The influence of biological sex, sexuality and gender role on interpersonal distance

David Uzzell1* and Nathalie Horne2

1Department of Psychology, University of Surrey, UK
2Research Development Centre, Greenwich, Lambeth, Lewisham & Southwark PCTs, London, UK

This research reports on a conceptually and methodologically innovative study, which sought to measure the influence of gender on interpersonal distance. In so doing, we argue for an important distinction to be made between biological sex, gender role, and sexuality. To date, however, progress in the study of interpersonal distance (IPD) has been inhibited by poor operational definitions and inadequate measurement methodologies. For our own investigation, we innovated on methodology by devising the digital video-recording IPD method (DiVRID) that records interpersonal spatial relationships using high quality digital video equipment. The findings highlighted not only the validity of our innovative method of investigation, but also that a more sophisticated conceptualization of the impact of gender on IPD is warranted than can be accounted for by biological sex differences. In this study, we found that gender role accounts for more of the variation in IPD than the conventionally reported gender variable, sex.

Of more than 1,200 papers on personal space between 1964 and 2003 recorded in the PsycInfo database, two-thirds (67.6%) were published before 1983. Since that date, there has been a marked decline in published studies and presumably research (1964 to 1973: 95; 1974 to 1983: 725; 1984 to 1993: 211; 1994 to 2003: 182). Such a decline cannot be attributable to a lessening relevance of the research or its findings. The importance of the socio-environmental context and contingencies that affect social interaction means that the study of personal space is highly relevant to our understanding of processes in social psychology (e.g. personal attraction, prejudice). Current concern with quality of life, housing standards, and working conditions also raises questions concerning the degree and quality of personal space available to individuals and groups.

Why then the decrease in research interest in interpersonal space? We believe that after several decades of studies there was a gradual realization that research on personal space suffered from two principal shortcomings. First, and most fundamental to the
conclusions and inferences we draw, are weaknesses in the methodologies employed to measure interpersonal distance. Charges can be made on ecological grounds (i.e. differences obtained in controlled laboratory settings are not a reflection of real life differences) and on grounds of unreliability or inaccuracy.

Second one of the principal factors investigated to identify individual and intergroup differences in the use of personal space was gender. Research sought to show that there were significant gender differences in interpersonal distance (IPD) behaviour. The theoretical formulation and operationalization of gender differences, however, has been poor. In particular, changes in the definition and interpretation of gender over the last decade invite us to revisit and question assumptions that were taken for granted in the early years of research on personal space (e.g. increased dissociation between biological sex and learned gender role). Moreover, the study of gender and the use of space has become an increasingly litigious area. For example, in legal cases of sexual harassment, spatial proximity can be a critical issue. Hern (1991) cites examples of judges specifying minimum distances between anti-abortion protesters and clients in demonstrations outside clinics.

In the current study, we address these two shortcomings by, firstly, devising a new methodology drawing on recent technological developments, which enable a more accurate and ecologically valid recording of personal space relationships, and, secondly, by arguing for a more sophisticated conceptualization of sex differences using the gender role concept. In particular, we look at gender differences in spatial behaviour using the operational concept of IPD (as opposed to personal space, proxemics, individual distance, interpersonal spacing, body-buffer zone, etc.) as this describes concisely the focus of investigation in this paper.

**Describing sex differences in IPD behaviour**

In the study of IPD, it has been conventional to investigate gender differences simply by comparing male and female behaviour against various benchmark indicators. On this purely descriptive level, the general consensus among researchers (notwithstanding the many inconsistencies and exceptions in the findings) is that male pairs maintain larger distances than female pairs at all ages (Aiello, 1987; Barnard & Bell, 1982; Sussman & Rosenfeld, 1982). Moreover, many studies have found that sex differences have most impact on IPD in combination with other factors, such as race and age (Heckel & Hiers, 1977; Severty, Forsyth, & Wagner, 1979). However, these findings must be located in the context of some quite serious methodological shortcomings in the study of IPD. Three principal methodologies have been employed to examine variation in personal distances: *projective, laboratory,* and *observation*. Projective techniques involve asking participants to hypothetically imagine a situation and indicate, either with pencil or paper or using dolls or figures, how they believe they or another individual would respond spatially in that scenario (e.g. Duke & Nowicki, 1972; Gifford & Price, 1979; Little, Ulehla, & Henderson, 1968; Summit *et al.*, 1992). Reviewing the studies using this technique, Hayduk (1983) concluded that it is simply not credible. It has several obvious flaws such as requiring complex cognitive skills like reconstruction, imagination, empathy, memory demands, and most difficult of all, re-scaling from life-size to the perceived scale of the figures.

Laboratory measures have been also widely used (e.g. Dosey & Meisels, 1969; King, 1966; Kunzendorf & Denney, 1982). The most common laboratory method is the ‘stop-distance’ method in which the experimenter asks one participant to enter a room and
approach another subject until the point when they start to feel uncomfortable with the other’s proximity. Alternatively, ‘approach distance’ is used in which subjects are asked to move towards another person(s) or person surrogate (e.g. a photograph of different types of people) and indicate at which point they cease to feel comfortable. Laboratory studies have the advantage that they employ human beings rather than dolls, they are easily administered, and by contriving the setting to resemble, for example, an office, the experiment can have some degree of ecological validity. However, accurate measurements are difficult as participants are asked to use their own bodies to position themselves according to hypothetical situations.

The third methodology, observation, has most ecological validity as it involves direct observation of people interacting with each other in real situations and preferably by unobtrusive means; it also gives rise to the most practical difficulty (e.g. Jorgenson, 1975; White, 1975), principally in the accurate measurement of interpersonal distances. There are two types of observation which strive to be unobtrusive and field-based: (a) unstructured, which is largely a naturalistic, unobtrusive, and uncontrolled observation, and reflects people interacting in a real-world setting; (b) staged invasions or blocked access in natural settings. In both situations, either unwitting subjects are approached by a confederate or the paths of people are blocked by confederates and the reactions monitored.

Two shortcomings are crucial to each of these techniques – ecological validity and accuracy of measurement, with some resulting trade off between the two. While observation studies and even laboratory studies can have ecological validity, to date, they have not been able to permit accurate measurements of interpersonal distance. This is likely to be a critical factor as variations in interpersonal distances are probably extremely small and subtle. In defence of field experiments, it is only fair to note that their goal has also been to identify variations in behavioural response, not to measure the actual IPD between subjects. Likewise, projective techniques lack ecological validity and it is doubtful whether they can provide accuracy of measurement either.

If the issue of gender differences is to be explored and explained with any degree of confidence, then studies will require the employment of a highly accurate IPD recording methodology that can be used within an ecologically valid setting.

**Explanations of gender differences in IPD**

Gender is not a biological fact, but a social and cultural construction prescribing how men and women should behave. In recent years, however, there has been an increasing dissociation between sex and gender, insofar as it is becoming more acceptable for women to endorse at least some masculine traits and characteristics and for men to endorse at least some feminine traits and characteristics. The perceived acceptability of these gender role deviations are nonetheless highly person and context-dependent, and in part a function of the extent to which there is deviation. However, the fact remains that dissociation is possible; thus to automatically conflate sex with gender is now considered inappropriate.

Explanations for variations in IPD can be characterized as having either focused on the function of space in mediating interpersonal relationships and/or the higher order factors that moderate variations in the functional use of space, with gender in particular being one of the key explanatory variables. On a functional level, explanations have centred on the role played by IPD in communication self-protection, and arousal regulation. The communication function of IPD (Hall, 1959, 1963, 1966) tells another
person and onlookers information concerning the nature of the relationship between
the individuals (e.g. it can distinguish between intimate and public relations, but also
closeness can be used to demonstrate affection for another). The self-protective
function (Dosey & Meisels, 1969, 1971) pertains to the idea that the greater the
individual perceives risk to their emotions, physical being or privacy, the greater the IPD
required to enable escape (Altman, 1975; Edney, Walker, & Jordan, 1976). Finally, the
arousal regulation function (Evans, 1974) uses IPD to control the amount of sensory
information they are receiving and avoid sensory overload.

Arguably, none of the above ‘functions’ of IPD are mutually exclusive and can be
considered to be lower order explanations (or manifestations) of higher order level
concepts like gender, age, attractiveness (Gifford, 1997), culture (Aiello, 1987),
personality (Gifford, 1997), disability (Eaton, Fuchs, & Snook-Hill, 1998; Rapp &
Gutzmann, 2000; Sommer, 1669, 2002), and other contextual factors (Sinha & Navyar,
2000). This study focuses on one especially powerful ‘moderating’ factor – gender.

Previous research has generally concluded that same-sex female pairs maintain closer
distances than same-sex male pairs (Aiello, 1987; Gifford, 1997). It has been argued that
basic sex differences are due to either a female predisposition to be more affiliative than
males and/or a stronger female socialization to be affiliative. One way to test this
hypothesis is to distinguish between the concepts of biological sex (i.e. male, female)
and gender role (i.e. masculine, feminine). To date, these concepts have been conflated
(i.e. used interchangeably) and although, in practice, the two concepts are likely to be
highly correlated in Western societies, there is no necessary association between the
two. In other words, men can be feminine and women can be masculine. Moreover, it is
not a simple case of assuming one or other gender role. Most individuals of either sex in
contemporary Western culture are likely to subscribe to a greater or lesser degree and in
varying complex combinations to both gender role concepts. Thus, while a female may
self-endorse a predominantly feminine gender role, she may also endorse some
masculine characteristics too. In short, applications of gender-related terms to the study
of human spatial behaviour have been confused and operationally inappropriate,
confounding basic biology with gender.

Explanations of sex differences with reference to social learning concepts require
some acknowledgement and appreciation of the socially constructed nature of the
gender roles, culturally known by the terms ‘masculinity’ and ‘femininity’ (Gilligan,
1982). Masculinity refers largely to instrumental traits and characteristics (e.g.
competitive, means-end, power-distant) while femininity refers to more relational traits
and characteristics (e.g. expression, collaborative, caring, affiliative). The concept of
gender role is permeated with normative and evaluative judgments about how men and
women should behave in accordance with masculine and feminine stereotypes. People
either comply with gender role stereotypes (which create cultural expectations and
obligations) or internalize them (in which case, the stereotype will be assimilated to self-
identity; Pulling & Stark, 2000).

Whether externally or internally generated, behaviour under the regulatory impact
of gender role stereotypes will exhibit predictable patterns. For example, subscribing
strongly to a feminine gender role will manifest itself in largely affiliative attitudes and
behaviours. By contrast, subscribing to a masculine gender role will manifest itself in
largely instrumental goal-oriented attitudes and behaviours, involving distance, and
means-end control (e.g. Rees, 2003).

Early work on gender roles emphasized the correlation between sex and gender
(i.e. males are and should be mostly masculine, while females are and should be mostly
feminine), and assumed that masculinity and femininity were polarized (see Bem, 1993 for a review). Masculinity and femininity were treated as ‘states’ occupying opposite ends of a bipolar masculinity-femininity scale. However, in contemporary conceptualizations of gender, it is appreciated that not only are the concepts ‘fully independent’ (which means that any one individual can have attributes of both), but that the relationship between sex and gender is far more complex than originally assumed, with the added dimension of sexuality (or sexual preference) also to be taken into consideration.

For instance, homosexuality has been related to gender role ‘deviations’ or gender role reversal (Al-Issa, 1987). An influential study by Thompson, Schartz, McCandless, and Edwards (1973), and similar research by Evans (1971) and Heilbrun and Thompson (1977) found that lesbians scored higher on masculinity compared with their ‘straight’ controls, and gay men were less masculine and sometimes more feminine than their straight controls. Others have consistently found likewise (Spence & Helmreich, 1978; Oldham, Farnill, & Ball, 1982). Conversely, Bernard and Epstein (1978) found that gay men scored higher than straight men on femininity.

The most well-established means of investigating gender role is known as the Bem Sex Role Inventory (BSRI). It includes two scales: a Masculinity scale and a Femininity scale constructed specifically for the purpose of identifying individuals’ gender roles as masculine, feminine or androgynous, achieved by assessing the differences between the subjects’ endorsements of masculine or feminine characteristics. If the difference between the masculine/feminine endorsement is high, then the person is categorized as the gender-type with the highest score (i.e. masculine or feminine); if the difference is low, they are categorized as androgynous.

The BSRI has been used extensively, and hence its reliability and validity have been subject to considerable scrutiny yielding both confirmatory (e.g. Ballardreisch & Elton, 1992; Blanchardfields, Suhrerroussel, & Hertzog, 1994; Campbell, Gillaspy, & Thompson, 1997) and more sceptical results (Hoffman & Borders, 2001; Wilcox & Francis, 1997). Much of the criticism of the scale has stemmed from disagreement with the principle of androgyny. As this has slowly become accepted, critics have become more interested in the internal validity of the measure (e.g. Wilcox & Francis, 1997). A factor-analytical study by Campbell et al. (1997) found the short form of the inventory (i.e. the one used in this study) was more reliable than the longer form. Chung (1995) examined the construct validity of the BSRI for straight and gay men and found that it was valid for use with both groups of men. More recently attention has focused on assessing if and how the roles of men and women have changed since 1974 and whether Bem’s measure is still valid. Holt (1998) repeated Bem’s method to categorize various adjectives and concluded that it is still a valid measure for assessing present gender roles although frequent revalidations would be warranted in the future.

Research question and hypotheses

The study reported in this paper investigated the degree to which interpersonal distances between men and women are a function of the three different gender variables: sex, gender role, and sexuality. The potential for dissociation between sex, sexuality, and gender role affords an opportunity to test hypotheses regarding the

---

1 Following the growing convention in social psychology, we use the term ‘straight’, rather than heterosexual, by way of contrast to gay/lesbian/bisexual.
relative viability of biological versus social learning explanations of IPD behaviour. Previous research has examined straight people’s choice of IPD when interacting with a known lesbian or gay man (Gentry, 1988; Mooney, Cohn, & Swift, 1993), but there appears to be no research concerning the IPDs that lesbians and gay men use between themselves, i.e. research on IPD and sexuality and also gender role. Lesbians, gay men, and bisexuals are ideal groups to investigate in this area due to their increased frequency of gender role reversal. Consequently, a sample was selected for this study with the specific intention of measuring the impact of sexual preferences on interpersonal distances.

The principal hypotheses investigated in this paper are:

(1) \( H_1 \) – gender role (masculine/feminine) will account for more of the variance in IPD than biological sex (male/female).

(2) \( H_2 \) – the IPD of masculine/masculine dyads will be greater than the IPD of feminine/feminine dyads.

(3) \( H_3 \) – the IPD of intermediate/intermediate (i.e. middle of the sexuality range) dyads is expected to be different from the masculine/masculine dyads or feminine/feminine dyads.

Gender role reversal is also of interest in this research since the design is partly based on the assumption that this phenomenon will be less common in straight than in lesbian, gay, and bisexual people.

**Methodology**

In the introduction, we identified what we believe are essential features of a more efficacious methodology for understanding the effect of biological sex and gender on interpersonal distance. Balancing ecological validity with accuracy of measurement is probably the most problematic issue. Therefore, we argue that an accurate and ecologically valid measure needs to minimize intrusion, permit direct observation, and enable accuracy of measurement of IPD as a subconscious behaviour.

**Digital video-recording IPD method (DiVRID)**

Since the majority of research on interpersonal distances was undertaken in the 1970s and 1980s, there have been considerable technological advances in digital technology, especially in the use of digital video-recording equipment, which permits highly accurate measurements of recorded distances. In this experiment, the observation of subjects was structured, conducted in a laboratory setting, and employed high quality digital video-recording equipment so that consent could be obtained and interactions could be controlled and accurately recorded. Two measures were taken; the IPD of each dyad, and a pre-tested measure of each participant’s gender role.

The laboratory was laid out as in Figure 1. Three equally spread measurement mats known to the participants as ‘Stations A, B, and C’ were laid on the floor. These were an integral part of the means by which accurate measurements of interpersonal distances could be recorded. Each mat was \( 0.89 \times 1.60 \) m and made from cream-coloured, durable plastic sheeting marked in black with a grid of \( 1 \times 1 \) squares. Distances were subsequently converted into centimetres for data analysis and presentation. A video-camera on a tripod and at a height of 2.5 meters was placed three meters from the near edge of each mat. The cameras were positioned so that only the measurement mats filled the frame.
In order to test the influence of biological sex, sexuality, and gender role on IPD, the study focused on dyads as the unit of analysis. This was achieved by conducting the experiment in groups of six participants so that each participant interacted with each of the other five participants in the group of varying gender characteristics. Therefore, each participant was associated with five IPD measurements for interactions with five different people. Twelve sessions with six participants in each yielded 180 dyad trials in total.

The grid on the mat enabled highly accurate measures of IPD between dyads to be recorded using a high quality digital video-cameras. Measurements were taken from the mid-point between Participant A’s feet to the mid-point between Participant B’s feet as illustrated in Figure 2. The videotapes were analysed using a 15-second interval observational recording method.

**Participants**

The authors were very alert to the various sampling problems through heterosexual bias as identified by Herek, Kimmel, Amaro, and Melton (1991). These included not confusing sexual orientation with gender identity and gender role conformity, as well as perhaps one of the principal problems in this area of work, ensuring that the sample is representative. Lesbians, gays, and bisexuals, notwithstanding cultural and societal changes over the last decade or so, are still stigmatized groups and so, as with any social stigma, an unknown proportion of the population will not disclose their sexuality. Consequently, it is difficult to know the size of the population from which one is hoping to draw a representative sample.

The sample comprised 72 university students from the University of Sussex, England. A university sample was seen as appropriate, and not just a matter of convenience.
First, a university offered a better opportunity for recruiting participants of varying sexualities and therefore increased the chance of achieving more diversity in gender role reversal. Second, it was thought that students at university may be more accustomed to the non-heterosexual sexualities and therefore would be more at ease, and that homophobia may be less influential as a confounding variable. The sample was drawn by two means. Participants were randomly recruited by approaching students outside the Students’ Union on the university campus. The University of Sussex has an active Lesbian, Gay, Bisexual, and Trans-sexual Society (LGBT), and members were approached, with the cooperation of its officers, by e-mail. LGBT members were asked to participate in a study as a favour for ‘a friend’ so that they did not believe they were selected because of their membership of the society or their sexuality. All other participants were recruited simply by asking them as they walked past the Students’ Union. Students were only approached if they appeared to be approximately 18 to 26 years of age, of white ethnicity, and UK nationals.

Of the 72 participants, 34 (47%) were male and 38 (53%) female, with ages ranging from 17 to 31 with a mean age of 21.2 years. Just under 90% of the female sample (N = 33) said they were straight, four were lesbians, and one was bisexual. Of the male sample, 25 (74%) said that they were straight, 8 were gay, and 1 was bisexual. The majority of the participants (89%) were from the UK and all participants were white adults.

Measures
The BSRI (Bem, 1974) comprises 60 adjectives against which participants indicate on a 7-point Likert scale how well each item describes them (1 never/almost never true; 2 usually not true; 3 sometimes but infrequently true; 4 occasionally true; 5 often true; 6 usually true; 7 always or almost always true). Of the adjectives, 20 constitute the masculine measure and a second 20 constitute the feminine measure. The remaining 20 adjectives are neutral and are not included in the final calculations. The resulting BSRI score identifies the participant on a scale from very masculine to very feminine, with androgynous as a narrow band of scores in the middle.

In the same questionnaire, there were four demographic questions on the participants’ sex, age, nationality, and sexuality (straight/gay/bisexual). They were also asked whether they knew any of the other participants within the experimental session.

Procedure
Each session of the experiment consisted of six randomly selected participants of mixed sexes, sexualities, and gender roles. Participants were taken to the laboratory situated within the Students’ Union. The laboratory was approximately 11.5 × 10.5 m with a ceiling height of 4 m. Initially, participants were led to understand that their participation was required for a psychology research project concerning memory and their ability to remember facts about other people to whom they had spoken.

On entering the laboratory, participants were briefed that the purpose of the study was to talk to each of the other five people, and ask prompt questions displayed on a poster at each end of the room (these were positioned to encourage the interacting participants to orientate themselves at 90° to the camera). The questions were their ‘partner’s’ name, age, mother’s name, father’s name, what time they woke up, what they had for breakfast, and brothers’ and sisters’ names and ages. They were asked to
remember what they could about each person in the 2 minutes they were allocated, using whatever mechanisms they felt necessary. They were also informed that they would be asked to complete a short questionnaire afterwards. They were told that the experiment would be video-recorded for future analysis, should it be required.

Participants were given a badge randomly numbered between 1 and 6 and asked to go to their first station as instructed by the experimenter. They were reminded that they should remain at each station for the full 2 minutes, rehearsing the information if necessary. After the first interaction trial, the experimenter indicated that they should stop talking and move on to the next interaction, which was indicated by the researcher. This was repeated until all participants had spoken to each other (for order of dyads, see Table 1).

<table>
<thead>
<tr>
<th>Station</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>1/2</td>
<td>3/4</td>
<td>5/6</td>
</tr>
<tr>
<td></td>
<td>3/5</td>
<td>2/6</td>
<td>1/4</td>
</tr>
<tr>
<td></td>
<td>1/3</td>
<td>4/6</td>
<td>2/5</td>
</tr>
<tr>
<td></td>
<td>1/6</td>
<td>5/4</td>
<td>2/3</td>
</tr>
<tr>
<td></td>
<td>2/4</td>
<td>3/6</td>
<td>1/5</td>
</tr>
</tbody>
</table>

Participants were then given a questionnaire marked with their badge number and session number, and were reminded of the confidentiality of the data collected. Once all the questionnaires were completed, participants were debriefed as to the true purpose of the study and given the opportunity to ask questions; they were also given an opportunity to withdraw their contribution to the experiment should they wish. No participants indicated that they wished to withdraw their participation. Each group was also asked if they had any suspicions that their IPD was being measured; none had.

**Results**

The analysis examined IPD and its relationship with three sex-related variables (sex, sexuality, and BSRI score). Importantly, there were no significant differences in IPD between dyads that knew each other and those that did not, \( t(178) = -1.62, p = ns; \) thus, it was not necessary to account for this factor in any further analysis. Descriptive statistics of the IPD measurements according to the categorization of the two variables can be found in Table 2.

**Categorization of BSRI scores**
The BSRI scores are typically categorized into three groups. Bem’s scoring requires that the androgynous group is defined ‘on the basis of their Femininity Minus Masculinity Difference Score, with small difference scores indicating androgyny and large different scores indicating either sex typing or cross sex typing’ (Bem, 1993, p. 120). The BSRI defines androgynous people as having an index score of between \(-1\) and \(+1\), while masculine and feminine individuals fall outside this range (i.e. masculine \(<-1\); feminine \(>1\)). We accept Bem’s argument that an individual can have attributes of both masculinity and femininity and therefore masculinity-femininity is not a continuous
Table 2. Descriptive statistics for the IPD measurements for dyads within each variable group

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>63.41</td>
<td>62.80</td>
<td>56.33</td>
<td>70.00</td>
<td>64.90</td>
<td>61.57</td>
<td>62.25</td>
<td>54.79</td>
<td>53.40</td>
<td>66.19</td>
<td>57.11</td>
<td>76.20</td>
<td>65.88</td>
<td>60.20</td>
<td>54.02</td>
<td>54.02</td>
</tr>
<tr>
<td>SD</td>
<td>9.66</td>
<td>12.20</td>
<td>11.18</td>
<td>9.75</td>
<td>11.61</td>
<td>10.38</td>
<td>7.73</td>
<td>11.39</td>
<td>11.74</td>
<td>8.88</td>
<td>12.01</td>
<td>10.23</td>
<td>1.91</td>
<td>11.22</td>
<td>–</td>
<td>7.92</td>
</tr>
<tr>
<td>Minimum</td>
<td>45.42</td>
<td>29.36</td>
<td>32.08</td>
<td>53.04</td>
<td>41.91</td>
<td>32.08</td>
<td>47.63</td>
<td>29.36</td>
<td>33.50</td>
<td>46.35</td>
<td>29.36</td>
<td>51.92</td>
<td>62.23</td>
<td>35.08</td>
<td>59.69</td>
<td>59.69</td>
</tr>
<tr>
<td>Maximum</td>
<td>84.61</td>
<td>93.35</td>
<td>76.20</td>
<td>87.78</td>
<td>86.06</td>
<td>93.35</td>
<td>73.99</td>
<td>76.20</td>
<td>73.66</td>
<td>76.20</td>
<td>84.61</td>
<td>82.07</td>
<td>66.68</td>
<td>93.35</td>
<td>59.69</td>
<td>74.63</td>
</tr>
</tbody>
</table>

588 David Uzzell and Nathalie Horne
uni-dimensional scale; we aimed to reflect this in our measurement instrument of gender. Thus, respondents were given the two scales to complete and their score involved subtracting their masculinity score from their femininity score. Because androgyny was not of primary interest to us, we felt less duty bound to fulfil the strictures of Bem’s criteria for the measurement of androgyny.\(^2\) Hence, we employed a wider band for comparison between groups. Categories were formed by dividing the entire population \((N = 72)\) into three equal groups according to the range of BSRI scores. The most masculine group comprised participants with BSRI \(\leq -11.61\), the middle group were participants with \(-11.61 > BSRI \leq 14.36\) and the most feminine group were participants with BSRI \(> 14.36\). Therefore, the group who were high in masculinity were participants with BSRI \(\leq -11.61\), the intermediate group comprised participants with \(-11.61 > BSRI \leq 14.36\), while the group most high in femininity were participants with BSRI \(> 14.36\). The middle group was called intermediate, and not ‘androgynous’ since it included participants with masculine or feminine scores according to the BSRI, yet were not as extreme as participants from the other two groups. When converted into dyads, six group types were formed: 1 masculine/masculine; 2 masculine/intermediate; 3 masculine/feminine; 4 intermediate/intermediate; 5 intermediate/feminine; 6 feminine/feminine.

**Relationships between sex and gender role**

The masculine and feminine categories contain approximately 75% of males and females, respectively, and therefore the remaining 25% demonstrate gender role reversal. Thus, the intermediate category contains both males and females and is thus structurally different to groups that are differentiated by biological sex alone (Figure 3).

Using a two-way ANOVA, a main effect of sex on BSRI scores was found, \(F(1, 70) = 14.70, p < .01\). \(H_1\) predicted that gender role would account for more variance in IPD than biological sex. This hypothesis was tested first by looking at the mean differences in IPD as a function of both sex (male, female) and gender role (masculine, feminine, intermediate group) using a two-way ANOVA. In support of the hypothesis, the findings showed a significant main effect for gender role, \(F = 4.3 df = 2.71 p < .018\), but no significant main effect for sex, \(F = 1.3 df = 1.71 p < .258\), and no significant interaction between sex and gender role, \(F = 0.06 df = 2.71 p < .938\). To this extent, it can be argued that gender role accounts for significantly more variance in IPD than biological sex. Looking at the mean differences, it is clear that masculinity (mean = 25.7 \(SD = 2.4\)) is associated with a significantly greater IPD than femininity (mean = 22.4 \(SD = 2.7\)), with the intermediate group displaying a mean IPD in between those who were identified as either predominantly masculine or feminine (mean = 24.2 \(SD = 2.7\)). However, only the difference between the masculine and the feminine group \((p < .05)\), and between the intermediate and the feminine group were statistically significant \((p < .05; F = 9.6 p < .000)\). It is also noteworthy that adding sexuality as a covariate in the \(2 \times 3\) analysis does not add any explanatory power: the covariate is insignificant \((F = 2.1 p < .15)\). This strongly suggests that gender role provides the overriding explanatory basis for understanding variation in IPD over and above both biological sex and sexual preferences (Figure 4).

To ascertain the degree of variance explained in IPD as a function of gender role \((\text{vis-à-vis sex})\), three linear regression analyses were performed. IPD was the dependent

---

\(^2\) Two participants within this sample fell within the range of \(11/1\).
variable across all three analyses. The first analysis entered sex as the independent variable, the second entered gender role, and the third entered both sex then gender role (Table 3). The results show that sex accounts for a small significant amount of variance in IPD (around 4%) in and of itself with males exhibiting greater IPDs on average than females, \( F = 4.4 \) \( df = 1.71 \ p < .039 \ \text{Adj} \ R = .046 \). However, gender role accounts for significantly more variance than sex (around 20%), with masculinity predicting a higher mean IPD than femininity, \( F = 14.4 \) \( df = 1.71 \ p < .000 \ \text{Adj} \ R = .20 \). When sex and gender role are entered together (Model 3 Table 3), gender role overrides the impact of biological sex, wiping out all of the variance it might otherwise account for (Model 1 \( t = -2.11 \ p < .039 \); Model 3 \( t = -2.64 \ p < .523 \)). This confirms that gender role not only accounts for significantly more variance in IPD than biological sex, but that its impact on IPD completely overrides the impact of biological sex.

\( H_2 \) predicted that the IPD of masculine/masculine dyads will be greater than the IPD of feminine/feminine dyads. A factorial ANOVA identified a main effect of the dyad’s BSRI combination, \( F(5, 163) = 3.92 \ p < .05 \), but no main effect for the dyad’s sex combination, nor a significant interaction. Further analysis shows where differences in means lie between the dyads (Table 4).

A one-way ANOVA found a significant main effect of the dyad’s sexuality on IPD (\( F(9, 167) = 3.43; \ p < .05 \)). A post hoc analysis, using a Scheffé test, identified that straight female/straight female dyads differed significantly from straight male/lesbian

---

3 This factor was dealt with separately because some of the groups had fewer than two cases and therefore a factorial ANOVA was not possible. Three groups had only one case, and were therefore removed for the purpose of this analysis only (gay/gay; gay/bisexual; and lesbian/lesbian).
dyads and also from straight male/straight female dyads ($p < .05$) in IPD. This again demonstrates the difference in IPD between sexualities within the sexes.

H3 proposed that the IPD of intermediate/intermediate (i.e. middle of the sexuality range) dyads will be different from the masculine/masculine dyads or feminine/feminine dyads. This hypothesis was not supported. The intermediate/intermediate dyad is the only dyad that does not differ significantly from any other dyad. These results are graphically displayed in the box plot in Figure 5.

**Discussion**

The results show some effect of sex on IPD but gender role accounts for substantially more variance in IPD. In fact, when considered together, gender role has a completely overriding impact on IPD removing biological sex as a viable explanation of IPD. Sex does not even interact with gender role in accounting for IPD; it has no unique role

<table>
<thead>
<tr>
<th>Table 3. regression: sex, gender role, and sex/gender role on IPD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Model 1</td>
</tr>
<tr>
<td>Sex</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Model 2</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Model 3</td>
</tr>
<tr>
<td>Sex and gender</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

*Dependent variable: IPD.*
Gender role, on the other hand, explains 20% of variance in IPD. Notably, accounting for sexual preferences also makes no difference to this finding, it having no significant covariant impact on IPD. The strong explanatory significance of gender role in understanding IPD suggests that social and cultural factors in association with gender have a substantial part to play in spatial interaction. As has been suggested by Deaux and LaFrance (1998) and DePaulo and Friedman (1998), the influence of socialization can account for more of the variation in IPD (and perhaps other non-verbal behaviours) than the influence of biological sex. Ruling out the significance of sex as having any major part to play in accounting for patterns of spatial interaction also rules out the meaningfulness of a biological explanation. One caveat to ruling out biology entirely, however, is that gender roles are correlated significantly with sex differences; thus, masculinity is significantly more likely to be the gender identification endorsed by a male, while femininity is, in turn, significantly more likely to be the gender identification endorsed by a female. The correlation is not perfect, but nonetheless indisputably strong and significant. Thus, sex differences to some extent appear to have a constraining impact on gender roles,

Table 4. Dyad gender role combinations and significant differences in interpersonal differences between these groups

<table>
<thead>
<tr>
<th>Gender Role Combination</th>
<th><strong>p &lt; .05</strong></th>
<th><strong>p &lt; .01</strong></th>
<th>– (p = ns.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>masculine/masculine</td>
<td>–</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>masculine/intermediate</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>masculine/feminine</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>intermediate/intermediate</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>intermediate/feminine</td>
<td>**</td>
<td>*</td>
<td>–</td>
</tr>
<tr>
<td>feminine/feminine</td>
<td>**</td>
<td>*</td>
<td>–</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; –p = ns.

Figure 5. Box plots showing differences of IPD between dyads of different Bem Gender Role Inventory (BSRI) categories.
making one or other social construction (i.e. masculinity, femininity) more or less legitimate for males and females, respectively.

The average IPD used by a dyad involving a masculine person was significantly different to almost any other dyad that did not include a masculine person (except for a dyad involving two people that are in the middle of the range of BSRI scores). If it were simply an issue of controlling influence, and feminine people were controlling smaller distances, then the feminine/feminine and masculine/feminine combination would be expected to show similar distances rather than the significant difference that was found.

It is for this reason that it is suggested that the masculine participants were more influential in interactions than the feminine participants since their preferences for significantly larger IPDs were granted. This conclusion is similar to that made by Sayers, Baucom, and Tierney (1993) who discovered that high masculinity rather than sex predicted who was more convincing in a verbal dyadic situation. Weitz (1976) also concluded that the more submissive participants (women and feminine people) adjusted their non-verbal communications to fit the more dominant (male or masculine) people.

Bearing in mind that participants were assigned to categories according to their scores on the BSRI, it is instructive to have an understanding of some of the specific items on the questionnaire to which these groups of participants were responding. Masculine participants thought that the following adjectives described their characteristics most frequently; assertive, strong personality, forceful, leadership abilities, dominant, aggressive, competitive; whereas examples of the adjectives that the feminine participants scored highest on were; shy, affectionate, loyal, sensitive to needs of others, soft-spoken, warm, childlike, gentle. Research on authoritarianism (Frankel & Barrett, 1971), and aggression (Kinzel, 1970), for example, would have predicted similar results based on these different scales. The classification into masculine and feminine therefore clusters these personality characteristics together; this is ultimately the essence of gender role.

The results of this study obviously rely heavily on the validity of the gender role measure (BSRI). Pillard (1991), reviewing approximately 30 studies, found the majority indicated that homosexual adults are gender atypical. An alternative interpretation of these results is that gay men simply respond to the BSRI measures in a similar manner to the majority of straight females, and that lesbians respond in a similar fashion to straight males. In other words, people that respond to the BSRI in a particular way exhibit larger IPDs than people that respond in another way, but that these two groups of people should not necessarily be labelled masculine or feminine. As Deaux and LaFrance (1998) note, the terms masculine and feminine will conjure up particular social representations, but one’s own gender role is defined in more idiosyncratic terms; therefore, Pillard’s notion should not be so easily dismissed. Pillard acknowledges the utility of these measures, but suggests that great caution should be attached to their interpretation. Despite these limitations, this is how gender role is currently operationalized, and will continue to be so until an alternative measure is created.

Some have argued that the terms masculinity and femininity are too simplistic to account for the way gender is constructed in everyday reality. Such critics maintain that the terms masculinity and femininity are hypothetical ‘scientifically’ imposed constructions rather than meaningful descriptions of gender in practice. However, the current investigation does not assume that gender role can be reduced or accounted for entirely by these two constructions alone; rather, this study demonstrates the power of these two role interpretations to account for more variance in IPD than sex alone.
Moreover, the fact that the majority of both males and females were strongly identified with the ‘constructions’ of masculine and feminine made available to them within the study suggests that they are not entirely an artifact of science. Other findings endorse this conclusion. Research, for example, shows that masculinity and femininity identifications account for substantially more variance than sex in pay differences, promotional prospects, and levels of seniority in an organizational context (Millward & Brown, 2005; Millward, Brown, Cronin, & Ozbilgin, 2004; Heilman, 2001). The same two gender role constructions predict vocational choice and aspirations, domestic division of labour, working patterns and schedules, leadership style, and so on (Escott & Whitfield, 2002). This is not to deny that any one individual may identify in a complex way with both gender role constructions. Nor does it imply that there are many other iterations of gender role unaccounted for by the terms masculinity and femininity. What it does say is that people do organize their gender preferences in ways that are meaningfully captured by the terms masculinity and femininity.

We suggest that this study is also significant because it has led to the development and testing of a new methodology (DiVRID) to examine IPD with a level of accuracy not hitherto achieved. It was noted in the introduction that are significant shortcomings of previous methodologies employed to measure interpersonal distance. Accuracy of measurement has invariably been sacrificed for ecological validity. While this may be seen as a sin of commission rather than omission, it is our view that accuracy of measurement should be the first priority. Differences between individuals and groups in IPD are likely to be small. Small interpersonal distances may, however, be socially significant and therefore an accurate measurement instrument is critical. The DiVRID technique developed here fulfils the principal criterion of evaluation, that of accuracy of measurement.

This is not to devalue the importance of ecological validity. We would argue that although the ecological validity of the experiment in this study does not match that found in naturalistic settings, the experiment was contrived in such a way that, for the purpose of testing both the methodology and the hypotheses, it was acceptable. It would be desirable in future research to employ this methodology in a more naturalistic setting; for example, a more purposely designed social setting. Furthermore, the artificiality of the setting could also be reduced by superimposing the grid on to the digital video images after the recording. Subsequent research measuring interpersonal conflict on footpaths has tested and employed this methodology successfully (Uzzell, Leach, & Ravenscroft, 2002).

Both the application of a more theoretical construction of gender and the development of a new technique for measuring IPD with a high degree of accuracy challenges the results of previous research and invites a revisiting of those studies that found no IPD differences between males and females. This study has demonstrated that as a consequence of a more discriminating approach to the measurement of sex/gender, we now have a more subtle appreciation and understanding of human spatial behaviour. Of course, gender is not the only area to have experienced a cultural shift in the way in which it has been interpreted and employed over the last two or more decades. For example, ethnicity and the concept of contact culture may be further factors that influence IPD but for which inconclusive or even contradictory effects have been found to date. It now remains for other areas investigated in the 1980s and earlier to be re-examined in the light of changing societal attitudes and values as well as advances in social and environmental psychology.
References


Received 11 April 2004; revised version received 22 May 2005