2015

The interplay between self-perceived gender and the perception of the gender of others: an examination of exogenous and endogenous factors contributing to judgements of sex and gender

Desirée Kozlowski
Southern Cross University

Publication details
Kozlowski, D 2015, "The interplay between self-perceived gender and the perception of the gender of others: an examination of exogenous and endogenous factors contributing to judgements of sex and gender", PhD thesis, Southern Cross University, Lismore, NSW.
Copyright D Kozlowski 2015

ePublications@SCU is an electronic repository administered by Southern Cross University Library. Its goal is to capture and preserve the intellectual output of Southern Cross University authors and researchers, and to increase visibility and impact through open access to researchers around the world. For further information please contact epubs@scu.edu.au.
The interplay between self-perceived gender and the perception of the gender of others

An examination of exogenous and endogenous factors contributing to judgements of sex and gender

Desirée Kozlowski

Bachelor of Psychology with Honours (First Class), SCU

Friday, December 19, 2014

Submitted in fulfilment of the requirements for the degree Doctor of Philosophy

Discipline of Psychology, School of Health and Human Sciences, Southern Cross University

Thesis Declaration:

I certify that the work presented in this thesis is, to the best of my knowledge and belief, original, except as acknowledged in the text, and that the material has not been submitted, either in whole or in part, for a degree at this or any other university.

I acknowledge that I have read and understood the University’s rules, requirements, procedures and policy relating to my higher degree research award and to my thesis. I certify that I have complied with the rules, requirements, procedures and policy of the University (as they may be from time to time).
Abstract

One way that humans make sense of their social environment is by assigning others to social categories. The work reported here was predicated on the importance of sex as a social category, but extends that concept to a more nuanced consideration, that of gender. Gender—the strength of one’s femininity and/or masculinity—is in some way superimposed on the physical sex of each person and is without doubt a factor in interpersonal interactions. Gender serves here as a device with which to test the main thesis: that judgements we make about others, which we most likely believe to be a pure function of properties possessed and expressed by those others, are in fact to some real extent mediated by endogenous factors. This work was intended to extend that picture in three ways. The first: by examining further the relationships between sex perception and gender perception with a consideration of the relative contributions of visual form and motion cues to observers’ judgements. The second: by looking at characteristics of the observer related to gender, at those endogenous factors that may be associated with the judgements individuals make about others. Finally: by turning our attention in the other direction and teasing apart the effect observing others may have on our perception of our own genderedness. To examine the importance of exogenous cues to sex and gender, the studies reported here employed dynamic point light stimuli varying systematically on both weight and type of sexually dimorphic visual cues conveyed. Endogenous factors considered included self-perceived gender, gender role, and digit ratio. Five key findings were reported: 1) The apparent hierarchy of usefulness of motion cues, structural cues and coherent composites to visual judgements of sex and of gender; 2) The demonstrated disconnect between maleness and masculinity but not between femaleness and femininity; 3) The agreement between various indices of observer gender; 4) The tendency for males higher on self-perceived masculinity to demonstrate a higher ‘masculinity threshold’ when making judgements of a target; and 5) The demonstrated tendency for observers of both sexes to shift their self-perceived gender toward the feminine after viewing highly feminine others and toward the masculine after viewing highly masculine others. Together these provide support for a dynamic, interactive account of gender and of social perception more broadly.
Key Finding 1 - The apparent hierarchy of usefulness of motion cues, structural cues, and coherent composites to visual judgements of sex and of gender.

Key Finding 2 - The demonstrated disconnect between maleness and masculinity but not between femaleness and femininity.

Key Finding 3 - The agreement between various indices of observer gender.

Key Finding 4 - The tendency for males higher on self-perceived masculinity to demonstrate a higher ‘masculinity threshold’ when making judgements of a target.

Key Finding 5 - The demonstrated tendency for observers of both sexes to shift their self-perceived gender toward the feminine after viewing highly feminine others and toward the masculine after viewing highly masculine others.
Acknowledgements

Inestimable encouragement, support, and indulgence were provided to me by the following individuals.

My Supervisors:
Rick van der Zwan. Anna Brooks.

My People:

And:

Family.

Friends.

Colleagues.

Thank you all.
俳句

Relative self meets
Mirror of others with
Ideas of normal
Preamble

Despite my best efforts, this work is no doubt replete with assumptions: some bordering upon legitimacy, some questionable, and possibly, some completely erroneous. Here I ask that the reader not take this as an indication of carelessness. On the contrary, I care deeply. There are many assumptions that I have studiously avoided, others that I have tried to avoid with perhaps less success.

Together with such unintended inclusions, offences of omission will no doubt occur throughout. For example, cross-cultural aspects of gender are all but ignored here; and, although working explicitly in the areas of sex and gender, I do not deal in this work with sexual identity, or transgender identification, or with much of the diversity across the gender spectrum. The scope of the material covered for this work was sufficiently broad and disparate as to make a truly thorough contextual account of even a single aspect impossible within the constraints of the exercise. Again, I seek the reader’s indulgence here on the grounds that I would dearly have loved to explore more deeply many aspects of the material that I have merely brushed across here.

With regard to the philosophical perspective from which I approach the material herein, an established label—a recognisable box into which I fit—may not exist. Post-positivism may be as close as I can go to defining my perspective, but I am far from a radical proponent and the reader will not need to delve far into this work to see the tell-tale signs of constructivist thinking. In this work I straddle theory and empirical, experimental work; indeed it is the nexus between these two that seems to me to be most likely to yield a richer understanding of ourselves as social beings.
Finally, I would like to offer a pre-emptive clarification regarding my use of the term ‘endogenous’ to refer to certain factors or processes at play in observers’ judgements of sex and gender. By using this term, I do not mean to imply that any aspect of self, particularly gender self-concept, is absolute, or innate, or immutable. Rather, a multitude of influences are likely to be at play, not the least of these being an individual’s own set of experiences. However, just as an intense bout of running might trigger a pleasant wash of μ-opioids—endogenous chemicals—social interaction equally may trigger, or activate, factors of self or of self-perceptions that I herein refer to as endogenous. As with an individual’s endogenous biochemical reactions (Zuckerman, 1995), these ‘endogenous’ aspects of gender undeniably result from the complex and dynamic interactions between multiple psychobiosocial influences over a lifetime of experience and learning. Thus, the distinction drawn here between exogenous and endogenous facets of gender is intended to distinguish those arising primarily from characteristics of the stimulus (or ‘target’) from those arising primarily from the internalised frame of reference of the observer.

---

1 I am not alone in this view of course (see for example Bussey, 2011 and the work cited by her).
Guide to the thesis structure

Chapter 1

In chapter 1 I review the relevant literature as background to the original work to be reported in later chapters. In doing this, I include both theoretical and empirical material and point out how and why I see these two branches coming together to enable a coherent and integrated consideration of gender perception.

Chapter 2

In chapter 2 I outline the particular indices of gender, both established and novel, to be used in the work reported here.

Chapter 3

Chapter 3 is the first of the three chapters in which I describe my original research. This chapter includes inferences about the relative contributions of structural and kinematic cues (exogenous factors) to visual judgements of sex and of gender. Observers viewed and responded to a range of point light walkers that varied systematically by cue-type and across a gender continuum. The relationships between judgements of sex (male/female) and gender (masculine/feminine) are also examined.

Chapter 4

In chapter 4, the second of the empirical chapters, I report on relationships identified among various measures of observer gender (endogenous factors), and then between those and observers’ judgements of target walkers. Essentially, this chapter examines self→other influences on gender judgements.
Chapter 5

In chapter 5, the third and final empirical chapter, I look in the opposite direction: at other →self influences on gender. Here, the experiment was designed to test for changes in self-perceived gender following exposure to highly-gendered targets (or ‘others’).

Chapter 6

In chapter 6, the general discussion, I review and discuss the key findings from chapters 3-5.
### List of Figures and tables

<table>
<thead>
<tr>
<th>Figure or table</th>
<th>Page</th>
<th>Illustrating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1.1</td>
<td>21</td>
<td>Sampled representation of point light walkers (PLWs) from the objective gender continuum developed by Troje (2002)</td>
</tr>
<tr>
<td>Figure 3.1</td>
<td>51</td>
<td>Sampled representation of PLWs from the objective gender continuum developed by Troje (2002)²</td>
</tr>
<tr>
<td>Table 3.1</td>
<td>52</td>
<td>Range of PLWs used in the current studies showing the weighted gender cues conveyed in terms of motion and structure</td>
</tr>
<tr>
<td>Figure 3.2</td>
<td>61</td>
<td>A: ‘Male’ responses as a proportion of all responses to target PLWs. B: ‘Masculine’ responses as a proportion of all responses to target PLWs</td>
</tr>
<tr>
<td>Figure 3.3</td>
<td>64</td>
<td>A: ‘Female’ responses as a proportion of all responses to target PLWs. B: ‘Feminine’ responses as a proportion of all responses to target PLWs</td>
</tr>
<tr>
<td>Figure 3.4</td>
<td>68</td>
<td>A: ‘Female’ and ‘Feminine’ responses as a proportion of all responses to ‘coherent’ target PLWs. B: ‘Male’ and ‘Masculine’ responses as a proportion of all responses to ‘coherent’ target PLWs</td>
</tr>
<tr>
<td>Figure 3.5</td>
<td>70</td>
<td>A: ‘Female’ and ‘Feminine’ responses as a proportion of all responses to ‘structure only’ target PLWs. B: ‘Male’ and ‘Masculine’ responses as a proportion of all responses to ‘structure only’ target PLWs</td>
</tr>
<tr>
<td>Figure 3.6</td>
<td>71</td>
<td>A: ‘Female’ and ‘Feminine’ responses as a proportion of all responses to ‘motion only’ target PLWs. B: ‘Male’ and ‘Masculine’ responses as a proportion of all responses to ‘motion only’ target PLWs</td>
</tr>
<tr>
<td>Figure 4.1</td>
<td>79</td>
<td>A simple model of the factors, both of the target—or other—and of the observer, that may influence the perception of target gender</td>
</tr>
<tr>
<td>Figure 4.2</td>
<td>83</td>
<td>Frequencies for self-perceived gender (SPG) values by observer sex</td>
</tr>
<tr>
<td>Figure 4.3</td>
<td>84</td>
<td>Respondents’ PDQ-F:M (overall gender role) scores as a function of sex</td>
</tr>
<tr>
<td>Figure 4.4</td>
<td>85</td>
<td>Respondents’ PDQ-F (masculinity) scores as a function of sex</td>
</tr>
<tr>
<td>Figure 4.5</td>
<td>85</td>
<td>Respondents’ PDQ-F (femininity) scores as a function of sex</td>
</tr>
<tr>
<td>Figure 4.6</td>
<td>86</td>
<td>Respondents’ RH 2D:4D (digit ratio) as a function of sex</td>
</tr>
<tr>
<td>Table 4.1</td>
<td>88</td>
<td>Pearson Product-Moment Correlations between Measures of Observer Gender</td>
</tr>
<tr>
<td>Figure 4.7</td>
<td>89</td>
<td>The relationship between self-perceived gender and scores on the PDQ-M (masculinity subscale)</td>
</tr>
<tr>
<td>Figure 4.8</td>
<td>91</td>
<td>The relationship between self-perceived gender and scores on the PDQ-F:M (composite gender role score)</td>
</tr>
<tr>
<td>Table 4.2</td>
<td>95</td>
<td>Pearson Product-Moment Correlations between Measures of Target Gender and Judgements of Target Gender for Female Observers</td>
</tr>
<tr>
<td>Figure 4.9</td>
<td>98</td>
<td>The relationship between scores on the PDQ-M (the masculinity subscale) and neutrality range for female observers</td>
</tr>
<tr>
<td>Figure 5.1</td>
<td>110</td>
<td>Outline of the tasks included in the study reported in chapter 5</td>
</tr>
<tr>
<td>Figure 5.2</td>
<td>113</td>
<td>Shifts in pre-post self-perceived gender (SPG) as a function of experimental condition for female participants</td>
</tr>
<tr>
<td>Figure 5.3</td>
<td>114</td>
<td>Shifts in pre-post self-perceived gender (SPG) as a function of experimental condition for male participants</td>
</tr>
</tbody>
</table>

² Figure reproduced from chapter 1.
Chapter 1 - Setting the Scene

Introduction

The questions asked within this work concern social judgements around sex and gender. Of particular interest are those characteristics, of both the judge and the judged, that contribute to variability in judgements. The current work, through experimentation, looked at the way exposure to masculine and feminine models influenced observers’ perceptions of their own masculinity or femininity. In addition, the way in which observers’ perceptions of their own femininity or masculinity influenced their judgements of target gender was examined.

For the perceiver, endogenous aspects that may affect judgements include self-perceived gender in terms of physicality and of gender-role orientation. Exogenous characteristics include both local and global aspects of the target. For example, here, the relative contributions of structure and motion to judgements of sex and gender are considered.

Social psychology tells us that priming has been found to affect subjective judgements via either assimilation or contrast effects (Förster, Liberman, & Kuschel, 2008; Herr, Sherman, & Fazio, 1983; Higgins, Rholes, & Jones, 1977). From the perception literature comes the idea of ‘thin slicing’, which refers to humans’ ability to infer social information from minimal samples (Ambady, Bernieri, & Richeson, 2000; Ambady, Krabbenhoft, & Hogan, 2006; Carney, Colvin, & Hall, 2007). Evolutionary theory offers its own perspectives on inter-personal perception (Barber, 1995; Buss & Schmitt, 1993; Feinberg, 2008; Moore, Law Smith, Cassidy, & Perrett, 2009). However, the current work is not situated within a single theoretical area; rather, consideration has been given to ideas from disparate disciplines and sub-disciplines and this research was thus intended to be more exploratory than confirmatory in nature.

Background

Humans are acutely social creatures and one of the key tools we use to negotiate the complexity of our social world is interpersonal categorisation. According to many theorists from
Sherif (1948) and Allport (1954) on, we assign others to various social categories in order more simply and economically to infer information about them. So, when we meet an unfamiliar person, we are likely to attend to her or his face, body, and clothing; listen to her or his voice; and take note of any olfactory cues. From these disparate pieces of information we may decide, to give one example, that this person is a fit, well-educated, professional, middle aged, European woman. Thus, we use a range of available perceptual cues to infer things about others and on this information we base, at least to some extent, our opinions about, attitudes to, and expectations of them (Brewer, 1988; Stangor, Lynch, Duan, & Glas, 1992; Todorov, Said, Engell, & Oosterhof, 2008).

Of course, the number of possible social categories that we can map onto a given individual is very large indeed, but certain categorical dimensions are regarded as being central to interpersonal classification; these are race, sex, and age (Bargh & Williams, 2006; Kinzler, Shutts, & Correll, 2010; Messick & Mackie, 1989; Ridgeway, 2009; Stangor et al., 1992). These three social dimensions have been found to be rapidly and consistently processed (Bargh, 1994; Ito & Urland, 2003, 2005; Mouchetant-Rostaing, Giard, Bentin, Aguera, & Pernier, 2000; Tomelleri & Castelli, 2012; Wiese, Kloth, Güllmar, Reichenbach, & Schweinberger, 2012; Zhao & Bentin, 2008), but also to be dynamic and interactive (Freeman & Ambady, 2011; Johnson, Freeman, & Pauker, 2012; K. Quinn & Macrae, 2005). Further, humans employ such categories from an early age (for an overview see Kinzler et al., 2010) and this seems to be so especially in the case of sex categorization (Johnson, Lurye, & Tassinary, 2010; Maccoby, 1988; P. Quinn, Yahr, Kuhn, Slater, & Pascalis, 2002; Ramsey-Rennels & Langlois, 2006). Indeed, there is some evidence that sex is primary among these social categories (Haslam, Rothschild, & Ernst, 2000; Stangor et al., 1992).

So, sex can be considered a fundamental social dimension on which we base our judgements of others. It is not difficult to see that these judgements can have pervasive cognitive and

---

3 This ability to infer social information from minimal samples is also known in the perception literature as ‘thin slicing’ (examples include Ambady et al., 2000; Ambady et al., 2006; Balas, Kanwisher, & Saxe, 2012; Carney et al., 2007; Friedman, Oltmanns, & Turkheimer, 2007).
behavioural consequences. Even an apparently ‘objective’ act such as measuring blood pressure has been found to be influenced by an interaction between patient and observer sex (Millar & Accioly, 1996). It is fair to say then that sex, at least implicitly, may be at play in almost every interpersonal exchange.

The work to be reported here is predicated on the importance of sex as a social category, but will extend that concept to a more nuanced consideration, that of gender. Gender—the strength of one’s femininity and/or masculinity—is in some way superimposed on the physical sex of each person and is without doubt a factor in interpersonal interactions (Ridgeway, 2009). This work concerns judgements that people make about gender, both their own and that of others, and thus, it is important to define this key term and, importantly, to delineate ‘sex’ from ‘gender’.

Sex and Gender

According to Muehlenhard and Peterson (2011), the first time a formal distinction between sex and gender was made in the literature was by John Money and his colleagues. Money, Hampson, and Hampson (1955) wrote of a person’s gender role as comprising those psychological and behavioural characteristics associated with being a girl or boy, a man or woman, and as a separate concept to physiological sex. Far from providing a clear and universal delineation though, the introduction of this pair of terms engendered a contentious, and somewhat disorderly, cascade of competing theories and accompanying definitions as well as attempts to reconcile various approaches (Annandale & Hunt, 1990; Ashmore, 1990; Capdevila, 2007; Deaux, 1985; Muehlenhard & Peterson, 2011; Rogers, 2010; Shields & Dicicco, 2011; Springer, Mager Stellman, & Jordan-Young, 2012; Stewart & McDermott, 2004; Unger, 1979; Unger & Crawford, 1993; Walker & Cook, 1998).


4 Interestingly, the relevance of sex to social exchange seems not to be limited to conspecifics (Sorge et al., 2014).
The issue of causality has been a particular stumbling block to attempts to standardise the terminology of sex and gender, or sex or gender (Unger & Crawford, 1993). In particular, gender has often been regarded as somehow emerging from biological sex, with sex resolutely free from any influence outside the physical (Springer et al., 2012). Many commentators have regarded sex as accounting for biological, or innate, factors and gender for social, or learned, factors, but a myriad of interpretations, definitions, and opinions have been offered (Muehlenhard & Peterson, 2011 provide an excellent overview). Many working from the feminist perspective embraced gender as a means of extricating ‘sex differences’ from the figurative jaws of biological causality and acknowledgment of the socio-cultural influences at play in these matters has largely endured. Indeed, Springer et al. (2012) recommend that causal models generally should be either purely social-based, or based on a biological/social interaction.

Despite a robust and continuing discourse on the specific meanings of the terms sex and gender though, very often they are conflated (Annandale & Hunt, 1990; Lehavot & Lambert, 2007) and still the terms are commonly used interchangeably (Haig, 2004). Indeed, some authors have suggested that the distinction between the terms sex and gender is likely to be of decreasing importance as the dynamic and, above all, reciprocal nature of the interplay between biology and culture becomes better understood and acknowledged (Muehlenhard & Peterson, 2011; Yoder, 1999).

This may well prove to be so, however, with the merest of explanations of the two terms, every one of the participants in the studies reported in the following chapters expressed what seemed to be an effortless understanding that the term ‘sex’ was being used to refer to the categories of male and female and ‘gender’ to a point on a masculinity or femininity continuum that ranges from something like ‘not masculine at all’ to ‘extremely masculine’ (or feminine). Each person responded about themselves as being either ‘male’ or ‘female’ on the questionnaire with which

---

5 At least this is the case for commentators writing in English (Walker & Cook, 1998).
she or he was provided. Perhaps most importantly, participants had no trouble imagining a male who was not masculine or a female who was not feminine.

So, while something of a philosophical minefield exists around these terms, in this thesis they will be used in their least theory-laden forms. Although, as Capdevila writes, “...language is not neutral and science cannot be isolated from the broader context” (2007, p. 468), there is no intent herein to promote the idea of sex differences (or gender differences). Nor is the question of whether our individual level of masculinity and femininity is a product and expression of our biology or is socially determined a focus here; it does seem to be the fact that we do each possess a certain idea of our own gender, and of the apparent gender of others.

Thus, the property of gender serves here as a device with which to test the main thesis: that judgements we make about others, which we most likely believe to be a pure function of properties possessed and expressed by those others, are in fact and to some real extent, mediated by endogenous factors. Similar questions have been probed with respect to the property of ‘attractiveness’ (see for example Cash, Cash, & Butters, 1983; Little & Mannion, 2006) and these will be explored later. Throughout this account, I will refer to male and female as the dichotomous categories of ‘sex’ and to masculinity and femininity as aspects of ‘gender’. In fact, part of what is considered here is whether and to what extent sex and gender are perceived to map onto one another.

A final point on this is that a number of the authors cited here have reported findings about ‘gender perception’ when the question or questions asked of participants was some variation of “male or female”. To maximise the clarity of this report I will refer to these studies as concerning ‘sex perception’. Where studies incorporate estimates of masculinity and/or femininity in a way consistent with that outlined above I will refer to them as concerning

---

6 Further conceptual and psychometric considerations regarding the construct of gender as it is employed here are provided in chapter 2.
'gender perception'. Some other issues, particularly relating to the quantification of various aspects of gender, will be specified later.

Conveying Sex via Point Light Displays

The theoretical dialogue around sex and gender, although generally considered separately, is not incompatible with empirical methodologies employed by visual perceptionists. Questions of sex in particular have been investigated using point light walkers (henceforth PLWs) and it is this nexus between theoretical and empirical methods that is central to the work to be reported here. In this section I will outline the way I see these aspects coming together, beginning with a brief overview of previous work with PLWs that could potentially underpin a coherent and integrated consideration of gender perception.

PLWs are visual representations of human movement conveyed by a relatively small number of dots representing discrete points on a body. Essentially, the viewer sees an array of dots on a computer screen that, as they begin to move, instantly seem to resolve into a percept of a moving human figure. PLWs have been used extensively as stimuli in psychophysical visual perception tasks to convey—via both structure (form) cues and dynamic (motion) cues—a wide range of characteristics. Originally employed 40 years ago by Gunnar Johansson (1973)\(^7\), these PLWs subsequently have provided a controllable means of delivering a range of visual cues from which observers can extract, or infer, information on characteristics such as identity (Cutting & Kozlowski, 1977; H. Hill & Pollick, 2000; Troje, Westhoff, & Lavrov, 2005), age (Sumi, 2000), affect (Alaerts, Nackaerts, Meyns, Swinnen, & Wenderoth, 2011; Atkinson, Tunstall, & Dittrich, 2007; Atkinson, Vuong, & Smithson, 2012; Dittrich, Troscianko, Lea, & Morgan, 1996; Pollick, Lestou, Ryu, & Cho, 2002), and sex (L. Kozlowski & Cutting, 1977, 1978; Mather & Murdoch, 1994; Pollick, Kay, Heim, & Stringer, 2005; Pollick et al., 2002).

---

\(^7\) For a more complete account of the development of PLWs see Blake and Shiffrar (2007b).
In the case of discriminations of sex, human observers are regarded as being adept at judging sex from PLWs, especially from frontal presentations (Mather & Murdoch, 1994; Troje, 2002). Indeed, Pollick et al. (2005) reported an overall estimate for human accuracy at judging the sex of PLWs at other than sagittal views to be 71%. So, even without visual cues such as secondary sexual characteristics, waist-to-hip ratio (WHR)\(^8\), hairstyle, clothing, makeup, et cetera, these PLWs provide salient cues to sex, which are able to be identified by observers with some confidence (L. Kozlowski & Cutting, 1977). PLWs thus represent an ideal way to present systematically varying weights of sexually dimorphic information without introducing explicit attractiveness cues or other potentially confounding information.

Males and females differ both in body structure and in their patterns of movement (for an overview see Pollick et al., 2005). PLW stimuli convey information via local motion (the movement of each individual point light) and global motion (the holistic movement of the figure). So although not including structure per se, importantly, some structural information can be inferred from global motion cues provided by PLWs. Manipulation of this class of stimuli has proliferated with the aims of isolating those variables, including structure and kinematics, that contribute to observers’ judgements and of quantifying their relative contributions. Of particular interest here has been a body of work examining the relative contributions of structural and kinematic cues to observers’ judgements of sex\(^9\).

As already stated, although no explicit body morphology is delivered by the discrete points of PLWs, the global array of moving point lights does allow some information about body structure—and importantly, no information about WHR—to be inferred. Primarily, the relative positioning of shoulder points and of hip points provides information about shoulder and hip widths and thus some limited information about shoulder-to-hip ratio (SHR). In this way...

---

\(^8\) WHR is a sexually dimorphic characteristic and a key cue to sex (Heid et al., 2010; Johnson, Iida, & Tassinary, 2012; Johnson, Lurye, et al., 2010).

\(^9\) Here I limit my review to studies that specifically examine sex judgements; for the reader interested in form and motion cues from PLWs more broadly, see, for example, Thirkettle, Benton, and Scott-Samuel (2009).
structural information can be extrapolated from the motion of the PLW, even when it is presented sagitally (side-on) (Barclay, Cutting, & Kozlowski, 1978). SHR is regarded as an effective cue to sex (Barclay et al., 1978) with males more likely to have a wedge shaped torso tapering from wider shoulders to narrower hips whereas females more often present a wedge shape in the opposite direction. SHR is a key to the inferred single point, “center of moment”, proposed by Cutting, Proffitt, and Kozlowski (1978) as a potent contributor to the accuracy of sex judgements based on PLWs. Indeed, the so-called inversion effect, whereby male PLWs presented upside down are systematically judged to be female and vice versa, has been attributed to the inversion of the sexually dimorphic torso wedge (Barclay et al., 1978; Cutting et al., 1978).

It was dynamic information though, kinematic cues, that Mather and Murdoch (1994) found to be of primary importance in judging the sex of a PLW. In that study, the authors set structural and kinematic cues in opposition to one another and found that while varying the structure of the figure resulted in a 6% performance decrement compared to a coherent walker, varying the kinematic cues induced a drop of more than 50%. Further, sex judgements based on kinematic cues were found to be significantly more accurate at short presentation durations than those based on structural cues. Although Mather and Murdoch (1994) concede that their figures may have carried exaggerated lateral kinematic cues, they nevertheless concluded that kinematic cues, specifically lateral sway, dominate structural information as cues to sex.

Troje (2002) also found that depriving observers of kinematic cues resulted in significantly more errors in judgements of sex than when structural cues were missing. In that case the effect was markedly greater at viewpoints other than the frontal one.

Interestingly, PLW stimuli for these sex discrimination tasks often include an array of different walkers and in a number of cases these walkers have been synthesised to convey incremental changes in the degree, or weighting, of the sex information each conveys (those developed by
Troje, 2002 and 2008 are most germane to the studies reported here. Such a stimulus set contains an objectively sex-neutral walker, set at the point of sex ambiguity—the mathematically derived ‘0’ walker, the average of all female and male walkers—and walkers either side of that sex-neutral one that occupy the ‘female’ space and the ‘male’ space respectively. Essentially, this type of stimulus set represents a mono-dimensional sex continuum: each walker beyond the ‘0’ walker will be incrementally more heavily weighted based on sexually dimorphic cues (see Figure 1.1 for an illustration). Thus, the -2 walker will convey, for example, twice the degree of different-to-neutral ‘female’ information than will the -1 walker; the -5 walker, five times the distance from neutral. Accordingly, the +5 walker will carry the same degree of ‘male cues’ as the -5 walker carries ‘female cues’.

Figure 1.1. Sampled representation of PLWs from the objective gender continuum developed by Troje (2002). The statistically neutral walker is at 0; increments represent 1 standard deviation. Female walkers comprise the negative extent of the continuum, male walkers the positive extent.
Gender from Point Light Displays

Many studies essentially treat sex as an interval scale variable rather than a nominal one. If the distinction between sex and gender is taken seriously though, and sex is regarded as a dichotomy, logic is being sorely tested by ideas that one walker is ‘more female’ or ‘more male’ than another. Any walker into the female space from the neutral point should theoretically be as female as any other, any male as male as any other. To follow this line of thought, with a set of walkers diverging incrementally from a sex-neutral walker, there would be only three points of possible interest when observers judge the sex of these PLWs:

1. the point on the continuum at which a walker is judged to be male (the male threshold)
2. the point at which a walker is judged to female (the female threshold), and
3. the point at which a walker is judged equally often to be male and female (the point of subjective sex-ambiguity).

Further, these points would be subjectively derived and thus vary across individuals, groups, and time.

The construct of gender though provides a more nuanced variable to correspond with the nature of the information available from such PLW stimuli. The stimulus set previously described offers a true interval level variable, with equal increments (of 1 SD). The walker at -1 can certainly be thought of logically as being less feminine than that at -4, the walker at +6 more masculine than that at +2. Indeed, there is at least one study where gender discrimination has been examined explicitly in this way.

Johnson and Tassinary (2005) specifically examined the contributions made to judgements of sex and of gender by the morphology and the motion of their presented stimuli. Those stimuli were not simple PLWs however, but were animations of human figures (via Higa, 1999) where waist to hip ratio (WHR), as well as shoulder and hip motion, were manipulated. Johnson and Tassinary found that when participants were judging sex, the WHR (a cue to form or structure)
of the walkers was more influential than the kinematic manipulation (swagger compared to sway), and that participants’ eye gaze was concentrated on the waist area of the figures. In contrast, gender judgements were influenced equally by WHR and kinematic cues. Consistent with findings that (as outlined previously) sex can quite accurately be inferred in the absence of cues to WHR from PLWs, Johnson and Tassinary found that kinematic cues did indeed provide information sufficient for sex perception. They concluded that judgements of sex from motion are mediated by, even inferred from, assessments of gender. In other words, when making sex judgements in the absence of form cues (specifically WHR), people use kinematic information to decide whether the figure is masculine or feminine and on that basis, subsequently, whether the figure is male or female. It should be said that this process generally involves sub-threshold, or unconscious, decision making.

With those findings in mind, it is notable that the question of the human ability to infer gender from structure and motion cues conveyed by PLWs so far has not been explored fully. The relationship between sex judgements and gender judgements from these stimuli would seem to offer possibilities for obtaining a finer-grained picture of the basis or bases of these types of social judgements.

Gender as an aspect of self-concept

The idea of gender as introduced earlier is relevant to the work reported here in two major ways: Firstly, in the way or ways that we perceive the gender of others. The second deals with factors affecting our perception of our own ‘genderedness’.

Henceforth I will address the first aspect—the perception of the gender of others—in terms of the judgements made by participants in response to PLWs that convey the various visual cues to gender already described. Here, as already outlined, the terms ‘feminine’ and ‘masculine’ are employed as they are in day-to-day usage, as Spence (2011) puts it, as “…labels people use to
describe observable qualities, objects, or behaviors that are widely perceived in a given culture to distinguish one gender from another” (p. 508).

Spence also writes though of a more ‘essential’ sense in which these terms can be used; she suggests that they can also denote “...people’s ineffable sense of their gender identity, a psychological sense that for the vast majority of women and men is a fundamental aspect of self” (2011, p. 508). This is the second sense in which gender is relevant to the current work.

Gender self-identity has been described as being related to but distinct from an individual’s understanding of sex stereotypes and their gender-related attitudes (Ashmore, 1990; Stets & Burke, 2000). Although sex stereotypes do vary to an extent (Ashmore, 1990; Garcia-Retamero, Müller, & López-Zafra, 2011; Tobin et al., 2010), they are generally well understood by individuals within a social context; gender self-identity is more heterogeneous (Tobin et al., 2010). We each have an individual gender self-concept, a sense of our own masculinity and/or femininity, and this self-concept colours our interactions with our broader social world (Bussey, 2011). As mentioned earlier, the work here concerns the interplay between our perceptions of our own gender and our perceptions of the gender of others. The theoretical underpinnings, the relative contributions of biological and psychosocial influences and the precise mechanisms involved in the development of our own genderedness are thus only peripheral to the central considerations of this research. However, this sense of one’s self as being masculine or feminine has consistently been reported, as have individual differences in direction and degree.

**Context, behaviour, and self-perceptions**

In an attempt to account for the range of findings on gender differences, Deaux and Major (1987) proposed an interactive, context-dependent model of gender. These authors stress that the interactive social context is central to “the enactment of gender” (p. 370) and incorporate immediate and proximal influences on gendered behaviour in adulthood. Rather than keeping

---

10 For a comprehensive and recent summary of these issues see Leaper (2013).
the focus on the initial process of developing a percept of one’s own gender—distal causes—Deaux and Major emphasize the immediate contextual aspects related to social interaction where the perceiver, the target, and the situation are all in play. Gender-related behaviour is in this way acknowledged as emerging from the specifics of the goals and expectations of the players and on contextual aspects in a given social situation. The resulting model accommodates both stability and flexibility in gender-related social behaviours. This raises a question as to whether situational interaction affects only an individual’s gender behaviour, or whether their inner sense of their own gender identity can also be affected by transitory contextual aspects.

Ashmore (1990) wrote that self-gender does seem to be modified by personal experiences and events in the life-stage. Burke and Cast (1997) subsequently demonstrated such apparent modification of the gender identities in a study of 574 couples in the first three years of married life. Although making the point that gender identity largely was stable over time, Burke and Cast found that taking the role of one’s spouse (i.e., identifying with the role of one’s partner) and, to an even greater extent, the birth of a child, were associated with shifts in gender identity. Thus, in these couples, both partners experienced shifts in their gender identities as a result of social psychological processes.

So, despite the purportedly ‘essential’ nature of gender self-identity, there is research indicating a somewhat fluid nature to this aspect of self (also see Frable, 1997; Hundhammer & Mussweiler, 2012). Thus, it appears that patterns of masculinity and femininity not only shift over time within a population (Twenge, 1997), but that an individual’s gender self-identity is labile through adulthood (Burke, 2006; Burke & Cast, 1997; Leszczynski, 2009).

Evidence of this lability is not limited to major life events either; rather, indices of gender identity have been found to be affected by influences of a more fleeting, or situational (Reilly & Neumann, 2013), nature. For example, Hundhammer and Mussweiler (2012) found that priming with cues related to sexuality shifted participants’ self-perceptions toward a more gender-
typical position. Indeed, gender self-identity appears to be quite markedly context-specific and self-reported measures of gender have been found to vary in both males and females depending on social context (Leaper, 2000; Leszczynski, 2009; Leszczynski & Strough, 2008; Pickard & Strough, 2003; Smith, Noll, & Bryant, 1999). To return to Deaux and Majors’ (1987) ideas, such context-specificity is likely to result from interactions between target and perceivers’ expectations and goals, and indeed, the study of social perception can perhaps provide some more pieces of the puzzle as to the nature of these self/other interactions.

Social perception

Over 60 years ago, a revolution in thinking about sensory perception occurred whereby the idea of perception as a passive reception of objective reality gave way to one where the perceiver was assigned a far more dynamic role. One of the seminal papers of that time was by Bruner and Goodman (1947), who reported that judgements of coin size by children from economically well-off families systematically differed from judgements made by children from “poor” families. Bruner subsequently estimated that around 300 pieces of research and theoretical examination were published within ten years of that 1947 paper on or related to the influence of “extra-stimulus factors” on perception (Bruner, 1957, p. 123). This movement became known as the ‘New Look’ and the constructive role of the perceiver was central to it. Although not without its critics (for an overview see Erdelyi, 1974), it now seems clear that ‘inner states’ can and do affect the way the world, or some specific aspect of it, is perceived (or at least ‘judged’), and a number of theorists regard this as an adaptive phenomenon (Neuhoff, Long, & Worthington, 2012; Proffitt, 2006; Stefanucci, Gagnon, & Lessard, 2011).

Certainly, it is not difficult to envisage an adaptive role for motivational forces acting on perceptual processes, for example, hunger influencing our visual perception relating to food cues (Radel & Clément-Guillotin, 2012). Also highly plausible are results from research on inner

---

11 For a contemporary (and somewhat quirky) experiment looking at influences on visual perception beyond pure “retinal input” see (van der Hoort, Guterstam, & Ehrsson, 2011).
states affecting visual perception such as that inclines appear steeper when an observer is feeling tired, is carrying a heavy load, or is elderly or unwell (Bhalla & Proffitt, 1999), or a water bottle seeming nearer when one is thirsty (Balcetis & Dunning, 2010). These types of altered perception also have been linked to the availability, or perhaps more typically scarcity, of psychosocial resources such that with the availability of sufficient resources the ‘threat’ aspect can be ameliorated (Gorman, Harber, Shiffrar, & Quigley, 2012; Harber, Einev-Cohen, & Lang, 2008; Harber, Yeung, & Iacovelli, 2011). For example, Doerrfeld, Sebanz, and Shiffrar (2012) demonstrated that the weight of a box was assessed as lighter when participants expected to share the lifting of it with another person than when they expected to have to lift it alone. Further, the weight of the box was estimated to be lighter when the expected co-lifter appeared healthy and able-bodied rather than injured.

Stokes (2012) wrote of the influence of motivational forces on perception from a philosophical perspective and describes examples that he regards as evidence that “desires and desire-like states may influence perceptual experience in a non-externally mediated way” (p. 477). At its most blunt, this idea may equate to something like ‘we see what we want to see; we hear what we want to hear’ and is in direct contrast to a concept of sensory perception being purely objective and “cognitively impenetrable” (p. 478). An example of the kind of evidence cited by Stokes is a study by Epstein (1961, as cited in Stokes, 2012) where a relationship was found between hunger state and food related activity responses to Rorschach images. Epstein found that food deprivation resulted in respondents more often identifying ambiguous images as being related to food activities. Stokes goes on to propose his orectic penetration hypothesis as accounting for this type of ‘cognitive penetration’. The idea being that the appetitive, or desire, state penetrates (and thus affects) perception.

---

12 Up to 8 hours.
13 This is not inconsistent with the idea of a visual ‘search image’ in birds and other animals (Tinbergen, 1960).
If we are to view orectic, or appetitive, forces as drivers of cognitive penetration, then social perception would be another likely area for these phenomena to occur. Of course, it is such social influences on perception that are of primary relevance to this work and there is a growing body of evidence for these.

Proffitt (2006) outlined the evolutionary argument for the social advantages of human visual perception being sensitive to inner states including motivational and emotional factors as well as to objective characteristics of the visual stimulus. Much of the research in these areas involves the use of human face images as visual stimuli and it seems that inner states, or top-down information, can indeed influence our visual perception of others. For example, Halberstadt, Winkielman, Niedenthal, and Dalle (2009) reported top-down influences not only on judgements regarding facial emotions of others, but on participants’ facial movements when they were asked to reproduce observed expressions, a behavioural indicator of their actual perception. This type of observation is by no means limited to face stimuli though; indeed, reporting on a study of perception of PLWs, Sumi (2000) concluded “The detection of gait-signals is not only perception-dependent but also observer-dependent” (p. 132).

A full review of the literature on social/ perceptual interactions is not the intention here, but interestingly, some studies have uncovered a relationship between affiliative social state and temperature. Zhong and Leonardelli (2008) found that social exclusion (or recalling social exclusion) was associated with the perception of lower ambient temperature and with an increased desire for warm food and drink. More recently, Fay and Maner (2012) reported that people primed with warmth reported a greater level of affiliative drive. It is worth considering the evidence, across a number of characteristics, of influences of the ‘self’ on judgements of the ‘other’, in other words, the influence of characteristics of the perceiver on their percept of the target.
Self/other perception

Within the field of evolutionary psychology aspects of self have consistently been demonstrated to be associated with preferences (e.g., mate preference, voice pitch, etc.). Preference for voice pitch is a case in point. Women tend to prefer a deeper (i.e., lower frequency) male voice (Collins, 2000), while men prefer the opposite in women (Collins & Missing, 2003); but interestingly, this preference appears to be mediated by characteristics of the observer (Feinberg et al., 2012; Vukovic et al., 2008; Vukovic et al., 2010). For example, hormonal fluctuations across the female menstrual cycle have been reported to influence both women’s preferences for frequency in a male voice (Feinberg et al., 2006; Puts, 2005) and men’s attractiveness ratings of women’s voices (Pipitone & Gallup Jr, 2008).

The prevailing view on this phenomenon, and others related to it, is that these patterns of preferences are adaptive in evolutionary terms and are related to fitness; indeed, Pipitone and Gallup Jr (2008) state that the human voice is “...an honest signal of fitness” (p. 268). In fact, several different characteristics regarded as being indicators of overall femininity have been found to coincide in women; these include body shape, voice pitch, and facial attractiveness (Collins & Missing, 2003; Feinberg et al., 2005; Thornhill & Grammer, 1999). This seems also to be true of males, with interrelationships occurring between such characteristics as facial masculinity, testosterone level, voice pitch, physical strength, and dominance (Barber, 1995; Dabbs Jr & Mallinger, 1999; Knussmann & Sperwien, 1988; Penton-Voak & Chen, 2004; Sell et al., 2010; Thornhill & Gangestad, 1999; Wolff & Puts, 2010). Although the patterns are somewhat complex, context dependent, and vary as a function of whether the mating strategy is short or long-term (Feinberg et al., 2012; Moore et al., 2009), it seems that female

---

14 It should be noted that, although the literature is dominated by studies consistent with those mentioned here, such findings are being challenged (see Harris, Chabot, & Mickes, 2013 for a direct refutation).

15 In addition to being influenced by these labile endogenous factors, it is claimed that preference judgements are also sensitive to environmental factors. For example, there is an increased preference for femininity in faces of both sexes when social support is at a premium (Watkins, DeBruine, Little, & Jones, 2012).
preferences for masculinity and male preferences for femininity are associated with individual hormonal differences (Gangestad & Thornhill, 2008; Little, Burris, Petrie, Jones, & Roberts, 2013; Little & Jones, 2012; Little, Jones, & Burris, 2007; Little et al., 2010; Roney & Simmons, 2008; van der Zwan & Herbert, 2012; Welling et al., 2007; Welling et al., 2008).

Here again, more stable or enduring traits appear to be in play. To return to voice preferences for a moment, Vukovic et al. (2010) found that the pitch of women’s own voices predicted their preference for male voice pitch. Specifically, along with the overall trend for women to prefer lower pitched male voices over higher, women whose own voice was higher pitched (i.e., more feminine) showed stronger preferences for lower pitched (i.e., more masculine) male voices. Those authors took this finding to be accretive evidence for the overall idea that high-value females can better afford to target more masculine men than their less attractive, and thus lower-value, sisters (Grammer, Fink, Møller, & Thornhill, 2003; Little, Burt, Penton-Voak, & Perrett, 2001; Penton-Voak et al., 2003; Vukovic et al., 2008). Consistent with this idea, males’ own level of attractiveness was related to their preference for femininity in a prospective female partner (Burriss, Welling, & Puts, 2011b). Specifically, attractive men show stronger preferences for facial femininity in a short-term mate than men who are less attractive.

Similarly, preferences for relative partner height—another comparatively stable and sexually dimorphic characteristic—have been found to be mediated by own-height, at least in samples from Western countries (Fink, Neave, Brewer, & Pawlowski, 2007; Pawlowski, 2003). A recent study tested this theory of ‘condition-dependent mate choice’ in a novel way, scanning participant’s bodies in 3D to yield a range of measures of sexually dimorphic characteristics and then examining self/other relationships in expressed preferences (Price, Pound, Dunn, Hopkins, & Kang, 2013). In this way the authors were testing, using multiple indices, whether and to what extent males’ and females’ own level of ‘attractiveness’ was related their expressed preferences.

16 For a review, see Little, Connely, Feinberg, Jones, and Roberts (2011).
17 Although this may vary across cultures (Sorokowski, Sorokowska, Fink, & Mberira, 2012).
for attractiveness in opposite-sex bodies. This can be thought of as a kind of ‘mate value’ effect: individuals of high mate value can ‘afford’ a preference for higher value mates. Results were not unequivocal in that study, but reasonable support was found for condition-dependent choices made by males, to which less attention had previously been given, and somewhat softer support for female choices.

So, although the evidence for condition-dependent mate preferences is quite compelling, it cannot be assumed that demonstrating a preference for some characteristic in a potential mate is the same as perceiving things differently according to self-referential and context specific factors (the true focus of this work). But, indeed, systematic differences in perception related to individual traits of the observer have been taken as evidence of perceptual differences. Park, van Leeuwen, and Stephen (2012) found that unattractive faces were rated as significantly less attractive by observers high in pathogen disgust compared to those observers with lower disgust sensitivity. The authors of that study liken this finding to some of those studies on state-dependent perception mentioned earlier.  

The other two studies I will consider here are perhaps even more relevant to the central considerations of this thesis. In 2008, Lee, Loewenstein, Ariely, Hong, and Young, via a huge data set from the attractiveness rating and dating website www.HOTorNOT.com, explored whether or not individual’s own attractiveness was related to their attractiveness ratings of others. Those authors reported that it was not: Although it did affect their date-requesting behaviour, neither males’ nor females’ attractiveness ratings of others were related to their own level of attractiveness as rated by other members of the site. In the same year, however, Montoya (2008) conducted a series of studies and reported just the opposite: that ratings of individuals’ own objective attractiveness were inversely related to their ratings of target attractiveness.

---

18 Specifically, to Balcetis and Dunning (2010), Proffitt (2006), and Stefanucci et al. (2011).
19 www.HOTorNOT.com has changed its business model since 2005 when Lee et al’s (2008) data collection took place and the site no longer works in the same way as was reported in that study.
Thus, more physically attractive perceivers in Montoya’s study consistently rated targets as less attractive than did perceivers of lower attractiveness.

Those two studies obviously asked very similar questions but reported directly opposing results. There are a few details worth noting with the studies that may explain the difference. Lee et al. (2008), although utilising a very large data set, used a self-selecting sample. Specifically, their sample consisted of individuals with a pre-existing membership of www.HOTorNOT.com. It does seem plausible that people with an interest in rating the attractiveness of others, in having their own attractiveness rated by others, and/or in using the dating service provided through the site may not be entirely representative of the broader population. Indeed, members contributing data to the Lee et al. study provided attractiveness ratings on a mean of 82 images, with a standard deviation of 209 (p. 671), so it seems that a number of these people voluntarily rated a very high number of images (and thus were presumably extremely interested in attractiveness). Also, males comprised just over 79% of the sample contributing attractiveness ratings. Given there was a sex difference in attractiveness rating tendencies overall, with males consistently assigning higher ratings than females, this is a potential shortcoming of the Lee et al. (2008) study. In contrast, Montoya’s (2008) participants were a more general university sample and were more closely balanced in terms of sex. In addition, the nature of the images used in that study was likely to have been more ‘controlled’ than those that were popular on HOTorNOT.com.

Thus, with fewer concerns regarding participants in the study, Montoya (2008) seems to have provided the more valid test of the question as to whether our own level of attractiveness is at play in our evaluations of others’ attractiveness. The answer he delivered was ‘yes’.

---

20 It may or may not be relevant that two of the authors were founders of www.HOTorNOT.com.
21 As it has been claimed there is in rating one’s own attractiveness (Gabriel, Critelli, & Ee, 1994).
22 Indeed both the limitations mentioned here were acknowledged by the authors.
23 Participant numbers were reported by sex for studies 2-4 and 48.4% of the 275 participants in those studies were male (Montoya, 2008).
24 The author did not see the original www.HOTorNOT.com site, but word of mouth from multiple sources implies that high ratings were mostly achieved by those posting the most ‘revealing’ or ‘provocative’ images.
compared to an observer of average attractiveness, an observer one standard deviation more attractive rated targets as significantly less attractive. Accordingly, an observer one standard deviation less attractive assigned significantly higher attractiveness ratings. It is worth noting that no effect of subjective (i.e., self-rated) attractiveness was found on ratings assigned to others. Further, these results were based not on preferences, but on perceived attractiveness, a subtle but important distinction. Attractive observers perceived others to be less attractive than did less-attractive observers. Indeed, Montoya (2008) suggested that an assumption that the process of evaluating the attractiveness of others is an ‘objective’ one is erroneous.

Similar questions have been asked about sex and gender, although one needs to look back over 30 years. Lippa (1983) considered observer characteristics—including gender role—and the relationship between those and perceptions of target sex, attractiveness, and typicality. In that study, Lippa found that males tended more strongly than females to classify targets by sex, as did sex-typed\textsuperscript{25} compared to non-sex-typed individuals. Gender role was also demonstrated to be influential in observers’ selections of attractive male and female bodies. Specifically, females with a more feminine gender role and males with a more masculine gender role demonstrated greater distances between attractive female and male bodies. Lippa (1983) did find these patterns to be quite complex, and to be mediated by sex; however, this study provided some intriguing early evidence of the influence of observer sex and gender on judgements of target ‘others’.

**Other/self perception**

If the self does have such an influence on other-perception, what of the reverse; can others affect the way we perceive ourselves? There is a robust literature around visual adaptation to faces whereby consistently viewing faces with a particular characteristic systematically affects perception of subsequently presented faces (Buckingham et al., 2006; Little, DeBruine, Jones,

\textsuperscript{25} Broadly, this means participants who subscribed more strongly to either femininity or masculinity in relative terms.
Waitt, 2008; Rhodes, Jeffery, Watson, Clifford, & Nakayama, 2003). Similarly, it has been reported that viewing particularly attractive individuals can reduce attractiveness ratings for subsequently presented individuals (Kenrick & Gutierres, 1980; Melamed & Moss, 1975).

Of particular interest are studies that have demonstrated that prolonged viewing of a face of one sex will shift perception of a previously sex-neutral face such that it is judged to be of the opposite sex to the adapting stimulus (Little, DeBruine, & Jones, 2005; Rhodes et al., 2004; Watson & Clifford, 2006). That is, extended viewing of a male face can cause a subsequently viewed neutral face to appear female and vice versa. Interestingly, this type of effect has also been demonstrated via PLWs (Troje, Sadr, Geyer, & Nakayama, 2006; van der Zwan et al., 2009). Although these after-effects experiments could be argued to be qualitatively different to simple exposure-based shifts, the main point here is that it seems that person-context can influence person-perception, at least perception of other persons. To return to the question at hand though, can social viewing history influence self-perception?

Sixty years ago, Festinger (1954) proposed that in the absence of absolute references people evaluate aspects of themselves relative to others and that the more similar the ‘other’ the more likely are such comparisons. Gutierres, Kenrick, and Partch (1999) suggest that self-judgements can also be subject to ‘contrast effects’ such as those described above, and indeed, such effects have been demonstrated. Morse and Gergen (1970) found that participants’ self-esteem was affected by exposure to either ‘Mr Clean’ or ‘Mr Dirty’: self-esteem rose in response to an encounter with a dishevelled, dazed ‘other’ and lowered when the encounter was with a well-groomed, socially desirable ‘other’. It was some years before an empirical study of contrast effects on self-perceived physical attractiveness was conducted, but when it was Cash et al. (1983) did indeed find that women who spent time viewing photographs of attractive others subsequently rated their own physical attractiveness as significantly lower than a comparable
group who had viewed photographs of ‘not attractive’ others. Brown, Novick, Lord, and Richards (1992) extended that research (although not so far as to consider male participants), and again found that viewing an unattractive target increased women’s self-perceived attractiveness and vice versa. Broadly consistent with previous work (Cash et al., 1983), and with Festinger’s (1954) theory, Brown et al. (1992) found that this contrast effect was all but reversed when the target was represented as similar to the participant.

Thornton and Moore (1993) were the first to consider males in a study of this other/self effect and they found that, indeed, both males and females rated their own attractiveness lower after exposure to same sex individuals who were highly attractive and vice versa. Later, Gutierres et al. (1999), basing their questions on the idea of different parental investment from evolutionary theory (Trivers, 1972), tested the effects of high and low dominance and high and low attractiveness in a competitor on both females’ and males’ self-ratings. Although their results on self-rated attractiveness and self-rated dominance were complex, those authors did find different effects for males and females, and participants’ appraisals of their own mate value shifted in the directions hypothesised. Direct assessments of own attractiveness and own dominance failed to follow the hypothesised pattern. Gutierres et al. (1999) suggested that the shifts in mate value appraisals may have been a function of perceived changes in competitor population.

This is consistent with the ‘market value’ explanation alluded to earlier, where an individual’s mate value is not absolute, but rather is tied to the prevailing conditions of the market and their own position relative to that market (see for example Little et al., 2001). If the perceived proportion of attractive individuals in the population is reduced, demand for that individual is likely to increase (Pawłowski & Dunbar, 1999).

Little and Mannion (2006) set out empirically to test for behavioural evidence of a market value effect. They found that, once again, viewing images of either attractive or unattractive others

---

26 The Cash et al. (1983) study included only female participants.
caused predictable shifts in women’s self-perceived attractiveness. Specifically, women who viewed images of attractive other women rated their own level of attractiveness as lower than before they had viewed the images and those who had viewed unattractive others increased their self-assessed attractiveness. This was the case for self-ratings of both facial and body attractiveness (Little & Mannion, 2006).

Further, Little and Mannion (2006) found that women’s subsequently expressed preferences for masculinity in male faces also shifted as a function of their social viewing history, and this was in a direction consistent with market value forces. Women in the unattractive condition demonstrated a significantly greater preference for male facial masculinity than did those who had viewed attractive images. The authors did find a positive relationship between the magnitude of change in self-perceived body attractiveness and the strength of preference for sexual dimorphism in the male faces. This too is consistent with what one would expect if women were sensitive to shifts in the population of competitors and aware of the resulting shift in their relative market value. When the competition becomes less attractive one’s market value increases and the likelihood of success with a higher value potential mate rises. Although not completely straightforward (see for example Perrett et al., 1998), masculinity, or sexual dimorphism is one potential signal of mate value in men (Little et al., 2001; Thornhill & Gangestad, 1999) and, as has been highlighted by the Little and Mannion (2006) study, seems to have utility for teasing out information about what women find attractive in a potential mate.

Chapter Summary

Sex and gender are central aspects of our social selves. Sex is regarded as one of the cardinal social categories into which we immediately attempt to fit any unfamiliar person. While sometimes being used as a term interchangeable with sex, gender is here defined as the strength of one’s femininity and/or masculinity. Although generally regarded as stable across time, there is evidence that one’s gender identity may be subject to effects of experience and context and thus be somewhat dynamic in nature.
Aspects of gender are associated with the idea of signalling ‘good genes’ (see for example Roberts & Little, 2008) and thus with other putative indices of mate value. Attractiveness is of particular relevance here as objective ratings of observer attractiveness have been found inversely to predict those observers’ attractiveness ratings of others (Montoya, 2008). That is, more attractive people rate others as less attractive. Further, and extending the idea of oneself having a particular value within a ‘market’, Little and Mannion (2006) found that viewing images of less attractive others caused women to increase their ratings of their own attractiveness and vice versa. Those authors also found that women exposed to less attractive others increased their preference for facial masculinity and that the magnitude of the shift in self-perceived attractiveness was correlated with the degree of preference for masculinity in male faces. Thus, the perception of attractiveness can be regarded, at least to some extent, as self-referential and as context-dependent. Given the relationship between attractiveness and genderedness, questions arise from here as to whether, in what ways, and to what extent there also may be such interplay between self-perceived gender and the perception of the gender of others.

Setting the Scene for...

The studies to be reported here are intended to extend this picture in three ways. The first: by examining further the relationships between sex perception and gender perception with a consideration of the relative contributions of visual form and motion cues to observers’ judgements. The second: by looking more closely at some characteristics of the observer related to gender, at those endogenous factors that may be associated with the judgements individuals make about others. Finally, by turning our attention in the other direction and teasing apart what effect observing others may have on our perception of our own genderedness.
Chapter 2 - Operationalising

Introduction

As was outlined in chapter 1, our perception of self and our perception of others appear to be far from discrete, objective processes. On the contrary, as illustrated particularly by the literature on attractiveness, these processes, and the products of them, have been found to be interactive, context-dependent, and prone to contrast effects. The questions arise whether sex and gender will be similarly context dependent and prone to contrast effects and, if so, which aspects, or cues, are involved in forming these potentially dynamic percepts. The purpose of the current studies was to explore the relative contributions of various exogenous cues to sex and gender, whether and to what extent gender judgments are self-referential, and whether social viewing history can shift gender self-perception. In considering aspects of sex and gender, both endogenous and exogenous, experimentally, it was first necessary to operationalise these constructs and to establish measurement parameters allowing them not only to be defined, but to be quantified.

Measuring gender

Gender, as may seem obvious, is a complex and multi-dimensional characteristic (Smiler & Epstein, 2010). To assign a number to it is potentially to miss some, or even much, of the undoubted subtlety and complexity of the interpersonal, and perhaps intrapersonal, variability in our lived experience. To calculate a ‘gender score’ for example, a function of an individual’s responses to groups of questions essentially intended to measure interpersonal warmth, nurturance, self-assertion, and dominance (Deaux, 1985), seems not to capture what it is to feel feminine or masculine.

Of course, there are numerous ways that gender can and has been represented and measured, and each measure has arisen from some theoretical or structural concept of gender. It is likely that none are entirely devoid of limitations. Similarly, with such a multi-dimensional construct,
whatever range of measures is selected to represent it is unlikely to capture a fully nuanced picture of any individual’s ‘genderedness’. Nevertheless, in order to tackle the questions that I here seek to answer (or at least, to explore), a start must be made.

Thus, in the research to be reported here, a number of broad and novel constructs have been set up as putative indices of gender. The use of multiple indices was intended to allow for both relative and absolute ideas of gender, and to maximise the likelihood of identifying any relationships that might exist among the characteristics being considered. Specifically, two measures of self-reported gender have been used in this work—one more overt, or explicit, than the other—and two non-self-report measures.

**Gender role**

An index representing the extent to which individuals see themselves as conforming to a range of characteristics that culturally are regarded as more appropriate for, or pertinent to, one sex than the other is one way to measure gender (Smiler & Epstein, 2010). Perhaps the most widely used instrument for measuring gender role is the Bem Sex Role Inventory (BSRI; Bem, 1974). The BSRI emerged from a masculinity/femininity research tradition that, until Constantinople (1973) suggested otherwise, treated masculinity and femininity as the poles of a single continuum. With her newly developed instrument, Bem (1974) forged the way toward a more nuanced consideration of gender roles. She did this by treating masculinity and femininity as independent dimensions and taking into account individuals’ relative scores on these two (Hoffman & Borders, 2001; Holt & Ellis, 1998). Bem (1974) developed the BSRI to discriminate empirically between highly ‘sex-typed’ individuals—those who had internalised society’s standards for each sex—and ‘androgynous’ individuals—those who scored similarly on both masculinity and femininity.

Despite its continued popularity, and bearing in mind the role of societal context in gender role understanding, there have been a number of researchers who have expressed reservations as to
the applicability of the BSRI to an Australian sample (Antill & Cunningham, 1979; Antill & Russell, 1980; Rowland, 1977; Russell, Antill, & Cunningham, 1978). To address this, the Personal Description Questionnaire (PDQ; Antill, Cunningham, Russell, & Thompson, 1981)\(^{27}\) was developed. The motivation behind the PDQ was to better tap aspects of masculinity and femininity as they applied in Australia.

Thus, the first measure of self-reported gender used in the current study was the PDQ, a measure of the extent to which an individual endorses various characteristics, or traits, associated with gender role. The PDQ, via 50 self-report items, yields scores on both masculinity and femininity scales as well as a social desirability scale (Antill et al., 1981; Farnill & Ball, 1985; Russell & Antill, 1984).

The reliability of the PDQ has been reported to be reasonable (Hong, Kavanagh, & Tippet, 1983). The PDQ also incorporates both positive and negative items—or socially desirable and socially undesirable items—in the femininity and masculinity scales; this addressed a criticism of the BSRI, which contains only items related to desirable attributes (Antill et al., 1981; Marsh & Myers, 1986). Although not without its own complexities and potential shortcomings (Hong & Grambower, 1986; Russell & Antill, 1984), as the research reported here was conducted entirely with Australian participants, the decision was taken to use the PDQ to measure gender role.

**Self-perceived gender**

The second index of self-reported gender was a very simple one designed explicitly to provide a perception-based measure of self-perceived gender. Observers were asked to choose the walker that they regard to be “most like me”. Henceforth this will be referred to as ‘self-perceived gender’ (SPG). Being derived essentially from the range of PLWs that also served as stimuli, SPG provided a neat parallel between the indices of observer and target gender. This

---

\(^{27}\) The PDQ is also sometimes referred to as the “Australian Sex Role Scale”.
was designed to allow a meaningful examination of the relationship between self and other in terms of gender cues carried by gait.

Digit Ratio as an index of gender

The relative length of the second and fourth fingers has strong appeal as a potential correlate of gender and, even more tantalising, as an objective index of it. Commonly regarded as a function of exposure to prenatal sex hormones (Breedlove, 1994; Lutchmaya, Baron-Cohen, Raggatt, Knickmeyer, & Manning, 2004; Manning, 2002), the ratio derived from second finger (2D) length divided by the fourth finger (4D) length (2D:4D) is reported to be a sexually dimorphic feature in humans (Baker, 1888; Manning, 2002; Peters, Mackenzie, & Bryden, 2002; Peters, Tan, Kang, Teixeira, & Mandal, 2002) and is undoubtedly an interval level variable. Generally, a longer fourth finger relative to the second finger is exhibited by males, whilst females’ second and fourth fingers tend to be closer to the same length (Baker, 1888; Peters, Mackenzie, et al., 2002; Peters, Tan, et al., 2002).

Certain authors have found 2D:4D to be of broad and profound promise; perhaps most notable is John Manning (see for example the seminal paper: Manning, Scutt, Wilson, & Lewis-Jones, 1998), who has written on 2D:4D, its sexually dimorphic nature, and various of its correlates. Some examples of this line of research include reports on the relationships between digit ratio and spatial skills (Csathó et al., 2001; Peters, Manning, & Reimers, 2007; Reilly & Neumann, 2013; Sanders, Berczkei, Csathó, & Manning, 2005), dominance (Manning & Fink, 2008; Neave, Laing, Fink, & Manning, 2003), sexuality (Manning et al., 2000; Manning, Churchill, & Peters, 2007; Manning & Fink, 2008), and aspects of personality (Austin, Manning, McInroy, &

---

28 The second digit is also referred to both colloquially and in the literature as the ‘index’ finger.
29 The fourth digit is also referred to both colloquially and in the literature as the ‘ring’ finger.
Most germane to the present research though are a handful of studies that concern 2D:4D and measures associated with gender. Although his work predated the idea of prenatal steroid hormones as drivers of digit ratio, Wilson (1983) found that women who had a shorter forefinger relative to their ring finger—so, lower 2D:4D ratios—were more likely to report themselves as being more ‘assertive and competitive’. More recently, in a sample that included participants with female to male gender identity disorder (GID), Hisasue, Sasaki, Tsukamoto, and Horie (2012) found 2D:4D to correlate significantly with a novel measure of gender identity. However, that measure was quite specific to GID and in fact, seems to relate more closely to sex-identity than to gender identity as the terms have been defined herein.  

Most relevant among these though, was a study by Csathó et al. (2003). Those authors found that 2D:4D was significantly correlated with Bem Sex Role Inventory (BSRI; 1974) scores in women. Specifically, Csathó et al. (2003) found that women who scored in the higher range (more masculine) on the BSRI had lower 2D:4D ratios and women that scored in the lower range (more feminine) on the BSRI had higher 2D:4D ratios. The idea that this could be the first evidence of a link between self-reported gender-identity and an objective physical characteristic, at least in women, is intriguing.

Further, Beech and Mackintosh (2005) explored scores on the BSRI and 2D:4D in both males and females as part of a study on handwriting style. They reported that in the total sample the two variables were significantly correlated; specifically, that the digit ratio of both the left and the right hands were correlated with the femininity scale of the BSRI (BSRI-F), and that the

---

30 Indeed, an advanced search of Google Scholar specifying “Manning” as author and “digit ratio” as the search term returned 308 results. (Search conducted on November 20, 2013 at 09:23 AEDT via http://scholar.google.com.au)
31 Hisasue et al. (2012) used the Gender Identity Scale (GIS), the items of which relate to the strength of the respondent’s sense of themselves as a male or female, which differs from the idea of masculinity and femininity as quantifiable aspects of gender.
masculinity scale of the BSRI (BSRI-M) was correlated with right hand but not left hand digit ratio.

Perhaps unsurprisingly though, all is not as straightforward as one would like. Rammsayer and Troche (2007), in a study with a sample of over 700 males and females, did not identify any link between BSRI scores and 2D:4D in women, but in males found a significant correlation between scores on BSRI-F and the 2D:4D of the left hand. In an even larger study, Lippa (2006) found no association between BSRI scores and 2D:4D in either males or females, however, he did find small covariations between 2D:4D and other gender-related indices for males and for females. Of particular interest was Lippa’s explicit 6-item self-ascribed masculinity-femininity scale, scores on which were found to correlate (albeit weakly) with 2D:4D in males. However, there may be an argument that, with a sample comprising around 50% homosexual participants, Lippa’s study may not reflect patterns found in the general population as sex differences in gender-related characteristics for homosexual participants tended to be less than those for heterosexual participants (Lippa, 2000, 2002). If this is the case, the possibility exists that real effects could have been missed in that study.

Other studies further confound the idea of a clear relationship between 2D:4D and gender. Troche, Weber, Hennigs, Andresen, and Rammsayer (2007) studied the relationship between digit ratio and gender role in samples from four European countries and reported not only a failure to find any such association, but that right hand 2D:4D was not found to be sexually dimorphic in three out of four of those national samples. In a meta-analysis, Voracek and colleagues (2011) found a very small but significant correlation between left-hand digit ratio and femininity scores for males, however that result hinged on the inclusion of a single study among heterosexual males or females from their original data gathered from three studies using

---

32 This was very different to the findings of a meta-analysis of 116 samples by Hönkopp and Watson (2010) where sex differences in 2D:4D were found to be larger in the right hand than the left hand.

33 The study that pushed the meta-analysis to significance was that of Rammsayer and Troche (2007) mentioned in the preceding paragraph.
increasingly large samples. Similarly, Schmukle, Liesenfeld, Back, and Egloff (2007), while finding a significant correlation between 2D:4D and scores on the BSRI for males \(^{34}\), posited that the relationship between 2D:4D and gender self-concept is more effectively demonstrated using *implicit* means of measuring gender. Even so, those authors found no such relationship between either the explicit or implicit association tests of gender self-concept and 2D:4D for females and thus failed to validate Csathó et al.'s (2003) results.

Taking these and other reports into account, this area of 2D:4D literature, even in the most optimistic light, could only be described as deeply equivocal in nature (for example, see: Fine, Jordan-Young, Kaiser, & Rippon, 2013; Grossi & Fine, 2012; Rammsayer & Troche, 2007; Valla & Ceci, 2011)\(^ {35}\). Indeed, even authors who regularly publish in the area concede that digit ratio is a somewhat troublesome beast: "In general, the sex difference\(^ {36}\) between finger length ratios is relatively weak, and not entirely consistent across studies" (Peters, Mackenzie, et al., 2002, p. 215). On top of all this, the claims and extrapolations arising from this body of work overlaps with the even broader ‘brain organisation’ hypothesis (see Breedlove, 2010 for a review).

**In summary**, the literature on the relationship between digit ratio (2D:4D) and other putative indices of genderedness is far from a harmonious endorsement. However, if biological aspects are regarded as influencing gender (Hines, 2003; Udry, 2000), there seems at present no superior index of these than 2D:4D. Indeed, this literature continues to build\(^ {37}\) and, despite the criticisms, digit ratio is still treated as a fairly robust, sexually dimorphic indicator of the action of prenatal steroid hormones. On that basis, for the purposes of the research to be reported

---

\(^{34}\) To add further ambiguity to the mix, in the Schmukle et al. (2007) study the relationship was between right hand digit ratio and M-F scores on the BSRI, whereas Rammsayer and Troche (2007) reported an association between left hand digit ratio and BSRI-F scores.

\(^{35}\) Particularly relevant is a paper by Galis, Ten Broek, Dongen, and Wijnaendts (2010) in which the authors suggest that postnatal environmental factors probably influence 2D:4D.

\(^{36}\) By this the authors mean the difference between males and females.

\(^{37}\) A search of a single scientific database, Science Direct ([www.sciencedirect.com](http://www.sciencedirect.com)), using the search term "2D:4D" (limited to journal articles) returned 113 papers with a publication date of 2013. (Search conducted at 11:28am December 12, 2013).
here 2D:4D represents an additional potential index of genderedness and therefore expands the possibilities for a broad investigation into aspects of self/other perception.

Cues to visual judgements of sex and gender

A consideration of the distinction between sex judgements and judgements of gender from the visual cues carried by PLWs was provided in chapter 1. There it was proposed that when making categorical judgements of sex from these displays three points are of key relevance:

1. the point on the continuum at which a walker is judged to be male (the male threshold)
2. the point at which a walker is judged to female (the female threshold), and
3. the point at which a walker is judged equally often to be male and female (the point of subjective sex-ambiguity).

To treat the proportion of female (or male) responses to a target when asked “is this walker female or male” as an index of perceived femininity and/or masculinity would be akin to treating the proportion of responses to a question about physical attractiveness as an index of desirability. Each pair of concepts is closely related, but are unlikely to map perfectly onto each other.

Prompting for explicit judgements of gender delivers a more nuanced and appropriate match to the full range of available PLW stimuli and avoids the fundamental absurdity of rating two ‘female’ walkers in terms of which appears ‘more female’. To rate a ‘female’ PLW as more or less feminine than another, however, is more conceptually and semantically meaningful.

Further, the introduction, and specifically, the addition, of judgements of gender to those of sex facilitates the teasing apart of these two constructs, which often are confused or at least poorly delineated. Thus, in the research reported here, the perception of femininity or masculinity overlays those points related to the perception sex.
Judgements of sex from PLWs yield a proportion of male responses and a proportion of female responses. Similarly, when an observer indicates whether she/he perceives a particular PLW stimulus to be “feminine or not?” or “masculine or not?” a subjectively derived ‘femininity point’ and ‘masculinity point’ can be calculated. In the work reported here, the femininity point was taken to be where an observer responded “feminine” to at least 60% (a majority) of presentations of a specific PLW, and to all others farther along the gender continuum in that direction. The distance between the masculinity point and the femininity point can be thought of as the ‘zone of ambiguity’ (D. Kozlowski, 2008), here described as the neutrality range, and this was a subjectively derived range, which differed from observer to observer in terms of both the anchor points and the magnitude of the zone. Explicating these points allowed the type of nuanced consideration of sex and gender alluded to previously.

A further element was explored here too: the relative contributions of structural (or form) cues and kinematic (or motion) cues to sex and to gender. For the purposes of the research undertaken here a set of PLWs were used wherein dissociable manipulations of both structural cues and kinematic cues to gender were possible. Stimuli thus varied in the direction and strength\(^{38}\) of visual cues to gender conveyed on each of these dimensions (see chapter 3 for details) resulting in three discrete sets of PLWs\(^{39}\): ‘coherent’ walkers (where structure and kinematics convey equivalent, or congruent, gender cues); ‘structure-only’ walkers (where kinematics are gender-neutral and variations in cues to gender are conveyed only via structure); and ‘motion-only’ walkers (where structural cues are gender-neutral and variations in cues to gender are conveyed only via kinematics).

In this way, relationships between the strength of visual cues to sex and to gender were able more subtly, and precisely, to be explored. For example, new questions were able to be asked such as how closely judgements of femininity mapped onto ‘female’ judgements across a range

\(^{38}\) Recall that the statistically gender-neutral point is at 0 and increments represent 1 standard deviation from that statistically gender-neutral anchor. Female walkers comprise the negative extent of the continuum (i.e., -1 through -6), male walkers the positive extent (i.e., +1 through +6).

\(^{39}\) Discrete but for the common structurally and kinematically gender-neutral walker (S0-M0).
of PLWs; whether manipulation of form cues without according motion cues differentially affected judgements of sex and of gender; and whether and to what extent context was able to shift the subjectively-derived zones of sex- and gender-ambiguity.

Chapter summary

Perception of self and of others, particularly in the area of physical attractiveness, appears to be interactive, context-dependent, and prone to contrast effects.

In an attempt to maximise the sensitivity of the research to be reported here, four measures of observer gender were selected. These were:

1. Masculinity and femininity scores from the PDQ contributed an index of gender role
2. A self-selected PLW from a range along a gender continuum yielded an index of self-perceived gender (SPG)
3. Digit ratio (2D:4D), which has been proposed as an index of sexual dimorphism.

Of these three, two measures were derived via self-report (1 and 2) and one more ‘objective’ (3); further, one was directly parallel to the stimuli employed in the research (2).

Those stimuli were PLWs representing human gait along a gender continuum from extremely feminine, through gender-neutral, to extremely masculine. Further, the stimuli conveyed coherent as well as dissociated structural and kinematic gender cues in order to allow analysis of the absolute and relative contributions of these two visual cues to gender and to sex. Most importantly, via the multi-dimensional means outlined in this chapter, the interplay between endogenous (viewer) factors and exogenous (stimulus) factors contributing to judgements of gender, and of sex, were considered.
Chapter 3 – Exogenous cues to judging sex and gender

Introduction

As outlined at the end of chapter 1, the studies to be reported here are intended to further our understanding of the processes at play when we consider interpersonal judgements of sex and gender. That will be done in three steps. The first of these, and the step with which this chapter is concerned, is an examination of the relationships between sex perception and gender perception with a consideration of the relative contributions of visual form and motion cues to observers’ judgements.

Recall that point light walkers (PLWs) are visual representations of human movement conveyed by a relatively small number of dots representing discrete points on a body. The viewer sees an array of dots on a computer screen that, as they begin to move, instantly seem to resolve into a percept of a moving human figure. PLWs have been used extensively as stimuli in visual perception tasks to convey—via both form (structure) cues and kinematic (motion) cues—a wide range of characteristics. Recall too that human observers are adept at judging sex from this class of stimulus (L. Kozlowski & Cutting, 1977; Mather & Murdoch, 1994; Pollick et al., 2005; Troje, 2002).

Even more germane to the current questions, some work has also been done on distinguishing the perception of sex from the perception of gender from cues conveyed by PLWs: Johnson and Tassinary (2005) found that sex judgements were largely based on morphological, or structural cues\(^{40}\), but that when those cues were absent observers were able to infer sex from judgements of gender via kinematic, or motion, cues.

Here, by systematically varying the degree of sexually dimorphic information conveyed by PLWs across those two dimensions (structure and motion)\(^{41}\), the relative and incremental contributions of each could be examined experimentally. This study was concerned with those

---

\(^{40}\) Johnson & Tassinary’s (2005) stimuli included explicit information about WHR.

\(^{41}\) See Table 2.1 for more detail.
exogenous cues—target characteristics—that inform judgements of sex and of gender. There were two aims here: to consider the relative contributions of structure and motion to judgements of sex and of gender, and to explicate the relationships between such judgements.

Methods

Data collection for the analyses reported in this chapter and for those to be reported in chapter 4 was conducted in one comprehensive study. In the interest of providing the reader with a thorough representation of the materials and procedures involved, the entire study is described here; however, data from the Personal Description Questionnaire and the digit ratio data are examined in chapter 4.

Participants

Participants were a convenience sample of 44 adult volunteer observers (19 females and 25 males) with normal or corrected-to-normal vision. The mean age of all observers was 35 years (SD=11.17; range 19-61) with males’ mean age being 33.4 years (SD=11.7; range 19-61) and females’ mean age being 38.58 (SD=9.97; range 19-55). The majority were university students. Observers were naive to the aims of the study. Observers gave informed consent and took part in all tasks. Data from one male participant was excluded from the PLW analyses reported in this chapter due to a large number (22%) of missing responses.

Apparatus

The Personal Description Questionnaire (PDQ) and all PLW stimuli were displayed on a standard 17” flatscreen CRT monitor in a light- and sound-attenuated testing room. The display resolution was 1024 x 768 pixels, refresh rate was set at 100Hz, colour resolution was 32 bit and luminance was calibrated. Observers were seated in a standard adjustable office chair and indicated their responses via key-presses on a standard Microsoft Wireless Multimedia Keyboard 1.0A (for the PLW tasks), via selecting the appropriate on-screen response box or typing information (in the

---

42 Following a common protocol within the area (see for example Armann & Bülthoff, 2009; Gaetano, van der Zwan, Blair, & Brooks, 2014).
case of the PDQ), or by providing their response verbally (see below). The monitor and the keyboard were situated so that the viewing distance from observer to screen was 57cm.

Visual (target) stimuli were PLWs generated with PointLightLab software. PointLightLab is a piece of custom-built software with the capacity to generate point-light movies or movies of lights attached to the joints of an otherwise invisible actor. Use of such movies is an industry-standard technique for probing the perceptual correlates of human biological motion presentations (Johansson, 1973). Further details are provided below.

Stimuli

Point Light stimuli consisted of frontal view figures arising from recording movements of human actors previously described in detail by Troje (2002) in his methods. All PLWs used in the present study comprised 15 dots (black in colour; 0.7cd/m²) presented against a grey background (12.2cd/m²). Dots represented the head, shoulders, mid-chest, elbows, wrists, mid-pelvis, hips, knees, and ankles of the figure. Individual point-lights subtended a visual angle of 0.3°; on average, whole walkers subtended 6.5° visual angle in width and 20.5° in height. The temporal aspects of the walking sequences were held constant across presentations and walkers.

Two dissociable classes of sexually dimorphic information are conveyed by the PLW stimuli. Firstly, ‘structural’ cues—cues to the body structure of the walker—are conveyed by the relative spatial location of the dots. Secondly, ‘motion’ cues—cues to the bodily gait movements of the walker—are conveyed by the motion paths of the individual dots. As illustrated in Figure 3.1 below, systematic changes in these cue types can shift the apparent gender of a PLW along a continuum from appearing extremely feminine (the walker at -6) through gender-neutral (the walker at 0) to extremely masculine (the walker at +6).

43 http://www.pointlightlab.com/index.html
Figure 3.1. Sampled representation of PLWs from the objective gender continuum developed by Troje (2002). The statistically neutral walker is at 0; increments represent 1 standard deviation. Female walkers comprise the negative extent of the continuum, male walkers the positive extent.

As per Troje (2002), three sets of PLW stimuli were employed here: ‘coherent’ walkers (where structure and kinematics convey equivalent, or congruent, cues to gender); ‘structure-only’ walkers (where kinematics are gender-neutral and variations in cues to gender are conveyed only via structure); and ‘motion-only’ walkers (where structural cues are gender-neutral and variations in cues to gender are conveyed only via kinematics). Details of the structural and kinematic cues conveyed by each stimulus are outlined in Table 3.1 below. Thus, the total number of PLWs employed was 37 (as the ‘0’ walker was common across the three stimulus sets).

Reproduced from chapter 1.

\[^{44}\text{Reproduced from chapter 1.}\]
Table 3.1

Range of PLWs used in the current studies showing the weighted gender cues conveyed in terms of motion and structure for each where ‘0’ is statistically gender-neutral and increments represent one standard deviation from that. Negative numbers represent cues into the ‘feminine’ range, positive toward the ‘masculine’.

<table>
<thead>
<tr>
<th>‘Coherent’ Walkers</th>
<th>‘Structure-only’ Walkers</th>
<th>‘Motion-only’ Walkers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Kinematics</td>
<td>Structure</td>
</tr>
<tr>
<td>-6</td>
<td>-6</td>
<td>-6</td>
</tr>
<tr>
<td>-5</td>
<td>-5</td>
<td>-5</td>
</tr>
<tr>
<td>-4</td>
<td>-4</td>
<td>-4</td>
</tr>
<tr>
<td>-3</td>
<td>-3</td>
<td>-3</td>
</tr>
<tr>
<td>-2</td>
<td>-2</td>
<td>-2</td>
</tr>
<tr>
<td>-1</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>+1</td>
<td>+1</td>
<td>+1</td>
</tr>
<tr>
<td>+2</td>
<td>+2</td>
<td>+2</td>
</tr>
<tr>
<td>+3</td>
<td>+3</td>
<td>+3</td>
</tr>
<tr>
<td>+4</td>
<td>+4</td>
<td>+4</td>
</tr>
<tr>
<td>+5</td>
<td>+5</td>
<td>+5</td>
</tr>
<tr>
<td>+6</td>
<td>+6</td>
<td>+6</td>
</tr>
</tbody>
</table>

PLWs across the gender continuum were used here in two ways: as discrete clips and as a continuous, interactive display. Where clips were employed, they were presented for 1,000 milliseconds. Where the interactive display was used, observers viewed a single continuous point-light figure, which could be dynamically controlled by the participant via the arrow keys on the computer keyboard. As the participant moved the arrow keys forward and back, the gender cues conveyed by the point-light walker changed forward and back—by increments of 1
SD—from exaggerated masculine (+6), through more gender-neutral walkers, to exaggerated female (-6) [refer to Figure 3.1]. In this display only the coherent stimuli were used.

Materials

The PDQ (Form A)\(^{45}\) (Antill et al., 1981) is a 50-item self-report instrument designed to measure gender role. The scale comprises 10 masculine positive items, 10 masculine negative, 10 feminine positive, 10 feminine negative, and 10 items measuring socially desirable responding. Thus, the PDQ allows the calculation of scores on the masculinity and femininity subscales for each participant as well as an index of socially desirable responding with 20 items each contributing to the masculinity and femininity subscales and the social subscale the product of 10 items.

Application of the PDQ

Items take the form of adjectives to which the respondent assigns a number from 1-7 reflecting self-applicability such that scores indicate the degree to which each adjective is self-endorsed [see Appendix A]. Items that load onto the femininity scale include both socially positive and socially negative items associated with femininity; for example, “humane” (positive) and “gullible” (negative). Items contributing to the masculinity scale include “daring” (positive) and “arrogant” (negative). The respondent is asked to respond by clicking on one of seven radio buttons corresponding to the degree to which they believe that item applies to them. The first button (coded as ‘1’) represents that the item is regarded by the respondent as “never or almost never true” of them while the button coded as ‘7’ represents “always or almost always true”. Demographic questions, in the form of participant age and sex, were added to the PDQ in this study.

\(^{45}\) Only Form A of the PDQ was used in this study; Forms A and B were used in study 2, which is reported in Chapter 5.
There are two forms of the PDQ: Form A and Form B; both were used in the current research. In the study relating to chapters 3 and 4 of this work, Form A was used as it has been recommended as the preferred form (Russell & Antill, 1984). In the study reported in chapter 5, both forms of the PDQ were used, Form A as a pre-treatment measure and Form B post-treatment. Agreement between the two forms has been reported to be high for the various gender sub-scales, and particularly for the masculinity sub-scale, with Russell and Antill (1984) finding a correlation of .72 for total masculinity scores on the two forms for both male and female respondents. The femininity sub-scale is less strongly correlated at .63 for male and .60 for female respondents (Russell & Antill, 1984 p. 15). However, the two forms are not directly compared in the work reported in this chapter; rather, in chapter 5 pre- (Form A) minus post-treatment (Form B) difference scores were calculated and those difference scores were compared across experimental conditions.

Although the PDQ can be used to classify respondents into one of four categories as those conducting earlier work on gender often did, this practice has several shortcomings (see Carothers & Reis, 2013, p. 402 for a succinct summary) and was not used here. Instead, in addition to scores on the femininity and masculinity scales, a composite score for gender role was calculated by dividing respondents’ femininity scores by their masculinity scores to yield the PDQ-F:M score. This is a novel variation on the subtraction method used on the BSRI and was designed to produce an overall score for gender role that considered the weighted relative contributions of endorsed ‘feminine’ and ‘masculine’ traits.

**Procedure**

Individuals who expressed interest in participating were provided with an information sheet and informed consent sheet [see Appendices C and D]. Upon providing informed consent, participants were informed that they would be asked to take part in a number of activities that

---

46 Although developed as parallel forms, some caution is needed (and is exercised) in treating them as such (Russell & Antill, 1984).
had, in some way, been related to gender. Gender was explained as a continuum comprising ‘masculine’ through ‘feminine’ as opposed to the sex categories of ‘male’ and ‘female’. To check that the participant understood that distinction in broad terms, the researcher asked each participant “Is it possible for you to imagine a person who is male but is not masculine and a female who is not feminine?” All participants agreed that they could and were then invited to proceed with the six tasks as outlined below. Tasks 3-5 were completed in partially randomised order across participants. For all tasks (see below for details), participants were seated in a light and sound-attenuated room. Participants were not given immediate feedback about their performance. Breaks between blocks were provided as per participant comfort.

**Task 1**: “most like me”. Observers viewed the interactive, continuous PLW display. Observers were asked to manipulate the walker, at their own pace, to the position that they thought best represented themselves. The starting point of the walker was at 0 (gender-neutral); when the participant indicated that s/he had made a final decision, the position of the walker was recorded manually by the researcher.

In this way, participants were asked explicitly to consider, through the form and motion of the PLWs, the idea of gender variation as represented by these visual displays and as it could be related to ‘self’. The result of this was a number between -6 and +6 for each participant based on the PLW that was self-selected as closest to the participant in terms of visually represented masculinity/femininity. Henceforth this will be referred to as ‘self-perceived gender’ (SPG).

**Task 2**: Personal Description Questionnaire. Participants completed the PDQ Form A (Antill, Cunningham, Russell, & Thompson, 1981), as described above, via Survey Monkey. PDQ data will be reported in chapters 4 and 5.

---

47 Presentation order for Tasks 3-5 were partially randomised such that the ‘masculine or not’ and feminine or not’ tasks were presented consecutively. Thus, task orders were: 3, 4, 5; or 3, 5, 4; or 4, 5, 3; or 5, 4, 3.

48 Where ‘0’ represents the objectively gender-neutral walker, increasing numbers into the negative represent increasingly feminine walkers at increments of one standard deviation, and numbers into the positive increasingly masculine walkers (see Table 3.1 for more detail).

49 Only the coherent walkers (see Table 3.2) were used in the range available for SPG.
Task 3: “female or male?” Observers viewed a total of 195 x 1000 millisecond presentations of 37 individual point light walkers (these were drawn from the motion-only (12 walkers); structure-only (12 walkers); and coherent walkers (13 walkers) as described previously). Stimuli were presented via Point Light Lab. In a two-alternative forced-choice (2AFC) design, observers were asked to respond, via a key press, to indicate whether they judged each walker to be ‘female’ or ‘male’. A response could be given at any time during the 1000 millisecond presentation of the target stimulus or during a 1000 millisecond inter-stimulus interval. Upon registering a response, the following stimulus was presented. The order of stimulus presentation was random.

The rationale for including an either/or question for target sex was to replicate previous studies (Barclay et al., 1978; L. Kozlowski & Cutting, 1977, 1978; Mather & Murdoch, 1994; Pollick et al., 2005; Pollick et al., 2002; Troje, 2002; van der Zwan et al., 2009 and others) and to reflect the broad sex dichotomy as outlined in chapter 2. In combination, the ‘gender questions’ that follow in this section (masculine or not” and “feminine or not”) allowed a subtle difference in that there was an implicit third category created for gender: neither masculine nor feminine. Designed to mirror the real-life idea that a male need not be masculine nor a female feminine, this was a novel approach, and is referred to herein as the gender ‘neutrality zone’.

Task 4: “feminine or not?” Stimuli were exactly as for Task 3, but this time participants were asked to indicate whether they judged each walker to be ‘feminine’ or ‘not feminine’.

Task 5: “masculine or not?” Stimuli again were exactly as for Tasks 3 & 4, but participants were asked to respond, via key press, to indicate whether they judged each walker to be ‘masculine’ or ‘not masculine’.

Task 6: Finger Measurements. Methods of measuring 2D:4D vary from asking thousands of people to measure and report their own finger lengths for an internet study (Manning & Fink, 2008; Reimers, 2007), measuring finger lengths from photocopies (Beech & Mackintosh, 2005;
Hisasue et al., 2012; Huh, 2012; Lippa, 2006; Rahman & Wilson, 2003), through to direct measurement of digit length from skeletons (Pfitzner (1893) as cited in Peters, Mackenzie, et al., 2002). It has been suggested that differing techniques should neither be combined nor compared (Manning, Fink, Neave, & Caswell, 2005), and measurement of finger length by means that do not distort soft tissue are regarded as more valid (Hönkopp & Watson, 2010). With these things in mind, and following many of the later studies on digit ratio (including but not limited to: Bogaert, Fawcett, & Jamieson, 2009; Charles & Alexander, 2011; Csathó et al., 2003; Rammsayer & Troche, 2007; Scarbrough & Johnston, 2005; Troche et al., 2007), direct measurement was used in the current studies.

The researcher measured and recorded the lengths of the ventral surfaces of observers’ second (2D) and fourth (4D) fingers on each hand from the 1st proximal crease at the base of the finger to the fingertip using electronic digital Vernier callipers with a resolution of 0.01mm/0.0005”. These measurements were used to calculate digit ratios for each participant by dividing the length of the 2nd digit by the length of the 4th digit for each hand. Finger measurement data will be reported in chapter 4.

Data analysis

De-identified data were collected from each of the tasks (via an assigned Participant Code) and collated to a Microsoft Excel spreadsheet.

Results

This was a repeated measures design where observers responded to three different questions (male or female; masculine or not; and feminine or not) while observing three sets of target PLWs (one set varied on both structural and on motion gender cues; one set on structure cues only with motion cues held at neutral; and one set varying in motion cues only with structure held at neutral). Raw scores for each stimulus condition were transformed to proportional summary responses to each target.
To examine group differences, data were examined based on the multivariate approach for within-groups analysis (O’Brien & Kaiser, 1985). Unless otherwise specified, the presence or absence of an omnibus effect was assessed via an analysis of variance (ANOVA) using IBM SPSS version 20. A set of planned comparisons on the differences between individual conditions, and orthogonal polynomials (trend analysis) on the targets, were tested using PSY Statistical Program\textsuperscript{50}.

Responses to targets did not differ systematically as a function of observer sex [see Appendix E for details]. Thus, data reported here were those for all observers combined.

In all cases there was a main effect of target; that is, observers’ responses to all questions varied as a function of the weight of gender cues carried by the target PLW. This was irrespective of cue type and was always in the direction consistent with the objective information. As the focus here was to compare responses by cue type and by question asked, main effects of target will not be reported individually.

Effects of cue-type on judgements of sex and gender

The effect of cue-type (coherent, motion-only and structure-only) on judgements of sex (male and female) and of gender (masculine/feminine) will be reported in this first sub-section. Then, judgements of sex and gender will be compared directly.

As can be seen in Figure 3.2 A, the proportion of male responses to target PLWs along the gender continuum varied according to the cue-type by which gender (sexually dichotomous) information was conveyed. In response to the coherent PLWs, where gender cues conveyed by structure and by motion were in accord, male responses essentially were at zero for the three PLWs with the strongest feminine cues and at 100% for the three with the strongest masculine cues. This indicated that consistency was high in responses to those targets. The response curve rises quite steeply from the walker at -2 to that at +2 with observers’ responses to only the

\textsuperscript{50}http://www.psy.unsw.edu.au/research/research-tools/psy-statistical-program
three middle targets demonstrating rates of ‘certainty’ (consistency) below 80%. In other words, observers were reasonably sure of the sex of 10 out of 13 target walkers.

In contrast, to those PLWs where gender cues were conveyed only by motion cues, responses resulted in a visibly flatter curve. It appears that there was more variance, and thus less certainty, in responding across the whole continuum when motion was the only cue to gender. This produced a function along which there were no levels of ‘certainty’ equivalent to the levels observed in the combined (coherent) cue condition and only 3 of 13 walkers elicited a consistency in responses of 80% or greater.

Interestingly, these were all walkers at the male end of the continuum. Thus, there seemed to be greater uncertainty in responding ‘male’ to walkers carrying strong female cues than to those carrying strong male cues in the motion-only condition. Recall that this was a 2AFC task, with the alternative responses being ‘male’ or ‘female’. It seems that where male cues were present observers showed some consistency. They showed less consistency in their responding if there were no or weak male cues. Indeed, in this motion-only condition no walker in the female space elicited 20% or fewer male responses whereas three of the walkers in the male space showed over 80%. One could think of this as: if male cues were present observers were more sure; if those cues were not present observers were not sure that they were not.

Responses to PLWs where the gender information varied on structural cues alone generally lay between the other two functions, which indicated superiority of structural cues over motion cues in this task. Where gender information was strongest, so where the walkers were five and six standard deviations from the neutral point, participants were as consistent in their responses as to the coherent PLWs. Where structural gender cues were not so strong, the higher consistency in responding to the presence of male cues than to the absence of them was evident again, although certainly not to the extent seen in the motion-only condition.
These patterns were confirmed statistically\(^{51}\). The ANOVA revealed a significant main effect for cue type on the proportion of male responses, \(F(2, 41) = 6.48, p = .004\), the proportion of variance explained (henceforth PVE) by cue type was 0.19. There was also a significant interaction between cue type and target, \(F(24, 19) = 5.69, p < .001\). Results of a priori comparisons examining exactly where the differences occurred between cue types confirmed the aberrant pattern of responses produced by PLWs conveying gender exclusively via motion cues. Responses to coherent PLWs differed significantly from those to motion-only PLWs, \(F(1, 42) = 13.07, p < .001\) (PVE = 0.24), but not from those to structure-only targets, \(F(1, 42) = 4.28, p = .045\) (PVE = 0.09), while responses to motion-only targets also differed significantly from those to structure only PLWs, \(F(1, 42) = 8.02, p = .007\) (PVE = 0.16).

There were also a number of significant interactions between cue-type and the shape of the curves. Significant linear/cue-type interactions were found for all three comparisons (coherent/structure*linear, \(F(1, 42) = 49.71, p < .001\); coherent/motion*linear, \(F(1, 42) = 69.29, p < .001\); and structure/motion*linear, \(F(1, 42) = 22.13, p < .001\)). In addition, cubic interactions were significant for the coherent/structure, \(F(1, 42) = 23.14, p < .001\), and the coherent/motion comparisons, \(F(1, 42) = 31.71, p < .001\). Thus, the cue type affected the proportion of male responses differently depending on where on the continuum the target lay. Overall, observers’ male responses to targets, especially those at the outer ends of the gender continuum, were moderated by cue-type.

\(^{51}\) Via the Bonferroni method, a critical value of 0.0167 was used here to accommodate for multiple comparisons (O’Brien & Kaiser, 1985). The reader will use her or his own discretion regarding the likelihood of Type I error when considering these results.
A consideration of masculine responses to these three sets of targets again reveals different response patterns. As illustrated in Figure 3.2 B above, the three functions diverge toward the poles of the gender continuum, and this is again most noticeable when comparing responses to the coherent and the motion-only targets. As with male responses, observers consistently responded ‘masculine’ to the most masculine coherent PLWs and ‘not masculine’ to the most feminine coherent PLWs, but were not nearly so consistent when gender cues were conveyed.
only by motion. This resulted once again in a steeper response curve for coherent walkers compared to that for motion-only walkers.

Again, responses to the structure-only targets appeared closer to those given to the coherent PLWs than to the motion-only walkers. This appeared to be so especially with the targets on the masculine end of the continuum. The functions for structure-only and motion-only walkers diverged noticeably earlier heading from the neutral walker into the male space than to the female space. Thus, it may be that structural cues are more important than motion cues to judgements of masculinity, and even more so when those masculinity cues were present than when they were absent.

In considering PLWs conveying gender cues via motion only in isolation however, the opposite trend was seen for masculine responses to that seen for male responses reported previously. Compared to responses to the question of sex, where consistency was found to be lower where male cues were weak or absent, when the question was whether the target was masculine or not, observers demonstrated greater consistency when cues to masculinity were absent than when they were present. So in this case, observers responded ‘not masculine’ with more reliability when masculinity cues were weak or absent. This seems to indicate the possibility that observers employed a different decision criterion (or criteria) for judgements of maleness to that (or those) of masculinity. This will be considered directly later in this chapter.

When testing these results statistically though, there was no significant main effect of cue type, $F(2, 41) = 1.51, p > .05$; however, there was a significant interaction between cue type and target, $F(24, 19) = 11.83, p < .001$. This picture was reinforced by the results of the a priori comparisons, which showed no significant differences between responses to coherent compared to either of the other cue-types (structure-only: $F(1, 42) = 1.02, p > .05$; motion-only: $F(1, 42) = 0.83, p > .05$), or between motion-only and structure-only targets ($F(1, 42) = 2.92, p > .05$). There were, however, significant interactions between cue-type and the shape of the curves. Significant linear/cue-type interactions were found for all three comparisons (coherent/structure*linear, $F(1, 42) = 17.84, p < .001$; coherent/motion*linear, $F(1, 42) = 23.14$,
In addition, cubic interactions were significant for the coherent/structure, $F(1, 42) = 23.14, p < .001$, and the coherent/motion comparisons, $F(1, 42) = 28.70, p < .001$. So, for masculine responses, cue-type differentially affected the proportion of masculine responses depending on where the target lay on the continuum.

Effects of cue type on observers’ **female responses** to the target PLWs can be seen below in Figure 3.3 A. Recall from the sex judgements reported earlier, that responses to the three cue types diverged markedly. This was the case particularly in response to walkers conveying gender cues via motion only (compared to the other two cue-types) and was more marked in the female space than the male. Also, when viewing PLWs carrying female motion cues, but neutral structure, observers demonstrated less consistency in their responses compared to when they viewed walkers carrying male motion cues.

---

52 As these data derive from a 2AFC task where the two possible responses were ‘female’ or ‘male’, essentially they are the inverse of those reported previously as male responses by cue type. Thus, although the graph is provided here to provide a congruent visual comparison for that illustrating feminine responses by cue type (Figure 3.3 B), statistical results will not be repeated.
Figure 3.3. A: ‘Female’ responses as a proportion of all responses to target PLWs. B: ‘Feminine’ responses as a proportion of all responses to target PLWs. *n* = 43. Vertical lines represent ± one standard error of the mean (SEM). ‘Coherent walkers’ are those where sexually dimorphic information is conveyed congruently by both structural and motion cues (e.g., -4 target PLW: structure = -4 and motion = -4); ‘motion only’ are those walkers where the structural (or form) configuration is constrained to that of the neutral walker and variation is exclusively via motion cues (e.g., -4 target PLW: structure = 0 and motion = -4); ‘structure only’ are those walkers where the motion (or kinematic) configuration is constrained to that of the neutral walker and variation is exclusively via structural cues (e.g., -4 target PLW: structure = -4 and motion = 0).

As illustrated in Figure 3.3 B, observers’ feminine responses to the targets seemed to echo their female responses very closely; certainly more closely than was seen for male and masculine responses. Here, as for the female responses (Figure 3.3A), the steeper curve is apparent in responses to the coherent PLWs with responses to walkers at each end of the continuum reflecting high levels of consistency in responding in that condition.
The curve for motion-only targets is noticeably shallower. Again, as for masculine responses, consistency was higher in responding to walkers conveying more masculine cues than to walkers conveying mathematically comparable levels of feminine cues. This indicated a high level of ‘not feminine’ responses. Thus, observers were ‘surer’ when feminine motion cues were absent than when they were present.

Responses to structure-only walkers again were closer to those of the coherent targets than to those carrying motion cues only. In fact, in the case of those PLWs in the male space, structural cues appear to be as potent as the combined cues of the coherent walkers.

This picture becomes more nuanced when we consider that there was no such accord between responses to structure-only and coherent walkers in the female space. Here, we see what appears to be a clear hierarchy of cues to feminine judgements with motion cues eliciting the most equivocal response rates, structural cues better, and the coherent condition noticeably superior. This pattern is consistent with structural and motion cues each providing unique information and summative contributions to observers’ feminine judgements of female targets.

Statistical analysis confirmed a significant main effect of cue type on the proportion of feminine responses, $F(2, 41) = 15.72, p < .001$ (PVE = 0.20). Again, a significant interaction effect was also in evidence, $F(24, 19) = 6.64, p < .001$. The a priori comparisons revealed that the proportion of feminine responses to coherent PLWs differed significantly from those to structure-only targets, $F(1, 42) = 17.97, p < .001$ (PVE = 0.30), and to motion-only PLWs, $F(1, 42) = 19.66, p < .001$ (PVE = 0.32), but that responses to structure-only targets did not differ significantly from those to motion-only PLWs, $F(1, 42) = 1.09, p > .05$. Again, there were a number of significant polynomial interactions, with significant linear interactions for all three comparisons (coherent/structure*linear, $F(1, 42) = 26.09, p < .001$; coherent/motion*linear, $F(1, 42) = 70.28, p < .001$; and structure/motion*linear, $F(1, 42) = 27.25, p < .001$). As with female responses, here again cubic interactions were significant for the coherent/structure, $F(1, 42) = 27.68, p <
.001, and the coherent/motion comparisons, \( F(1, 42) = 53.02, p < .001 \), confirming that the shape of the sigmoid response curves for these cue-types were indeed different.

**In summary**, although the precise patterns of observer responses varied according to the question asked, cue-type significantly affected both sex and gender judgements. Broadly, targets conveying gender exclusively via motion, or kinematic, cues produced flatter response curves compared to the other two cue-types. Coherent targets, in which motion and structural cues were both present and in accord, produced the steepest curves with a wider range of targets attracting consistent responses, and response curves for targets conveying gender through structural, or form, cues only most often sat between the other two functions. These patterns were most clearly evident in judgements of sex.

However, undoubtedly some of the value of this work lay in the subtleties. These emerged from the judgements of gender, from the questions ‘masculine or not’ and ‘feminine or not’. Results reported here indicate that, when only motion cues were available, observers responded most consistently when gender cues were low or absent. Thus, the highest consistency in responding occurred for ‘not masculine’ responses (to targets on the female end of the continuum) and for ‘not feminine’ responses (to targets on the male end of the continuum). So, in the motion-only condition, observers seemed to be surer when gender cues were missing than when they were present.

Interestingly, in the structure-only condition, levels of consistency were highest when judging male targets to be ‘not feminine’. In fact, in the male space, the functions for judgements of coherent and structure-only targets were largely the same, whereas they clearly diverged in the female space indicating an interaction between cue-type and target gender. The function for motion-only targets was closer to chance at both ends of the gender continuum, thus producing a hierarchical picture that was two-tiered in the male space and three-tiered in the female space. This may indicate that, while structural cues were a sufficient basis for a reliable
judgement of ‘not feminine’, the addition of motion cues was required to bring the equivalent level of consistency to judgements of a target as ‘feminine’. It should be noted that female responses demonstrated a similar pattern.

However, cue-type produced different patterns in male responses compared to masculine responses. The most equivocal responses were elicited by walkers varying on motion cues only in both conditions, but consistency in responding was least evident on the female end of the continuum when judging walkers as male, and on the male end when judging walkers to be masculine. As mentioned, no such difference was observed between female and feminine responses. Judgements of sex and gender will now be compared directly.

**Contrasting judgements of sex and gender**

In order to examine more closely the relationships between perceived sex and perceived gender, observer responses to the two pairs of related questions were compared. That is, female responses compared to feminine responses and male responses to masculine for each of the three cue-types. These comparisons were performed via orthogonal contrasts using PSY Statistical Program.

Interestingly, and as can be seen in Figure 3.4, for coherent targets feminine and female functions largely were the same. For every target the proportion of female responses were equal. This was not the case for functions representing male and masculine responses. Those clearly diverged across a number of targets. This is evident from the -1 PLW right through to the +4. For this subset of targets, the proportion of male responses was higher than the proportion of masculine responses, so observers reported the targets in a number of cases as being male but not as being masculine.

These results were confirmed statistically. Observers’ female and feminine responses to the range of coherent target PLWs did not differ significantly, $F(1, 42) = 0.02, p > .05$, while their male and masculine responses did, $F(1, 42) = 13.32, p < .001$ ($\text{PVE} = 0.24$). Interactions were not
significant (female/feminine*linear, $F(1, 42) = 1.82, p > .05$; female/feminine*quadratic, $F(1, 42) = 0.09, p > .05$; female/feminine*cubic, $F(1, 42) = 1.78, p > .05$; male/masculine*linear, $F(1, 42) = 1.27, p > .05$; male/masculine *quadratic, $F(1, 42) = 2.34, p > .05$; male/masculine *cubic, $F(1, 42) = 2.73, p > .05$).

**Figure 3.4.** A: ‘Female’ and ‘Feminine’ responses as a proportion of all responses to ‘coherent’ target PLWs. B: ‘Male’ and ‘Masculine’ responses as a proportion of all responses to ‘coherent’ target PLWs. $n=43$. Vertical lines represent ± one standard error of the mean (SEM). ‘Coherent’ PLWs are those where sexually dimorphic information is conveyed congruently by both structural and motion cues (e.g., -4 target PLW: structure=-4 and motion=-4).

A second mixed within-between subjects ANOVA tested the disconnect between male and masculine response functions on a truncated range of walkers: -2 through to 2. There was a significant main effect of walker, $F(1, 42) = 5.82, p = .02$. 
In the case of targets conveying gender only through structural cues, which are illustrated in Figure 3.5 below, the picture was not quite as clean as for the coherent targets. Feminine responses again tracked quite closely onto female responses, but not to the same extent for the most feminine targets as for the others. As with the previous data set, masculine responses diverged noticeably from male responses for the neutral to the +2 targets, but the functions converged beyond that point.

Statistically, the picture was also more equivocal (but still consistent with earlier results) for the structure only walkers. As previously, feminine responses did not differ significantly from female ones, $F(1, 42) = 2.19, p > .05$, while the difference between male and masculine responses did reach statistical significance, $F(1, 42) = 4.10, p = .049$ (PVE = 0.09). It should be noted that the male/masculine difference has a $p$ value that would not make the critical cut-off if any adjustment were made to accommodate multiple comparisons; also, the proportion of variance explained by the question type was minimal. In addition, there was a significant quadratic interaction here, $F(1, 42) = 4.32, p = .044$, which indicates a difference in the curve between the two types of responses. Overall, the graph does look as though a real difference occurs, but the possibility that the statistical significance of the difference between masculine and male responses to the structure-only targets was due to Type I error cannot be ruled out and this finding cannot be interpreted with any confidence.
Figure 3.5. A: ‘Female’ and ‘Feminine’ responses as a proportion of all responses to ‘structure only’ target PLWs. B: ‘Male’ and ‘Masculine’ responses as a proportion of all responses to ‘structure only’ target PLWs. \( n=43 \).

Vertical lines represent ± one standard error of the mean (SEM). ‘Structure only’ PLWs are those where the motion (or kinematic) configuration is constrained to that of the neutral walker and variation is exclusively via structural cues (e.g., -4 target PLW: structure=4 and motion=0).

Responses to targets carrying motion-only gender cues produced no such equivocations. As Figure 3.6 illustrates, feminine and female responses, despite some noise in the numbers from target to target, once again broadly tracked each other, while masculine and male responses differed markedly, and this time across the entire continuum. Observers showed a consistent tendency to label a target more often male than masculine.

These observations were borne out by the statistical analyses. Firstly, feminine responses did not differ significantly from female responses to motion-only targets, \( F(1, 42) = 0.06, p > .05 \). In contrast, the proportion of masculine responses was significantly different to that of male
responses, \( F(1, 42) = 16.52, p < .001 \), and the proportion of variance explained by question-type was 0.28.

Figure 3.6. A: ‘Female’ and ‘Feminine’ responses as a proportion of all responses to ‘motion only’ target PLWs. B: ‘Male’ and ‘Masculine’ responses as a proportion of all responses to ‘motion only’ target PLWs. \( n=43 \). Vertical lines represent ± one standard error of the mean (SEM). ‘Motion only’ PLWs are those where the structural (or form) configuration is constrained to that of the neutral walker and variation is exclusively via motion cues (e.g., -4 target PLW: structure=0 and motion=4).

**In summary**, irrespective of cue-type, observers made no apparent distinction between their judgements of a target as feminine or as female, but consistently did draw a distinction between male and masculine. Perception of targets as male occurred at a higher rate across all three cue-types, and, especially in the case of coherent targets and those conveying gender via
motion cues only, this difference in responding was at a statistically significant and meaningful level and question type explained a substantial proportion of the variance.

Discussion

Overview

In this experiment observers responded to three different questions while viewing three sets of targets. The questions were ‘male or female?’, ‘feminine or not?’, and ‘masculine or not?’ The targets were coherent PLWs—where gender cues were conveyed both by motion and structure—targets varying only on motion, and targets varying only on structure. The aim was to examine the relationships between sex perception and gender perception and to consider the relative contributions of visual form and motion cues to observers’ judgements.

Results of comparisons based on cue-type were largely consistent across questions. Coherent targets produced steep curves in the neutral range with a high level of consistency in responses to all but the most ambiguous targets. Viewing motion-only targets resulted in less consistent responding, flatter curves, and more targets being perceived as ambiguous. Structure-only targets produced response curves somewhere between those of the other two cue conditions. In some cases the differences were clear and significant main effects, in others the differences were indicated by significant polynomial interactions pointing to the fact that the shape of the curves differed based on cue-type.

Thus, although observers may have been able to infer sex and gender from motion cues alone, particularly when cue strength was strong, superior information on which to base such judgements was provided by structural cues. The addition of motion cues to those conveyed by structure further enhanced observers’ performance. This is consistent with previous work demonstrating coherent or complementary information from more than one cue-type facilitates visual detection from PLWs (Mather & Murdoch, 1994; Thomas & Shiffrar, 2010; van der Zwan et al., 2009). In addition to this broad trend though, some interesting response patterns and
differences between conditions were uncovered, which may indicate support for the idea that observers use different strategies or decision criteria depending on the task (Freeman & Ambady, 2011; Hirai, Chang, Saunders, & Troje, 2011). These will be discussed further below.

Comparisons of responses to the sex and the gender tasks were made. The analyses of female compared to feminine and male compared to masculine responses told an intriguing and consistent story: Regardless of cue-type, observers’ female and feminine responses did not differ from each other whereas their male responses were significantly higher than their masculine responses, essentially shifting the masculinity curve to the right of the male curve. Especially where there was ambiguity, observers labelled a target more often as male than as masculine, but assigned a judgement of feminine equally often as that of female. A truncated range of targets, where those with the strongest gender cues are excluded, would be likely to produce even more stark differences between male and masculine responses. Again, this will be outlined in more detail below.

Cue-type

In general and irrespective of the question asked, observers’ responses to motion-only targets tended to be further from those to coherent walkers and responses to structure-only targets were closer to those to coherent walkers. The functions of the three cue-types indicated that, for targets conveying stronger gender cues, observers were most consistent in their responses to coherent PLWs and least consistent when observing targets conveying gender exclusively via motion cues.

Lippa (1983), and later, Johnson and Tassinary (2005), reported the pivotal role of morphology, or structure, and particularly of absolute waist size and of waist size relative to hip size—that is, the waist-to-hip ratio (WHR)—to judgements of sex and gender. Although the stimuli in the current study did not directly convey either of these cues, what can be inferred from the coherent and structure-only, but not from the motion-only targets, is shoulder-to-hip ratio
(SHR). SHR is thought to be a key to judgements of sex from PLWs via the inferred torso shape known as the ‘centre of moment’ (Cutting et al., 1978). The classic torso shape for females is a wedge that is narrower at the shoulders and wider at the hips; for males that is inverted. It is certainly feasible that the superior results for structure-only targets compared to motion-only in this current study is to some extent attributable to the availability of this sexually dimorphic cue.

With regard to judgements from motion though, Mather and Murdoch (1994) in fact regarded motion cues as dominant to structure when those two were not in accord. Similarly, Johnson and Tassinary (2005) concluded that judgements of target sex are able to be made via motion cues alone and that these judgements are mediated by judgements of gender; indeed, are inferred from them. So, those authors contend that from motion-only cues the observer first perceives the target as either masculine or feminine and then draws from that a conclusion as to the sex of the target.

However, although broad or universal rules are attractive—indeed, Cutting et al. (1978) sought a ‘gait invariant’ that underlies surface expressions of male and female gaits—it seems likely observers here used a range of different cues and strategies for the various judgements they made. Especially in the case of motion-only walkers, results from the current study hinted at a subtle difference in the decision criteria used for making male and masculine judgements. When making male judgements from motion, observers showed greater consistency in their responses to targets at the male end of the continuum, that is, when cues were present. In contrast, when categorising them as masculine, observers’ consistency was highest when cues were lowest. This could be thought of as searching for male cues in the sex condition and searching for ‘not-masculine’ cues in the gender condition. Could it be that ‘male’ motion cues in a walker of neutral body shape (structure) satisfy the criteria (or criterion) for a judgement of maleness, but that a ‘masculine’ structure is required for observers reliably to make a judgement of ‘masculine’?
For male and female judgements in the motion-only condition, consistency was lower in response to the PLWs in the female space than to those in the male space. Of course, in both the motion-only and the structure-only condition, something was indeed missing. That ‘something’ can be thought of as the expected level of the other cue-type. It may be that this missing information differs in importance across conditions and across the range of stimuli. Thus, it may be that where motion appeared ‘male’, that was sufficient information to judge the walker as male, but for a judgement of female, observers really needed body shape cues to feel confident.

Response functions to the question ‘feminine or not’ also differed by cue type according to where on the continuum the targets lay. In the male space, functions for structure-only and coherent walkers were virtually identical, however, those functions diverged in the female space. Indeed, in response to ‘female’ targets the motion → structure → combined hierarchy was very clearly exhibited. This seems to indicate that it was primarily structural cues driving observers’ judgements of ‘not feminine’ to the coherent walkers, but that structural cues were insufficient to elicit confident judgements of ‘feminine’. Motion cues there, although still inferior alone, seemed to make a unique contribution to feminine judgements: they had an additive effect. The general hierarchy of usefulness of the three cue-types will be explored further in chapter 6.

**Sex vs gender**

Perhaps the most novel and intriguing finding from this experiment was that in all cases and regardless of cue-type the proportion of observers’ feminine responses accorded with that of their female responses, while masculine responses diverged from male responses. Clearly, to these observers, targets satisfying the necessary criterion (or criteria) for ‘femaleness’ also

---

53 Consistency in responding was lower across the board to motion-only walkers; here we are simply concerned with contrasting responses to motion-only PLWs on either side of neutral on the gender continuum.
satisfied that or those for femininity, but something different to mere ‘maleness’ was at play in ascribing the characteristic of masculinity.

In the cases of coherent and structure-only targets, the male and masculine responses largely converged for targets in the feminine space (i.e., targets -6 through -2), diverging at around the -1 walker, and then reconverging at the extreme masculine end of the continuum. The -1 target, although statistically female, has previously been reported to be the subjective neutral point\textsuperscript{54} on this PLW gender continuum (Troje, 2002; Troje et al., 2006; van der Zwan et al., 2009). Consistent with a previously reported tendency to a male categorisation bias (Armann & Bülthoff, 2012; Johnson, Iida, et al., 2012; Mather & Murdoch, 1994), observers’ male responses were higher than female to the statistically neutral (‘0’) walker\textsuperscript{55}. Thus, for both these cue-types, the discrepancy between male responses and masculine responses occurred when observers viewed what is likely to have been the most subjectively ambiguous PLW and continued through the male space up until the target became strongly masculine. The response function from the point at which gender ambiguity is highest into the male space was lower for masculine responses than for male responses. This indicated that observers were significantly more sure that the target was male than that it was masculine. No such difference was found between female and feminine responses.

This difference in the pattern of responding was even more marked in the case of motion-only targets. When responding to questions about the PLWs that conveyed gender exclusively via motion cues, the functions for male and masculine responses did not accord even for targets in the female space. Observers consistently reported motion-only targets to be male at significantly higher rates than was the case for the ‘masculine’ responses. This disconnect between the sex and gender judgements of motion-only targets was not consistent with observers inferring sex from gender as might have been expected based on the work of Johnson

\textsuperscript{54} That is, the point at which observers judge the target equally often to be male and female.
\textsuperscript{55} The 0 target had both structure and motion cues at 0 and data for this target were drawn from five presentations and used across all cue-type conditions.
and Tassinary (2005). Once again though, there was no difference in the rate of female and feminine judgements. This will be explored further in the general discussion in chapter 6.

**Chapter summary**

In order to explore the relative contributions of structure and motion to judgements of sex and of gender, and to explicate the relationships between such judgements, observers were asked to provide sex and gender judgements in response to PLWs in which visual gender information was systematically manipulated. Forty three observers participated in the experiment.

The three cue-types employed in this study served to provide some rather nuanced pictures of the way or ways that observers might utilise visual cues to gender when making judgements about others. It seems likely that observers employed different strategies for different judgements and that, at least in some cases, structural and kinematic cues made separate and unique contributions to sex and gender information. Broadly speaking, structural cues were superior to motion cues when each was presented in isolation, but performance was best when those cue-types were combined.

Contrasting judgements of sex and gender yielded an intriguing result that was robust across cue-types. Specifically, while judgements of targets as female accorded with those as feminine, male judgements diverged from masculine ones. It appears that the categories of female and feminine may share cues, but that something more than ‘maleness’ is required of a target in order to be categorised consistently as masculine.
Chapter 4 - Measures of observer gender and the interplay between those and the perception of gender in others

Introduction

As outlined at the end of chapter 1, the purpose of the research to be reported here was to test the interplay between factors affecting self-perceived gender and the role those factors play in influencing how the gender of others is perceived. Thus, there were two foci here: firstly, the extent to which different putative indices of observer gender were related to each other; and secondly, whether judgements that observers made regarding the gender of targets—others—were related to the putative indices of observer’s own genderedness.

So, the use of several different measures was intended further to inform our understanding of these various ways of quantifying gender. The aim was to identify whether and to what extent the indices of an individual’s gender used here covaried. Agreement among measures would provide evidence of some common factor or factors underlying one’s genderedness, and may increase the convergent validity of the indices.

The second focus was designed to test the idea that gender judgements of others are, to some extent, self-referential. A simple model to illustrate this idea can be seen in Figure 4.1. The aim was to test whether or not the ‘product’, here being judgements of another’s gender, might be influenced by factors relating to the observer’s own genderedness. If such influences were demonstrated empirically then we would have evidence that endogenous factors do influence the perception of others’ gender.
Methods

Gender role (PDQ scores), self-perceived gender (SPG), and digit ratio (2D:4D) were the three indices of observer gender used in these studies\textsuperscript{56}. As indices of the judgements that observers make about the gender of others, the subjective femininity point\textsuperscript{57} and masculinity point\textsuperscript{58} were calculated for each observer from repeated visual presentations of rarefied walkers along the gender continuum\textsuperscript{59}. The aim of this work was to identify any relationships within and between aspects of observer gender (self) and judgements of the gender of these target PLWs (others).

The participants, apparatus, stimuli, materials, and procedure employed in this study were set out in full in chapter 3. The tasks relevant to this chapter were\textsuperscript{60}:

**Task 1**: “most like me”. Observers viewed the interactive, continuous PLW display\textsuperscript{61}. Observers were asked to manipulate the walker at their own pace, to arrive at the position that they

---

56 Chapter 2 includes further details of these measures.
57 The point on the PLW gender continuum at which an observer judges a walker (and all walkers beyond that point on the continuum) most often to be ‘feminine’.
58 The point on the PLW gender continuum at which an observer judges a walker (and all walkers beyond that point on the continuum) most often to be ‘masculine’.
59 As a function of these two, the subjective ‘neutrality range’ is derived.
60 Reproduced from chapter 3.
61 Explained in full in chapter 3
thought best represented themselves. The starting point of the walker was at 0 (gender-neutral); when the participant indicated that s/he had made a final decision, the position of the walker was recorded manually by the researcher.

In this way, participants were asked explicitly to consider, through the form and motion of the PLWs, the idea of gender variation as represented by these visual displays and as it could be related to ‘self’. The result of this was a number between -6 and +6\(^{62}\) for each participant based on the PLW that was self-selected as closest to the participant in terms of visually represented masculinity/femininity\(^{63}\). Henceforth this will be referred to as ‘self-perceived gender’ (SPG).

**Task 2: Personal Description Questionnaire.** Participants completed the PDQ Form A (Antill, Cunningham, Russell, & Thompson, 1981), as described in chapter 3, via Survey Monkey.

**Task 3:** “female or male?” Observers viewed a total of 195 x 1000 millisecond presentations of 37 individual point light walkers (these were drawn from the motion-only (12 walkers); structure-only (12 walkers); and coherent walkers (13 walkers) as described previously). Stimuli were presented via Point Light Lab. In a two-alternative forced-choice (2AFC) design, observers were asked to respond, via a key press, to indicate whether they judged each walker to be ‘female’ or ‘male’. A response could be given at any time during the 1000 millisecond presentation of the target stimulus or during a 1000 millisecond inter-stimulus interval. Upon registering a response, the following stimulus was presented. The order of stimulus presentation was random.

The rationale for including an either/or question for target sex was to replicate previous studies (Barclay et al., 1978; L. Kozlowski & Cutting, 1977, 1978; Mather & Murdoch, 1994; Pollick et al., 2005; Pollick et al., 2002; Troje, 2002; van der Zwan et al., 2009 and others) and to reflect the sex dichotomy as outlined in chapter 2. In combination, the ‘gender questions’ that follow in

---

\(^{62}\) Where ‘0’ represents the objectively gender-neutral walker, increasing numbers into the negative represent increasingly feminine walkers at increments of one standard deviation, and numbers into the positive increasingly masculine walkers (see Table 3.1 for more detail).

\(^{63}\) Only the coherent walkers (see Table 3.2) were used in the range available for SPG.
this section (masculine or not” and “feminine or not”) allowed a subtle difference in that there was an implicit third category created for gender: neither masculine nor feminine. Designed to mirror the real-life idea that a male need not be masculine nor a female feminine, this was a novel approach and is referred to herein as the gender ‘neutrality zone’.

**Task 4:** “feminine or not?” Stimuli were exactly as for Task 3, but this time participants were asked to respond to indicate whether they judged each walker to be ‘feminine’ or ‘not feminine’.

**Task 5:** “masculine or not?” Stimuli again were exactly as for Tasks 3 & 4, but participants were asked to respond, via key press, to indicate whether they judged each walker to be ‘masculine’ or ‘not masculine’.

**Task 6:** Finger Measurements. The researcher measured and recorded the lengths of the ventral surfaces of observers’ second (2D) and fourth (4D) fingers on each hand from the 1st proximal crease at the base of the finger to the fingertip using electronic digital Vernier callipers with a resolution of 0.01mm/0.0005”. These measurements were used to calculate digit ratios for each participant by dividing the length of the 2nd digit by the length of the 4th digit for each hand.

**Data analysis**

Raw data were treated in Microsoft Excel version 14 to produce proportional responses to each target. Scores and measures were then entered into IBM SPSS Statistics Version 20 (SPSS), which was used to calculate descriptive statistics, bivariate correlation coefficients, and to compare group means via independent samples t-tests. Correlational analyses were via Pearson product-moment correlation coefficient. Any procedures different to this will be described below.

A missing data analysis revealed non-response rates of less than 10% across the variables of interest. The single exception to this was ‘neutrality range’ for which 13.6% of cases had data missing. Missing values were excluded on a casewise basis.
All data on judgements of target gender reported in this chapter relate to a subset of the PLWs viewed by observers. Specifically, only data from judgements of the 13 ‘coherent’ walkers—those where kinematic and structural gender cues were in accord—were used here.

Results

Results will be presented here in four subsections. The first, measures of observer gender, will outline results from the three measures of observer gender used in this study and contrast males’ and females’ scores on those.

The second subsection, will address relationships among measures of observer gender. This will inform the questions of whether, and to what extent, the indices of an individual’s gender used here covaried. Thus, associations between different measures will be described below.

The next subsection, judgements of target gender, will be brief. There it will be reported whether or not males’ and females’ judgements of target gender differed significantly. If not, sex can be ruled out as a significant overall driver of gender judgements. In that case, the focus can shift to a more nuanced consideration of how individual differences in observer gender, both within-sex and in the sample overall, might influence judgements of the gender of others. That will be examined in the fourth subsection, relationships between measures of observer gender and judgements of target gender, which will inform the second of the research questions in this chapter: are judgements of another’s gender influenced by factors relating to the observer’s own genderedness.

Measures of observer gender

SPG
In task 1, when choosing the PLW that was “most like me” from the 13 possible PLWs across the gender continuum, females selected walkers exclusively in the range from 0 to -4 as best

64 PLWs ranged from 6 SDs into the masculine space from the neutral ‘0’ walker (+6) through to 6 SDs into the feminine space (-6) at increments of 1 SD.
representing their own self-perceived gender. As can be seen in Figure 4.2, only one male selected a PLW in the feminine space as best representing his own gender; all other males chose in the range 0 to +4. The modal SPG score for females was -1 and for males, 1. An independent samples t-test revealed that SPG differed significantly between males (\(M=1.32, SD=1.21\)) and females (\(M=-1.26, SD=1.05; t(42)=-7.4, p<.001\)). The effect size of sex on SPG was very large (eta squared=0.78).

**Figure 4.2.** Frequencies of participants choosing each SPG (self-perceived gender) value (by observer sex). Illustrating the point on the gender continuum at which participants placed themselves. Males = grey; females = black. ‘0’ on the abscissa indicates the objectively gender-neutral walker; ‘-6’ a point 6 SDs into the female space; and, ‘6’ a point 6 SDs into the male space; \(n=44\).

**PDQ**

Responses to the PDQ (task 2), were collated and coded to yield masculinity (PDQ-M) and femininity (PDQ-F) scores for each respondent. In terms of a single composite index of gender role, and as mentioned in chapter 3, a ratio score was calculated by dividing respondents’ femininity scores by their masculinity scores (PDQ-F:M score). In this way, PDQ-F:M scores of <1 indicated relatively higher endorsement of items on the masculinity sub-scale and scores >1 relatively higher endorsement of items on the femininity sub-scale. PDQ-F:M scores differed
significantly between males and females (males: $M=1.03, SD=0.25$; females: $M=1.23, SD=0.23$; $t(42)=2.68, p=.011$) and the effect size was large ($\eta^2=0.15$).

Scores on the masculinity subscale of the PDQ (PDQ-M) also differed significantly as a function of respondent sex (see Figure 4.4). The mean masculinity score for males was 86.4 ($SD=12.42$) while for females it was 71.2 ($SD=8.73; t(42)=-4.56, p<.001$). Again the effect size was large ($\eta^2=0.33$). Thus, compared to female respondents, males more often or more strongly endorsed those items that culturally are regarded as more appropriate for, or pertinent to, males.

Figure 4.3. Mean PDQ-F:M (overall gender role) scores as a function of sex. Bars = 1 SEM; $n = 44$. 

Scores on the masculinity subscale of the PDQ (PDQ-M) also differed significantly as a function of respondent sex (see Figure 4.4). The mean masculinity score for males was 86.4 ($SD=12.42$) while for females it was 71.2 ($SD=8.73; t(42)=-4.56, p<.001$). Again the effect size was large ($\eta^2=0.33$). Thus, compared to female respondents, males more often or more strongly endorsed those items that culturally are regarded as more appropriate for, or pertinent to, males.
As illustrated in Figure 4.5, no such sex difference was found for the femininity subscale (males: $M=87.3$, $SD=13.85$; females: $M=87.6$, $SD=11.02$; $t(42)=0.077, p>.05$). A range of scores were evident in these data for both males (range: 61-119) and females (range: 61-110).

Males and females did not differ significantly on the social desirability subscale of the PDQ, (males: $M=42.36$, $SD=5.48$; females: $M=39.42$, $SD=3.66$; $t(42)=-0.69, p=.050$). However, social responding was significantly correlated with scores on masculinity for both females, $r(19) = .46$, 

![Figure 4.4](image1.png)

**Figure 4.4.** Mean PDQ-M (masculinity) scores as a function of sex. Bars = 1 SEM; $n = 44$.

![Figure 4.5](image2.png)

**Figure 4.5.** Mean PDQ-F (Femininity) scores as a function of sex. Bars = 1 SEM; $n = 44$. 

85
By dividing the length of participants’ second digit on the right hand by the length of the fourth digit on the same hand, a single number representing the right hand digit ratio (RH 2D:4D) for each observer was produced. Females as a group had higher RH 2D:4D ($M=0.99, SD=0.029$) than males ($M=0.97, SD=0.024$), and this difference was statistically significant ($t(41)=2.17, p=.035$). The effect size of sex on RH 2D:4D was moderate ($\eta^2 = .10$). Thus, compared with males, females in this sample did demonstrate a RH 2D:4D where the index finger (2D) was longer relative to the ring finger (4D).

In this way, a RH 2D:4D of 1 would mean that the second and fourth digits are of equal length, greater than 1 that the second digit was longer (more often seen in females), and lower than 1 that the fourth digit was longer (more often seen in males).
genderedness of their own gaits, with males’ SPG predominantly falling in the male space of the
gender continuum and females’ in the female space.

With regard to gender role, scores for males and females differed significantly on the overall
score, PDQ-F:M, with females’ scores reflecting higher femininity-relative-to-masculinity. Mean
scores for males and females on the femininity subscale barely differed, but those on the
masculinity subscale differed significantly.

Digit ratio has been proposed as an objective index of prenatal exposure to sex hormones.
Males and females in this sample had significantly different right hand digit ratios with females’
2D:4D found to be higher than males’, which was consistent with what would be expected.

Thus, sex differences were found on all three indices of observer gender. All differences were in
the directions that would be expected. It should be noted that between-sex differences were
not the focus of this work; within-sex variability is more important than that between females
and males where questions are of gender rather than sex. However, these results provided a
measure of validity to these indices as being sensitive measures of sexually dimorphic
characteristics, and thus justify their use in the following analyses.

Relationships among measures of observer gender

The relationships between the various measures of observer gender were investigated using
Pearson’s product-moment correlation coefficients. Results are presented in Table 4.1. Note
that this is presented with no adjustment for the number of tests conducted.
Table 4.1

Pearson Product-Moment Correlations between Measures of Observer Gender

<table>
<thead>
<tr>
<th>Measures</th>
<th>SPG</th>
<th>RH 2D:4D</th>
<th>PDQ-F</th>
<th>PDQ-M</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPG</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RH 2D:4D</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>-.25</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>-.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PDQ-F</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>-.06</td>
<td>.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>-.20</td>
<td>.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>.15</td>
<td>-.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PDQ-M</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>.55**</td>
<td>-.37**</td>
<td>-.09</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>.32</td>
<td>-.23</td>
<td>-.14</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>-.00</td>
<td>-.36</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td><strong>PDQ-F:M</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>-.32*</td>
<td>.44**</td>
<td>.44**</td>
<td>-.73**</td>
</tr>
<tr>
<td>Males</td>
<td>-.32</td>
<td>.31</td>
<td>.78**</td>
<td>-.71**</td>
</tr>
<tr>
<td>Females</td>
<td>.38</td>
<td>.44</td>
<td>-.09</td>
<td>-.60**</td>
</tr>
</tbody>
</table>

Pearson’s product-moment correlation coefficients for measures of observer gender. For All observers, n=44 in every case except RH 2D:4D, where n=43. For Males, n=25 in all cases except RH 2D:4D, where n=24. For Females, n=19 in all cases. SPG=Self-perceived gender (lower scores are more ‘feminine’); RH 2D:4D=the ratio of the 2nd to 4th digit length of the right hand; PDQ-F=score on the femininity subscale of the PDQ; PDQ-M=score on the masculinity subscale of the PDQ; PDQ-F:M=composite gender score on the PDQ derived by dividing the score on the femininity subscale by the score on the masculinity subscale.

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

**Relationships between self-perceived gender and other measures**

The relationship between SPG and scores on the masculinity subscale of the PDQ (PDQ-M) was moderate ($r=.32$) but not statistically significant for males, and essentially non-existent ($r=-.01$) when considering only female participants. However, SPG significantly predicted scores on the PDQ-M for all participants combined ($r=.55; p<0.01$).
As can be seen in Figure 4.7 below, this increase in the strength of the correlation is likely a function of the extended range of SPG scores resulting from combining data for males and females. The increments available for SPG, which represent one standard deviation of the within- and between-sex variation in sexually dimorphic gait cues, provide a less sensitive index of individual variability than that of the PDQ-M. A finer-grained index for SPG and/or an increased sample size may improve the chance of correctly quantifying the real within-sex relationships between SPG-M and SPG.

However, a significant positive correlation was identified in this study between the extent to which participants endorsed ‘masculine’ items on the PDQ and their self-reported perceptions of their own gait gender: the more ‘masculine’ their score on the PDQ-M, the more ‘masculine’ their self-perceived gait gender.

Figure 4.7. The relationship between self-perceived gender and scores on the PDQ-M (masculinity subscale). Black markers=females; grey markers=males.
The femininity subscale of the PDQ (PDQ-F) was not related in any meaningful way with SPG in this sample. For females and for all participants combined, correlation coefficients were negligible (females: $r=-.15$; all participants: $r=-.06$). For males, a weak negative relationship was found ($r=-.20$) indicating a weak, non-significant tendency for males with more masculine self-reported gait to have lower femininity scores on the PDQ.

The composite gender role score, PDQ-F:M, for all participants was significantly negatively correlated with SPG ($r=-.32; p<0.05$), while for males an almost identical correlation coefficient ($r=.32$) was identified but did not reach significance. For females the relationship between these two variables, while also of moderate strength ($r=.38$), was in the opposite direction (positive) but was not statistically significant. This is illustrated in Figure 4.3 below.

So for participants as one group, and for males, those whose self-reported gait was more masculine were likely to have lower femininity-relative-to-masculinity scores on the PDQ. For females, this was not the case; those with lower femininity-relative-to-masculinity scores on the PDQ were likely to have more feminine self-reported gait. Again though, given that this relationship was non-significant, more work is warranted.
The relationship between self-perceived gender and scores on the PDQ-F:M (composite gender role score). Black markers=females; grey markers=males.

Relationships between RH 2D:4D and other measures

Right hand digit ratio was found to correlate significantly with gender role scores. Specifically, there was a significant relationship between 2D:4D and scores on the PDQ-M \( (r=-.37; p<0.01) \) and on the composite gender role score, PDQ-F:M \( (r=.44; p<0.01) \), for all participants combined.

The relationship was inverse in the case of the PDQ-M scores, indicating that higher (more ‘feminine’) digit ratios were significantly associated with lower masculinity scores.

No real relationship was identified between RH 2D:4D and the femininity subscale of the PDQ for any group (males: \( r=.15 \); females: \( r=-.06 \); all participants: \( r=.06 \)). As was the case for SPG, PDQ-F score was a less effective predictor here than PDQ-M score.

For overall gender role score (PDQ-F:M), the significant positive correlation with digit ratio for all participants combined meant that higher scores on femininity relative to masculinity were associated with more feminine digit ratios and vice-versa. Although the relationship between
digit ratio and PDQ-M was moderate for female participants ($r=-.36$) and those between digit ratio and PDQ-F:M were moderate for both sexes (males: $r=-.31$; females: $r=-.44$), none of these were significant at the 0.05 level (2-tailed). Neither males alone nor females alone produced significantly correlated scores on any measure of gender role and RH 2D:4D.

Thus, right hand digit ratio, a putative index of exposure to sex hormones *in utero*, was found to be a significant predictor of gender role in this adult sample when males and females were considered as a single group. More ‘feminine’ digit ratios were associated with higher femininity-relative-to-masculinity scores on the PDQ and vice versa. However, this relationship disappeared at the within-sex level.

*Relationships between gender role subscales*

PDQ-F and PDQ-M were not significantly related in any group and correlation coefficients were negligible (males: $r=-.14$; females: $r=-.01$; all participants: $r=-.09$). These two subscales are intended to measure discrete aspects and thus the fact that they were found to be uncorrelated in this sample contributes to the validity of their use.

The composite PDQ-F:M score (derived from dividing the PDQ-F score by the PDQ-M score) was strongly and significantly related to masculinity scores in all groups (males: $r=-.71$, $p<0.01$; females: $r=-.60$, $p<0.01$; all participants: $r=-.73$, $p<0.01$). These correlations were negative as would be expected as higher scores on the masculinity subscale are likely to reduce the composite score.

PDQ-F:M was strongly and significantly related to femininity scores for males ($r=.78$, $p<0.01$) and for all participants combined ($r=.44$, $p<0.01$), but not for females ($r=-.09$, $p>0.05$). This indicates that, for females, the score on masculinity seemed to be the dominant driver of the composite score.
Summary

In order to address the first research question in this chapter, relationships among the various measures of observer gender were explored. This returned some novel and fascinating results. SPG was significantly correlated with overall gender role such that those whose femininity-relative-to-masculinity scores on the PDQ were lower were likely to have more masculine self-reported gait. An examination of the relationships between the masculinity and femininity subscales of the PDQ revealed them to be uncorrelated. This is consistent with the idea that those two subscales tap into discrete aspects of gender.

Gender role was significantly predicted by right hand digit ratio. Here, lower scores on femininity relative to masculinity (PDQ-F:M) were associated with more masculine digit ratios and vice-versa. However, this was only true when participants were considered as a single group; no significant within-sex relationship was found between digit ratio and any other measure.

The fact that these significant relationships were identified is evidence of some commonality in what is being captured by these three different indices of gender. More feminine digit ratios are likely to be found in individuals with a more feminine overall gender role orientation, and in turn, those individuals are more likely to identify a more feminine gait as best representing their own.

Judgements of target gender

When judging the gender of the target PLW stimuli in tasks 4 and 5, there were no significant differences between the judgements of males and females. Females judged the subjective femininity point\(^66\) to be -0.88 (SD=0.93), which was not significantly different to the group judgement by males (M=-1.22, SD=0.95; t(38)=1.13, p>.05). The subjective masculinity point\(^67\)

---

\(^{66}\) The point on the gender continuum at which, and beyond which, a walker was judged to be ‘feminine’ on ≥60% of presentations.

\(^{67}\) The point on the gender continuum at which, and beyond which, a walker was judged to be ‘masculine’ on ≥60% of presentations.
was also not judged to be significantly different by females and males (females: $M=0.722$, $SD=1.27$; males: $M=0.409$, $SD=1.22$; $t(38)=0.791$, $p>.05$), nor did the neutrality range$^{68}$ differ between the sexes (females: $M=-1.87$, $SD=1.50$; males: $M=-2.05$, $SD=1.53$; $t(36)=-0.342$, $p>.05$).

Relationships between measures of observer gender and judgements of target gender

Stepwise linear regression analysis was used to assess the level to which the various indices of observer gender predicted their judgements of the gender of target stimuli. Regression analyses included self-perceived gender (SPG), digit ratio (RH2D:4D), masculinity score on the PDQ gender role sub scale (PDQ-M), femininity score on the PDQ gender role sub scale (PDQ-F), and composite PDQ gender role score (PDQ-F:M) as predictors with masculinity point, femininity point, and neutrality range as dependent variables. Analyses were run on data from male observers, female observers and all observers combined.

One single variable was found to be a statistically significant predictor: In male observers, SPG ($\beta=.45$) was a significant predictor of masculinity point ($F(1,19) = 4.71, p=.04$, with an $R^2$ of .20, $R^2_{Adjusted} = .16$. No further predictor variable was included in that model. No predictor variable satisfied the criterion for entry for female observers. No predictor variable satisfied the criterion for entry in all observers combined.

Thus, SPG was found to be a strong and statistically significant predictor of the point at which male observers judged a PLW to be masculine. Thus, male observers who had chosen more masculine walkers as best representing themselves were likely to require more masculine cues in a target PLW in order to assess that stimulus as masculine.

Summary

In order to address the second research question in this chapter, relationships between the various measures of observer gender and observers’ judgements of the gender of target walkers were investigated through a series of regression analyses.
were explored. A number of interesting relationships were identified; the strength of some was low, but certainly several moderate to strong relationships were in evidence.

The single relationship to achieve statistical significance in terms of characteristics of observer gender predicting judgements of target gender was that between SPG and masculinity point for male observers. Males with higher self-reported masculinity in gait required stronger masculinity cues in order to judge a target to be masculine. In other words, male observers with higher SPG had a higher threshold for masculinity and male observers with lower SPG were more sensitive to masculinity cues in the target walkers. This finding was consistent with self-referential gender perception.

**Discussion**

In this study, observers were asked to judge whether a range of target PLWs were ‘masculine or not’ and ‘feminine or not’. Their responses to these visual stimuli yielded two measures of subjective gender judgements: the femininity point and masculinity point, which in turn provided a subjective neutrality range. In addition, observers responded to a range of tasks related to measuring their own gender: the PDQ, a 50-item instrument designed to measure masculinity and femininity served as an index of each observer’s gender role; the self-selected SPG was a task measuring the observer’s assessment of the gender information carried by his or her own gait; and, right hand 2D:4D, or digit ratio.

The aims here were to identify any relationships within and between aspects of observer gender (self) and judgements of the gender of these target PLWs (others). Relationships among the various measures of observer gender would serve to provide a better understanding of the construct of gender itself and to validate the measures where agreement between them was found. Relationships between these measures and judgements of target gender, where found, would be evidence for endogenous factors influencing judgements of others.
Not entirely unexpectedly given the results of previous research, the results of this study indicated that the pattern of relationships between indices of observer gender was complex. However, some relationships were identified among the measures of observer gender and a single significant predictive relationship was identified between observer gender and judgements of target gender. These will be discussed here briefly and those of most relevance will be considered in a broader context in chapter 6.

**Measures of observer gender**

Digit ratio consistently has been reported as a sexually dimorphic feature in humans (Manning, 2002; Peters, Mackenzie, et al., 2002; Peters, Tan, et al., 2002). There has been more ambiguity in terms of its association with sex roles (Troche et al., 2007; Voracek et al., 2011). Nonetheless, while digit ratio was found here to be only weakly correlated with SPG in participants as a group, it was moderately and significantly correlated with PDQ-M (masculinity) score, and strongly and significantly correlated with overall gender role (PDQ-F:M). In other words, these data support the suggestion that digit ratio is related, either directly or through a third variable, with gender role.

The between-sex difference in 2D:4D was to be expected, and from that alone it could still be the case that direct categorisation into male and female (i.e., a judgement of observer sex rather than gender) would be sufficient to predict digit ratio. To be regarded as truly relevant to gender (rather than only to sex), significant *within* sex relationships between RH 2D:4D and SPG would need to be evident. This was not the case in the current study. Indeed, when males and females were considered separately, the associations between digit ratio and all other measures were non-significant.

The predictive nature of SPG for scores on gender role was demonstrated in the present study. However, this was not driven by raw femininity scores; indeed, any correlations between the femininity subscale and SPG were small at best. Males’ and females’ mean scores on the PDQ-F
scale were close to identical, which meant that, although there was within-sex variability in femininity scores, between-sex differences in the composite PDQ-F:M score were driven by masculinity score and relative rather than absolute femininity scores.

In fact, it was the composite gender role index, PDQ-F:M, that was most informative overall, and especially so for female observers when assessing the relationship with SPG. The ratio score was calculated to provide a standardised index of masculine and feminine gender role traits relative to each other. PDQ-F:M, was moderately related to SPG in female participants. Indeed, the correlation between those variables was stronger for females ($r=.$38) than for all participants combined ($r=-.32$) although the latter was a significant correlation (at the 0.05 level, 2-tailed).

So, in this sample, the more feminine a woman reported herself to be via the SPG task, the more likely she was to score relatively highly on the femininity scale compared to the masculinity scale of the PDQ. Accordingly, the reverse was true for males. However, it should be remembered that neither correlation reached statistical significance for the sexes treated separately. The results reported here could perhaps, with caution, be considered as convergent evidence for the construct validity of these gender measures. However, the fact that the within-sex relationships were non-significant means that there may well be no more than sex differences driving the significant associations.

The first aim of this work was to identify whether and to what extent the indices of an individual’s gender used here covaried. Although the picture that emerges from these various measures of observer gender is quite nuanced and likely to have been compromised at least to some extent by a limited sample size, the indices of genderedness reported here were interrelated. It certainly is not possible from this new evidence to claim that these measures are different methods of measuring the same characteristic, but the fact that each significantly covaries with another is perhaps evidence that a common underlying factor may be at play. These indices may represent different dimensions of a multi-dimensional characteristic known
as gender, or they may be no more than artefacts of the overarching effects of sex. This will be considered in more detail in chapter 6.

Relationships between observer gender and judgements of target gender

To consider the question of whether and to what extent an endogenous factor, specifically, our own gender, might influence judgements we make about the gender of others, relationships between the indices of observer gender and observers’ judgements of the gender of target PLWs were examined. Masculinity point, femininity point, and neutrality range served as subjectively derived indices of each individual observer’s judgements of the gender of others.

The sole relationship to reach statistical significance here was that between SPG and masculinity point for male observers: Male observers’ SPG significantly predicted their subjective masculinity point. So, males who assessed themselves, via gait, as more masculine required stronger masculinity cues in a target before classifying that target as masculine.

This accords with a finding by Wolff and Puts (2010) that men who rated themselves as more physically dominant were more likely to rate other men lower on that characteristic. Although physical dominance was not considered in the current study per se, gait masculinity as conveyed by PLWs has previously been found to contribute to impressions of trait characteristics such as dominance and power (Montepare & Zebrowitz-McArthur, 1988). In any case, the fact that male observers rating themselves as more masculine tended to have a higher threshold for assigning masculinity to a target is certainly evidence of a self-referential social judgement and this will be explored further in chapter 6.

The second aim of the research reported in this chapter was to test whether or not the ‘product’, here being judgements of another’s gender, might be influenced by factors relating to the observer’s own genderedness. The fact that a strong and significant correlation was identified between SPG and masculinity point for male observers means that the answer to that
research question is yes: male observers’ judgements of the gender of others were influenced by their own genderedness.

The nature of the sample in the current study should also be mentioned. Predominantly comprising a university sample, although a range of ages were represented, this sample may not be generalizable to the broader population. Future work could sample across a range of gender stereotypical and non-stereotypical groups.

Chapter Summary

This study highlighted relationships both among the various measures of observer gender and between those measures and observers’ judgements of the gender of others. Although some relationships were identified here, there were inconsistencies and ambiguities in the findings. Given the exploratory nature of the work, this is not surprising, but it is also likely that with a construct such as gender, which is very likely to be complex and multi-dimensional in nature, these apparently anomalous relationships are actually indicative of a highly nuanced reality. For example, the patterns of relationships differ for males and females and for all observers combined, indicating perhaps that gender cannot be extricated from sex, but certainly that a nuanced consideration of gender should not exclude sex.

When considering male and female observers as a single group, SPG correlated strongly and significantly with PDQ-M and significantly with PDQ-F:M. Digit ratio also significantly predicted PDQ-M and PDQ-F:M scores. No significant within-sex correlations were found between the indices of observer gender, which may indicate a pre-eminent role for sex in driving the significant relationships identified for participants combined.

In contrast, when considering relationships between observer gender and observers’ judgements of the gender of others, no relationship of interest was identified for all participants combined or for female observers. One significant predictive relationship was identified here: when judging the gender of others, SPG strongly and significantly predicted masculinity point
for male observers. So, males who rated themselves as more masculine in terms of gait gender required stronger masculinity cues in order to classify a target as masculine. This is consistent with self-referential gender judgements and may be considered evidence of an endogenous factor influencing observers’ judgements of the gender of others.
Chapter 5 – The effect of viewing highly gendered others on gender self-perception

Introduction

As laid out at the end of chapter one, the third and final aspect to this exploration of the possible interplay between self-perceived gender and the perception of the gender of others is to consider the effect of perceived others on the self. Here, the task was to tease apart what effect observing others may have on our perception of our own genderedness.

The idea that individuals have a sense of their own worth as a mate and of that worth varying according to social context, and in particular to the current level of supply of high quality competitors for potential mates, has been called ‘market value’ (Pawlowski & Dunbar, 1999). In this way, one’s market value can be thought of as fluid and context-dependent. If the mating market is flooded with high-value competitors, a mid-value individual’s worth relative to the market is reduced, whereas a marketplace populated with low-value competition is likely to result in an increased market value for the same individual. Individuals seem, at least on some level, to be aware of this market value as it has been demonstrated to affect mate preference (Bailey, Durante, & Geary, 2011; Pawłowski & Dunbar, 1999; Waynforth & Dunbar, 1995).

The likely effects of mate value largely have been explored through consideration of the perceptual aspects of attractiveness (Bailey et al., 2011; Gutierres et al., 1999; Morgan & Kisley, 2014). For example, Morgan and Kisley (2014) found that both target attractiveness and observer’s own mate value affected processing of faces. More attractive males, compared to males who themselves are less attractive, have been found to show a stronger preference for facial femininity when judging for short-term partners (Burriss et al., 2011b). Similarly, more attractive females have been found to prefer higher levels of masculinity in a male partner (Little et al., 2001; Penton-Voak et al., 2003).
Of particular relevance to the study to be reported here, is the fact that self-perceived attractiveness has been found to be susceptible to context-effects consistent with mate value. Specifically, experimental manipulation of observers’ self-perceived market value has been demonstrated (Cash et al., 1983; Little & Mannion, 2006; Wade & Abetz, 1997). Little and Mannion (2006) demonstrated that viewing highly attractive others lowers women’s self-rated attractiveness⁶⁹ and vice-versa. Thornton and Moore (1993) had previously found a similar effect for both males and females⁷⁰.

In addition, women in the high market value condition of the Little and Mannion (2006) study demonstrated an increased preference for facial masculinity when judging for a short-term partner. In this way, Little and Mannion (2006) confirmed that a change in subjectively-perceived mate value can occur in response to a short-term, manipulated shift in the nature of ‘the market’; and further, that mate preference shifts in accord with the change in the observer’s mate value relative to that market. More recently, males have been shown to attend more to females of similar mate value to themselves and to shift their assessment as a result of experimentally induced shifts in their own perceived mate value (Bailey et al., 2011).

Masculinity and femininity are often conceived as ends of or aspects of sexual dimorphism and robustly are associated with attractiveness as well as a variety of other traits relating to reproductive ‘value’ (see for example Little et al., 2011). If something like ‘market value’ undergirds self perceptions of attractiveness and affects preferences for sexual dimorphism in the face of a short term partner, it may also drive similar shifts in gender self-perception and in preferences for sexual dimorphism in gait. Indeed, although broadly regarded as a stable characteristic, gender self-perception has been found to be labile under certain conditions (Ashmore, 1990; Burke, 2006; Burke & Cast, 1997; Deaux & Major, 1987). Thus, given that experimental manipulation of self-perceived market value shifts both self-rated attractiveness

---

⁶⁹ Little and Mannion (2006) included only female participants in their study.
⁷⁰ The keen reader can see also: Brown et al. (1992); Cash et al. (1983); Gutierres et al. (1999); Oikawa et al. (2012)
and preferences for attractiveness in a partner, the aim of the present study was to explore whether or not this is the case also for gender.

Methods

Participants

Participants were a convenience sample of 30 adult volunteer observers (19 females and 11 males) with normal or corrected-to-normal vision. The mean age of all observers was 35.8 years (SD=12.22; range 19-60) with males’ mean age being 35.5 years (SD=13.24; range 21-60) and females’ mean age being 36.0 (SD=11.96; range 19-58). Participants were naive to the aims of the study other than knowing that it related to ‘perception of gender in self and others’. Participants gave informed consent and took part in all tasks.

Materials

The PDQ (Form A) (Antill et al., 1981) is a 50-item self-report instrument designed to measure gender role. The scale comprises 10 masculine positive items, 10 masculine negative, 10 feminine positive, 10 feminine negative, and 10 items measuring socially desirable responding. Thus, the PDQ allows the calculation of scores on the masculinity and femininity subscales for each participant as well as an index of socially desirable responding with 20 items each contributing to the masculinity and femininity subscales and the social subscale the product of 10 items. The PDQ Form B (Antill et al., 1981) was also used in this study. PDQ Form B is a parallel form to the PDQ Form A. Although the items themselves are different in the two forms of the PDQ, all other details are the same including sub-scales, instructions and format, numbers of items, et cetera. The use of these two forms was considered in chapter two.

Further details on the PDQ were provided in chapter 3.
Procedure

Individuals were provided with an information sheet and informed consent sheet [see Appendices F and G]. Upon providing consent, participants were informed that they would be asked to take part in a number of activities that had, in some way, been related to gender.

For all tasks (see below for details), participants were seated in a light and sound-attenuated room. Participants were not given immediate feedback about their performance. Breaks between blocks were provided as per participant comfort.

The procedure for this study is illustrated in Figure 5.1 below. As described in chapter three, the “most like me” task yields an indication of self-perceived gender (SPG). Tasks two and six were concerned with the genderedness of the participants’ preferred short-term partner (PP). Those tasks were structured precisely as for the SPG task (i.e., an interactive display wherein the participant can manipulate the gender of a PLW between 13 points along the gender continuum), but the question asked was “please select the walker that best represents your preferred short-term partner”.

<table>
<thead>
<tr>
<th>Task 1</th>
<th>&quot;Most like me&quot; (SPG) Pre-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 2</td>
<td>&quot;Preferred Partner&quot; (PP) Pre-treatment</td>
</tr>
<tr>
<td>Task 3</td>
<td>Personal Description Questionnaire (Form A)</td>
</tr>
<tr>
<td>Task 4</td>
<td>Treatment (2 experimental conditions: 'feminine' and 'masculine')</td>
</tr>
<tr>
<td>Task 5</td>
<td>&quot;Most like me&quot; (SPG) Post-treatment</td>
</tr>
<tr>
<td>Task 6</td>
<td>&quot;Preferred Partner&quot; (PP) Post-treatment</td>
</tr>
<tr>
<td>Task 7</td>
<td>Personal Description Questionnaire (Form B)</td>
</tr>
</tbody>
</table>

Figure 5.1. Outline of the tasks included in the study reported in this chapter.
The experimental treatment was **Task four**, “More or less feminine/masculine than me”. In this task participants were asked to view a series of PLWs and to indicate via a key press whether the target walker appeared to be more or less masculine/feminine than him- or herself (males were asked ‘masculine’; females ‘feminine’). It was intended that by making judgements relative to themselves participants’ gender self-concept would be made salient\(^{72}\).

The study utilised a between-subjects design with two experimental conditions into one of which participants were pseudo-randomly assigned\(^{73}\). In the feminine condition PLWs were all from the feminine end of the gender continuum (-2 through -6); in the masculine condition PLWs were all from the masculine end (+2 through +6). Thus, in each condition, 15 target walkers (5 coherent; 5 motion-only; and 5 structure-only\(^{74}\)) were each presented 10 times in random order such that a total of 150 trials were completed. Each PLW was presented for a maximum of 2000 milliseconds with a 1000 millisecond inter-stimulus interval; the participant could respond at any time and a response triggered the presentation of the subsequent PLW.

The purpose of the treatment conditions was to provide each participant with either an intensely feminine or intensely masculine social viewing history prior to the post-treatment measures (Tasks 5-7). Participant responses to these stimuli are not germane to the aims of the current work and so will not be reported here.

**Data analysis**

In the cases of both self-perceived gender (SPG) and preferred short-term partner (PP) the pre-treatment selection was subtracted from the post-treatment selection thereby yielding a pre-post difference score. A negative difference score indicated that the PLW selected post-treatment was more feminine (or less masculine) than that selected pre-treatment, while a

\(^{72}\) Note that differs from the study previously reported, which asked for objective judgements of the stimuli. Here the task was to judge the stimuli relative to self.

\(^{73}\) Participants were assigned alternately to one of the two conditions by sex; that is, every second male participant was allocated to the masculine condition as was every second female and the alternate male and female participants were allocated to the feminine condition.

\(^{74}\) Target cue-type is not considered in this study; the variation in targets was implemented only in order to obscure from participants the fact that this observation task was the experimental treatment.
positive difference score meant the selected post-treatment PLW was less feminine (or more masculine).

Scores on the PDQ were treated in a similar way. Scores on the femininity subscale (PDQ-F), the masculinity sub-scale (PDQ-M), and the composite score (PDQ-F:M)\textsuperscript{75} for Form A (pre-treatment) were subtracted from the corresponding scores on the post-treatment Form B to provide a raw difference score. These differences were then calculated as a percentage of the pre-treatment score and are reported here as percentage difference scores.

Scores and measures were entered into IBM SPSS Statistics Version 20 (SPSS), which was used to calculate descriptive statistics and to compare group means via independent samples t-tests. Correlational analyses were via Pearson product-moment correlation coefficient. Any procedures different to this will be individually described below.

**Results**

**Self-perceived gender**

The consistency of self-perceived gender ratings was high. Pre- and post-treatment ratings of SPG correlated significantly for both males ($r_{9} = .88, p<.01$) and females ($r_{17} = .80, p<.01$) indicating that these self-ratings were stable over time\textsuperscript{76}.

For female participants, viewing more feminine or more masculine PLWs significantly shifted SPG scores. As can be seen in Figure 5.2, women in the feminine condition, where immediate viewing history was of highly feminine PLWs, shifted their SPG judgements toward the feminine end of the gender continuum (pre-post shift: $M=-0.30, SD=0.48$). Similarly, females in the masculine condition changed in the opposite direction, to a more masculine—or less feminine—point (pre-post shift: $M=0.44, SD=0.88$).

\textsuperscript{75} See chapter 2 for more detail.

\textsuperscript{76} This is comparable to consistency levels for self-rated attractiveness over time ($r=.83; p<.005$) reported by Burriss et al. (2011b, p. 544).
Figure 5.2. Shifts in pre-post self-perceived gender (SPG) as a function of experimental condition for female participants (n = 19). The '0' point on the Y axis represents no shift in pre-post SPG judgements, positive values mean that SPG shifted toward the masculine, and negative values that SPG shifted toward the feminine. Error bars = 95% confidence intervals.

Male participants demonstrated a similar pattern in their pre-post shifts in SPG. Males in the feminine condition shifted their SPG in the feminine direction (pre-post shift: $M=-0.50$, $SD=0.84$), and in the masculine direction after viewing masculine PLWs (pre-post shift: $M=0.60$, $SD=0.89$; $t(9)=-2.10$, $p=.06$). Interestingly, shifts in pre-post SPG were recorded only for males whose initial SPG was in the range 0 through 1; those males rating themselves as more masculine—in the range 2 through 6—did not shift their SPG in either direction irrespective of treatment condition.

The influence of viewing condition on shifts in SPG was confirmed by running a 2 x 2 factorial ANOVA, which showed a significant main effect of viewing condition, $F (1, 26) = 5.42$, $p < .03$. There was no significant main effect of observer sex ($F (1, 26) = 0.01$, $p > .05$) nor was there a significant interaction between observer sex and viewing condition ($F (1, 26) = 1.50$, $p > .05$).
Preferred partner

Neither male nor female participants exhibited significant changes in their pre-post indications of their preferred short-term partner (PP) based on experimental condition. For males there was a slight but non-significant tendency to prefer a more feminine partner after viewing feminine PLWs (pre-post shift: $M=0.17$, $SD=2.04$), and in the masculine direction after viewing masculine PLWs (pre-post shift: $M=0.20$, $SD=1.09$; $t(9)=-0.36$, $p=.73$). The direction of these shifts are consistent with what would be predicted if a shift in self-perceived market value had been elicited by the treatment condition, but the size of this effect was very small indeed and thus no such conclusion will be proffered.

Unlike the consistency seen in the effects of treatment condition between females and males in SPG, female participants did not reflect the same pattern as males in their pre-post shifts in PP. No difference reached significance. Women in the feminine viewing condition shifted their PP in
a masculine direction (pre-post shift: $M=0.20, SD=1.13$), and further in the same direction after viewing masculine PLWs (pre-post shift: $M=0.44, SD=1.01$; $t(17)=-0.49, p=.63$).

Self-reported gender role

PDQ Form A (pre-treatment) and PDQ Form B (post-treatment) scores were significantly correlated (PDQ-F: $r=.6$, $p<0.01$ (2-tailed); PDQ-M: $r=.76$, $p<0.01$ (2-tailed); PDQ-F:M: $r=.64$, $p<0.01$ (2-tailed)) demonstrating reasonable levels of consistency. There were no significant pre-post shifts in PDQ scores as a result of viewing condition. Neither males’ nor females’ shifts in PDQ-F, PDQ-M, or the composite PDQ-F:M differed as a function of experimental condition. All $p$-values were $>.05$77. Thus, viewing condition did not differentially affect self-reported gender role scores for either males or females.

Discussion

The aim of this study was to expose male and female participants to highly gendered PLWs in order to gauge whether this would result in shifts in self-perceived gender (SPG), in preferred short-term partner (PP), or in self-reported gender role. Post-viewing measures were subtracted from those recorded pre-viewing (i.e., at baseline) to quantify any shifts.

Comparisons of pre-post difference scores between those who had viewed feminine PLWs and those who had viewed masculine ones revealed a statistically significant main effect of viewing condition on explicit SPG. Specifically, viewing highly feminine PLWs in the treatment phase resulted in participants selecting a more feminine (or less masculine) PLW to best represent themselves compared to that selected prior to the treatment phase. A shift to less feminine (or

77 For male participants pre-post measures on the PDQ were: PDQ-F (feminine viewing condition $M=6.42$, $SD=12.29$; masculine viewing condition $M=8.85$, $SD=11.38$; $t(9)=-0.34, p=.74$); PDQ-M (feminine viewing condition $M=6.19$, $SD=7.97$; masculine viewing condition $M=-0.42$, $SD=14.57$; $t(9)=-0.84, p=.42$); PDQ-F:M (feminine viewing condition $M=14.04$, $SD=15.38$; masculine viewing condition $M=12.42$, $SD=27.40$; $t(9)=0.12, p=.90$). For females: PDQ-F (feminine viewing condition $M=8.18$, $SD=8.71$; masculine viewing condition $M=11.74$, $SD=14.71$; $t(17)=-0.65, p=.52$); PDQ-M (feminine viewing condition $M=5.75$, $SD=11.45$; masculine viewing condition $M=8.95$, $SD=8.19$; $t(17)=0.09, p=.50$); PDQ-F:M (feminine viewing condition $M=16.31$, $SD=16.14$; masculine viewing condition $M=23.97$, $SD=22.24$; $t(17)=-0.87, p=.40$).
more masculine) PLWs occurred for those who had viewed highly masculine walkers. No systematic shift in either preferred partner or gender role was identified.

In the case of self-rated attractiveness, Little and Mannion (2006) found that women exhibited shifts in self-rated attractiveness as a result of their immediate social viewing history that were consistent with market value awareness. If market value forces similarly influence SPG, we would expect to see women with a viewing history dominated by highly feminine ‘others’ demonstrate a reduction in their self-perceived ‘value’ as represented by their self-rated femininity. This would have resulted in SPG shifting toward the masculine end of the continuum. Accordingly, males viewing highly masculine others subsequently would be expected to rate themselves as less masculine. Of course, those viewing highly-gendered opposite-sex PLWs would be expected to increase their sense of their own mate value, which would then be reflected by pre-post shifts in self-rated gender. This is not what was found in the current study.

In direct contrast to the market value model, where viewing feminine PLWs would be expected to shift SPG in both males and females upwards (i.e., in a more masculine or less feminine direction), the result here was that participants’ SPG actually dropped in the feminine viewing condition. Viewing masculine walkers affected SPG in the inverse direction, and the difference between viewing conditions was significant. Again, this seems inconsistent with what would be expected based on the market value model. These findings will be explored further in chapter 6.

With regard to partner preference, Little and Mannion (2006) found that women selected a more masculine image as their preferred partner after viewing low-attractiveness same-sex others (i.e., those in the high value condition) and vice versa. While males in the current study demonstrated shifts—albeit non-significant ones—in partner preferences that were consistent both with those of Little and Mannion (2006) and with market value awareness, this was not the case for females. Indeed, given the very small magnitude of the shifts in male Ps and the lack of
any systematic difference between treatment conditions for females, these findings must be considered a null result.

It should be noted that in procedural terms, SPG was prioritised in the current study. In all cases, it was the SPG task that participants completed immediately after the treatment phase of the experiment. It may be that the effect of the treatment decays quickly and thus that the failure to identify an effect of viewing condition on PP was a type II error. Certainly visual aftereffects have been shown to be temporally transient (Leopold, Rhodes, Mueller, & Jeffery, 2005; Rhodes, Jeffery, Clifford, & Leopold, 2007; Tootell et al., 1995). It may therefore be of value to replicate this study with the PP task introduced immediately following the treatment, or to introduce ‘top-up’ treatments between subsequent post-treatment tasks.

A similar conclusion must also be drawn regarding the various sub-scale differences on the gender role measures. Here it may be—as mentioned in chapter 3—that the parallel forms of the PDQ are insufficiently ‘parallel’ to allow a discrimination of difference scores between conditions. Certainly, variability in scores was high in the current study, but the correlations found here were consistent with those reported and regarded as acceptable in previous studies (Antill et al., 1981; Hong et al., 1983; Russell & Antill, 1984). It may also be that the extent to which individuals subscribe to gender-stereotypical attributes is insufficiently labile to reflect change over a time period as short as the one used in this study. Either way, the difference scores on those variables were highly dispersed here.

The test of the shift in females’ SPG as a function of viewing condition did identify a statistically significant difference, so where a consistent, or systematic, difference occurred, the power here was sufficient to detect it. However, SPG employed an identical task pre- and post-treatment whereas the use of different forms of the PDQ may mean that a far larger sample size is required to detect what may or may not be shifts in self-reported gender role as a function of immediate social viewing history.
Chapter Summary

In this study, males and females were exposed either to a highly feminine or highly masculine social viewing condition. In order to identify the effect of treatment condition, shifts from pre-treatment (baseline) to post-treatment responses on two measures of self-perceived gender and on preferred short-term partner were compared.

Treatment condition was found to have a significant effect on females’ self-perceived gender (SPG) whereby those viewing highly feminine others shifted their SPG in the feminine direction while those viewing highly masculine others shifted their SPG toward the masculine. Males showed the same pattern although this did not reach statistical significance. No meaningful results were found either for differences in preferred partner or for self-reported gender role as a function of treatment condition.

The directions of the shifts in SPG were inconsistent with what may have been expected if market value awareness were driving self-reported gender. Reasons for this will be discussed further in chapter 6.
Chapter 6 - General discussion and conclusions

Introduction

The work reported here relates to the factors that may influence our perceptions of gender, both our own and others’. These factors incorporate exogenous cues—characteristics of an observed other—and endogenous influences, such as the observer’s sense of their own genderedness and the social context in which an observation is made.

Based on questions arising from elements of a somewhat disparate literature, the aims of the studies that have been reported here were threefold: Firstly, to examine the relationships between sex perception and gender perception with a consideration of the relative contributions of visual form and motion cues to observers’ judgements. Secondly, to look more closely at some characteristics of the observer related to gender, at those endogenous factors that may be associated with the judgements individuals make about others. Thirdly, to turn our attention in the opposite direction: to the effect of others on the self, where the task became to tease apart any effect observing highly-gendered others may have on an observer’s perception of her or his own genderedness.

This chapter will proceed with a summary of the findings from the studies reported in chapters 3, 4, and 5, which relate, sequentially, to the three aims just stated. The key findings from these studies will be identified and their nature and implications will then be discussed in turn. Those discussions will include a consideration of the shortcomings of the studies and suggestions for ways in which an interrogation of the questions asked here might logically continue. The final section of this chapter will outline conclusions and provide an overview of this body of work as a whole.
Summary of findings

Chapter 3 detailed an investigation of the relative contributions of visual cue type to judgements of sex and of gender. Observers were asked to judge whether targets were ‘male or female’; ‘masculine or not’; and ‘feminine or not’. Targets were three sets of PLWs: one set conveyed gender across the continuum only via motion cues while structural cues were held neutral and constant; one set varied on structural cues only; and in the third set, motion and structure varied in congruence between targets.

With regard to the effect of visual cue type on judgements of sex and of gender, irrespective of whether observers were judging the sex or the gender of target PLWs, the congruent visual cues provided by the coherent PLWs—where targets varied on both structural and kinematic gender cues—provided superior information to either structural or kinematic cues in isolation. It appeared that observers may have employed different strategies according to the characteristic they were being asked to judge and that structure and motion cues informed observers’ judgements in separate and unique ways. In general, observers’ responses to motion-only targets were furthest from those to coherent walkers, and responses to structure-only targets were generally closer to those for coherent walkers.

So here, the functions of the three cue-types indicated that, for those targets conveying stronger gender cues, observers were most consistent in their responses to coherent PLWs and least consistent when observing targets conveying gender exclusively via motion cues. Coherent targets showed reduced regions of ambiguity along the cue-strength continuum. Viewing motion-only targets resulted in less consistent responding, especially to walkers conveying weaker gender cues, and thus, a broader region of ambiguity. Structure-only targets produced response curves somewhere between those two conditions. In some cases the differences were clearly and significantly different, in others the differences were indicated by significant polynomial interactions pointing to the fact that the shape of the curves differed based on cue-type. Overall then, motion was found to be a less-useful cue than structure, but in most cases
added unique information to it such that observers’ judgements of the coherent walkers were facilitated.

The second category of findings reported in chapter 3 concerned **contrasts of sex judgements and gender judgements**. Here, the critical finding was that regardless of cue-type, the proportion of observers’ feminine responses accorded with that of their female responses across the gender continuum, while masculine responses diverged from male responses. In other words, female equalled feminine, but male did not equal masculine. That is, targets satisfying the necessary criterion or criteria for ‘femaleness’ also satisfied that or those for femininity so that all walkers judged to be female were also judged be feminine.

However, something different to mere ‘maleness’ was in play when observers were ascribing the characteristic of masculinity. Perception of targets as male occurred at a higher rate than as masculine across all three cue-types. So, unlike the judgements of female and feminine, which were in accord across the continuum, there were a range of walkers that observers were willing to describe as male but not as masculine. The bar for masculinity seemed to be set higher than that for maleness. Especially in the case of coherent targets and those conveying gender via motion cues only, this difference was statistically significant. Question type (masculine vs male) also explained a substantial proportion of the variance in responses.

**Relationships among various putative indices of observer gender** were reported in chapter 4. Although the patterns of relationships were somewhat complex, particularly as the investigation included male and female observers separately as well as in a single group, a number of strong and significant convergences were found between measures. Firstly, digit ratio was significantly related to composite gender role score as measured by the femininity to masculinity ratio (PDQ-F:M) when observers were treated as a single group. This correlation was in the logical direction, with higher (more ‘feminine’) digit ratios associated with PDQ-F:M scores (indicating higher femininity relative to masculinity) and vice-versa.
SPG (self-perceived gender) was also a significant predictor of PDQ-F:M score in all participants combined. Again, this relationship was in the direction that would be expected: participants higher on femininity relative to masculinity tended to select more feminine walkers as best representing themselves and vice-versa.

Also reported in chapter 4 were relationships between indices of observer gender and the judgements of target gender made by those observers. Here the point on the gender continuum at which each observer judged the walker in a majority of cases to be masculine (the ‘masculinity point’) or feminine (the ‘femininity point’)\(^78\) were used as indices of observers’ subjective gender judgements of others. Only one measure of observer gender predicted judgements of target gender: SPG was a significant predictor of the point at which male observers judged a target to be masculine.

This was a key finding from the current study. Males who perceived themselves to be more masculine applied a higher threshold when ascribing masculinity to a target; while those with lower SPGs required less strength of masculinity cues in order to judge a target masculine. In other words, for male participants, sensitivity to masculinity cues was inversely, strongly, and significantly related to self-perceived masculinity.

Chapter 5 covered the effect of viewing highly gendered ‘others’ on self-perceived gender and on partner preference. The results reported there with regard to the effect of social viewing history on gender self-perceptions were consistent for male and female observers: viewing highly masculine others shifted SPG in the masculine direction while viewing highly feminine others shifted SPG toward the more feminine end of the continuum. The difference between viewing conditions was statistically significant. This was the first demonstration of its kind using visual representations of both target and self-perceived gender.

\(^{78}\) The number of walkers falling between those two points comprised that observer’s subjective ‘neutrality range’.
Shifts in preferred partner as a function of social viewing history were less clear-cut with no systematic or significant results found. As reported in chapter 5, females in both the feminine and the masculine viewing conditions shifted their PP in a masculine direction and the difference between conditions was non-significant. Males produced a different pattern, a slight but non-significant tendency to prefer a more feminine partner after viewing feminine PLWs and in the masculine direction after viewing masculine PLWs. Nor were any differences between experimental conditions found in pre-post measures of gender role as indicated by PDQ scores.

Key findings

In summary, the five key findings were:

1. The apparent hierarchy of usefulness of motion cues, structural cues and coherent composites to visual judgements of sex and of gender.
2. The demonstrated disconnect between maleness and masculinity but not between femaleness and femininity.
3. The agreement between various indices of observer gender.
4. The tendency for males higher on self-perceived masculinity to demonstrate a higher ‘masculinity threshold’ when making judgements of a target.
5. The demonstrated tendency for observers of both sexes to shift their self-perceived gender toward the feminine after viewing highly feminine others and toward the masculine after viewing highly masculine others.

Discussion

Key Finding 1 - The apparent hierarchy of usefulness of motion cues, structural cues, and coherent composites to visual judgements of sex and of gender.

Whether judging sex or gender, observers showed the highest consistency in responding to targets in which motion and structural cues were in accord, the least consistency where targets varied on motion cues alone, and somewhere between those two when targets varied only on
structural cues. Here ‘consistency’ can be taken to mean responding in the same way to the same question. Although performance on motion cues alone was not generally as high as structure, motion cues seemed to make a unique contribution, particularly to certain judgements.

It is important to note that structure is not completely absent from the motion-only walkers employed in the current study; rather, structural cues are held constant at a statistically sex-neutral point (see Troje, 2002) in these PLWs while motion cues vary across the 13-point gender continuum. Likewise, motion is held constant, but is not absent, in the structure-only walkers. In this way, those two sets of walkers can be thought of as incoherent, or inconsistent, in the gender cues they convey. For example, the motion-only +5 PLW carries kinematic cues five standard deviations from the sex-neutral point into the masculine space, but statistically sex-neutral structural cues. Rather than isolating these cue types then, the current paradigm is, at least to some extent, putting them into conflict. Where the expectation may be that motion and structure will be in accord, here those two cues were inconsistent, with each telling a different visual story. Given that perceptual experience, or fluency, is necessary to make accurate judgements from visual patterns (Barclay et al., 1978; Johnson, Pollick, & McKay, 2010; Winkielman, Halberstadt, Fazendeiro, & Catty, 2006), these somewhat aberrant examples may have provided contradictory information that impeded fluency and thus reduced the ease or automaticity of judgements (Bargh, Schwader, Hailey, Dyer, & Boothby, 2012).

The fact that the accuracy of judgements of structure-only PLWs was closer to that for coherent walkers than that for judgements of motion-only targets may seem to contradict those of a well-known study by Mather and Murdoch (1994), who reported body motion as being a more salient cue than body structure to judgements of sex. However, the stimulus set used in Mather and Murdoch’s (1994) work was synthesised and varied on lateral sway alone, whereas the

79 See Blake and Shiffrar (2007b) for a review of studies where these cues have more fully been dissociated.
PLWs used in the current study were originally derived from coherent walkers (see Troje, 2002 for details) and thus are likely to comprise more complex variations. Indeed, Mather and Murdoch (1994) acknowledged the possibility that the sway cues in their stimuli may have been exaggerated.

In a study employing PLW stimuli, Ben Schouten, Troje, and Verfaillie (2011) isolated structural from kinematic cues. They found that the proportion of male responses to structure-only and to motion-only PLWs was very similar. However, there was a difference in perceived in-depth orientation (i.e., whether the PLW was perceived to be walking toward or away from the observer), and specifically, that structural cues dominated motion cues for this task. Response patterns to structure-only walkers but not motion-only walkers in that study were very similar to patterns previously found in responses to coherent walkers (Brooks et al., 2008; B. Schouten, Troje, Brooks, van der Zwan, & Verfaillie, 2010). This is consistent with the greater agreement between structure-only and coherent responses than between motion-only and coherent responses demonstrated in the current study.

A study by Johnson and Tassinary (2005) also examined the relative contributions of form and motion cues. Importantly, that study included judgements of both sex and gender. Those authors found that structural and motion cues equally influenced judgements of gender and that, where only motion cues are available observers first perceived the gender of the walker and from this inferred its sex. This seems partially consistent with the findings of the current study, at least in the case of feminine and female judgements. It may well have been the case that when making their judgement of sex observers first decided whether or not the walker was feminine and, if so, inferred that the walker was female.

There the similarities end because the same is not true for judgements of maleness and masculinity. Observers here judged PLWs significantly more often to be male than to be

---

80 Given that judgements of feminine and female were essentially the same here and that reaction time was not considered, an alternative explanation for the findings of the current study could be that in fact gender is inferred from sex.
masculine, and that effect spanned the entire continuum. If maleness was being inferred from a judgement of ‘masculine’ a significant difference between them would not be expected.

The finding here that is broadly consistent with other approaches is the primacy of structural cues for sex judgements. Johnson and Tassinary (2005) showed structural cues inform categorical judgements of sex, as did Lu (2010) and Hiris and Mirenzi (2012). Thus, the primacy of structural cues over motion cues was here confirmed for the first time in judgements of sex and of gender from standard PLWs and this was consistent with the results of a number of previous studies on related questions.

In summary, the results of the current study accord with previous findings that structure, or morphology, is a more salient cue than motion to judgements of sex. Further, structural cues were found to dominate motion cues in judgements of gender. These results, specifically in the case of masculine and male judgements, did not support the idea that sex judgements are derived from judgements of gender when motion is the sole visual cue.

Key Finding 2 - The demonstrated disconnect between maleness and masculinity but not between femaleness and femininity.

As was reported in chapter 3, observers viewed a range of PLW targets that conveyed gender either via motion cues, structural cues, or a coherent combination of motion and structure. These stimuli were presented in three blocks and for each block observers responded to one of three questions: “is the walker male or female”, “is the walker masculine or not”, or “is the walker feminine or not”. Irrespective of cue-type, observers consistently responded ‘feminine’ at similar rates to ‘female’, but ‘masculine’ at lower rates than ‘male’. This pattern of responses may be evidence that judgements of ‘feminine’ and ‘female’ shared a common decision criterion (or criteria) whereas a judgement of ‘masculine’ required something more than did one of ‘male’. 
A tendency to respond ‘male’ at higher rates than ‘female’ in response to ambiguous PLW targets has been identified previously by a number of authors (Armann & Bülthoff, 2012; Johnson, Iida, et al., 2012; Mather & Murdoch, 1994; B. Schouten et al., 2010; Troje et al., 2006; van der Zwan et al., 2009); this is known as the male response bias, or simply, the ‘male bias’. Similarly, when the direction of facing is ambiguous—that is the stimulus could equally be perceived as approaching or retreating from the observer—a PLW is more likely to be perceived as approaching when it is perceived as male than when perceived as a female (Brooks et al., 2008; B. Schouten, Davila, & Verfaillie, 2013; B. Schouten et al., 2010; Vanrie, Dekeyser, & Verfaillie, 2004). It has been proposed that these tendencies may reflect the higher risk, in evolutionary terms, of mistaking a male for a female, or of mistaking a male as retreating when in fact he is approaching, than the reverse (Brooks et al., 2008; Johnson, Iida, et al., 2012; B. Schouten et al., 2013). Indeed, Johnson, Iida, et al. (2012) write that “The formidability of men and women is asymmetric” (p. 4982).

However, although this may go some way to accounting for the higher level of male responses to walkers at the feminine end of the continuum compared to female responses to masculine walkers, it does not account for the lower rate of masculine responses than male responses. If the evolutionary cost of neglecting to identify a conspecific as male can be high, surely the cost of under-estimating a male’s masculinity—which, although a different construct, is associated robustly in the evolutionary literature with dominance and strength (A. Hill et al., 2013; Lefevre & Lewis, 2013; McCarty, Hönekopp, Neave, Caplan, & Fink, 2013)—also would carry potential risk. In fact, if this kind of risk-averse strategy does underlie our judgements, we would expect a bias toward responding ‘masculine’ as well as to responding ‘male’.

A possible explanation for these results may be that they were an artefact of question-type. The dichotomous nature of the question for sex perception (“is the walker male or female”) may

---

81 This may also be related to conserving resources.
82 This link will be explored more fully later in this chapter.
have clashed with the effective trichotomy created by asking “is the walker feminine or not” and “is the walker masculine or not” in order to gauge perceived gender. This created a neutrality zone for gender—where the walker was classified neither as masculine nor feminine—that was not available for the question of sex. The rationale behind choosing those questions was the categorical nature of sex versus the more nuanced nature of gender as outlined in chapter 1. It was decided that these questions accommodated the idea that an individual, in the vast majority of cases, is perceived either as male or female (i.e., not-male = female and not-female = male), but that an individual can be perceived as male (or female) without being perceived as particularly masculine (or feminine). It may be though that the lack of a third option—neutral—for sex, as there was for gender, muddied the interpretation of these responses. The forced choice between male and female may have pushed male responses up via the male response bias, but the fact that a neither-masculine-nor-feminine category was available meant there was no need for masculine responses where ambiguity was present.

It could follow then that the gap between male and masculine judgements was a function of the differential activation of the male response bias in the sex judgement and gender judgement tasks. In this way the male response bias can be thought of as a function of forced dichotomous responding such that the point of delineation between male and female is dragged toward the male end of the continuum by ambiguous stimuli. No such bias would be present in judgements of gender due to the option of neutrality provided by allowing not-feminine and not-masculine responses. So, in case this is what was happening here, future work ideally would incorporate four questions: “male or not”, “female or not”, “masculine or not”, and “feminine or not”. However, this does not account for the fact that male responses exceed masculine responses even to the non-ambiguous walkers. The male response bias seems unlikely to be in play past the walker at one or two standard deviations into the male space, and indeed, proportions of male responses to non-ambiguous walkers largely mirror female responses to their opposite. Although question type may be a factor in the centre of the continuum, this is by no means a
definitive explanation for the observed disconnect between male and masculine responses across the entire male range, which were clear and consistent: female = feminine, but male ≠ masculine.

Indeed, if we look beyond the perception literature, we find a body of work with which the results of the current study fit very well. With their seminal paper, Precarious Manhood, Vandello, Bosson, Cohen, Burnafor, and Weaver (2008) coined a term for the uncertain and tenuous nature of the state of manhood. Precarious Manhood is based on the idea that the state of being a real man, as opposed to being simply male, is ‘hard won and easily lost’ (Vandello & Bosson, 2013). Gilmore earlier referred to this state as “…a prize to be won or wrested through struggle...” (Gilmore, 1990, p. 1) and suggested that this struggle to attain manhood is not directly paralleled in womanhood. For females, it is argued, womanhood is bestowed almost by default, whereas for males, manhood is subject to social arbitrament and must be earned through tightly prescribed actions (Bosson & Vandello, 2011; Gilmore, 1990; Vandello & Bosson, 2013; Vandello et al., 2008).

In addition, once earned, manhood is subject to constant reappraisal and maintaining it can be fraught (see Vandello & Bosson, 2013 for a review). Diverging from expectations and behaviours associated with social ideas of masculinity can come at a cost to males. Although, it is important, as Heesacker and Snowden (2013) point out, not to provide a negative account of masculinity, so perhaps not ‘at a cost’ then, but these divergences do seem to shift perceptions of masculinity (Vandello et al., 2008). This seems to be true more for males than for females diverging from femininity stereotypes (Bussey & Perry, 1982; Leszczynski & Strough, 2008; Lobel, Bempechat, Gewirtz, Shoken-Topaz, & Bashe, 1993; Maccoby, 1990). Indeed, back in the visual perception literature, Johnson, Gill, Reichman, and Tassinary (2007) found with regard to judgements of sexuality that the effects of departures from ‘typical combinations’—so, aberrations from gender expectations—were stronger for males than females.
In this way, manhood, which we could certainly think of as according with masculinity, is not a category of which membership is automatically conferred by maleness, whereas femininity is more likely to be thought of as an immutable aspect of being female (Smiler & Gelman, 2008; Vandello et al., 2008). Thus: female = feminine, but male ≠ masculine. This seems strongly to echo the experimental results presented here. It may be that here we are seeing experimental evidence of the precariousness nature of manhood, or of being judged ‘masculine’, in these results. Observers consistently granted ambiguous PLWs maleness, but targets needed more strongly to demonstrate masculinity before having the mantle of ‘masculinity’ bestowed.

**In summary**, feminine judgements were found closely to track female judgements in response to PLWs across the gender continuum whereas that was not the case for masculine and male judgements. PLWs, specifically those from neutral into the masculine space, were judged to be male at higher rates than they were judged to be masculine. This occurred across the three cue-types. Future studies should include four questions (“male or not”, “female or not”, “masculine or not”, and “feminine or not”) in order to avoid possible differential activation of the male response bias in the sex judgement and gender judgement tasks. However, these results fit remarkably well with the idea of manhood—or masculinity—being a state, unlike femininity, that must be earned or actively demonstrated and may well constitute further experimental evidence of ‘Precarious Manhood’ (Vandello et al., 2008).

**Key Finding 3 - The agreement between various indices of observer gender.**

Three discrete measures were taken for each participant as indices of observer gender. The first of these was self-perceived gender (SPG), a subjective and explicit indication of the individual’s assessment of the genderedness of their own gait. The second index was digit ratio (or 2D:4D), which is widely used as an index of exposure to prenatal sex hormones (Breedlove, 1994; Manning, 2002). The third was the Personal Description Questionnaire (PDQ; Antill et al.,
which quantifies the extent to which an individual endorses various characteristics, or traits, associated with a gender role. The PDQ yields scores on both masculinity (PDQ-M) and femininity (PDQ-F) subscales as well as a composite score (PDQ-F:M). The approach was broad and comprehensive here in order both to provide convergent validity to the more novel measures and to maximise the opportunity to identify relationships between indices of gender.

As mentioned previously, a number of correlations were identified between these measures: More feminine digit ratios were likely to be found in individuals with a more feminine overall gender role orientation, and in turn, those individuals were more likely to identify a more feminine gait as best representing their own.

In short, the convergences found among measures of observer gender do seem to support the idea that these measures were tapping, to some extent at least, a common aspect or some underlying aspect of genderedness. Indeed, inasmuch as gender—the level of our masculinity and/or femininity—can be thought of as a sexually dimorphic characteristic, this accords with other evidence for convergence among various characteristics thought to be of evolutionary importance (a few examples from many include: Barber, 1995; Dane, 2010; Feinberg, 2008; Moore, Law Smith, Taylor, & Perrett, 2011; Neave et al., 2003; Penton-Voak & Chen, 2004; Perrett et al., 1998; Thornhill & Grammer, 1999).

Indeed, for females, femininity has been found to be associated with attractiveness (Feinberg et al., 2005; Moore et al., 2011; Puts, Barndt, Welling, Dawood, & Burriss, 2011) and thus with mate value or success (Fracarro et al., 2010; Pflüger, Oberzaucher, Katina, Holzleitner, & Grammer, 2012; Rhodes, Chan, Zebrowitz, & Simmons, 2003; Rhodes, Simmons, & Peters, 2005). Accordingly, for males, masculinity has been related to testosterone levels (Penton-Voak & Chen, 2004; Sellers, Mehl, & Josephs, 2007)\(^4\), perhaps to attractiveness (DeBruine, Jones, Smith, & Little, 2010; Perrett et al., 1998), but certainly to dominance (DeBruine et al., 2006; 2005).

---

\(^{83}\) The PDQ is also sometimes referred to as the “Australian Sex Role Scale”.

\(^{84}\) Although this should not be interpreted as a simple, direct, causative relationship (in either direction) (Lefevre, Lewis, Perrett, & Penke, 2013; van Anders, 2013).
Doll et al., 2014; Perrett et al., 1998; Puts, 2010; Watkins, Jones, & DeBruine, 2010; Windhager, Schaefer, & Fink, 2011), and thus to mate value or success (A. Hill et al., 2013; Little et al., 2007; Puts, Jones, & DeBruine, 2012; Rhodes et al., 2005)\textsuperscript{85}.

Similar accord among different indices has also been identified in supposedly more abstract, or social, measures such as gender role. In fact, gender role has been linked to levels of salivary testosterone, with scores on the femininity scale of the Bem Sex Role Inventory (BSRI: Bem, 1974)\textsuperscript{86} negatively predicting testosterone in males (Law Smith, Deady, Sharp, & Al-Dujaili, 2013) and, in females, testosterone levels have been shown to be related to gender role in several ways (Baucom, Besch, & Callahan, 1985; Overlie, Morkrid, Finset, & Holte, 1996).

The role of sex hormones is at the heart of the idea of using digit ratio (2D:4D) as an index of gender. It seems to be well established that digit ratio is a sexually dimorphic characteristic – with females, on average, demonstrating larger 2D:4D ratios than males (Burriss, Little, & Nelson, 2007; Hampson, Ellis, & Tenk, 2008; Manning, 2002; McFadden & Shubel, 2002; Peters, Tan, et al., 2002; Puts, Gaulin, Sporter, & McBurney, 2004). It is widely reported that this variability is—at least in part (Galis, Ten Broek, Van Dongen, & Wijnaendts, 2010), directly or indirectly—a result, of exposure to sex hormones in utero (Kondo, Zakany, Innis, & Duboule, 1997)\textsuperscript{87} and it is said to remain relatively stable over the life course (Hönekopp, Bartholdt, Beier, & Liebert, 2007; Manning et al., 1998).

In the current study, digit ratio was significantly correlated with SPG (self-perceived gender). So, high (or feminine) digit ratio was associated with the selection of a more feminine walker as ‘most like me’, low (or masculine) digit ratios were related to the selection of a more masculine

\textsuperscript{85} This often has been found (although, see Harris et al., 2013 for cautions) to be mediated by female hormonal and other factors (for example, see Feinberg et al., 2006; Little et al., 2007; Roney & Simmons, 2008), however the current examination will be confined to general trends.

\textsuperscript{86} A widely-used instrument for measuring sex-role (or gender role); see chapter 2 for more details.

\textsuperscript{87} The careful reader will note that many authors refer to the idea that 2D:4D is an index of prenatal exposure to sex hormones although that has yet to be demonstrated empirically in humans (see Breedlove, 2010 for an outline of the issues involved; Hampson & Sankar, 2012; and Zheng & Cohn, 2011 for evidence from mouse models).
walker. Interestingly, digit ratio previously has been found to correlate with other-rated masculinity (Burriss, Welling, & Puts, 2011a; Neave et al., 2003), but not with actual measurements indicating sexual dimorphism in males (Burriss et al., 2011a). It could be said then that in those studies as well as the current one, digit ratio was associated with perceived gender. This is quite a fascinating result. Some time ago, a link between gender role and expressive movements was identified (Frable, 1987), but most recent work has tended to focus on searching for links between gait and sexual orientation, which largely focuses on gender atypicality (Johnson et al., 2007; Rieger, Linsenmeier, Gygax, Garcia, & Bailey, 2010). Here, none of the participants self-assessed as having a particularly gender atypical gait so the present relationship has the advantage of having been identified in a more typical sample.

It is worth noting though that the SPG/digit ratio correlation here was significant (at the $p<0.05$) level for all participants combined, but for neither males nor females when the groups were treated separately. Thus, digit ratio did not predict within-sex SPG.

SPG was also strongly and significantly related to gender role for all participants combined: lower femininity relative to masculinity scores on the PDQ were associated with more masculine (or less feminine) SPG. So again, in general terms, gait genderedness was found here to predict gender role scores (and vice versa). However, as with digit ratio, within-sex correlations were at non-significant levels. A more rigorous examination of this is likely to require an increased sample size and, importantly, a more fine-grained index for self-perceived gender.

It is quite possible that the narrow range of available values on the SPG measure may have obscured any within-sex relationship between SPG and other measures (Gravetter & Wallnau, 2009). Increments on the stimulus set employed for the SPG task essentially represent standard deviations from a gender neutral point so that of the six ‘female’ or six ‘male’ walkers, three are more than three standard deviations away from the mean of all walkers. So walkers further along the gender continuum are noticeably exaggerated in the genderedness of their gaits and
thus are less-likely to be chosen, which results in a restricted range of values for SPG. A range of only six values were chosen by males in the current study as representing their SPG, only five by females. In this way, some of the nuance of the individual variation in participants’ self-perceived gender may have been missed here. It seems likely that if a wider range values were available—so if incremental shifts in the gender cues conveyed by each walker were smaller, or more fine-grained—the chance of within-sex effects being identified would increase.88

Again, for all participants combined, but not for males or females alone, significant correlations were found in the current study between digit ratio and gender role. Although femininity score essentially was unrelated to digit ratio, both masculinity score (PDQ-M) and the composite gender role score (PDQ-F:M) were.

In a study by Csathó et al. (2003), composite score on the BSRI (gender role) was found to be significantly correlated with digit ratio in women. Those authors reported that lower 2D:4D ratios were significantly associated with higher (more masculine) scores on the BSRI in females. Here, although the correlation was strong between digit ratio and gender role scores for females, it was not significant at the .05 level. Nor was there a significant relationship between those two variables for males (Csathó et al., 2003 did not consider males in their study). This was consistent with at least one larger study (n=137) in which no relationship was found between gender role and digit ratio in a mixed sample (Kim et al., 2010).

So, the failure here to replicate the results found by Csathó et al. (2003) is not the first. Indeed, a broader look at the literature in this area indicates that these relationships in fact quite tenuous and far from unequivocal (Lippa, 2006; Puts et al., 2004; Schmukle et al., 2007). The lack of consistency, replication failures, and very small effect sizes of many reported results (see Voracek et al., 2011 for a meta-analysis) casts doubt on the robustness of any meaningful

88 Note that this idea applies to the types of correlations discussed in this section, where SPG is a much ‘blunter’ instrument than those used for the other variables. A significant within-sex correlation was identified between SPG and masculinity point (discussed below) where the two measures were matched.

89 Remember that in the current study the mean of males’ and females’ scores on the femininity scale of the PDQ were almost identical and the sexes varied predominantly on scores on the masculinity scale.
within-sex correlations between gender role and digit ratio. Puts et al. (2004), for example, reported that, of 57 correlations between digit ratio and a range of variables reported to be related to it, only 2 correlated in the predicted direction to a significant extent. Further, those authors point out that “lumping” males and females in this kind of analysis is a questionable analytical practice (p. 183).

This is a position supported by the results reported in chapter 4 here. The idea of the within-sex correlation found by Csathó et al. (2003) was intriguing, and was the motivation for including digit ratio in this suite of studies. If digit ratio is fixed in utero and is significantly associated with within-sex variability in other indices of genderedness, it could be thought of as evidence of some kind of early determinism, or at least of an early influence on gender development beyond that of biological sex. The fact that digit ratio was here not able to account for individual differences in genderedness once biological sex was controlled for means that 2D:4D, one sexually dimorphic physical characteristic among many (Wells, 2012), may predict nothing more meaningful than biological sex. Even there, the large overlap between male and female digit ratios (Peters, Mackenzie, et al., 2002) means that the inter-sex difference itself is generally very small (Breedlove, 2010). In fact, Puts et al. (2004) point out that there is a high likelihood that Type I errors have contributed to findings within the digit ratio literature. Voracek et al. (2011) suggest, persuasively, that publication bias may also have much to answer for in this area.

**In summary,** several strong and significant accordances between the discrete indices of gender used in the current study were demonstrated. This may be considered at least limited support for the idea that these measures may be tapping into a single underlying construct. However, no statistically significant correlations were identified after controlling for sex. Thus, the overarching nature of the relationships between sex and gait genderedness, sex and digit ratio, and between sex and gender role may well be the dominant factor here.
Key Finding 4 - The tendency for males higher on self-perceived masculinity to demonstrate a higher ‘masculinity threshold’ when making judgements of a target.

As reported in chapter 4, self-perceived gender (SPG) was found to be a strong and statistically significant predictor for masculinity point in male observers. In other words, for males, the level of masculinity of the walker chosen as best representing themselves predicted the level of masculinity cues required in a target in order for it to be judged as masculine. In this way, men reporting themselves to be more masculine based on gait tended to require stronger masculine cues in a target, and men reporting themselves to be lower on gait masculinity required lower levels of masculine cues, in order to assign masculinity to that target.

One possible account for this may be that masculinity as expressed by gait is some kind of motor expertise such that individuals with more experience of their own gait masculinity would be better able to detect it in others. In a number of domains, it has been demonstrated that expert observers are more sensitive to information conveyed via point light displays than are novices (Abernethy, Gill, Parks, & Packer, 2001; Calvo-Merino, Ehrenberg, Leung, & Haggard, 2010; Hohmann, Troje, Olmos, & Munzert, 2011; Sebanz & Shiffrar, 2009a, 2009b). Here though, the relationship was the opposite of what might be expected if expertise was driving sensitivity to masculinity cues: males higher on self-perceived masculinity were actually less sensitive to masculinity cues. Blake and Shiffrar (2007a), in addition to reviewing the evidence in support of the influence of motoric experience in visual action perception, highlight the role of socially relevant information and it seems likely that social factors, above simple motoric experience, are involved here.

Indeed, the relationship identified here corresponds with a body of evolutionary-focussed research relating to masculinity, dominance, and their correlates (see Puts, 2010 for an overview). For example, Watkins, Jones, et al. (2010) found that men scoring highly on dominance attributed lower levels of dominance to other male faces. Similarly, men rating their own dominance highly tended to rate others’ as lower (Wolff & Puts, 2010), and shorter men
have been found to be more sensitive to dominance cues in other men (Watkins, Fraccaro, et al., 2010).

It is also consistent with the expected effect of psychosocial resources on perception (Harber et al., 2008; Harber et al., 2011) as outlined in chapter 1 inasmuch as having higher self-perceived masculinity (higher resources) may ameliorate an inclination for males to overestimate masculinity in other males. Although not found in every case (see for example Lefevre & Lewis, 2013), the tendency for males to judge others relative, at least in part, to their own ‘level of resources’ in terms of masculinity or dominance\(^{90}\) seems to be evident in most studies for which it has been tested.

Masculinity has robustly been associated with dominance (DeBruine et al., 2010; Watkins, Jones, et al., 2010). In fact, dominance as an overall construct has been put forward as influencing male mating success more strongly than does attractiveness (A. Hill et al., 2013; Kenrick, Neuberg, Zierk, & Krones, 1994; Townsend & Wasserman, 1998) and the tendencies just described have been explained in terms of cost of fighting (Watkins, Fraccaro, et al., 2010). Male-male competition is, understandably, a greater risk for those males lower on dominance (Stirrat, Stulp, & Pollet, 2012). Interestingly, shifts in male perceptions of self-dominance—such as those resulting from losing or winning a competition with another male—have been associated with shifts in sensitivity to dominance cues in other men (Watkins & Jones, 2012) and with preference for femininity in a prospective female mate (Welling, Persola, Wheatley, Cárdenas, & Puts, 2013). Those findings lend weight to the idea that, rather than being absolute, or concrete, dominance or masculinity self-perceptions can be affected by situational, or environmental, factors.

In summary, males who perceived themselves to be more masculine in terms of their gait tended to have a higher threshold for assigning masculinity to others, while those who

---

\(^{90}\) 'Resources' in this context refers to characteristics that have ‘value’ in the market (such as dominance, attractiveness, masculinity, etc.).
perceived themselves to be lower on masculinity demonstrated higher sensitivity to masculinity cues in others. This result converges with the broader literature. Self-perceived masculinity may accord with dominance, and here we have seen the relationship between high masculinity and lower sensitivity to masculinity cues in other males confirmed via a novel index: that of gait masculinity.

**Key Finding 5 - The demonstrated tendency for observers of both sexes to shift their self-perceived gender toward the feminine after viewing highly feminine others and toward the masculine after viewing highly masculine others.**

In this study, males and females were exposed to point light walkers conveying high levels of gender cues in an attempt to provide either a high market-value or low market-value social viewing condition based on gender. In order to identify the effect of treatment condition on self-perceived gender (SPG), shifts from pre-treatment (baseline) to post-treatment SPG responses were compared across treatment conditions via ANOVA with observer sex included as a second independent variable. A significant main effect of treatment condition was identified. Females in the low-value condition (viewing feminine others) shifted their SPG in the feminine direction while those in the high-value condition (viewing masculine others) shifted their SPG toward the masculine end of the continuum. Males shifted their SPG in the feminine (or less masculine) direction after viewing feminine PLWs and toward the masculine after viewing masculine PLWs. No interaction was found, nor was there a main effect of observer sex.

An intriguing observation in this study was that only males initially rating themselves in the range 0 through 1 (lower masculinity) shifted their pre-post SPG; those higher on SPG did not shift their SPG at all. Irrespective of that, these results do not accord with what might be predicted if market value awareness were driving responses.

If femininity in females and masculinity in males are ‘valuable’, which is likely (Feinberg, 2008; Fracarro et al., 2010; Little et al., 2001; Little, DeBruine, & Jones, 2013; Little et al., 2007; Pflüger
et al., 2012), then viewing more feminine PLWs would be expected to serve as exposure to others of higher mate-value for female observers and viewing more masculine walkers would do the same for male observers. Subsequent to this type of exposure, observers’ perception of their own mate value, relative to the market, would be expected to decrease; thus, these would be considered the low mate-value conditions. Yet here, males who viewed masculine PLWs—essentially the low-value condition—actually shifted their SPG further toward the masculine and females who viewed feminine walkers shifted their SPG toward the feminine. That means that in the ostensible low mate-value conditions both males’ and females’ responses were consistent with an increased perception of their own market value. Results from the high market-value conditions were in the opposite directions. So in fact, these results were precisely the reverse of what would be expected if market value perceptions were at play.

Brown et al. (1992) found that, although women viewing unattractive images of other women shifted their attractiveness self-appraisals, viewing male targets had no such effect. Those authors concluded that only the same-sex targets were “…appropriate targets of comparison where physical attractiveness is concerned” (Brown et al., 1992, p. 719). Little and Mannion (2006) also showed only same-sex images to their participants in the treatment phase; thus encouraging self-referencing. In the current study, instructing participants to respond indicating whether the presented PLWs appeared “more or less feminine than you” (for females; “more or less masculine than you” for males) was designed to activate a similar self-referential focus. However, in contrast to images of faces, the stimuli employed here varied on a single continuum: from very feminine to very masculine. So PLWs in each condition did appear to be either male or female. Thus, rather than appearing to be less feminine—and so less valuable—females, PLWs in the masculine condition actually appeared to be male. For male observers this is likely to be somewhat equivalent to viewing ‘high value’ same-sex others, but for female observers, despite the focus on self-referential judgements, it is more akin to viewing opposite-sex others. This renders the treatment a considerable departure from that deployed in the Little
and Mannion (2006) study and from other similar studies and seems a credible explanation for the effects, at least of the low market-value conditions, not being in accord with market-value perception. So, market-value forces failed to exert an influence on the results of the current study, yet evidence was found here of systematic shifts in SPG as a function of viewing condition.

However, neither were these findings consistent with a straight social contrast effect—where viewing highly attractive individuals causes judgements of subsequently presented individuals to shift toward unattractive and vice versa (see for example Brown et al., 1992; Cash et al., 1983; Kenrick & Gutierres, 1980; Oikawa et al., 2012; Thornton & Moore, 1993). Allowing for gender being the focus rather than attractiveness, this would mean that after viewing highly masculine PLWs all observers would choose a less masculine walker and vice versa. Again, the results here, in both viewing conditions and for both male and female observers, were the reverse of what would be expected if a social contrast effect were influencing responses.

Clearly though, as the effect of social viewing condition was consistent across observers of both sexes, something was acting to shift self-perceived gender in the direction of recently-viewed social stimuli. There was another departure from previous protocols that may be responsible for this. In the current study, after viewing the treatment condition, each participant was asked to select the point on a dynamic point light display that best represented themselves. In this way, the gender self-rating task employed a similarly rich visual stimulus to the treatment stimuli, rather than the less visually redolent response scale often used in this type of study. Thus, where other studies have asked the observer to look at images of attractive or unattractive ‘others’ in the treatment condition, in the post-treatment self-rating task, observers would be responding via a written questionnaire (Bailey et al., 2011; Brown et al., 1992; Cash et al., 1983; Little & Mannion, 2006). Here they responded to visual stimuli of the same class as was used in the treatment.
**Sex-contingent visual after-effects** have been demonstrated in previous studies (Buckingham et al., 2006; Little et al., 2005; Troje et al., 2006; van der Zwan et al., 2009). These after-effects manifest in such a way that a stimulus previously perceived as sex-neutral appears female after visual adaptation to highly masculine stimuli and vice versa. Such perceptual after-effects can take some time to decay (Carbon & Ditye, 2011, 2012; Daelli, van Rijsbergen, & Treves, 2010; Kloth & Schweinberger, 2008). Thus, the treatment phase of the current experiment may have acted as the adaptation phase does in an aftereffects experiment, and viewing the dynamic walker in order to select self-perceived gender (SPG) may have acted as the target, or subsequently viewed stimulus. If this was the case, as with an adaptation aftereffect, the walker in the SPG display would have appeared less feminine to those observers who had just viewed highly feminine PLWs and less masculine to those having viewed highly masculine PLWs.

To fully explain the results of the current study though, one further step needs to be taken. Observers were selecting the walker that best represented **themselves**. Thus, post-treatment, observers in the masculine condition were selecting the walker that best fitted their self-referenced point from a range of PLWs that, due to an adaptation after-effect, now appeared less masculine (if the observer had been in the masculine viewing condition). Of course the opposite was the case for those in the feminine viewing condition. The high level of agreement between pre- and post-treatment SPG^92 indicated that observers’ self-perceived gender was quite stable. Thus, it may be that an imagined fixed point (self-gender identity) was being selected from a range that perceptually had shifted, resulting in the systematic shifts in SPG observed here based on treatment condition. In this way, observers’ idea of their self-perceived gender may not have shifted at all, but their visual perception of the available stimuli from which they could choose had.

---

^91 The author of the current work was also co-author on the van der Zwan et al. (2009) paper.

^92 Males ($r_9 = .884$, $p<0.01$); females ($r_{17} = .804$, $p<0.01$).
This is an interesting and novel result, and may strengthen the evidence that humans have a stable and prevailing sense of self-gender (Bussey, 2011). It should be noted this in no way precludes the possibility of fluidity in gender self-concept such as that discussed in chapter 1 (Burke, 2006; Burke & Cast, 1997; Frable, 1997; Hundhammer & Mussweiler, 2012; Leszczynski, 2009; Leszczynski & Strough, 2008), and it is possible that the results reported here reflect a real shift in observers’ gender self-perception. Further work will be required to establish this, and the activation of a sex-contingent visual after-effect seems to account most fully for what was observed here.

Importantly, if the desire is to elicit a market-value effect from viewing high or low market-value others, a change in methodology will be required. The first consideration would be to ensure that, for females and for males, both treatment conditions comprise only plausibly same-sex others. This could be achieved using the current set of stimuli: by considering the weightings assigned to the PLWs in chapter 3 and using those most often perceived as feminine (or masculine)—the coherent, or congruent, walkers—in the low-value conditions and the more ambiguous motion-only PLWs in the high-value condition.

The second adjustment to consider in planning further work in this area would be to interrogate SPG in a less-visual way in order to avoid activating the perceptual adaptation after-effect that may have contributed to the results here. As mentioned, other studies have utilised a non-visual scale (i.e., a Likert-type response scale) for self-assessment; future work based on that conducted here would benefit from employing a similar non-visual scale for measuring SPG. Alternatively, a non-visual treatment could be employed; perhaps, after choosing their pre-treatment SPG from the range used here, observers could listen to or read a scenario or vignette aimed at invoking either a high or a low perceived market-value.

In summary, both males and females shifted their self-perceived gender in a masculine (or more feminine) direction subsequent to prolonged viewing of masculine PLWs and in the opposite
direction after viewing feminine PLWs. This was not consistent with the results that would be expected if shifts in perceived relative market-value were driving the changes. Rather, it appears that sex-contingent visual after-effects were elicited by the methodology employed here. In order more effectively to interrogate potential market-value effects two potential adjustments were identified. Firstly, stimuli used in the treatment phase should be more plausibly same-sex than those used here in the high-value conditions; and secondly, a non-visual response scale for capturing self-perceived gender would avoid activating the visual after-effect seen here. However, these results lend credence to the idea that humans have a fairly stable concept of their own gait genderedness.

**Conclusion**

The findings reported here have been conceptually consistent with work in related areas and can certainly serve to form the basis for confirmatory work. Some of the data reported here were exploratory, but in terms of developing our understanding of the exogenous and endogenous factors that contribute to perception of sex and of gender the results indicate that both are likely to be in play.

In terms of exogenous cues to gender, visual cue-type is an important aspect of the target and, logically enough, the richer cues provided by coherent PLWs were found to equate with more accurate judgements. The real contribution of this work was in those cases where structural and motion cues were presented independent of each other. It seems that observers may use differing strategies according to the question asked, and that each cue type, at least in some cases, contributes unique information. Broadly though, structural cues were found to provide superior information to motion cues for judgements of sex and of gender.

The new contributions arising from the studies reported here also point to a kind of social relativity applying to gender perception: Men perceiving themselves to be less masculine are more sensitive to masculinity cues in others. Thus, an endogenous factor—namely, the self-
perceived gender of the observer—was significantly related to judgements of target gender. Specifically, this was significant for male observers, with self-perceived gender predicting the threshold at which the observer ascribed masculinity to a target. Consistent with the idea of psychosocial resources influencing perception, men who perceived themselves to be more masculine had lower sensitivity to masculinity cues in others and vice versa.

Interestingly, while femininity was found to map directly onto femaleness, to be regarded as masculine required something other than mere maleness here. So, while being judged feminine went hand in hand with being judged female, being judged male was significantly ‘easier’ than being judged masculine. This was a completely novel finding, it was evident across cue-types, and the effect size was large. This experimental evidence echoed a body of literature known as Precarious Manhood (Vandello et al., 2008) wherein the state of ‘being masculine’ is reported to be “hard won and easily lost” (Vandello & Bosson, 2013, p. 101).

Criticisms of work on masculinity (and, presumably, femininity) include that it can serve to promote an essentialist way of thinking about gender (Addis, Mansfield, & Syzdek, 2010). Broader reservations have been expressed, convincingly, with regard to research proposing biologically determined accounts of sex or gender differences (for some examples see Fine, 2011; Fine et al., 2013; Grossi & Fine, 2012; Jordan-Young & Rumiati, 2012). That is far from the intention here (despite the inclusion of digit ratio as a putative index of gender). One thing that does seem clear from the present results is that gender cannot easily be extricated from sex, something that should not come as a surprise given the differences in experiences throughout life that are contingent on perceived sex (Bussey & Bandura, 1999; Leaper, 2000; Wood & Eagly, 2002). Overall though, the work reported here has provided more support for a dynamic, interactive account of gender such as that proposed by Deaux and Major (1987)\(^3\).

\(^3\) Also see Wood and Eagly (2012) for a thoughtful attempt at integrating sociocultural and evolutionary/genetic influences on gender.
Bohan (2002) speculates that a rejection of the idea of the intrinsic gender identity in favour of a more relational self may threaten a primary tenet of psychology. She points out that the very idea of the ‘social’ as an aggregate of ‘individuals’ is at stake and asks: “Are we all participants in every self?” (Bohan, 2002, p. 84). We very well may be. The work reported here brings new evidence of both stability and fluidity in gender perception, of interactions between perceptions of self and other. The results are consistent with the idea of an interactive model of social perception regarding gender and of a rich and perhaps dynamic complexity in the way or ways we see ourselves in terms of others and others in terms of ourselves.

By considering self perceptions of gender as well as perceptions of the sex and gender of others and by attempting to isolate the contributions of both endogenous and exogenous factors related to those perceptions, a picture has emerged here of profoundly social interactions. As Markus and Cross (1990) wrote, “...however intensely private and uniquely individual the self seems to be, it is really a social self” (p. 578).
References


Armann, R., & Bülthoff, I. (2012). Male and female faces are only perceived categorically when linked to familiar identities - And when in doubt, he is a male. *Vision Research, 63*(0), 69-80. doi:10.1016/j.visres.2012.05.005


biological motion figures. Current Biology, 18(17), R728-R729. doi:10.1016/j.cub.2008.06.054


Dane, L. K. (2010). An analysis of the sexual dimorphism of hands: attractiveness, symmetry and person perception. (Doctoral), University of New Mexico


10.1037/a0016457.supp (Supplemental)


Hiris, E., & Mirenzi, A. (2012). The Role of Motion and Form in the Sex Aftereffect in Biological Motion. *Journal of vision, 12*(9), 646. doi:10.1167/12.9.646


146


Kozlowski, D. (2008). *Do we see what we see – or see what we hear? Searching for adaptation aftereffects and audiovisual interactions in gender perception from biological motion.* (BPsych Honours), Southern Cross University, Coffs Harbour.


Appendices

Appendix A

Personal Description Questionnaire (A) (Antill et al., 1981)

This task asks you to describe yourself. Below is a list of personality characteristics. Please use these characteristics to describe yourself. Indicate on a scale from 1 to 7 how true of you these various characteristics are. Please do not leave any characteristics unmarked.

**Example:** Happy

Mark that you are happy.
Mark 1 if it is NEVER OR ALMOST NEVER TRUE that you are happy.
Mark 2 if it is USUALLY NOT TRUE that you are happy.
Mark 3 if it is SOMETIMES BUT INFREQUENTLY TRUE that you are happy.
Mark 4 if it is OCCASIONALLY TRUE that you are happy.
Mark 5 if it is OFTEN TRUE that you are happy.
Mark 6 if it is USUALLY TRUE that you are happy.
Mark 7 if it is ALWAYS OR ALMOST ALWAYS TRUE that you are happy.

Loves children
Firm
Dependent
Patient
Tense
Bossy
Noisy
Needs approval
Rash
Show-off
Interesting
Appreciative
Nervous
Sensitive to the needs of others
Aggressive
Confident
Self-sufficient
Competitive
Casual
Timid
Self-critical
Logical
Grateful
Sarcastic
Forceful
Clear-thinking
Weak
Bashful
Mischiefous
Responsible
Emotional
Resourceful
Skilled in business
Shy
Childlike
Anxious
Devotes self to others
Feels Superior
Boastful
Loyal
Strong
Carefree
Absent-minded
Rude
Sees self running show
Outspoken
Worrying
Gentle
Silly

Pleasure-seeking
Appendix B
Personal Description Questionnaire (B) (Antill et al., 1981)

This task asks you to describe yourself. Below is a list of personality characteristics. Please use these characteristics to describe yourself. Indicate on a scale from 1 to 7 how true of you these various characteristics are. Please do not leave any characteristics unmarked.

**Example:** Happy
Mark that you are happy.
Mark 1 if it is NEVER OR ALMOST NEVER TRUE that you are happy.
Mark 2 if it is USUALLY NOT TRUE that you are happy.
Mark 3 if it is SOMETIMES BUT INFREQUENTLY TRUE that you are happy.
Mark 4 if it is OCCASIONALLY TRUE that you are happy.
Mark 5 if it is OFTEN TRUE that you are happy.
Mark 6 if it is USUALLY TRUE that you are happy.
Mark 7 if it is ALWAYS OR ALMOST ALWAYS TRUE that you are happy.

- Helpful
- Athletic
- Dreamy
- Humane
- Inefficient
- Big-headed
- Swears
- Fussy
- Complicated
- Crude
- Lively
- Gracious
- Hurried
- Soft-hearted
- Rebellious
- Mechanical ability
- Determined
- Defends own beliefs
- Not timid
Changes mind easily
Mild
Interests wide
Sensitive
Selfish
Brave
Relaxed
Gullible
Religious
Hard-headed
Forgiving
Considerate
Has good sense of humour
Adventurous
Reserved
Hasty
Cries easily
Understanding
Abrupt
Uses harsh language
Courteous
Daring
Acts as leader
Flashy
Loud
Arrogant
Willing to take risks
Excitable in a major crisis
Eager to soothe hurt feelings
Shortsighted
Independent
Appendix C

INFORMATION SHEET

My name is Desirée Kozlowski; I am conducting research as part of my Doctor of Philosophy in the Discipline of Psychology at Southern Cross University. This project is being supervised by Associate Professor Rick van der Zwan (Discipline of Psychology, Southern Cross University, Coffs Harbour). My research project is titled: ‘Gender Perceptions of Self and Others’

This is what participation would involve.

The aim of this experiment is to scientifically test the relationship between various personal characteristics and visual representations of and judgments of gender.

This research involves an experiment wherein you will be asked to view a number of very short video clips of figures walking and asked to respond to questions about these walkers by pressing a key on the computer keyboard. You will also be asked to allow the lengths of two fingers on each hand to be measured, and, twice during the session, to complete a questionnaire about yourself. Additionally, you will view a range of walkers and be asked to choose those walkers that you think are ‘most like you’ and those that are closest to your ‘ideal short-term mate’. You will also be asked to record your sex and age.

In total, participation will require approximately 40 minutes of your time. You qualify to participate in this study if you are aged between 18 and 29 years, if you are able to read and to respond to questions in English, if you have normal or corrected-to-normal vision, and if you have no injury or disease that affects the lengths of your 2nd or 4th fingers on either hand.

Other things you need to know.

Participation is entirely voluntary and there are no costs to participate. Should you wish to stop participating at any time, you may do so simply by advising the researcher without incurring adverse consequences of any kind. There are minimal foreseeable risks or discomforts for you should you choose to participate in the study. You will not be paid for their involvement (other than the provision of those things necessary to the study as stated above).

The results of this study will be included in my PhD thesis and they may also be published in a peer-reviewed journal and/or presented at conferences, but only group data will be reported. It is hoped that the wider community will benefit from this research by gaining greater understanding of human gender perception.

There is no requirement that you be identified with your data and you will not be. Your responses will be de-identified. All data will remain the sole property of the Southern Cross University researchers. Data will be stored in a locked cabinet at SCU for 7 years after the completion of the research as required by the Human Research Ethics Committee at Southern
Participant’s Consent

You can consent to participating in this research by reading, signing and returning the appropriate Consent Form, which will be supplied to you.

Enquiries

This form is yours to keep for future reference. If you have any questions, we would like you to ask us (Desirée in the first instance):

**Researcher**
Desirée Kozlowski  
Department of Psychology  
Southern Cross University  
desiree.kozlowski@scu.edu.au  
Phone: 02 6659 3655

**Supervisor**
Associate Professor Rick van der Zwan  
Department of Psychology  
Southern Cross University  
rick.vanderzwan@scu.edu.au  
Phone: 02 6659 3306

Feedback

All participants are entitled to feedback from the study. A summary of results will be available to you if you would like it. If you wish to receive results of this research personally, you can leave your contact details on the consent form.

*This research has been approved by the Human Research Ethics Committee at Southern Cross University. The approval number is ECN-12-285.*

Complaints about the research/researchers

If you have concerns about the ethical conduct of this research or the researchers, the following procedure should occur.

Write to the following:

The Ethics Complaints Officer  
Southern Cross University  
PO Box 157  
Lismore NSW 2480  
Email: ethics.lismore@scu.edu.au

All information is confidential and will be handled as soon as possible.

Support Services

In the event that your participation in this study raises issues of concern to you please contact a professional service below where people are available to offer information and/or help and assistance to you.

1. **Mental Health Access Line:** 1300 369968  
   **SCU Coffs Harbour Counseling Service:** (02) 6659 3263 (for current SCU students)


Appendix D

CONSENT FORM

Title of research project: ‘Gender Perceptions of Self and Others’

Name of researcher: Ms Desirée Kozlowski (under the supervision of Associate Professor Rick van der Zwan)

Please tick the box that applies, sign and date, and give to the researcher

I agree to take part in the Southern Cross University research project specified above.

I am aged 18 years or over.

I have normal or corrected-to-normal vision.

I am able to read and respond to questions in English.

I am free of injuries or disease affecting the length of my 2nd and 4th fingers.

I understand the information about my participation in the research project, which has been provided to me by the researchers.

I agree to answer questions about my personal attributes.

I understand that my participation is voluntary and that I can cease my participation at any time without consequences to me.

I understand that any information that may identify me will be de-identified at the time of analysis of any data.

I understand that no identifying information will be disclosed or published.

I understand that all information gathered in this research is confidential and that it will be kept securely and confidentially for 7 years at the University.

I am aware that I can contact the researchers at any time with any queries. Their contact details have been provided to me.

I understand that this research project has been approved by the SCU Human Research Ethics Committee (Approval Number: ECN-12-285).

Participant's name: ______________________________________________________

Participant's signature: _________________________________________________

Date: ______________________

☐ Please tick this box and provide your email or mail address below if you wish to receive a summary of the results:

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________
Appendix E

From chapter 3. Comparisons of male and female observers’ judgements:

- Of femininity point $t(38) = 1.11, p > .05$
- Of masculinity point $t(38) = .79, p > .05$
- Of neutrality range $t(36) = -.342, p > .05$
Appendix F

INFORMATION SHEET

My name is Desirée Kozlowski; I am conducting research as part of my Doctor of Philosophy in the Discipline of Psychology at Southern Cross University. This project is being supervised by Dr. Anna Brooks (Discipline of Psychology, Southern Cross University, Coffs Harbour).

My research project is titled: ‘Gender Perceptions of Self and Others’

This is what participation would involve.

This research involves an experiment wherein participants will be asked to view a number of very short video clips of figures walking and asked to respond to questions about these walkers (i.e.: ‘Is this figure male or female?’; ‘Is this figure feminine or not?’; and ‘Is this figure masculine or not?’) by pressing a key on the computer keyboard. Participants will also be asked to select one walker from a series and to complete a Personal Description Questionnaire about her/himself. This questionnaire consists of a list of 50 personality characteristics and respondents are asked to rate the extent to which each characteristic is true of her/him. Some examples of the type of characteristics included on the questionnaire are: ‘confident’, ‘self-critical’, and ‘clear-thinking’. Participants will also have their finger length (the 2nd and 4th digits on both the left and the right hand) measured. In total, participation will require approximately 50 minutes of your time.

The aim of this experiment is to scientifically test the influence of various characteristics on visual representation and judgements of gender.

Other things you need to know.

Participation is entirely voluntary and there are no costs to participate other than your time and efforts to attend. Should you wish to stop participating at any time, you may do so simply by advising the researcher without incurring adverse consequences of any kind. In this event, your data will be destroyed. There are minimal foreseeable risks or discomforts for you should you choose to participate in the study. Participants will not be paid for their involvement (other than the provision of those things necessary to the study as stated above).

Participants need to have normal or corrected-to-normal vision.

The results of this study will be included in my PhD thesis and they may also be published in a peer-reviewed journal and/or presented at conferences, but only group data will be reported. It is hoped that the wider community will benefit from this research by gaining greater understanding of human gender perception.

There is no requirement that you be identified with your data and you will not be; data will be de-identified. All data will remain the sole property of the Southern Cross University researchers. Data will be stored in a locked cabinet at the University for 7 years after the completion of the
research as required by the Human Research Ethics Committee at Southern Cross University.

**Participant’s Consent**

You can consent to participating in this research by reading, signing and returning the appropriate Consent Form, which will be supplied to you.

**Inquiries**

This form is yours to keep for future reference. If you have any questions, we would like you to ask us (Desirée in the first instance):

**Researcher** | **Supervisor**
--- | ---
Desirée Kozlowski | Dr Anna Brooks
Department of Psychology | Department of Psychology
Southern Cross University | Southern Cross University
desiree.kozlowski@scu.edu.au | anna.brooks@scu.edu.au
Phone: 02 6659 3655 | Phone: 02 6659 3385

**Feedback**

All participants are entitled to feedback from the study. A summary of results will be available to you if you would like it. If you wish to receive results of this research personally, you can leave your contact details on the consent form.

*This research has been approved by the Human Research Ethics Committee at Southern Cross University. The approval number is ECN-11-206.*

**Complaints about the research/researchers**

If you have concerns about the ethical conduct of this research or the researchers, the following procedure should occur.

Write to the following:

**The Ethics Complaints Officer**

Southern Cross University
PO Box 157
Lismore NSW 2480
Email: ethics.lismore@scu.edu.au

All information is confidential and will be handled as soon as possible.
Support Services

In the event that your participation in this study raises issues of concern to you please contact a professional service below where people are available to offer information and/or help and assistance to you.

1. **Salvation Army Care Line:** 1300 363622

2. **Mental Health Access Line:** 1300 369968

3. **Lifeline:** 131114

4. **Beyondblue:** 1300 22 4636

5. **The Gender Centre:** [http://www.gendercentre.org.au](http://www.gendercentre.org.au)

**SCU Coffs Harbour Counseling Service:** (02) 6659 3263 (for current SCU students)
CONSENT FORM

Title of research project: ‘Gender Perceptions of Self and Others’

Name of researcher: Ms Desirée Kozlowski

Tick the box that applies, sign and date and give to the researcher

I agree to take part in the Southern Cross University research project specified above.  
Yes ☐  No ☐

I am 18 years of age or older.  
Yes ☐  No ☐

I understand the information about my participation in the research project, which has been provided to me by the researchers.  
Yes ☐  No ☐

I agree to answer a questionnaire about myself  
Yes ☐  No ☐

I understand that my participation is voluntary and that I can cease my participation at any time.  
Yes ☐  No ☐

I understand that any information that may identify me will be de-identified at the time of analysis of any data.  
Yes ☐  No ☐

I understand that no identifying information will be disclosed or published  
Yes ☐  No ☐

I understand that all information gathered in this research is confidential.  
Yes ☐  No ☐

It will be kept securely and confidentially for 7 years at the University.  
Yes ☐  No ☐

I am aware that I can contact the researchers at any time with any queries. Their contact details have been provided to me.  
Yes ☐  No ☐

I understand that this research project has been approved by the SCU Human Research Ethics Committee.  
Yes ☐  No ☐

Participant’s name: ____________________________________________________

Participant’s signature: __________________________________________________

☐ Please tick this box and provide your email or mail address below if you wish to receive a summary of the results:

Email: ________________________________________________________________
## Appendix H

### Key to abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2D:4D</td>
<td>The ratio derived from the length of the second digit (index finger) divided by the length of the fourth digit (ring finger). This ratio is purported to be sexually dimorphic, with males having lower 2D:4D ratios than females.</td>
</tr>
<tr>
<td>BSRI</td>
<td>The Bem Sex-Role Inventory: A self-report questionnaire used as a measure of gender self-identity. Yields a masculinity and femininity score for each respondent.</td>
</tr>
<tr>
<td>LH 2D:4D</td>
<td>Left Hand 2D:4D ratio</td>
</tr>
<tr>
<td>PDQ</td>
<td>Personal Description Questionnaire: A 50-item self-report questionnaire incorporating socially desirable and socially undesirable items that yields both a masculinity and femininity score for each respondent. The instrument used to measure gender self-identity in these studies. Also sometimes called the Australian Sex Role Scale (ASRS).</td>
</tr>
<tr>
<td>PDQ F:M</td>
<td>The composite score used as an overall measure of gender role in these studies. Derived by dividing the femininity score by the masculinity score to yield a ratio.</td>
</tr>
<tr>
<td>PDQ-F</td>
<td>Score on the femininity sub-scale of the PDQ</td>
</tr>
<tr>
<td>PDQ-M</td>
<td>Score on the masculinity sub-scale of the PDQ</td>
</tr>
<tr>
<td>PLD</td>
<td>Point Light Display: Herein refers to computer-presented dynamic visual representations of human gait, which convey gender cues that can be quantified in degree and direction. The array of PLDs used in these studies incorporate dissociable manipulations of both structural (or form) cues and kinematic (or motion) cues to gender.</td>
</tr>
<tr>
<td>RH 2D:4D</td>
<td>Right Hand 2D:4D ratio</td>
</tr>
<tr>
<td>SHR</td>
<td>The ratio of shoulder to hip measurements</td>
</tr>
<tr>
<td>SPG</td>
<td>Self-perceived gender: A number between -6 and +6 for each participant based on the PLD walker that was self-selected as closest to the participant in terms of the strength and direction of gender cues carried by gait whereby +6 represents 6 standard deviations into the masculine space from objectively gender-neutral (0).</td>
</tr>
<tr>
<td>WHR</td>
<td>The ratio of waist to hip measurements</td>
</tr>
</tbody>
</table>