = .893$) was associated with perceived status. Perceived gender typicality showed a marginal positive association with status ($b = 0.037$, $SE = 0.02$, $t(96.52) = 1.93$, $p = .057$), such that more gender-typical targets tended to be rated as slightly higher in status.

There was limited evidence that the association between perceptual judgments and perceived status was moderated by perceived gender. The interaction between perceived gender and perceived gender typicality approached significance ($b = 0.011$, $SE = 0.006$, $t(2574.98) = 1.87$, $p = .062$), suggesting that the positive association between gender typicality and perceived status may have been somewhat stronger for targets perceived as men than for those perceived as women. However, the interaction between perceived gender and perceived masculinity was not significant ($b = -0.003$, $SE = 0.005$, $t(2371.41) = -0.60$, $p = .550$).

Between-person variability in baseline status ratings was substantial (intercept variance = 0.62), with modest variability in the slopes for perceived masculinity (variance = 0.02),

perceived gender typicality (variance = 0.01), and perceived gender (variance < 0.01), indicating that the effects of these perceptual judgments varied somewhat across participants. The total model explained 37.4% of the variance in status (R^2fvm = .374), with between-person mean differences accounting for the largest share (R^2m = .340), followed by slope variation (R^2v = .032), and fixed effects accounting for minimal variance (R^2f = .002).

Liking

The average liking rating was 4.50 (SE = 0.08, $t(130.38) = 54.87$, $p < .001$). None of the predictors or interactions significantly predicted liking (all $ps > .23$). Between-person variability in baseline liking ratings was substantial (intercept variance = 0.73), with modest variability in the slopes for perceived masculinity (variance = 0.01) and perceived gender typicality (variance = 0.004), indicating relatively small individual differences in these effects across participants. The total model explained 32.0% of the variance in liking (R^2fvm = .320), with between-person mean differences accounting for the largest share (R^2m = .309), followed by slope variation (R^2v = .010), and fixed effects accounting for negligible variance (R^2f < .001).

Cluster-robust standard errors were computed for all models to test if violations of model assumptions influenced conclusions. Results indicated that robust standard errors were highly similar to the model-based standard errors across all models, with no meaningful changes in the pattern of statistical significance. Of the effects that were marginal under the conventional models, only the interaction between perceived gender and perceived gender typicality in the power model moved further from significance under the robust specification. These findings suggest that the prior conclusions are not sensitive to violations of independence or homoscedasticity.

Mediation Models

To examine whether the effect of perceived gender on outcomes was mediated by perceived masculinity or perceived gender typicality, four 1–1–1 multilevel mediation models with random slopes were initially estimated using Blimp Studio (Version 3.2.2). The indirect effect (ab) was computed as the product of the mean a and b paths, incorporating their covariance ($ab = \bar{\alpha} \times \bar{\beta} + Cov(\alpha j, \beta j)$), following Bauer et al. (2006). Statistical inference was based on 95% posterior credible intervals derived from 20,000 MCMC iterations (10,000 burn-in). However, preliminary models indicated severe convergence problems and difficulty distinguishing the unique effects of the predictor and mediator.

In two of the mediation models, perceived gender (number of perceived male targets) and perceived group masculinity exhibited near-perfect collinearity ($\beta \approx 0.99$, $R^2 \approx .98$), indicating that they captured nearly identical underlying perceptions of the targets despite using different response formats. This overlap produced multicollinearity in the mediation model, making it difficult to distinguish the predictor's contribution from that of the mediator.

These estimation problems were reflected in the MCMC diagnostics. Specifically, effective sample sizes were extremely low for key parameters (e.g., αj intercept $N_{eff} \approx 2.2$; residual variance $N_{eff} \approx 6.1$), indicating poor chain mixing and unstable posterior estimation. In addition, Potential Scale Reduction (PSR) values reached as high as 1.96, suggesting that convergence had not been achieved, even after extending estimation to 60,000 iterations with a 30,000-iteration burn-in.

Additional evidence suggested that perceived gender reflected trial-level perceptual variability rather than the experimental manipulation. The within-person correlation between the manipulated number of male targets and perceived gender was only $r = .12$, indicating that participants' gender judgments varied only weakly with the manipulated stimulus composition.

Given these issues, the analytic strategy was revised. All mediation models were re-estimated using within-person centered (CWC) multilevel linear models with cluster-robust inference for the indirect effects. This approach retains the theoretically appropriate 1–1–1 structure while avoiding instability in MCMC-based estimation. Given these issues, the analytic strategy was revised. All four mediation models were re-estimated using centered within-cluster (CWC) multilevel linear models fit with lmer, with indirect effect significance evaluated using a 1,000-iteration cluster-level bootstrap.

To begin, the relationship between the number of male targets and evaluations of power was partially mediated by perceived masculinity (see Figure 20). The *a*-path indicated that groups with more male targets were perceived as more masculine ($b = 0.04$, 95% CI [0.020, 0.069], $p < .001$). The *b*-path was marginally significant, such that groups perceived as more masculine tended to receive slightly higher power ratings ($b = 0.04$, 95% CI [0.000, 0.077], $p = .051$). The indirect effect of the number of male targets on perceived power through perceived masculinity was small but statistically significant ($ab = 0.00$, 95% bootstrap CI [0.000, 0.004], $p = .036$). The direct effect of the number of male targets on perceived power remained significant ($b = −0.03$, 95% CI [−0.039, −0.020], $p < .001$). Although groups with more male targets tended to be perceived as more masculine, and greater perceived masculinity was associated with slightly higher power ratings, this indirect effect operated in the opposite direction of the overall direct effect. These findings suggest that perceived masculinity accounted for a small portion of the relationship between the number of male targets and perceived power, yet the overall association remained negative.

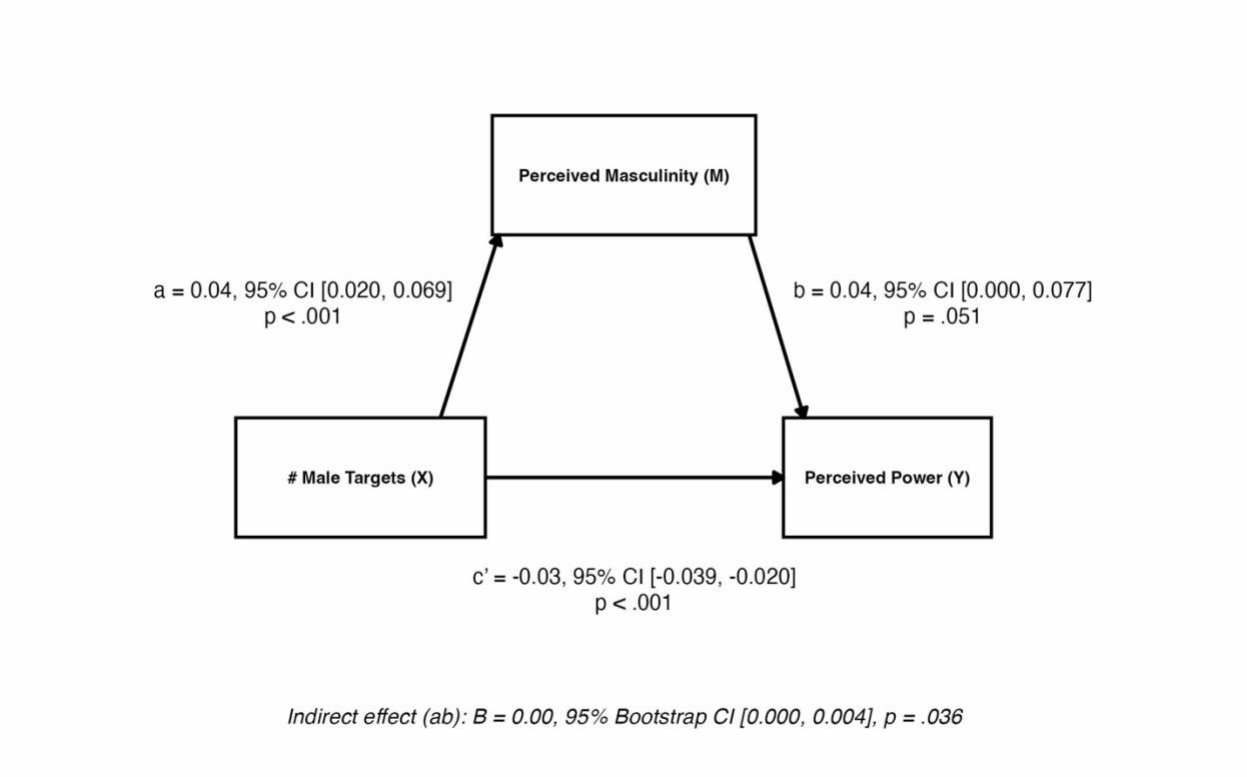


Figure 20. Chapter 4 Study 2 Number of Men in the Group, Masculinity, and Power Mediation Model Results

No evidence of mediation was observed for the remaining models (see Figures 21-23). Although groups with more male targets were perceived as more masculine (b = 0.04, 95% CI [0.020, 0.069], p < .001), perceived masculinity was not associated with perceived status (b = 0.00, 95% CI [−0.032, 0.042], p = .801), resulting in a non-significant indirect effect (ab = 0.00, 95% bootstrap CI [−0.002, 0.002], p = .808).

The number of male targets was unrelated to perceived gender typicality for both power and status (b = 0.00, 95% CI [-0.015, 0.015], p = 1.000), and perceived gender typicality was not associated with either perceived power (b = 0.01, 95% CI [−0.031, 0.049], p = .664) or perceived status (b = 0.03, 95% CI [−0.007, 0.065], p = .125). Consequently, neither indirect effect through perceived gender typicality was statistically significant (power: ab = 0.00, 95% bootstrap CI

[−0.000, 0.000], p = .988; status: ab = 0.00, 95% bootstrap CI [−0.001, 0.000], p = .958). Across all three models, the direct effect of the number of male targets on the outcome remained significant (ps < .001), indicating that neither perceived masculinity nor perceived gender typicality accounted for these relationships.

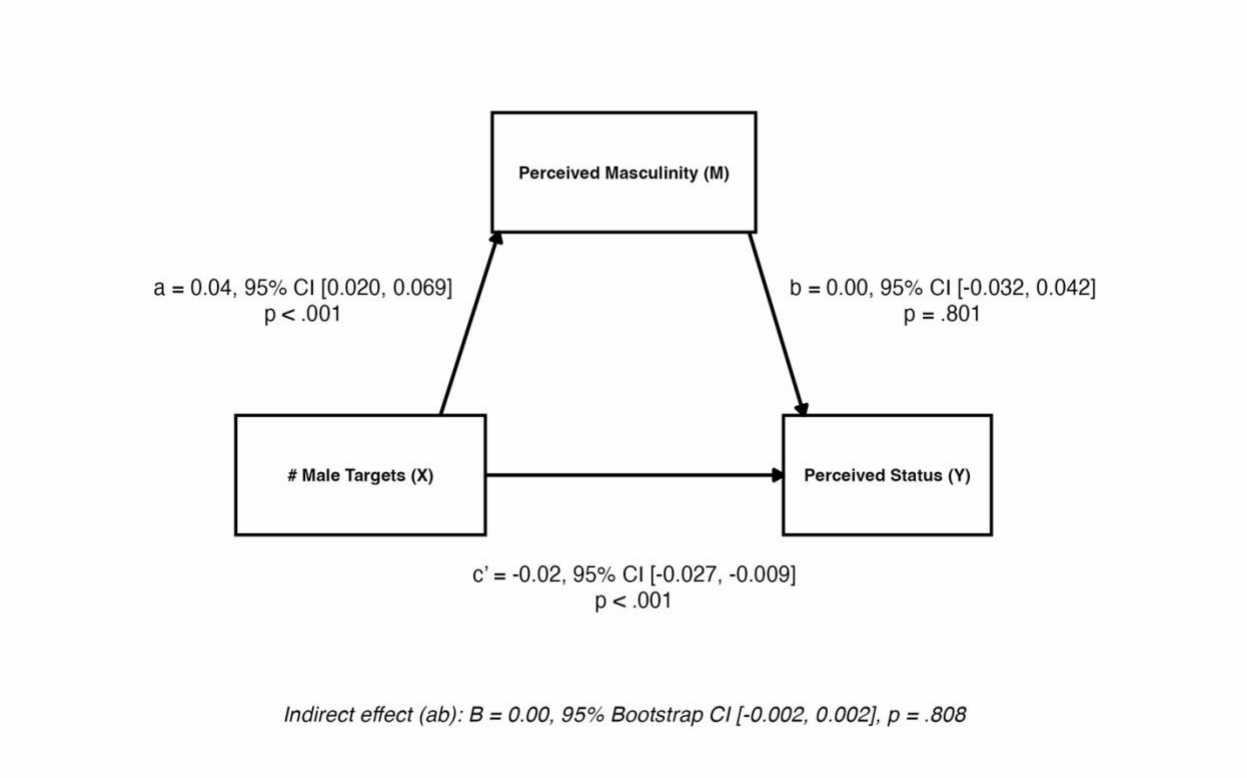


Figure 21. Chapter 4 Study 2 Number of Men in the Group, Masculinity, and Status Mediation Model Results

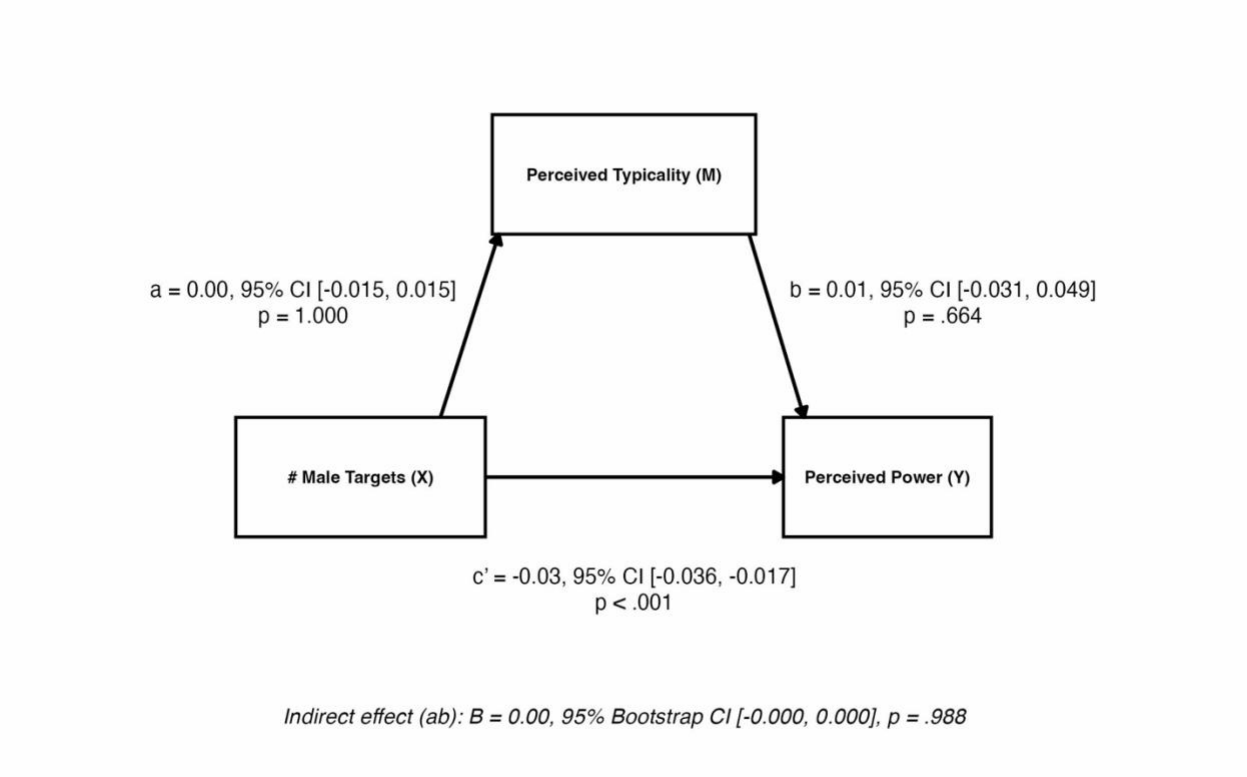


Figure 22. Chapter 4 Study 2 Number of Men in the Group, Typicality, and Power Mediation Model Results

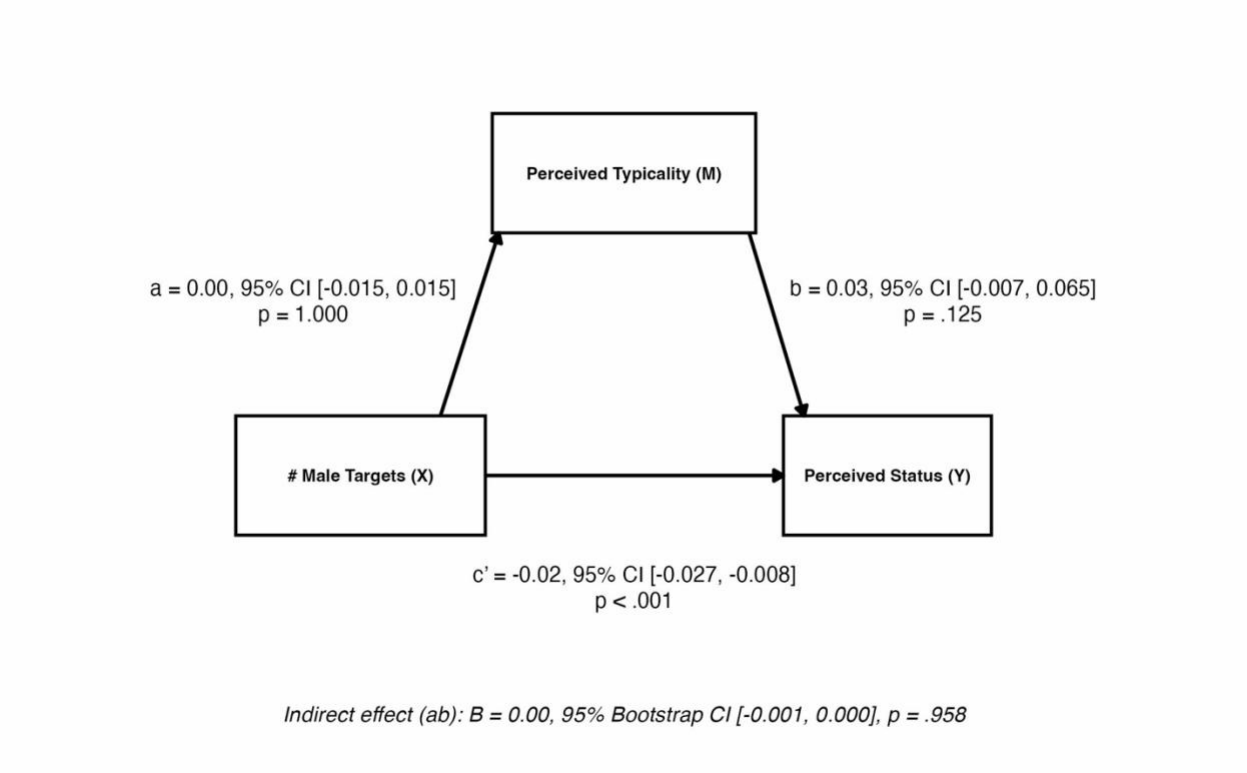


Figure 23. Chapter 4 Study 2 Number of Men in the Group, Typicality, and Status Mediation Model Results

In sum, these findings suggest that although observers extract some information about masculinity from body motion, these perceptual judgments do not appear to explain downstream evaluations of power or status in a consistent way. Study 3 therefore shifts focus to whether dynamic emotional cues in body motion provide a more reliable basis for social evaluations.

Chapter 4 Study 3

Method

Participants

I recruited 98 participants from Prolific (www.prolific.co) who were paid $5.00 for participation in a 30-minute study (Age: *M* = 39.6 years, *SD* = 12.4 years; Sex: 47 female, 50

male, 1 non-binary; Race: 53.1% White, 23.5% Black, 12.2% Latino/Latin American, 7.14% Asian, 4.08% biracial/other).

Stimuli

A total of 120 PLDs from the UCLA Point Light Display Database were used for Study 3 (Dayley, Johnson, Benitez, in prep). More specifically, 20 male and 20 female PLDs, each with an angry, happy, and sad walking gait, were used. The same PLD had to have all three emotional walking gaits to be selected. HTML code was created to randomly generate 3x4 ensemble arrays using selected PLDs. The arrays held constant the gender of the group (i.e., either all male PLDs or all female PLDs), but varied in the ratio of emotional expressions across three categories: 3:9, 6:6, and 9:3. Importantly, each emotion category was paired with each other so we had angry-happy, angry-sad, and happy-sad ensembles. In the study, five arrays were generated for the three ratios across all three emotion pairings, resulting in a total of 45 arrays.

Procedure

Study 3 used the same general procedure as Studies 1 and 2. Study 3 employed a mixed-model design in which participants saw either male or female PLDs ensembles across all three pairings of emotion expressions. As such, participants in this study saw 45 PLDs ensembles of all the same gender, but varying in the type of emotion expressions used in the ratio. All trials were randomized across the four blocks. Additionally, to capture the perceived emotion of the PLDs, a single-item emotion measure (i.e., What percentage of the group appears to be displaying each emotion: Angry, Happy, Sad 0-100% for each emotion with anchors at 0, 25, 50, 75, and 100%) was added to the first block of questions. The order of this question in the block was counterbalanced with the previous measures of perceived masculinity and perceived gender typicality.

Results

As done with Studies 1 and 2, this data was analyzed using multi-level modeling for repeated measures data. Level-one units were the individual trial-level observations, while each participant served as the level-two grouping factor.

To justify the use of multilevel modeling, an unconditional (empty) model was estimated for each variable using the lmerTest package with Kenward-Roger degrees of freedom approximation. The results supported the use of multilevel modeling for all variables. The inter-class correlations (ICCs) indicated that between 32.5% and 50.3% of the total variance in each variable was attributable to stable between-participant differences: perceived gender (ICC = .503), typicality (ICC = .442), masculinity (ICC = .358), power (ICC = .437), status (ICC = .384), and liking (ICC = .325). Likelihood ratio tests comparing each multilevel model to a single-level model confirmed that between-cluster variance was significant for all variables (ps < .001), providing sufficient justification for multilevel modeling across all analyses.

Perceived gender ratio, masculinity, and typicality were grand-mean centered within clusters (CWC) using the rockchalk package. This procedure yielded a within-person component (*genderResp.cwc*, *mascResp.cwc*, *typResp.cwc*) capturing trial-level deviations from each participant's mean response, and a between-person component (*genderResp.meanj*, *mascResp.meanj*, *typResp.meanj*) representing each participant's mean across all trials. Manipulated variables (i.e., ensemble gender ratio) were not centered, as the ICC of the manipulated predictor was expected to be approximately zero given the balanced within-participant design.

The relationship of power and status was also tested. The within-person correlation was small but significant (r = .08, 95% CI [.055, .117], p < .001), indicating that, within the same

participant, stimuli rated higher on power also tended to be rated slightly higher on status. In contrast, the between-person correlation was strong (r = .76, 95% CI [.665, .835], p < .001), indicating that participants who tended to give higher power ratings also tended to give higher status ratings overall. Consistent with prior validation of the scales, these findings provide additional evidence that the power and status measures assess related but distinct constructs.

A random-slope multilevel model was fit, predicting perceived power, status, and liking from four within-person centered predictors: gender response (genderResp.cwc), masculinity rating (mascResp.cwc), typicality rating (typResp.cwc), and emotion (*emotionResp.cwc*) with uncorrelated random intercepts and slopes across participants estimated via REML with Kenward-Roger degrees of freedom. The full random-slope specification was not supported for the models. As such, the random slope for perceived masculinity was removed for the power and liking models, and the random slope for perceived gender ratio of the group was removed for that model predicting status.

Power

The average perceived power rating was 4.09 (SE = 0.10, t(97.10) = 40.82, p < .001). There was a small but significant main effect of perceived emotion, such that groups perceived to have more angry PLDs, compared to happy PLDs, were rated as slightly higher in power (b = 0.002, SE = 0.001, t(4247.22) = 2.09, p = .037). No other main effects, including perceived gender, masculinity, and gender typicality, reached significance when predicting evaluations of power (ps > .09). There was no evidence that emotion moderated the relationship between perceptual judgments and perceived power. All two-way interactions between emotion and perceived gender, masculinity, or gender typicality were non-significant (ps > .19), suggesting

that the effects of these perceptual cues did not reliably differ as a function of emotional expression.

Between-person variability in baseline power ratings was substantial (intercept variance = 0.96), with minimal variability in the slopes for perceived gender (variance = 0.001) and perceived gender typicality (variance = 0.002). The total model explained 44.3% of the variance in power (R^2fvm = .443), with between-person mean differences accounting for the majority of explained variance (R^2m = .437), and minimal contributions from fixed effects (R^2fl = .002) and slope variation (R^2v = .004).

Status

The average perceived status rating was 4.49 (SE = 0.08, $t(97.12) = 53.74$, $p < .001$). There were no reliable main effects of perceived gender (b = 0.001, SE = 0.008, $t(2298.51)$ = 0.17, p = .867), perceived masculinity (b = 0.014, SE = 0.017, $t(140.76) = 0.79$, p = .433), or perceived gender typicality (b = −0.016, SE = 0.016, t(71.33) = −1.02, p = .313) on perceived status. There was one significant main effect of emotional expression, such that groups perceived to have more PLDs displaying sadness, than happiness, were rated as lower in status (b = −0.004, SE = 0.001, $t(4279.22) = -4.93$, $p < .001$). A greater number of perceived angry expressions, compared to happy expressions, was not significantly associated with status (b = −0.001, SE = 0.001, $t(4277.03) = -0.83$, p = .405). There was no evidence that emotion moderated the association between these judgments and perceived status. Similar to the model predicting power, all two-way interactions between emotion and perceived gender, masculinity, or gender typicality were non-significant (ps > .33).

Between-person variability in baseline status ratings was substantial (intercept variance = 0.66), with modest variability in slopes for perceived masculinity (variance = 0.006) and

perceived gender typicality (variance = 0.003). The model explained 39.7% of the variance in status (R^2fvm = .397), with between-person mean differences accounting for the majority of explained variance (R^2m = .385), and relatively small contributions from fixed effects (R^2fl = .005) and slope variation (R^2v = .008).

Liking

The average liking rating was 4.63 (SE = 0.09, t(97.16) = 53.86, $p < .001$). There were no significant main effects of perceived gender (b = −0.006, SE = 0.011, t(132.57) = −0.58, p = .564) or perceived masculinity (b = 0.011, SE = 0.018, t(2366.88) = 0.63, p = .531). However, perceived gender typicality was negatively associated with liking (b = −0.044, SE = 0.019, t(75.19) = −2.26, p = .027), such that targets perceived as more gender typical received slightly lower liking ratings. Emotional expression also influenced liking judgments. Targets displaying greater anger (b = −0.002, SE = 0.001, t(4272.09) = −2.28, p = .023) and greater sadness (b = −0.003, SE = 0.001, t(4255.32) = −2.84, p = .005) were rated slightly less favorably.

There was limited evidence that emotion moderated the relationship between perceptual judgments and liking. The interaction between perceived gender typicality and angry expression was significant (b = 0.003, SE = 0.001, t(4242.18) = 3.45, $p < .001$), suggesting that the negative association between gender typicality and liking was attenuated as angry expression increased. The interaction between perceived gender typicality and sadness approached significance (b = 0.001, SE = 0.001, t(3857.99) = 1.65, p = .098), whereas all remaining interactions between emotion and perceived gender or perceived masculinity were not significant ($ps > .24$).

Between-person variability in baseline liking ratings was substantial (intercept variance = 0.69), with modest variability in the slopes for perceived gender (variance = 0.002) and perceived gender typicality (variance = 0.007). The model explained 33.9% of the variance in

liking (R^2fvm = .339), with between-person mean differences accounting for the largest share of explained variance (R^2m = .325), followed by small contributions from slope variation (R^2v = .008) and the fixed effects (R^2fl = .005)

Cluster-robust standard errors were computed for all models to test if violations of model assumptions influenced conclusions. Overall, robust standard errors were very similar to the model-based standard errors, and the substantive pattern of findings remained largely unchanged. Across the power and status models, the conclusions regarding perceived gender, masculinity, gender typicality, and all interaction terms were unaffected. However, several emotion effects became more conservative under the robust specification. In the power model, the positive effect of angry emotion shifted from statistically significant to not significant (p = .101), whereas in the liking model, the negative effects of angry and sad emotion both became marginal rather than statistically significant (ps = .071 and .053, respectively). Importantly, the significant interaction between perceived gender typicality and angry emotion in the liking model remained significant under the robust specification (p = .008). Taken together, these results indicate that the primary conclusions are robust to potential violations of homoscedasticity and within-cluster dependence, although the evidence for some small main effects of emotional expression is somewhat weaker when using cluster-robust inference.

Mediation Models

To examine whether the effect of perceived gender on outcomes was mediated by perceived masculinity or perceived gender typicality, four 1–1–1 multilevel mediation models with random slopes were initially estimated using Blimp Studio (Version 3.2.2). The indirect effect (ab) was computed as the product of the mean a and b paths, incorporating their covariance ($ab = \bar{\alpha} \times \bar{\beta} + Cov(\alpha j, \beta j)$), following Bauer et al. (2006). Statistical inference was

based on 95% posterior credible intervals derived from 20,000 MCMC iterations (10,000 burn-in). However, like Studies 1 and 3, preliminary models indicated severe convergence. As such, the analytic strategy was revised. All four mediation models were re-estimated using centered within-cluster (CWC) multilevel linear models fit with *lmer*, with indirect effect significance evaluated using a 1,000-iteration cluster-level bootstrap. This approach retained the theoretically appropriate 1–1–1 mediation structure while avoiding the estimation instability encountered with the MCMC approach.

Across the four mediation models, none of the direct effects were significant (see Figures 24-27). However, the number of male targets significantly predicted perceived masculinity, b = 0.32, 95% CI [0.275, 0.362], $p < .001$. Perceived masculinity was not associated with either perceived power, b = -0.02, 95% CI [-0.050, 0.014], p = .280, or perceived status, b = 0.01, 95% CI [-0.024, 0.041], p = .612, after controlling for perceived gender. Consequently, perceived masculinity did not significantly mediate the relationship between perceived gender and either power, ab = -0.01, 95% CI [-0.017, 0.003], p = .210, or status, ab = 0.00, 95% CI [-0.007, 0.012], p = .594.

The number of male targets also significantly predicted perceived typicality, b = 0.04, 95% CI [0.006, 0.078], p = .025. However, perceived typicality was not associated with either perceived power, b = 0.00, 95% CI [-0.032, 0.032], p = .997, or perceived status, b = -0.01, 95% CI [-0.038, 0.022], p = .603, after controlling for perceived gender. Accordingly, perceived typicality did not significantly mediate the relationship between perceived gender and either power, ab = 0.00, 95% CI [-0.002, 0.002], p = .944, or status, ab = -0.00, 95% CI [-0.002, 0.001], p = .606.

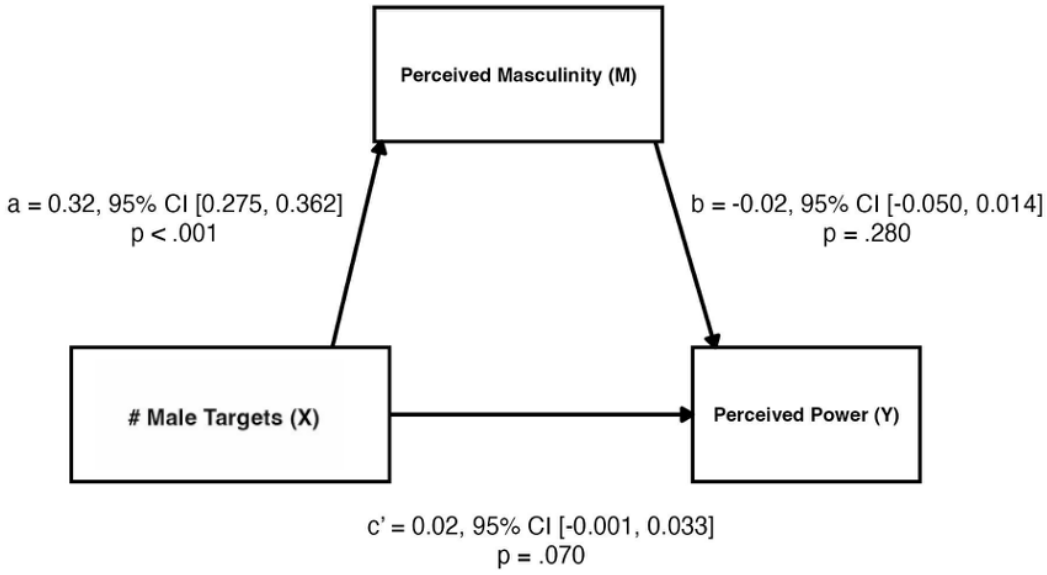


Figure 24. Chapter 4 Study 3 Number of Men in the Group, Masculinity, and Power Mediation Model Results

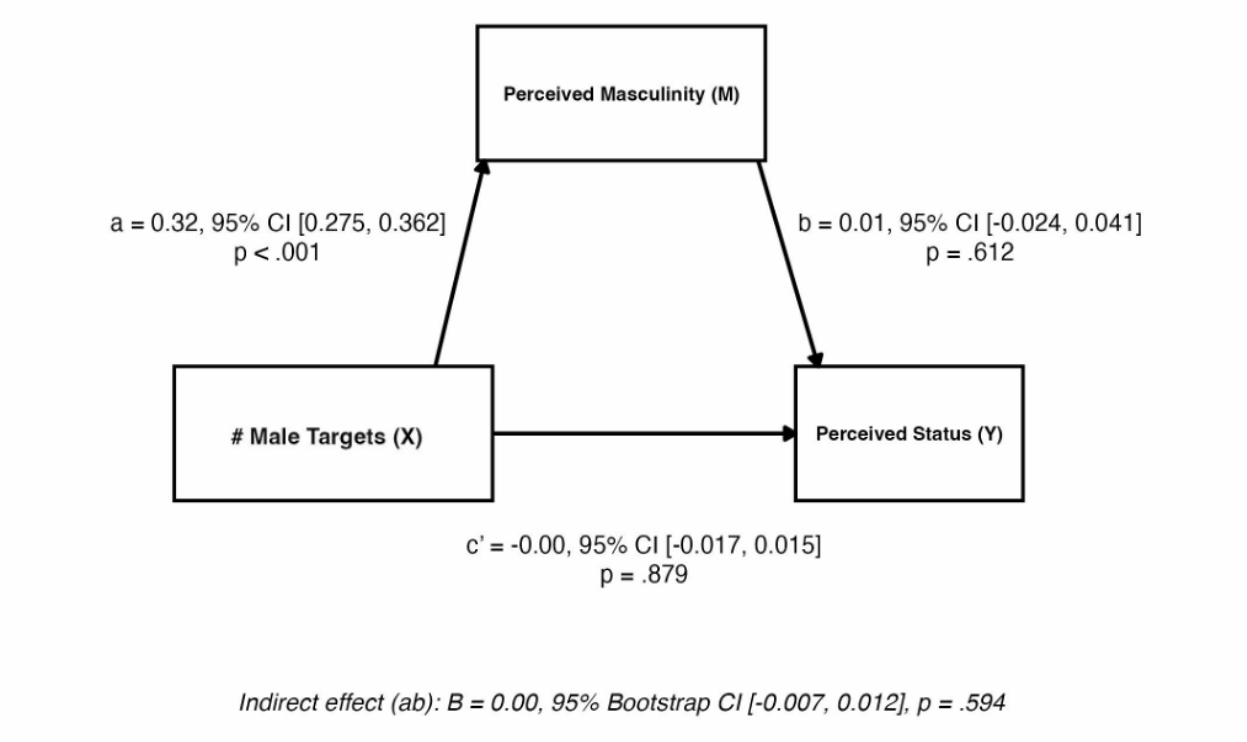


Figure 25. Chapter 4 Study 3 Number of Men in the Group, Masculinity, and Status Mediation Model Results

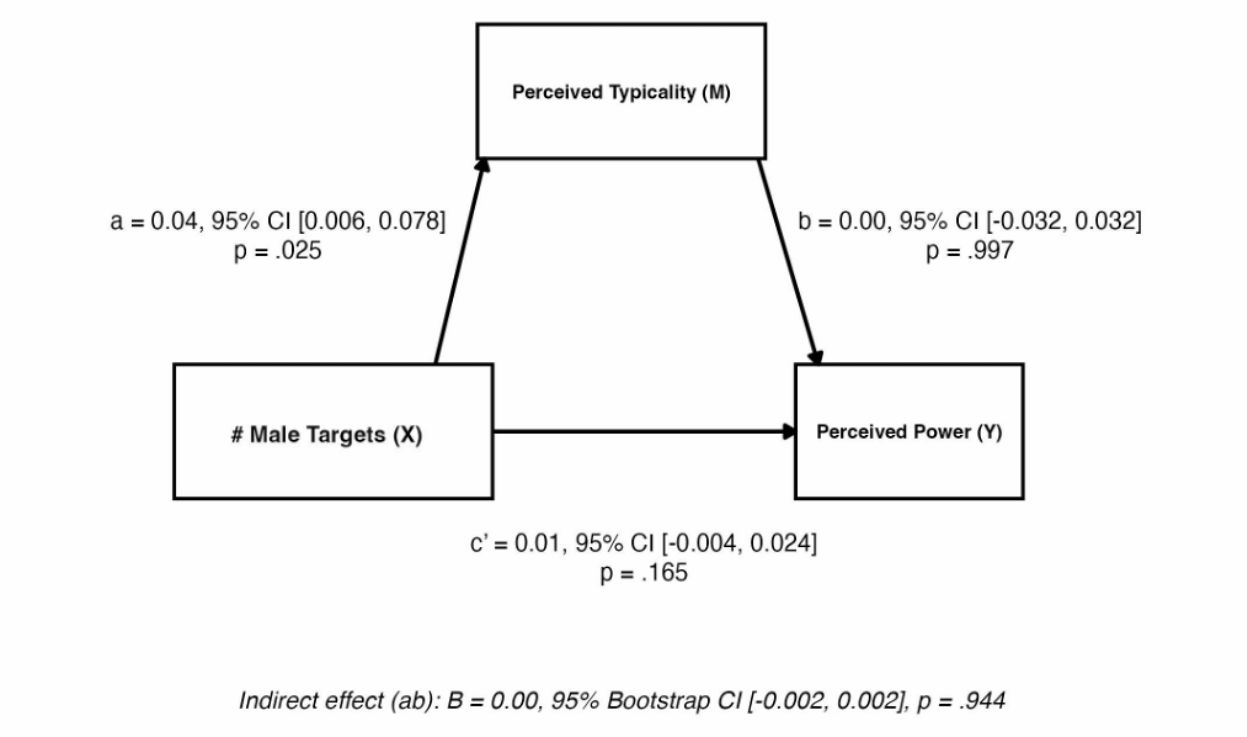


Figure 26. Chapter 4 Study 3 Number of Men in the Group, Typicality, and Power Mediation Model Results

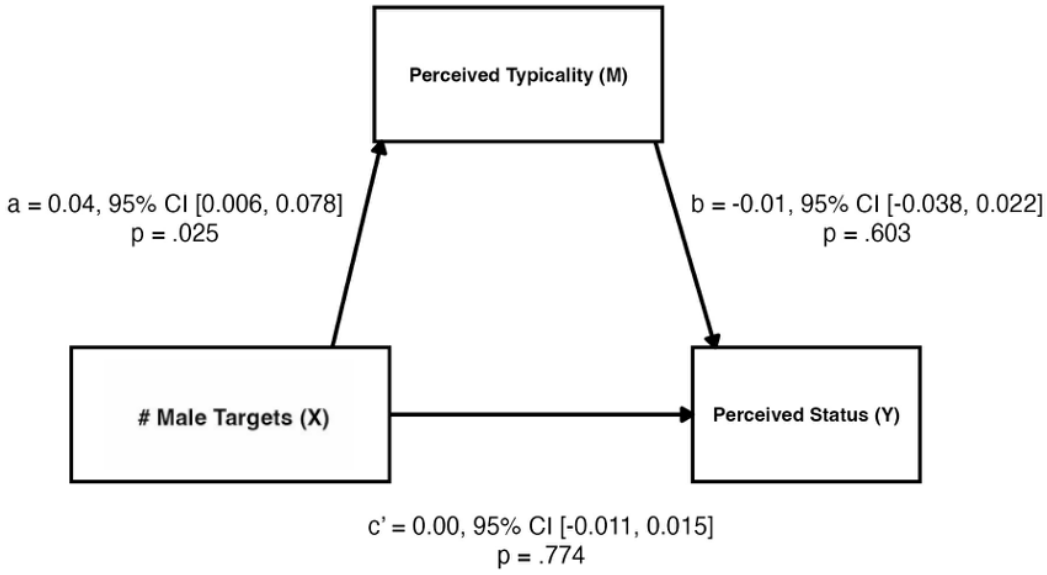


Figure 27. Chapter 4 Study 3 Number of Men in the Group, Typicality, and Status Mediation Model Results

General Discussion

Across four multilevel mediation models, this chapter examined whether gender-related evaluations explained the relationship between perceived gender and judgments of power and status. Specifically, the analyses tested whether perceived masculinity and perceived gender typicality mediated the association between perceived gender and evaluations of power and status. Although perceived gender significantly predicted both perceived masculinity and perceived gender typicality, neither construct significantly predicted evaluations of power or status after controlling for perceived gender. Consequently, none of the indirect effects were statistically significant.

These findings did not support the hypothesis that perceived masculinity would mediate the relationship between perceived gender and evaluations of power or that perceived gender typicality would mediate the relationship between perceived gender and evaluations of status. Instead, the results suggest that although observers readily use body motion to infer gender-related characteristics, these inferences do not appear to explain subsequent evaluations of social hierarchy in these studies.

The absence of significant indirect effects also highlights the complexity of movement-based social perception. While body motion clearly provides sufficient information for observers to make judgments about gender expression, these evaluations alone were insufficient to account for perceptions of power and status. It is possible that other characteristics conveyed through movement, such as confidence, dominance, physical capability, or movement dynamics, contribute more directly to these social evaluations. Future research should examine additional mechanisms that may explain how body motion shapes impressions of power and status and determine whether these processes vary across contexts or target characteristics.

Overall, these findings suggest that gender-related evaluations derived from body motion are not the primary mechanism linking perceived gender to evaluations of power and status. Although the proposed mediation model was not supported, the results help refine our understanding of movement-based social perception by identifying theoretical pathways that are less likely to account for these judgments.

Conclusion

This dissertation sought to examine whether body motion contributes to social perception independently of other sources of social information. Across six studies, participants formed impressions of power, status, and liking from point-light displays depicting only biological motion. Although the findings provided limited evidence that perceptual judgments of gender, masculinity, and gender typicality consistently shaped these evaluations, they demonstrate that observers extract meaningful social information from highly impoverished motion displays. Together, these findings suggest that the contribution of body motion to social judgments may be more nuanced than initially anticipated and warrants further investigation.

These findings also underscore the challenges of studying body motion. For perceivers, point-light displays represent an unfamiliar and scarce source of social information. Although previous work has shown that observers can rapidly extract information from individual point-light displays, judging groups of moving individuals may require additional viewing time or richer motion cues than were available in the present studies. For researchers, body motion has received comparatively little attention in social cognition, due in part to the limited availability of standardized, well-characterized stimulus sets. Unlike face research, where shared databases have accelerated methodological and theoretical development, the study of body motion has lacked comparable resources. Together, these perceptual and methodological challenges have constrained both the questions that can be asked and the conclusions that can be drawn about the role of body motion in social perception.

A central contribution of this dissertation is therefore methodological. In addition to the empirical findings reported here, this work introduces and validates a database of point-light displays that will be made publicly available to researchers. By providing a standardized set of

stimuli accompanied by normative ratings, the database lowers a practical barrier to studying body motion and creates opportunities for more systematic investigation of how dynamic movement contributes to person and people perception. As researchers adopt and extend this resource, it will become possible to test new theoretical questions using larger stimulus sets, diverse participant samples, and paradigms that were previously difficult to implement.

Scientific progress often begins with the development of new methods and shared resources. Although the present studies provide only modest evidence for the role of body motion in shaping judgments of power and status, they establish a foundation upon which future work can build. Whether future research ultimately reveals body motion to be a primary social cue or one that operates primarily in concert with faces, voices, and context, those questions can now be addressed with greater methodological precision. It is hoped that the resources developed through this dissertation will contribute to that next stage of research and support continued advances in understanding the role of body motion in social perception.

REFERENCES

Abbate, J. (2012). *Recoding gender: Women's changing participation in computing*. Mit Press.

Abernethy, B., Zawi, K., & Jackson, R. C. (2008). Expertise and attunement to kinematic constraints. *Perception*, *37*(6), 931-948.

Adams, R. B., & Kveraga, K. (2015). Social vision: Functional forecasting and the integration of compound social cues. *Review of Philosophy and Psychology*, *6*, 591-610.

Adams, R. B., Ambady, N., Macrae, C. N., & Kleck, R. E. (2006). Emotional expressions forecast approach-avoidance behavior. *Motivation and emotion*, *30*, 177-186.

Adams, R. B., Jr., Ambady, N., Nakayama, K., & Shimojo, S. (Eds.). (2010). The science of social vision. New York: Oxford University Press.

Ahmed, F., Bari, A. H., & Gavrilova, M. L. (2019). Emotion recognition from body movement. *IEEE Access*, *8*, 11761-11781.

Alicke, M. D., Smith, R. H., & Klotz, M. L. (1986). Judgments of physical attractiveness: The role of faces and bodies. *Personality and Social Psychology Bulletin*, *12*(4), 381-389.

Almeida, D. J., Byrne, A. M., Smith, R. M., & Ruiz, S. (2021). How relevant is grit? The importance of social capital in first-generation college students' academic success. *Journal of College Student Retention: Research, Theory & Practice*, *23*(3), 539-559.

Alt, N. P., & Phillips, L. T. (2022). Person perception, meet people perception: Exploring the social vision of groups. *Perspectives on Psychological Science*, *17*(3), 768-787.

Alt, N. P., Goodale, B., Lick, D. J., & Johnson, K. L. (2019). Threat in the company of men: Ensemble perception and threat evaluations of groups varying in sex ratio. *Social Psychological and Personality Science, 10*(2), 152-159.

Alt, N. P., Wong Chavez, J., Dickter, C. L., & Shih, M. J. (2024). Power and the confrontation of sexism: the impact of measured and manipulated power on confronting behavior. *The Journal of Social Psychology*, *164*(1), 27-42.

Alvarez, G. A. (2011). Representing multiple objects as an ensemble enhances visual cognition. *Trends in cognitive sciences, 15*(3), 122-131.

Alzahabi, R., & Cain, M. S. (2021). Ensemble perception during multiple-object tracking. *Attention, Perception, & Psychophysics*, *83*, 1263-1274.

Ambady, N., & Rosenthal, R. (1992). Thin slices of expressive behavior as predictors of interpersonal consequences: A meta-analysis. *Psychological bulletin*, *111*(2), 256.

Ambady, N., & Rosenthal, R. (1998). Nonverbal communication. *Encyclopedia of mental health*, *2*, 775-782.

Ambady, N., Hallahan, M., & Conner, B. (1999). Accuracy of judgments of sexual orientation from thin slices of behavior. *Journal of personality and social psychology*, *77*(3), 538.

Anderson, C., & Brion, S. (2014). Perspectives on power in organizations. *Annu. Rev. Organ. Psychol. Organ. Behav.*, *1*(1), 67-97.

Ashton-James, C. E., Tybur, J. M., Grießer, V., & Costa, D. (2019). Stereotypes about surgeon warmth and competence: the role of surgeon gender. *PLoS One*, *14*(2), e0211890.

Atkinson, A. P., Dittrich, W. H., Gemmell, A. J., & Young, A. W. (2004). Emotion perception from dynamic and static body expressions in point-light and full-light displays. *Perception, 33*(6), 717-746.

Aviezer, H., Trope, Y., & Todorov, A. (2012a). Body cues, not facial expressions, discriminate between intense positive and negative emotions. *Science, 338*(6111), 1225-1229.

Aviezer, H., Trope, Y., & Todorov, A. (2012b). Holistic person processing: faces with bodies tell the whole story. *Journal of personality and social psychology*, *103*(1), 20.

Bachorowski, J. A. (1999). Vocal expression and perception of emotion. *Current directions in psychological science*, *8*(2), 53-57.

Bailenson, J. N., Beall, A. C., Loomis, J., Blascovich, J., & Turk, M. (2004). Transformed social interaction: Decoupling representation from behavior and form in collaborative virtual environments. *Presence: Teleoperators & Virtual Environments*, *13*(4), 428-441.

Bailey, A. H., LaFrance, M., & Dovidio, J. F. (2019). Is man the measure of all things? A social cognitive account of androcentrism. *Personality and social psychology review*, *23*(4), 307-331.

Bainbridge, W. A., Isola, P., & Oliva, A. (2013). The intrinsic memorability of face photographs. *Journal of Experimental Psychology: General*, *142*(4), 1323.

Balcetis, E. G., & Lassiter, D. (Eds.). (2010). Social psychology of visual perception. New York: Psychology Press.

Bannerman, R. L., Milders, M., De Gelder, B., & Sahraie, A. (2009). Orienting to threat: faster localization of fearful facial expressions and body postures revealed by saccadic eye movements. *Proceedings of the Royal Society B: Biological Sciences*, *276*(1662), 1635-1641.

Barclay, C. D., Cutting, J. E., & Kozlowski, L. T. (1978). Temporal and spatial factors in gait perception that influence gender recognition. *Perception & psychophysics*, *23*, 145-152.

Bardi, L., Di Giorgio, E., Lunghi, M., Troje, N. F., & Simion, F. (2015). Walking direction triggers visuo-spatial orienting in 6-month-old infants and adults: An eye tracking study. *Cognition*, *141*, 112-120.

Bardi, L., Regolin, L., & Simion, F. (2011). Biological motion preference in humans at birth: Role of dynamic and configural properties. *Developmental science*, *14*(2), 353-359.

Barrett, H. C., Todd, P. M., Miller, G. F., & Blythe, P. W. (2005). Accurate judgments of intention from motion cues alone: A cross-cultural study. *Evolution and Human Behavior*, *26*(4), 313-331.

Bauer, D. J., Preacher, K. J., & Gil, K. M. (2006). Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: new procedures and recommendations. *Psychological methods*, *11*(2), 142.

Baumeister, R. F., & Leary, M. R. (2017). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Interpersonal development,* 57-89.

Becker, D. V. (2017). Facial gender interferes with decisions about facial expressions of anger and happiness. *Journal of Experimental Psychology: General*, *146*(4), 457.

Becker, D. V., Kenrick, D. T., Neuberg, S. L., Blackwell, K. C., & Smith, D. M. (2007). The confounded nature of angry men and happy women. *Journal of personality and social psychology*, *92*(2), 179.

Bem, S. L. (1974). The measurement of psychological androgyny. *Journal of consulting and clinical psychology*, *42*(2), 155.

Bem, S. L. (1993). *The lenses of gender: Transforming the debate on sexual inequality*. Yale University Press.

Bernotat, J., Eyssel, F., & Sachse, J. (2021). The (fe) male robot: how robot body shape impacts first impressions and trust towards robots. *International Journal of Social Robotics, 13*, 477-489.

Bertamini, M., Byrne, C., & Bennett, K. M. (2013). Attractiveness is influenced by the relationship between postures of the viewer and the viewed person. *i-Perception*, *4*(3), 170-179.

Bertenthal, B. I., & Pinto, J. (1994). Global processing of biological motions. *Psychological science*, *5*(4), 221-225.

Bigler, R. S. (1999). Psychological interventions designed to counter sexism in children: Empirical limitations and theoretical foundations.

Billino, J., Braun, D. I., Böhm, K. D., Bremmer, F., & Gegenfurtner, K. R. (2009). Cortical networks for motion processing: effects of focal brain lesions on perception of different motion types. *Neuropsychologia, 47*(10), 2133-2144.

Bjornsdottir, R. T., Tskhay, K. O., Ishii, K., & Rule, N. O. (2017). Cultural differences in perceiving and processing emotions: a holistic approach to person perception. *Culture and Brain*, *5*, 105-124.

Blader, S. L., & Chen, Y. R. (2012). Differentiating the effects of status and power: a justice perspective. *Journal of personality and social psychology*, *102*(5), 994.

Blader, S. L., & Chen, Y. R. (2014). What's in a name? Status, power, and other forms of social hierarchy. *The psychology of social status*, 71-95.

Blader, S. L., Shirako, A., & Chen, Y. R. (2016). Looking out from the top: Differential effects of status and power on perspective taking. *Personality and Social Psychology Bulletin*, *42*(6), 723-737.

Blake, R. (1993). Cats perceive biological motion. *Psychological Science*, *4*(1), 54-57.

Blake, R., & Shiffrar, M. (2007). Perception of human motion. *Annu. Rev. Psychol.*, *58*, 47-73.

Bligh, M. C., Schlehofer, M. M., Casad, B. J., & Gaffney, A. M. (2012). Competent enough, but would you vote for her? Gender stereotypes and media influences on perceptions of women politicians. *Journal of Applied Social Psychology*, *42*(3), 560-597.

Boldry, J., Wood, W., & Kashy, D. A. (2001). Gender stereotypes and the evaluation of men and women in military training. *Journal of social issues*, *57*(4), 689-705.

Bonemei, R., Costantino, A. I., Battistel, I., & Rivolta, D. (2018). The perception of (naked only) bodies and faceless heads relies on holistic processing: Evidence from the inversion effect. *British Journal of Psychology*, *109*(2), 232-243.

Borkenau, P., & Liebler, A. (1995). Observable attributes a manifestations and cues of personality and intelligence. *Journal of Personality, 63*, 1–25.

Bouquet, C. A., Gaurier, V., Shipley, T., Toussaint, L., & Blandin, Y. (2007). Influence of the perception of biological or non-biological motion on movement execution. *Journal of Sports Sciences*, *25*(5), 519-530.

Bracha, H. S. (2004). Freeze, flight, fight, fright, faint: Adaptationist perspectives on the acute stress response spectrum. *CNS spectrums*, *9*(9), 679-685.

Brody, L. R. (1997). Gender and emotion: Beyond stereotypes. *Journal of Social issues*, *53*(2), 369-393.

Brown, G. W., & Harris, T. (2012). Social origins of depression: A study of psychiatric disorder in women. Routledge.

Bruce, V., & Young, A. (1986). Understanding face recognition. *British journal of psychology*, *77*(3), 305-327.

Bruce, V., & Young, A. W. (2012). Face perception. Psychology Press.

Burt, R. (1992). Structural Holes: The Social Structure of Competition. *Cambridge, Harvard University Press*, *10*, 20.

Byers, J., Hebets, E., & Podos, J. (2010). Female mate choice based upon male motor performance. *Animal Behaviour*, *79*(4), 771-778.

Campbell, D. T. (1958). Common fate, similarity, and other indices of the status of aggregates of persons as social entities. *Behavioral science*, *3*(1), 14.

Cañal-Bruland, R., van der Kamp, J., & van Kesteren, J. (2010). An examination of motor and perceptual contributions to the recognition of deception from others' actions. *Human movement science*, *29*(1), 94-102.

Cao, L., Dikmen, M., Fu, Y., & Huang, T. S. (2008). Gender recognition from body. In *Proceedings of the 16th ACM international conference on Multimedia* (pp. 725-728).

Cappelle, T., & Fink, B. (2013). Changes in women's attractiveness perception of masculine men's dances across the ovulatory cycle: preliminary Data. *Evolutionary Psychology*, *11*(5), 147470491301100503.

Carlton, S., Harrison, A., Honoré, S., & Goodmon, L. B. (2020). Conceal, don't feel: Gender differences in implicit and explicit expressions of emotions. *Modern Psychological Studies*, *25*(1), 10.

Cernas-Ortiz, D. A., & Wai-Kwan, L. (2021). Social connectedness and job satisfaction in Mexican teleworkers during the pandemic: the mediating role of affective well-being. *Estudios Gerenciales*, *37*(158), 37-48.

Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: The perception–behavior link and social interaction. *Journal of Personality and Social Psychology, 76*(6), 893–910. https://doi.org/10.1037/0022-3514.76.6.893

Chen, J. M., Norman, J. B., & Nam, Y. (2021). Broadening the stimulus set: Introducing the American multiracial faces database. *Behavior Research Methods*, *53*, 371-389.

Chouchourelou, A., Matsuka, T., Harber, K., & Shiffrar, M. (2006). The visual analysis of emotional actions. *Social Neuroscience, 1*(1), 63-74.

Chwe, A. H., & Freeman, J. B. (2023). Trustworthiness of crowds is gleaned in half a second. *Social Psychological and Personality Science, 15* (3), 351-359.

Clarke, T. J., Bradshaw, M. F., Field, D. T., Hampson, S. E., & Rose, D. (2005). The perception of emotion from body movement in point-light displays of interpersonal dialogue. *Perception*, *34*(10), 1171-1180.

Cleary, A. (2012). Suicidal action, emotional expression, and the performance of masculinities. *Social science & medicine*, *74*(4), 498-505.

Coetzee, V., Chen, J., Perrett, D.I., Stephen, I.D., 2010. Deciphering faces: quantifiable visual cues to weight. *Perception 39* (1), 51–61. https://doi.org/10.1068/p6560.

Cohen, Philip N., and Matt L. Huffman. 2003. "Individuals Jobs and Labor Markets: The Devaluation of Women's Work." *American Sociological Review 68*(3):443-63

Connell, R. W. (1995) Masculinities (Cambridge, Polity Press).

Connor, P., Varney, J., Keltner, D., & Chen, S. (2020). Social class competence stereotypes are amplified by socially-signalled economic inequality. *Personality and Social Psychology Bulletin, 47*(1): 89-105. https://doi.org/10.1177/0146167220916640

Connor, P., Weeks, M., Glaser, J., Chen, S., & Keltner, D. (2022). Intersectional implicit bias: Evidence for asymmetrically compounding bias and the predominance of target gender.

Journal of personality and social psychology, 10.1037/pspa0000314. Advance online publication. https://doi.org/10.1037/pspa0000314

Cook, R. E., Nielson, M. G., Martin, C. L., & DeLay, D. (2019). Early adolescent gender development: The differential effects of felt pressure from parents, peers, and the self. *Journal of Youth and Adolescence*, *48*(10), 1912-1923.

Cornwall, A., & Lindisfarne, N. (2016). Dislocating masculinity: gender, power and anthropology. In *Dislocating masculinity* (pp. 27-61). Routledge.

Cotter, D. A., Hermsen, J. M., Ovadia, S., & Vanneman, R. (2001). The glass ceiling effect. *Social forces*, *80*(2), 655-681.

Crandall, C. S., D'Anello, S., Sakalli, N., Lazarus, E., Nejtardt, G. W., & Feather, N. T. (2001). An attribution-value model of prejudice: Anti-fat attitudes in six nations. *Personality and Social Psychology Bulletin*, *27*(1), 30-37.

Cuddy, A. J., Fiske, S. T., & Glick, P. (2008). Warmth and competence as universal dimensions of social perception: The stereotype content model and the BIAS map. *Advances in experimental social psychology*, *40*, 61-149.

Cutting J. E., Proffitt, D. R., & Kozlowski, L. T. (1978). A biomechanical invariant for gait perception. *Journal of Experimental Psychology: Human Perception and Performance, 4,* 357 – 372.

Cutting, J. E. (1978a). Generation of synthetic male and female walkers through manipulation of a biomechanical invariant. *Perception, 7*, 393-405.

Cutting, J. E. (1978b). A program to generate synthetic walkers as dynamic point-light displays. *Behavior Research Methods & Instrumentation, 10*, 91-94.

Cutting, J. E., & Kozlowski, L. T. (1977). Recognizing friends by their walk: Gait perception without familiarity cues. *Bulletin of the Psychonomic Society, 9*, 353-356.

Dael, N., Mortillaro, M., & Scherer, K. R. (2012). Emotion expression in body action and posture. *Emotion*, *12*(5), 1085.

Darwin, C. (1888). *The descent of man: and selection in relation to sex*.

Davila, A., Schouten, B., & Verfaillie, K. (2014). Perceiving the direction of articulatory motion in point-light actions. *PLoS One, 9*(12), e115117.

Davis, M. H., & Kraus, L. A. (1997). Personality and empathic accuracy.

Day, J. C., & McDonald, S. (2010). Not so fast, my friend: Social capital and the race disparity in promotions among college football coaches. *Sociological Spectrum*, *30*(2), 138-158.

Dayley, P. N., Johnson, K. L., Benitez, J., (in prep). UCLA Point-Light Display Database: A Stimulus Set of Point-Light Display Walking and Waving Motions.

de Gelder, B. (2006). Towards the neurobiology of emotional body language. *Nature Reviews. Neuroscience, 7*(3), 242–249. https://doi.org/10.1038/nrn1872

de Gelder, B. & Van den Stock, J. (2011). The Bodily Expressive Action Stimulus Test (BEAST). Construction and validation of a stimulus basis for measuring perception of whole body expression of emotions. *Frontiers in Psychology* 2:181. doi:10.3389/fpsyg.2011.0018

De Visser, R. O., & McDonnell, E. J. (2013). “Man points”: Masculine capital and young men's health. *Health psychology*, *32*(1), 5.

DeBruine, L., Jones, B. (2017). Face Research Lab London Set. figshare. Dataset. https://doi.org/10.6084/m9.figshare.5047666.v5

Decety, J., & Grèzes, J. (1999). Neural mechanisms subserving the perception of human actions. *Trends in cognitive sciences, 3*(5), 172-178.

Dekeyser, M., Verfaillie, K., & Vanrie, J. (2002). Creating stimuli for the study of biological-motion perception. *Behavior Research Methods, Instruments, & Computers, 34*(3), 375-382.

DePaulo, B. M., & Rosenthal, R. (1979). Telling lies. *Journal of personality and social psychology*, *37*(10), 1713.

DePaulo, B. M., Stone, J. I., & Lassiter, G. D. (1985). Telling ingratiating lies: Effects of target sex and target attractiveness on verbal and nonverbal deceptive success. *Journal of Personality and Social Psychology*, *48*(5), 1191.

Deska, J., Hugenberg, K., & Johnson, K. L. (in prep). Awaiting title.

DeYoung, C. G. (2015). Openness/intellect: A dimension of personality reflecting cognitive exploration.

DeYoung, C. G., Quilty, L. C., Peterson, J. B., & Gray, J. R. (2014). Openness to experience, intellect, and cognitive ability. *Journal of personality assessment*, *96*(1), 46-52.

Dittes, J. E. (1959). Attractiveness of group as function of self-esteem and acceptance by group. *The Journal of Abnormal and Social Psychology*, *59*(1), 77.

Dittrich, W. H. (1993). Action categories and the perception of biological motion. *Perception*, *22*(1), 15-22.

Dittrich, W. H., Troscianko, T., Lea, S. E., & Morgan, D. (1996). Perception of emotion from dynamic point-light displays represented in dance. *Perception, 25*(6), 727-738.

Doyle, J. F. (2009). A woman's walk: Attractiveness in motion. *Journal of Social, E volutionary, and Cultural Psychology*, *3*(2), 81.

Dubois, D., Rucker, D. D., & Galinsky, A. D. (2015). Social class, power, and selfishness: when and why upper and lower class individuals behave unethically. *Journal of personality and social psychology*, *108*(3), 436.

Dunbar, R. I. (2003). The social brain: mind, language, and society in evolutionary perspective. *Annual review of Anthropology*, *32*(1), 163-181.

Eagly, A. H., & Carli, L. L. (2018). Women and the labyrinth of leadership. In *Contemporary issues in leadership* (pp. 147-162). Routledge.

Eagly, A. H., & Koenig, A. M. (2007). Gender prejudice: On the risks of occupying incongruent roles. *Beyond common sense: Psychological science in the courtroom*, 63-81.

Eagly, A. H., & Steffen, V. J. (1984). Gender stereotypes stem from the distribution of men and women into social roles. *Journal of Personality and Social Psychology, 46*, 735–754.

Egan, S. K., & Perry, D. G. (2001). Gender identity: a multidimensional analysis with implications for psychosocial adjustment. *Developmental psychology*, *37*(4), 451.

Eisenberger, N. I., & Cole, S. W. (2012). Social neuroscience and health: neurophysiological mechanisms linking social ties with physical health. *Nature neuroscience*, *15*(5), 669-674.

Ekman, P. (1999). Facial expressions. *Handbook of cognition and emotion*, *16*(301), e320.

Elias, E., Dyer, M., & Sweeny, T. D. (2017). Ensemble perception of dynamic emotional groups. *Psychological science*, *28*(2), 193-203.

Ellemers, N. (2018). Gender stereotypes. *Annual review of psychology*, *69*(1), 275-298.

England, P. (1992). *Comparable worth: Theories and evidence*. Routledge.

Ensmenger, N. (2015). "Beards, sandals, and other signs of rugged individualism": masculine culture within the computing professions. *Osiris*, *30*(1), 38-65.

Fagenson, E. A. (1990). Perceived masculine and feminine attributes examined as a function of individuals' sex and level in the organizational power hierarchy: A test of four theoretical perspectives. *Journal of applied psychology*, *75*(2), 204.

Fagot, B. I. (1977). Consequences of moderate cross-gender behavior in preschool children. *Child Development, 48*, 902–907.

Fagot, B. I. (1985). Beyond the reinforcement principle: Another step toward understanding sex role development. *Developmental Psychology, 21*, 1097–1104.

Farah, M. J., Tanaka, J. W., & Drain, H. M. (1995). What causes the face inversion effect?. *Journal of Experimental Psychology: Human perception and performance*, *21*(3), 628.

Farah, M. J., Wilson, K. D., Drain, M., & Tanaka, J. N. (1998). What is" special" about face perception?. *Psychological review*, *105*(3), 482.

Feldman, R. S., Jenkins, L., & Popoola, O. (1979). Detection of deception in adults and children via facial expressions. *Child development*, 350-355.

Fink, B., Hugill, N., & Lange, B. P. (2012). Women's body movements are a potential cue to ovulation. *Personality and Individual Differences, 53*(6), 759-763.

Fink, B., Weege, B., Neave, N., Pham, M. N., & Shackelford, T. K. (2015). Integrating body movement into attractiveness research. *Frontiers in Psychology, 6,* 220.

Fischbach, A., Lichtenthaler, P. W., & Horstmann, N. (2015). Leadership and gender stereotyping of emotions. *Journal of Personnel Psychology*.

Fiske, S. T. (2018). Stereotype content: Warmth and competence endure. *Current directions in psychological science*, *27*(2), 67-73.

Fiske, S. T., & Bai, X. (2020). Vertical and horizontal inequality are status and power differences: Applications to stereotyping by competence and warmth. *Current Opinion in Psychology*, *33*, 216-221.

Fiske, S. T., & Berdahl, J. (2007). Social power. *Social psychology: Handbook of basic principles*, *2*, 678-692.

Fiske, S. T., & Taylor, S. E. (1991). Social cognition (2nd ed.). McGraw-Hill.

Fiske, S. T., Cuddy, A. J., & Glick, P. (2007). Universal dimensions of social cognition: Warmth and competence. *Trends in cognitive sciences*, *11*(2), 77-83.

Flap, H., & Völker, B. (2001). Goal specific social capital and job satisfaction: Effects of different types of networks on instrumental and social aspects of work. *Social networks*, *23*(4), 297-320.

Foels, R., & Pappas, C. J. (2004). Learning and unlearning the myths we are taught: Gender and social dominance orientation. *Sex roles*, *50*, 743-757.

Fox, R., & McDaniel, C. (1982). The perception of biological motion by human infants. *Science*, *218*(4571), 486-487.

Fragale, A. R., Overbeck, J. R., & Neale, M. A. (2011). Resources versus respect: Social judgments based on targets' power and status positions. *Journal of Experimental Social Psychology*, *47*(4), 767-775.

Freeman, J. B., & Johnson, K. L. (2016). More than meets the eye: Split-second social perception. *Trends in Cognitive Science, 20,* 362 – 374.

Funder, D. C. (Ed.). (1999). *Personality judgment: A realistic approach to person perception*. Elsevier.

Gaetano, J., van der Zwan, R., Blair, D., & Brooks, A. (2014). Hands as sex cues: Sensitivity measures, male bias measures, and implications for sex perception mechanisms. *PLoS One*, *9*(3), e91032.

Galinsky, A. D., Magee, J. C., Gruenfeld, D. H., Whitson, J. A., & Liljenquist, K. A. (2008). Power reduces the press of the situation: implications for creativity, conformity, and dissonance. *Journal of personality and social psychology*, *95*(6), 1450.

Galusca, C. I., Quinn, P. C., Heron-Delaney, M., & Pascalis, O. (2022). Infant sensitivity to age-based social categories in full-body displays. *Infant Behavior and Development*, *68*, 101726.

Garber-Barron, M., & Si, M. (2012, June). Using body movement and posture for emotion detection in non-acted scenarios. In *2012 IEEE International Conference on Fuzzy Systems* (pp. 1-8). IEEE.

Gedro, J. (2010). The lavender ceiling atop the global closet: Human resource development and lesbian expatriates. *Human Resource Development Review*, *9*(4), 385-404.

Gervais, S. J., Vescio, T. K., Förster, J., Maass, A., & Suitner, C. (2012). Seeing women as objects: The sexual body part recognition bias. *European Journal of Social Psychology*, *42*(6), 743-753.

Giese, M. A., & Poggio, T. (2003). Neural mechanisms for the recognition of biological movements. *Nature Reviews Neuroscience, 4*(3), 179-192.

Glick, P., Wilk, K., & Perreault, M. (1995). Images of occupations: Components of gender and status in occupational stereotypes. *Sex roles*, *32*, 565-582.

Goffman, E. (2023). The presentation of self in everyday life. In *Social theory re-wired* (pp. 450-459). Routledge.

Goldenberg, A., Sweeny, T. D., Shpigel, E., & Gross, J. J. (2020). Is this my group or not? The role of ensemble coding of emotional expressions in group categorization. *Journal of Experimental Psychology: General*, *149*(3), 445.

Goodale, B. M., Alt, N. P., Lick, D. J., & Johnson, K. L. (2018). Groups at a glance: Perceivers infer social belonging in a group based on perceptual summaries of sex ratio. *Journal of Experimental Psychology: General*, *147*(11), 1660.

Gordon, A. R., & Meyer, I. H. (2007). Gender nonconformity as a target of prejudice, discrimination, and violence against LGB individuals. *Journal of LGBT health research*, *3*(3), 55-71.

Gosling, S. D., Rentfrow, P. J., & Swann Jr, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in personality*, *37*(6), 504-528.

Green, L., Rimes, K. A., & Rahman, Q. (2018). Beliefs about others' perceptions—gender typicality: Scale development and relationships to gender nonconformity, sexual orientation, and well-being. *The Journal of Sex Research*, *55*(7), 837-849.

Grèzes, J., Frith, C., & Passingham, R. E. (2004). Brain mechanisms for inferring deceit in the actions of others. *Journal of Neuroscience*, *24*(24), 5500-5505.

Guinote, A. (2007). Power and goal pursuit. *Personality and Social Psychology Bulletin*, *33*(8), 1076-1087.

Gunns, R. E., Johnston, L., & Hudson, S. M. (2002). Victim selection and kinematics: A point-light investigation of vulnerability to attack. *Journal of Nonverbal Behavior, 26,* 129 – 158.

Haas, B. W., Brook, M., Remillard, L., Ishak, A., Anderson, I. W., & Filkowski, M. M. (2015). I know how you feel: the warm-altruistic personality profile and the empathic brain. *PloS one*, *10*(3), e0120639.

Haberman, J., & Whitney, D. (2012). Ensemble perception: Summarizing the scene and broadening the limits of visual processing. *From perception to consciousness: Searching with Anne Treisman, 33*.

Haines, E. L., Deaux, K., & Lofaro, N. (2016). The times they are a-changing… or are they not? A comparison of gender stereotypes, 1983–2014. *Psychology of Women Quarterly*, *40*(3), 353-363.

Hall, J. A., Gunnery, S. D., Letzring, T. D., Carney, D. R., & Colvin, C. R. (2017). Accuracy of judging affect and accuracy of judging personality: How and when are they related?. *Journal of Personality*, *85*(5), 583-592.

Hamilton, D. L., & Hewstone, M. (2007). Conceptualising group perception: A 35-year evolution. In *The Scope of Social Psychology* (pp. 99-118). Psychology Press.

Hamilton, D. L., Sherman, S. J., & Castelli, L. (2002). A group by any other name—The role of entitativity in group perception. *European review of social psychology, 1*2(1), 139-166.

Hamilton, W. D. (1964). The genetical evolution of social behaviour. II. Journal of theoretical biology, 7(1), 17-52.

Hansson, L. S., Lasselin, J., Tognetti, A., Axelsson, J., Olsson, M. J., Sundelin, T., & Lekander, M. (2023). The walking sick: Perception of experimental sickness from biological motion. *Brain, behavior, and immunity*, *113*, 319-327.

Harris, A., Vyas, D., & Reed, C. L. (2016). Holistic processing of body postures and parts. *Psychological Bulletin and Review, 23,* 1513 – 1519.

Harris, M. A., & Orth, U. (2020). The link between self-esteem and social relationships: A meta-analysis of longitudinal studies. *Journal of personality and social psychology*, *119*(6), 1459.

Haslam, W. B., & Pedersen, D. M. (1966). Points of view in the perception of facial expressions of emotion. *Perceptual and Motor Skills*, *22*(2), 645-646.

Hays, J., Wong, C., & Soto, F. A. (2020). FaReT: A free and open-source toolkit of three-dimensional models and software to study face perception. *Behavior research methods*, *52*, 2604-2622.

Hays, N. A., & Bendersky, C. (2015). Not all inequality is created equal: Effects of status versus power hierarchies on competition for upward mobility. *Journal of personality and social psychology*, *108*(6), 867.

Heilman, M. E. (2012). Gender stereotypes and workplace bias. *Research in organizational Behavior*, *32*, 113-135.

Helbing, D., Farkas, I., & Vicsek, T. (2000). Simulating dynamical features of escape panic. *Nature, 407*(6803), 487-490. doi: 10.1038/35035023

Helmholtz, H. (1878). The facts of perception.

Hess, U., Adams, R. B., Jr., Grammar, K., & Kleck, R. E. (2009). Face gender and emotion expression: are angry women more like men? *Journal of Vision, 9,* 1 – 8.

Hess, U., Senécal, S., Kirouac, G., Herrera, P., Philippot, P., & Kleck, R. E. (2000). Emotional expressivity in men and women: Stereotypes and self-perceptions. *Cognition & Emotion*, *14*(5), 609-642.

Hiris, E., Conway, S., McLoughlin, W., & Yang, G. (2022). Individual Observer Differences in the Use of Form and Motion to Perceive the Actor's Sex in Biological Motion Displays. *Perceptual and motor skills, 129*(1), 5-32.

Hock, A., White, H., Jubran, R., & Bhatt, R. S. (2016). The whole picture: Holistic body posture recognition in infancy. *Psychonomic Bulletin & Review*, *23*, 426-431.

Hoffman, C., & Hurst, N. (1990). Gender stereotypes: Perception or rationalization?. *Journal of personality and social psychology*, *58*(2), 197.4. *Psychology of Women Quarterly*, *40*(3), 353-363.

Holzleitner, I.J., Hunter, D.W., Tiddeman, B.P., Seck, A., Re, D.E., Perrett, D.I., 2014. Men's facial masculinity: when (body) size matters. *Perception 43* (11), 1191–1202. https://doi.org/10.1068/p7673.

Hopkins, A. (2004). Price Waterhouse v. Hopkins: A personal account of a sexual discrimination plaintiff. *Hofstra Lab. & Emp. LJ*, *22*, 357.

Hu, Y., Parde, C. J., Hill, M. Q., Mahmood, N., & O'Toole, A. J. (2018). First impressions of personality traits from body shapes. *Psychological Science*, *29*(12), 1969-1983.

Huang, G. B., Mattar, M., Berg, T., & Learned-Miller, E. (2008). Labeled faces in the wild: A database forstudying face recognition in unconstrained environments. In *Workshop on faces in'Real-Life'Images: detection, alignment, and recognition*.

Hugenberg, K., & Wilson, J. P. (2013). Faces are central to social cognition. *The Oxford handbook of social cognition*, 167-193.

Hurlbert, J. S. (1991). Social networks, social circles, and job satisfaction. *Work and occupations*, *18*(4), 415-430.

Hutson-Comeaux, S. L., & Kelly, J. R. (2002). Gender stereotypes of emotional reactions: How we judge an emotion as valid. *Sex Roles*, *47*, 1-10.

Ikeda, H., & Watanabe, K. (2009). Anger and happiness are linked differently to the explicit detection of biological motion. *Perception*, *38*(7), 1002-1011.

Jack, R. E., & Schyns, P. G. (2015). The human face as a dynamic tool for social communication. *Current Biology*, *25*(14), R621-R634.

Johansson, G. (1973). Visual perception of biological motion and a model for its analysis. *Perception and Psychophysics, 14,* 201 – 211.

Johansson, G. (1975). Visual motion perception. *Scientific American*, *232*(6), 76-89.

Johansson, G. (1977). Studies on visual perception of locomotion. *Perception, 6*, 365–376.

Johnson, D. J., & Wilson, J. P. (2019). Racial bias in perceptions of size and strength: The impact of stereotypes and group differences. *Psychological science*, *30*(4), 553-562.

Johnson, K. L., & Adams Jr, R. B. (2013). Social vision: An introduction. *Social Cognition*, *31*(6), 633-635.

Johnson, K. L., & Tassinary, L. G. (2005). Perceiving sex directly and indirectly: Meaning in motion and morphology. *Psychological Science, 6,* 890 – 897.

Johnson, K. L., & Tassinary, L. G. (2007). Compatibility of basic social perceptions determines perceived attractiveness. *Proceedings of the National Academy of Sciences - PNAS, 104*(12), 5246–5251. https://doi.org/10.1073/pnas.0608181104

Johnson, K. L., Gill, S., Reichman, V., & Tassinary, L. G. (2007). Swagger, sway, and sexuality: Judging sexual orientation from body motion and morphology. *Journal of Personality and Social Psychology, 93*(3), 321–334. https://doi.org/10.1037/0022-3514.93.3.321

Johnson, K. L., Iida, M., & Tassinary, L. G. (2012). Person (mis)perception: functionally biased sex categorization of bodies. *Proceedings of the Royal Society, Biological Sciences, 279,* 4982 – 4989.

Johnson, K. L., McKay, L. S., & Pollick, F. E. (2011). He throws like a girl (but only when he's sad): Emotion affects sex-decoding of biological motion displays. *Cognition, 119,* 265 – 280.

Johnson, K., Gill, S., Reichman, V., & Tassinary, L. G. (2007). Swagger, Sway, and Sexuality: Judging Sexual Orientation From Body Motion and Morphology. *Journal of Personality and Social Psychology, 93*(3), 321–334. https://doi.org/10.1037/0022-3514.93.3.321

Jokisch, D., & Troje, N. F. (2003). Biological motion as a cue for the perception of size. *Journal of Vision*, *3*(4), 1-1.

Karkkainen, K., & Joo, J. (2021). Fairface: Face attribute dataset for balanced race, gender, and age for bias measurement and mitigation. *In Proceedings of the IEEE/CVF winter conference on applications of computer vision* (pp. 1548-1558).

Kaufman, S. B., Quilty, L. C., Grazioplene, R. G., Hirsh, J. B., Gray, J. R., Peterson, J. B., & DeYoung, C. G. (2016). Openness to experience and intellect differentially predict creative achievement in the arts and sciences. *Journal of personality*, *84*(2), 248-258.

Kaul, T. J., & Schmidt, L. D. (1971). Dimensions of interviewer trustworthiness. *Journal of Counseling Psychology*, *18*(6), 542.

Keefe, B.D., Villing, M., Racey, C., Strong, S.M., Wincenciak, J., Barraclough, N.E. (2014) A database of whole-body action videos for the study of action, emotion and untrustworthiness trustworthiness discrimination. *Behavior Research Methods* doi:10.3758/s13428-013-0439-6

Keltner, D., Gruenfeld, D. H., & Anderson, C. (2003). Power, approach, and inhibition. *Psychological review*, *110*(2), 265.

Kinsey, A. C., Pomeroy, W. B., Martin, C. E., & Gebhard, P. H. (1998). *Sexual behavior in the human female*. Indiana University Press.

Kinsey, A. C., Pomeroy, W. B., Martin, C. E., & Sloan, S. (1948). *Sexual behavior in the human male* (Vol. 1). Philadelphia: Saunders.

Klüver, M., Hecht, H., & Troje, N. F. (2016). Internal consistency predicts attractiveness in biological motion walkers. *Evolution and Human Behavior*, *37*(1), 40-46.

Klysing, A. (2023). Prototypicality at the intersection of gender and sexual orientation. *British Journal of Social Psychology*, *62*(3), 1506-1533.

Knoblich, G., & Flach, R. (2001). Predicting the effects of actions: Interactions of perception and action. *Psychological science*, *12*(6), 467-472.

Koch, J. W. (1999). Candidate gender and assessments of senate candidates. *Social Science Quarterly*, 84-96.

Koenig, A. M., Eagly, A. H., Mitchell, A. A., & Ristikari, T. (2011). Are leader stereotypes masculine? A meta-analysis of three research paradigms. *Psychological bulletin*, *137*(4), 616.

Koppensteiner, M., Stephan, P., & Jäschke, J. P. M. (2016). Moving speeches: Dominance, trustworthiness and competence in body motion. *Personality and Individual Differences, 94,* 101-106.

Kozak, M. N., Marsh, A. A., & Wegner, D. M. (2006). What do I think you're doing? Action identification and mind attribution. *Journal of personality and social psychology, 90*(4), 543.

Kramer, R. S., Arend, I., & Ward, R. (2010). Perceived health from biological motion predicts voting behaviour. *Quarterly Journal of Experimental Psychology*, *63*(4), 625-632.

Krusemark, E. A., & Li, W. (2011). Do all threats work the same way? Divergent effects of fear and disgust on sensory perception and attention. *Journal of Neuroscience*, *31*(9), 3429-3434.

Kuhlmeier, V. A., Troje, N. F., & Lee, V. (2010). Young infants detect the direction of biological motion in point-light displays. *Infancy*, *15*(1), 83-93.

Küster, D., Krumhuber, E. G., & Hess, U. (2019). You are what you wear: Unless you moved—Effects of attire and posture on person perception. *Journal of Nonverbal Behavior*, *43*, 23-38.

Langfeld, H. S. (1918). The judgment of emotions from facial expressions. *The Journal of Abnormal Psychology*, *13*(3), 172.

Lasselin, J., Sundelin, T., Wayne, P. M., Olsson, M. J., Göranson, S. P., Axelsson, J., & Lekander, M. (2020). Biological motion during inflammation in humans. *Brain, behavior, and immunity*, *84*, 147-153.

Lehavot, K., & Lambert, A. J. (2007). Toward a greater understanding of antigay prejudice: On the role of sexual orientation and gender role violation. *Basic and Applied Social Psychology*, *29*(3), 279-292.

Lei, Y., He, X., Zhao, T., & Tian, Z. (2020). Contrast effect of facial attractiveness in groups. *Frontiers in Psychology*, *11*, 533773.

Levanon, A., England, P., & Allison, P. (2009). Occupational feminization and pay: Assessing causal dynamics using 1950–2000 US census data. *Social forces*, *88*(2), 865-891.

Lick, D. J., & Johnson, K. L. (2014). Perceptual underpinnings of antigay prejudice: Negative evaluations of sexual minority women arise on the basis of gendered facial features. *Personality and Social Psychology Bulletin*, *40*(9), 1178-1192.

Lick, D. J., Johnson, K. L., & Gill, S. V. (2013). Deliberate Changes to Gendered Body Motion Influence Basic Social Perceptions. *Social Cognition, 31*(6), 656–671. https://doi.org/10.1521/soco.2013.31.6.656

Lick, D. J., Johnson, K. L., & Gill, S. V. (2014). Why do they have to flaunt it? Perceptions of communicative intent predict antigay prejudice based upon brief exposure to nonverbal cues. *Social Psychological and Personality Science*, *5*(8), 927-935.

Loula, F., Prasad, S., Harber, K., & Shiffrar, M. (2005). Recognizing people from their movement. *Journal of Experimental Psychology: Human Perception and Performance*, *31*(1), 210.

Ma, D. S., Correll, J., & Wittenbrink, B. (2015). The Chicago face database: A free stimulus set of faces and norming data. *Behavior research methods*, *47*, 1122-1135.

Machida, S. (1986). Teacher accuracy in decoding nonverbal indicants of comprehension and noncomprehension in Anglo-and Mexican-American children. *Journal of Educational Psychology*, *78*(6), 454.

Magee, J. C., & Galinsky, A. D. (2008). 8 social hierarchy: The self-reinforcing nature of power and status. *Academy of Management annals*, *2*(1), 351-398.

Magee, J. C., & Galinsky, A. D. (2008). 8 social hierarchy: The self-reinforcing nature of power and status. *The academy of management annals*, *2*(1), 351-398.

Manera, V., Becchio, C., Cavallo, A., Sartori, L., & Castiello, U. (2011). Cooperation or competition? Discriminating between social intentions by observing prehensile movements. *Experimental brain research*, *211*, 547-556.

Marey, E. J. (1894). Le mouvement. Paris: Masson.

Marzoli, D., Lucafò, C., Padulo, C., Prete, G., Giacinto, L., & Tommasi, L. (2017). Inversion reveals perceptual asymmetries in the configural processing of human body. *Frontiers in Behavioral Neuroscience*, *11*, 126.

Mather, G., & Murdoch, L. (1994). Gender discrimination in biological motion displays based on dynamic cues. *Proceedings of the Royal Society of London B: Biological Sciences, 258,* 273 – 279.

Matsunaga, Y. (2015). Salary commensurate with social capital. *Applied Economics Letters*, *22*(14), 1116-1121.

McCarty, K., Hönekopp, J., Neave, N., Caplan, N., & Fink, B. (2013). Male body movements as a possible cue to physical strength. *American Journal of Human Biology, 25* (3), 307 – 312.

McDermott, L. A., & Pettijohn, T. F. (2011). The influence of clothing fashion and race on the perceived socioeconomic status and person perception of college students. In *Poster presented at the 23rd Annual Association for Psychological Science Convention, Washington, DC*.

McDonnell, R., Jörg, S., Hodgins, J. K., Newell, F., & O'sullivan, C. (2009). Evaluating the effect of motion and body shape on the perceived sex of virtual characters. *ACM Transactions on Applied Perception (TAP)*, *5*(4), 1-14.

McElvaney, T. J., Osman, M., & Mareschal, I. (2021). Perceiving threat in others: The role of body morphology. *PLoS one*, *16*(4), e0249782.

McLaughlin, H., Uggen, C., & Blackstone, A. (2012). Sexual harassment, workplace authority, and the paradox of power. *American sociological review*, *77*(4), 625-647.

Meeren, H. K. M., van Heijnsbergen, C. C. R. J., & de Gelder, B. (2005). Rapid perceptual integration of facial expression and emotional body language. *Proceedings of the National Academy of Sciences, 102*, 16519 – 16523.

Meyer-Lindenberg, A., & Tost, H. (2012). Neural mechanisms of social risk for psychiatric disorders. *Nature neuroscience*, *15*(5), 663-668.

Miller, S. L., Maner, J. K., & Becker, D. V. (2010). Self-protective biases in group categorization: Threat cues shape the psychological boundary between "us" and "them." *Journal of Personality and Social Psychology, 99 (1),* 62 – 77.

Misa, T. J. (Ed.). (2011). *Gender codes: Why women are leaving computing*. John Wiley & Sons.

Mobbs, D., Hagan, C. C., Dalgleish, T., Silston, B., & Prévost, C. (2015). The ecology of human fear: survival optimization and the nervous system. *Frontiers in neuroscience*, *9*, 121062.

Möller-Leimkühler, A. M. (2003). The gender gap in suicide and premature death or: why are men so vulnerable?. *European archives of psychiatry and clinical neuroscience*, *253*, 1-8.

Montepare, J. M., & Zebrowitz-McArthur, L. A. (1988). Impressions of people created by age-related qualities of their gaits. *Journal of Personality and Social Psychology, 55 (4),* 547 – 556.

Montepare, J. M., & Zebrowitz, L. A. (1998). Person perception comes of age: The salience and significance of age in social judgments. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 30). San Diego, CA: Academic Press.

Morris, P. H., White, J., Morrison, E. R., & Fisher, K. (2013). High heels as supernormal stimuli: How wearing high heels affects judgments of female attractiveness. *Evolution and Human Behavior, 34,* 176 – 181.

Morrison, E. R., Bain, H., Pattison, L., & Whyte-Smith, H. (2018). Something in the way she moves: Biological motion, body shape, and attractiveness in women. *Visual Cognition*, *26*(6), 405-411.

Moss-Racusin, C. A., Dovidio, J. F., Brescoll, V. L., Graham, M. J., & Handelsman, J. (2012). Science faculty's subtle gender biases favor male students. *Proceedings of the national academy of sciences*, *109*(41), 16474-16479.

Murphy, N. A., Hall, J. A., & Colvin, C. R. (2003). Accurate intelligence assessments in social interactions: Mediators and gender effects. *Journal of personality*, *71*(3), 465-493.

Murphy, N. A., Hall, J. A., & Smith LeBeau, L. (2001). Who's smart? Beliefs about the expression of intelligence in social behavior. *Representative Research in Social Psychology, 25*, 34–42

Nelson, N. L., & Mondloch, C. J. (2017). Adults' and children's perception of facial expressions is influenced by body postures even for dynamic stimuli. *Visual Cognition, 25(4-6)*, 563-574.

Neuberg, S. L., Kenrick, D. T., & Schaller, M. (2011). Human threat management systems: Self-protection and disease avoidance. *Neuroscience & Biobehavioral Reviews*, *35*(4), 1042-1051.

Nielson, M. G., Schroeder, K. M., Martin, C. L., & Cook, R. E. (2020). Investigating the relation between gender typicality and pressure to conform to gender norms. *Sex Roles*, *83*, 523-535.

Noroozi, F., Corneanu, C. A., Kamińska, D., Sapiński, T., Escalera, S., & Anbarjafari, G. (2018). Survey on emotional body gesture recognition. *IEEE transactions on affective computing*, *12*(2), 505-523.

O'Sullivan, M., Ekman, P., & Friesen, W. V. (1988). The effect of comparisons on detecting deceit. *Journal of nonverbal behavior*, *12*(3), 203-215.

Ogren, M., Kaplan, B., Peng, Y., Johnson, K. L., & Johnson, S. P. (2019). Motion or emotion: Infants discriminate emotional biological motion based on low-level visual information. *Infant Behavior and Development*, *57*, 101324.

Oh, D., Buck, E. A., & Todorov, A. (2019). Revealing hidden gender biases in competence impressions of faces. *Psychological Science*, *30*(1), 65-79.

Olivola, C. Y., & Todorov, A. (2010). Elected in 100 milliseconds: Appearance-based trait inferences and voting. *Journal of nonverbal behavior*, *34*, 83-110.

Otterbacher, J., Bates, J., & Clough, P. (2017, May). Competent men and warm women: Gender stereotypes and backlash in image search results. In *Proceedings of the 2017 chi conference on human factors in computing systems* (pp. 6620-6631).

Paganini, G. A., McConnell, A. A., Deska, J. C., Almaraz, S. M., Hugenberg, K., & Lloyd, E. P. (2023). Waist-to-hip ratio predicts sexual perception and responses to sexual assault disclosures. *Personality and social psychology bulletin*, 01461672221148008.

Pan, X., & Hamilton, A. F. D. C. (2018). Why and how to use virtual reality to study human social interaction: The challenges of exploring a new research landscape. *British Journal of Psychology*, *109*(3), 395-417.

Parrott, D. J. (2009). Aggression toward gay men as gender role enforcement: Effects of male role norms, sexual prejudice, and masculine gender role stress. *Journal of personality*, *77*(4), 1137-1166.

Paterson, H. M., Pollick, F. E., & Sanford, A. J. (2001). The role of velocity in affect discrimination. In *Proceedings of the annual meeting of the cognitive science society* (Vol. 23, No. 23).

Patterson, M. M. (2012). Self-perceived gender typicality, gender-typed attributes, and gender stereotype endorsement in elementary-school-aged children. *Sex roles*, *67*, 422-434.

Phelan, J. E., Moss-Racusin, C. A., & Rudman, L. A. (2008). Competent yet out in the cold: Shifting criteria for hiring reflect backlash toward agentic women. *Psychology of Women Quarterly*, *32*(4), 406-413.

Phillips, L. T., Weisbuch, M., & Ambady, N. (2014). People perception: Social vision of groups and consequences for organizing and interacting. *Research in Organizational Behavior*, *34*, 101-127.

Pichon, S., de Gelder, B., & Grèzes, J. (2009). Two different faces of threat. Comparing the neural systems for recognizing fear and anger in dynamic body expressions.

NeuroImage (Orlando, Fla.), *47*(4), 1873–1883. https://doi.org/10.1016/j.neuroimage.2009.03.084

Plant, E. A., Hyde, J. S., Keltner, D., & Devine, P. G. (2000). The gender stereotyping of emotions. *Psychology of women quarterly*, *24*(1), 81-92.

Pollick, F. E., Kay, J. W., Heim, K., & Stringer, R. (2005a). Gender recognition from point-light walkers. *Journal of Experimental Psychology: Human Perception and Performance, 31 (6)*, 1247 – 1265.

Pollick, F. E., Paterson, H., Bruderlin, A., & Sanford, A. J. (2001). Perceiving affect from arm movement. *Cognition, 82,* B51 – B61.

Pope, M. (2005). Crashing through the "lavender ceiling" in the leadership of the counseling professions. *Deconstructing heterosexism in the counseling professions: A narrative approach*, 121-128.

Prentice, D. A., & Carranza, E. (2002). What women and men should be, shouldn't be, are allowed to be, and don't have to be: The contents of prescriptive gender stereotypes. *Psychology of women quarterly*, *26*(4), 269-281.

Provost, M. P., Quinsey, V. L., & Troje, N. F. (2008a). Differences in gait across the menstrual cycle and their attractiveness to men. *Archives of Sexual Behavior, 37,* 598 – 604.

Provost, M. P., Troje, N. F., & Quinsey, V. L. (2008b). Short-term mating strategies and attraction to masculinity in point-light walkers. *Evolution and Human Behavior*, *29*(1), 65-69.

Prunty, J. E., Jenkins, R., Qarooni, R., & Bindemann, M. (2023). Ingroup and outgroup differences in face detection. *British journal of psychology*, *114*, 94-111.

Purdie-Vaughns, V., & Eibach, R. P. (2008). Intersectional invisibility: The distinctive advantages and disadvantages of multiple subordinate-group identities. *Sex roles*, *59*, 377-391.

Re, D.E., Dzhelyova, M., Holzleitner, I.J., Tigue, C.C., Feinberg, D.R., Perrett, D.I., 2012. Apparent height and body mass index influence perceived leadership ability in threedimensional faces. *Perception 41* (12), 1477–1485. https://doi.org/10.1068/p7342.

Re, D.E., Hunter, D.W., Coetzee, V., Tiddeman, B.P., Xiao, D., DeBruine, L.M., et al., 2013. Looking like a leader-facial shape predicts perceived height and leadership ability. *PLoS One 8* (12). https://doi.org/10.1371/journal.pone.0080957

Reed, C. L., Stone, V. E., Bozova, S., & Tanaka, J. (2003). The body-inversion effect. *Psychological science*, *14*(4), 302-308.

Reed, C. L., Stone, V. E., Grubb, J. D., & McGoldrick, J. E. (2006). Turning configural processing upside down: part and whole body postures. *Journal of Experimental Psychology: Human Perception and Performance*, *32*(1), 73.

River, J., & Flood, M. (2021). Masculinities, emotions and men's suicide. *Sociology of Health & Illness*, *43*(4), 910-927.

Roberts, D. H. (2021). Gender stereotyping in public accounting: Price Waterhouse v. Hopkins. *Accounting History Review*, *31*(3), 315-334.

Rodway, V., Tatham, B., & Guo, K. (2019). Effect of model race and viewing perspective on body attractiveness and body size assessment in young Caucasian women: an eye-tracking study. *Psychological Research*, *83*, 347-356.

Roether, C. L., Omlor, L., Christensen, A., & Giese, M. A. (2009). Critical features for the perception of emotion from gait. *Journal of vision*, *9*(6), 15-15.

Rosenwasser, S. M., & Dean, N. G. (1989). Gender role and political office: Effects of perceived masculinity/femininity of candidate and political office. *Psychology of Women Quarterly*, *13*(1), 77-85.

Rudman, L. A. (1998). Self-promotion as a risk factor for women: the costs and benefits of counterstereotypical impression management. *Journal of personality and social psychology*, *74*(3), 629.

Rudman, L. A., & Phelan, J. E. (2008). Backlash effects for disconfirming gender stereotypes in organizations. *Research in organizational behavior*, *28*, 61-79.

Rury, J. L. (1991). *Education and Women's Work: Female Schooling and the Division of Labor in Urban America, 1870-1930. SUNY Series on Women and Work*. State University of New York Press, State University Plaza, Albany, NY 12246-0001 (hardcover--ISBN-0-7914-0617-2)..

Rydell, R. J., Hugenberg, K., Ray, D., & Mackie, D. M. (2007). Implicit theories about groups and stereotyping: The role of group entitativity. *Personality and Social Psychology Bulletin*, *33*(4), 549-558.

Satchell, L. P., Mayes, H. S., Lee, A. J., O'Reilly, L. C., Akehurst, L., & Morris, P. (2021). Is threat in the way they move? Influences of static and gait information on threat judgments of unknown people. *Evolutionary Psychological Science*, *7*, 61-68.

Scherer, K. R., Johnstone, T., & Klasmeyer, G. (2003). Vocal expression of emotion. *Handbook of affective sciences*, 433-456.

Schneider, T. M., Hecht, H., Stevanov, J., & Carbon, C. C. (2013). Cross-ethnic assessment of body weight and height on the basis of faces. *Personality and Individual Differences, 55*(4), 356-360

Scholz, B., Crabb, S., & Wittert, G. A. (2017). "Males don't wanna bring anything up to their doctor" Men's discourses of depression. *Qualitative Health Research*, *27*(5), 727-737.

Searcy, J. H., & Bartlett, J. C. (1996). Inversion and processing of component and spatial–relational information in faces. *Journal of Experimental Psychology: Human Perception and Performance*, *22*(4), 904.

Seitz, K. (2002). Parts and wholes in person recognition: Developmental trends. *Journal of experimental child psychology*, *82*(4), 367-381.

Shelton, B. A., & John, D. (1996). The division of household labor. *Annual review of sociology*, *22*(1), 299-322.

Sherbourne, C. D., Hays, R. D., & Wells, K. B. (1995). Personal and psychosocial risk factors for physical and mental health outcomes and course of depression among depressed patients. *Journal of consulting and clinical psychology*, *63*(3), 345.

Sherif, M. (1935). A study of some social factors in perception. *Archives of Psychology (Columbia University)*.

Shim, J., Carlton, L. G., Chow, J. W., & Chae, W. S. (2005). The use of anticipatory visual cues by highly skilled tennis players. *Journal of motor behavior*, *37*(2), 164-175.

Shropshire, J., Benitez, J., & Johnson, K. L. (in prep). *Something in the way she (or he) moves: The role of walk motion in sex categorization and attractiveness ratings*. Manuscript submitted for publication.

Sim, M., Almaraz, S. M., & Hugenberg, K. (2022). Bodies and minds: Heavier-weight targets are de-mentalized as lacking in mental agency. *Personality and Social Psychology Bulletin, 48(9)*, 1367-1381.

Simion, F., Regolin, L., & Bulf, H. (2008). A predisposition for biological motion in the newborn baby. *Proceedings of the National Academy of Sciences*, *105*(2), 809-813.

Singh, D. (1993). Adaptive significance of female physical attractiveness: Role of waist-to-hip ratio. *Journal of Personality and Social Psychology, 65 (2),* 293 – 307.

Sipe, D. (2020). Aesthetics and the Methods of Visual Enquiry in the Photography of Étienne-Jules Marey. *French Studies*, *74*(4), 554–571. https://doi.org/10.1093/fs/knaa170

Slaughter, V., Heron, M., & Sim, S. (2002). Development of preferences for the human body shape in infancy. *Cognition*, *85*(3), B71-B81.

Smith, J. C. (2013). *Cracking the lavender ceiling: Lesbian, gay, and bisexual student affairs professionals and their personal perspectives on career trajectory*. University of California, Los Angeles.

Sollberger, M., Stanley, C. M., Ketelle, R., Beckman, V., Growdon, M., Jang, J., ... & Rankin, K. P. (2012). Neuropsychological correlates of dominance, warmth, and extraversion in neurodegenerative disease. *Cortex*, *48*(6), 674-682.

Sumi, S. (1984). Upside-down presentation of the Johansson moving light-spot pattern. *Perception*, *13*(3), 283-286.

Sundelin, T., Karshikoff, B., Axelsson, E., Höglund, C. O., Lekander, M., & Axelsson, J. (2015). Sick man walking: Perception of health status from body motion. *Brain, behavior, and immunity*, *48*, 53-56.

Sweeny, T. D., & Whitney, D. (2014). Perceiving crowd attention: Ensemble perception of a crowd's gaze. *Psychological Science*, 25(10), 1903-1913.

Sweeny, T. D., Haroz, S., & Whitney, D. (2013). Perceiving group behavior: sensitive ensemble coding mechanisms for biological motion of human crowds. *Journal of Experimental Psychology: Human Perception and Performance*, *39*(2), 329.

Tan, L., Zhang, K., Wang, K., Zeng, X., Peng, X., & Qiao, Y. (2017). Group emotion recognition with individual facial emotion CNNs and global image based CNNs. In *Proceedings of the 19th ACM International Conference on Multimodal Interaction* (pp. 549-552).

Thompson, J., & Parasuraman, R. (2012). Attention, biological motion, and action recognition. *Neuroimage*, *59*(1), 4-13.

Thornton, I. M. (2006). Biological motion: Point-light walkers and beyond. *Human body perception from the inside out*, 271-303.

Thornton, I. M., & Vuong, Q. C. (2004). Incidental processing of biological motion. *Current biology : CB, 14*(12), 1084-1089. doi: 10.1016/j.cub.2004.06.025

Thornton, I. M., Pinto, J., & Shiffrar, M. (1998). The visual perception of human locomotion. *Cognitive Neuropsychology*, *15*(6-8), 535-552.

Thornton, I. M., Srismith, D., Oxner, M., & Hayward, W. G. (2014). Establishing a majority: Observer race influences estimates of crowd ethnicity. *i-Perception*, *5*(5), 490-490.

Thye, S. R. (2000). A status value theory of power in exchange relations. *American Sociological Review*, *65*(3), 407-432.

Todorov, A., Pakrashi, M., & Oosterhof, N. N. (2009). Evaluating faces on trustworthiness after minimal time exposure. *Social cognition*, *27*(6), 813-833.

Tottenham, N., Tanaka, J. W., Leon, A. C., McCarry, T., Nurse, M., Hare, T. A., Marcus, D. J., Westerlund A., Casey, B., & Nelson, C. (2009). The NimStim set of facial expressions: Judgments from untrained research participants. *Psychiatry Research*, *168*(3), 242-249.

Tovée, M. J., & Cornelissen, P. L. (2001). Female and male perceptions of female physical attractiveness in front-view and profile. *British Journal of Psychology*, *92*(2), 391-402.

Troje, N. F. (2008). Retrieving information from human movement patterns. *Understanding events: How humans see, represent, and act on events*, *1*, 308-334.

Troje, N. F., & Westhoff, C. (2006). The inversion effect in biological motion perception: Evidence for a "life detector"? *Current Biology, 16*(8), 821–824.

Trout, D. L., & Rosenfeld, H. M. (1980). The effect of postural lean and body congruence on the judgment of psychotherapeutic rapport. *Journal of Nonverbal Behavior, 4,* 176-190.

Tsang, T., Ogren, M., Peng, Y., Nguyen, B., Johnson, K. L., & Johnson, S. P. (2018). Infant perception of sex differences in biological motion displays. *Journal of experimental child psychology, 173*, 338-350.

Tuminello, E. R., & Davidson, D. (2011). What the face and body reveal: In-group emotion effects and stereotyping of emotion in African American and European American children. *Journal of experimental child psychology*, *110*(2), 258-274.

U.S. Bureau of Labor Statistics. (2024a). Occupational Outlook Handbook, Computer and Information Technology Occupations. https://www.bls.gov/ooh/computer-and-information-technology/home.htm

U.S. Bureau of Labor Statistics. (2024b). Occupational Outlook Handbook, Kindergarten and Elementary School Teachers. https://www.bls.gov/ooh/education-training-and-library/kindergarten-and-elementary-school-teachers.htm

Ullah, H., & Wilson, M. A. (2007). Students' academic success and its association to student involvement with learning and relationships with faculty and peers. *College student journal*, *41*(4), 1192-1203.

US Equal Employment Opportunity Commission. (2024, March 11). *2023 annual Performance Report*. EEOC Releases Annual Performance Report for Fiscal Year 2023. https://www.eeoc.gov/2023-annual-performance-report

Utochkin, I. S., Choi, J., & Chong, S. C. (2023). A population response model of ensemble perception. *Psychological Review*.

Valentine, T. (1988). Upside-down faces: A review of the effect of inversion upon face recognition. *British journal of psychology*, *79*(4), 471-491.

Van den Stock, J., Righart, R., & de Gelder, B. (2007). Body expressions influence recognition of emotions in the face and voice. *Emotion, 7,* 487 – 494.

Van der Toorn, J., Pliskin, R., & Morgenroth, T. (2020). Not quite over the rainbow: The unrelenting and insidious nature of heteronormative ideology. *Current Opinion in Behavioral Sciences*, *34*, 160-165.

van der Zwan, R., & Herbert, N. (2012). "I like the way you move": how hormonal changes across the menstrual cycle affect female perceptions of gait. *BMC Research Notes*, *5*, 1-10.

van Kleef, G. A., Oveis, C., Van Der Löwe, I., LuoKogan, A., Goetz, J., & Keltner, D. (2008). Power, distress, and compassion: Turning a blind eye to the suffering of others. *Psychological science*, *19*(12), 1315-1322.

van Osch, Y., Blanken, I., Meijs, M. H., & van Wolferen, J. (2015). A group's physical attractiveness is greater than the average attractiveness of its members: The group attractiveness effect. *Personality and Social Psychology Bulletin*, *41*(4), 559-574.

Verfaillie, K. (2000). Perceiving human locomotion: Priming effects in direction discrimination. *Brain and Cognition*, *44*(2), 192-213.

Veto, P., Einhäuser, W., & Troje, N. F. (2017). Biological motion distorts size perception. *Scientific Reports*, *7*(1), 42576.

Vignolo, A., Noceti, N., Rea, F., Sciutti, A., Odone, F., & Sandini, G. (2017). Detecting biological motion for human–robot interaction: A link between perception and action. *Frontiers in Robotics and AI, 4*, 14.

Voos, A. C., Pelphrey, K. A., Tirrell, J., Bolling, D. Z., Wyk, B. V., Kaiser, M. D., ... & Ventola, P. (2013). Neural mechanisms of improvements in social motivation after pivotal response treatment: two case studies. *Journal of autism and developmental disorders, 4*3, 1-10.

Wang, L., Zhang, K., He, S., & Jiang, Y. (2010). Searching for life motion signals: Visual search asymmetry in local but not global biological-motion processing. *Psychological Science*, *21*(8), 1083-1089.

Wareham, J. (2024, February 20). *New report shows where it's illegal to be transgender in 2020*. Forbes. https://www.forbes.com/sites/jamiewareham/2020/09/30/this-is-where-its-illegal-to-be-transgender-in-2020/

Washburn, M. (1897). The process of recognition. *The Philosophical Review*, *6*(3), 267-274.

Waytz, A., & Young, L. (2012). The group-member mind trade-off: Attributing mind to groups versus group members. *Psychological Science*, *23*(1), 77-85.

Whitney, D., & Yamanashi Leib, A. (2018). Ensemble perception. *Annual review of psychology*, *69*, 105-129.

Whitney, D., Haberman, J., & Sweeny, T. D. (2014). From textures to crowds: multiple levels of summary statistical perception. *The new visual neuroscience*s, 695-710.

Whitson, J. A., Liljenquist, K. A., Galinsky, A. D., Magee, J. C., Gruenfeld, D. H., & Cadena, B. (2013). The blind leading: Power reduces awareness of constraints. *Journal of Experimental Social Psychology*, *49*(3), 579-582.

Willems, S., Vrancken, L., Germeys, F., & Verfaillie, K. (2014). Holistic processing of human body postures: evidence from the composite effect. *Frontiers in Psychology*, *5*, 88799.

Willer, R. (2009). Groups reward individual sacrifice: The status solution to the collective action problem. *American Sociological Review*, *74*(1), 23-43.

Williams, K. L., & Galliher, R. V. (2006). Predicting depression and self–esteem from social connectedness, support, and competence. *Journal of Social and Clinical Psychology*, *25*(8), 855-874.

Williams, M. J., Elizabeth, L. P., & Spencer-Rodgers, J. (2010). The masculinity of money: Automatic stereotypes predict gender differences in estimated salaries. *Psychology of Women Quarterly*, *34*(1), 7-20.

Willis, J., & Todorov, A. (2006). First impressions: Making up your mind after a 100-ms exposure to a face. *Psychological science*, *17*(7), 592-598.

Willis, M.L., Palermo, R., Burke, D., 2011. Judging approachability on the face of it: the influence of face and body expressions on the perception of approachability. *Emotion 11* (3), 514–523. https://doi.org/10.1037/a0022571.

Wilson, M. S., & Liu, J. H. (2003). Social dominance orientation and gender: The moderating role of gender identity. *British Journal of Social Psychology*, *42*(2), 187-198.

Wiltermuth, S. S., & Heath, C. (2009). Synchrony and cooperation. *Psychological science*, *20*(1), 1-5.

Yang, X., & Dunham, Y. (2019). Hard to disrupt: Categorization and enumeration by gender and race from mixed displays. *Journal of Experimental Social Psychology*, *85*, 103893.

Yeh, C. J., & Inose, M. (2003). International students' reported English fluency, social support satisfaction, and social connectedness as predictors of acculturative stress. *Counselling Psychology Quarterly*, *16*(1), 15-28.

Young, A., & Bruce, V. (2013). *Face perception*. Psychology Press.

Young, I. M. (1980). Throwing like a girl: A phenomenology of feminine body comportment motility and spatiality. *Human studies*, *3*(1), 137-156.

Yovel, G., Pelc, T., Lubetzky, I., 2010. It's all in your head: Why is the body inversion effect abolished for headless bodies? *J. Exp. Psychol. Hum. Percept. Perform. 36* (3), 759–767. https://doi.org/10.1037/a0017451.

Yu, A., Hays, N. A., & Zhao, E. Y. (2019). Development of a bipartite measure of social hierarchy: The perceived power and perceived status scales. *Organizational Behavior and Human Decision Processes*, *152*, 84-104.

Yu, S., Tan, T., Huang, K., Jia, K., & Wu, X. (2009). A study on gait-based gender classification. *IEEE Transactions on image processing*, *18*(8), 1905-1910.

Yzerbyt, V., Judd, C. M., & Corneille, O. (Eds.). (2004). *The psychology of group perception*. Psychology Press.

Zebrowitz, L. A., Hall, J. A., Murphy, N. A., & Rhodes, G. (2002). Looking smart and looking good: Facial cues to intelligence and their origins. *Personality and Social Psychology Bulletin, 28*, 238–249.

Zhang, K., Zhang, M., Liu, T., Luo, W., & He, W. (2019). The inversion effect of body recognition. *Advances in Psychological Science*, *27*(1), 27.

Zhu, N., & Chang, L. (2019). Evolved but not fixed: A life history account of gender roles and gender inequality. *Frontiers in psychology*, *10*, 1709.

Appendix A: Measure of Power

Perceived Power Scale (adapted from Yu et al., 2019)

1. They oversee a large number of people.
2. They have control over many other people.
3. They can provide rewards to others at their discretion.
4. They have a great deal of power.
5. They have the authority to discipline others when needed.
6. They control a lot of resources.

Appendix B: Measure of Status

Perceived Status Scale (adapted from Yu et al., 2019)

1. Others often seek their opinion because they respect them.
2. They have a good reputation among those around them.
3. They are highly respected by others.
4. People look up to them because they are successful.
5. They are admired by others because they are seen as competent.
6. Others come to them because they trust their judgment.