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Exploring the effects of sexual prejudice on dyadic interactions through an automated analysis of nonverbal behaviours

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ABSTRACT

Nonverbal behaviours (NVB) are a fundamental part of the communication process: especially indicative of individuals' inner states such as attitudes and motivations, NVBs can deeply shape the perceived quality of the interaction. Despite their practical importance and theoretical value, NVBs in intergroup interactions (i.e. intergroup nonverbal behaviours; INVB) are an understudied topic. So far, they have been mainly investigated within interethnic contexts (i.e., White and Black people) and by employing invasive or time-consuming procedures, mainly involving subjective evaluations of video-recorded interactions by external coders.

The present work aimed at extending previous literature by exploring NVB and its relationship with prejudice within gay/straight dyadic interactions, a relevant but still partially unexplored intergroup context within this field of research. Differently from ethnicity, sexual orientation is less identifiable and cannot be ascertained from visible markers such as the skin colour, but requires self-disclosure. Further and most importantly, we assessed patterns of NVBs through an RGB-depth camera – the Microsoft Kinect V.2 Sensor – that allowed us to obtain exact quantitative measures of body movements in a fully automatic and continuous way. In doing so, we conducted three experimental studies in which heterosexual participants (total $N = 284$) were first administered measures of implicit bias and explicit prejudice towards gay men (Study 1 & 3) or lesbians (Study 2), and then asked to interact with a gay (vs. straight; Study 1 & 3) or lesbian (vs. straight) confederate (Study 2), whose sexual orientation was manipulated (Studies 1 & 2) or disclosed (Study 3). A fake Facebook profile, shown to the participant before the interaction, revealed the confederates' sexual orientation. In all the studies, we considered the pattern of results on two main NVBs, one concerning proxemics

(i.e., interpersonal volume between interactants) and the other concerning kinesics (i.e., amount of upper body motions). We selected these NVBs because previous research revealed that they are particularly meaningful for the comprehension of the psychological immediacy between interactants (i.e., interpersonal volume) and their comfort (or discomfort; amount of upper body motions) during a dyadic interaction.

Overall, our work revealed a relevant (and unexpected) pattern of findings concerning interpersonal distance. Unlike previous literature, Study 1 revealed that high (vs. low) implicitly biased participants, instead of keeping a larger distance, tended to stay closer to the confederate presented as gay (vs. straight), especially when discussing a topic concerning the intergroup relation (i.e., the situation of the gay community in Italy) than a neutral one. This result was importantly extended in Study 3: high (vs. low) implicitly biased participants that stood closer to the gay (vs. straight) confederate revealed greater cognitive depletion (i.e., lower performance on a *Stroop colour-naming task*) after the conversation. This latter result suggests that, at least within gay/straight men interactions, interpersonal distance is an NVB that (high implicitly biased) people can control to manage their self-presentation, with consequent greater impairment of their cognitive resources.

This main finding was not replicated in Study 2, in which we focused on dyadic interactions between heterosexual participants and lesbian women, by confirming how heterosexual people's attitudes (and their consequent INVBs) towards this minority group is distinct from those towards gay men and, presumably, people's gender plays a more predominant role than their implicit or explicit attitudes. Further, across our studies, we found inconsistent or non-significant results concerning the participants' upper body motion as an outcome variable. A possible explanation for these inconsistent results could be due to the relatively coarse algorithmic index that we used for this INVB.

Theoretical and methodological implications of this work are discussed in the General Discussion section, together with its limitations and indications for future research.

1 – SEXUAL PREJUDICE

1.1 Definition and individual correlates

In the last decades, a proliferation of terms has been used to describe negative attitudes towards sexual minorities. They have been often used interchangeably in scientific research, bringing confusion and challenging the creation of clear definitions used in empirical investigations (Rye & Meaney, 2010). According to Rye and Meaney (2010), homophobia, homonegativism, and sexual prejudice are the most used terms in literature. Homophobia (Weinberg, 1972) is probably the most commonly used term in both scientific and general language. It was originally introduced to refer to an irrational fear towards homosexuals, while nowadays it is used to describe a general hostility towards homosexuality and people who belong to sexual minorities (Herek, 2004). Similarly, homonegativity (Hudson & Ricketts, 1980) refers to irrational fear and negative reactions towards homosexuality. Besides these terms, heterosexism was first introduced by members of the gay and lesbian community (Lesbians respond, 1972; Revolution is also gay consciousness, 1972) and then spread into the scientific language to describe an ideological system in which heterosexuality is normative, and therefore sexual minorities are denied, denigrated, and stigmatised (Levitt & Klassen, 1974; Herek, 1990).

Among these terms, most social psychology scholars agree on using *sexual prejudice*. It was proposed by Gregory Herek in 1984, who identified in this term a preferable definition to describe all negative attitudes towards an individual because of their sexual orientation, whether the target is gay, lesbian, bisexual, or straight. Homophobia, in fact, implicitly assumes that antigay attitudes and behaviours arise from irrational fear and are better understood

within an illness model (e.g., Herek, 1984; 1991; 2000b; 2015; Herek & Capitanio, 1999): it refers to a phobia, an intense and irrational fear response that should interfere with the individual's life (Herek & McLemore, 2013). Research on sexual prejudice has instead demonstrated that fear is not the prevalent emotion, but other emotions (e.g., anger, disgust, anxiety) are associated with negative attitudes towards sexual minorities, and can be considered developmental consequences of socialisation rather than irrational responses (e.g., Fyfe, 1983; Giner-Sorolla, Bosson, Castwell, & Hettinger, 2012; Herek, 1984, 1988, 2002a; Hudson & Ricketts, 1980; MacDonald, 1976; Parrot et al., 2008). Also, heterosexuals are often able to provide rational and meaningful reasons to justify their negative attitudes (Herek & McLemore, 2013). Conversely, sexual prejudice does not refer to an individual pathology or irrationality, has no assumptions about the origins underlying the motivations of antigay attitudes, and the definition is explicitly connected to research on attitudes and prejudice (Herek, 1984; 2000b; 2015).

In other words, sexual prejudice must be considered as a "common" form of prejudice: its roots can be connected to antecedent variables holding content and similar nature compared to other forms of prejudice. Accordingly, like many other types of prejudice, sexual prejudice has been found to consistently correlate with several psychological and social variables. For example, it is more common among heterosexuals who are older and have a low educational level (Besen & Zicklin, 2007; Herek, 2002, 2009; Olson, Cadge & Harrison, 2006; Kite & Whitley, 1996; Patrick, Heywood, Simpson, Pitts, Richters, Shelley & Smith, 2013; Steffens & Wagner 2004). These sociodemographic variables have been found to correlate with sexual prejudice across a wide range of national contexts, including the Italian one (see e.g., Baiocco, Nardelli, Pezzuti & Lingiardi, 2013; Fasoli, Paladino, & Sulpizio, 2016).

Political conservatism (e.g., Fasoli, Paladino, et al., 2016; Haddock & Zanna, 1998; Pacilli, Taurino, Jost, & Van der Toorn, 2011) and right-wing authoritarianism (Altemeyer, 1996; Basow & Johnson, 2000; Cramer, Miller, Amacker, & Burks, 2013; Goodman & Moradi, 2008; Herek, 1984; Pacilli et al., 2011; Rubinstein, 2003) are also associated with higher levels of prejudice towards both gay men and lesbians. In fact, individuals with high levels of authoritarianism tend to adhere to conventional values and authority over individual freedom, have low tolerance of ambiguity and high cognitive rigidity, and tend to perceive those who may violate conventional norms as a threat (Altemeyer, 1998). As a consequence, they are more likely to harbour negative attitudes towards gay men and lesbians, who represent a minority group often perceived as a dynamic one, promoting social and political change (Lingiardi, Falanga, & D'Augelli, 2005; Lingiardi et al., 2016; Roggemans, Spuryt, Van Droogenbroeck, & Kappens, 2015; Whitley & Lee, 2000).

Similarly, individuals with higher levels of religious conservatism tend to score higher on sexual prejudice (Adams, Nagoshi, Filip-Crawford, Terrell, & Nagoshi, 2016; Agnew, Thompson, Smith, Gramzow, & Currey, 1993; Forstein, 1988; Fyfe, 1983; Herek & Capitanio, 1999; Roggemans et al., 2015; Maher, 2013; Stulhofer & Rimac, 2009; Whitley, 2009). Several studies conducted in Italy (see e.g., Fasoli, Paladino, et al., 2016; Lingiardi et al., 2005; Lingiardi et al., 2016) also highlighted the impact of greater involvement with religion on sexual prejudice. The Italian scenario, however, has some peculiarities: a historical ambivalence towards lesbians and gay men, and the traditional closeness of the Vatican State that affected attitudes towards gay men and lesbians, and their achievement of civil rights (Lingiardi et al., 2016). The traditional Catholic view on the concept of family – a man and a woman, whose relationship has the purpose of procreation – still influence Italians' opinions (explicitly or implicitly), and same-gender relationships can be perceived as a threat to the cultural

institution of the family (Baiocco et al., 2013; Lingiardi et al., 2016). Italians, in fact, may consider the attraction towards people of the same sex as a "sin" or a "deviation", but at the same time it is considered a private matter and sometimes an "artistic" personality trait (e.g., Baiocco et al., 2013; Capozzi & Lingiardi, 2003; Lingiardi & Capozzi, 2004; Rossi Barilli, 1999): consequently, people belonging to sexual minorities are better "tolerated" if they do not openly affirm their identity or engage in political activities to achieve equal rights (Baiocco, Argalia, & Laghi, 2014; Baiocco & Laghi, 2013; Lingiardi, Baiocco, & Nardelli, 2012).

From a more social psychological perspective, similar to other forms of prejudice (e.g., ethnic prejudice), positive intergroup contact has been consistently found to be negatively correlated with sexual prejudice. Consistent with the contact hypothesis (Allport, 1954), knowing a lesbian or a gay man personally (i.e., friends or family members) is related to lower levels of sexual prejudice (Herek & Capitanio, 1996; Herek & Glunt, 1993; Smith, Axelton, & Saucier, 2009; Walch, Orlosky, & Sinkkanen, 2010). Separate studies conducted on Italian samples also support that interpersonal contact is important: the lack of contact with gay men or lesbians is associated with higher levels of sexual prejudice (Fasoli, Paladino, et al., 2016; Lingiardi et al., 2005).

1.2 Gender differences in sexual prejudice towards gay men and lesbians

Within the individual differences variables, the relation between gender differences and sexual prejudice is perhaps the most investigated and complex.

Research has consistently suggested that straight men – if compared to straight women – are more prejudiced towards gay men and lesbians (e.g., Banse, Seise, & Zerbes, 2001; Fasoli, Paladino, et al., 2016; Herek, 1988, 1991, 1994; Hinrichs & Rosenberg, 2002; Kerns & Fine, 1994; Kite, 1984; Kite & Whitley, 1996; Lingiardi et al., 2005; Lingiardi et al., 2016; Negy &

Eisenman, 2005; Parrott, Adams, & Zeichner, 2002), especially towards gay men compared to lesbians (Baiocco et al., 2014; Baker & Fishbein, 1998; Davies, 2004; Herek, 1984; Herek & Capitanio, 1996; Kite & Whitley, 1998). On the contrary, straight women are less prejudiced towards gay men and lesbians, and often show a similar level of prejudice towards gay men and lesbians, despite some research found higher levels of prejudice towards lesbians (Kite, 1984; Lingiardi et al., 2012; Raja & Stokes, 1998), and other research found lower levels of bias (e.g., Steffens, 2005).

The above differences in heterosexual men and women's attitudes towards gay men and lesbians have been explained in connection with the violation of traditional gender roles (Herek, 2000a; Kite, 1994), which refer to social norms that establish what is acceptable, appropriate, anticipated, and desirable according to the stereotypical view featuring men and women (Glick, Gangl, Gibb, Klumpner, & Weinberg, 2007; O'Neil, 1981). Men and women that violate expectations related to their gender are not only more likely to be perceived as gay or lesbian (Lehavot & Lambert, 2007; Lick & Johsnosn, 2014), but also more likely to be target of prejudice and discrimination (Boonzaier & Zway, 2015; Cohen, Hall, & Tuttle, 2009; Salvati Pistella, & Baiocco, 2018).

1.2.1 Stereotypes

After defining sexual prejudice and outlining the individual correlates, it is necessary to define the cognitive roots of this prejudice, by examining the cultural stereotypes that are commonly associated with gay men and lesbians.

So far, research has demonstrated that heterosexual men and women, although displaying different levels of sexual prejudice, share similar stereotypes about gay men and lesbians (e.g., Blashill & Powlishta, 2009; Fasoli, Mazzurega & Sulpizio, 2017; LaMar & Kite,

1998; Salvati, Piumatti, Giacomantonio, & Baiocco, 2019), who are often believed to be similar to the opposite gender (Brambilla, Carnaghi & Ravenna, 2011b; Corley & Pollack, 1996; Kite & Deaux, 1987; Madon, 1997; Walker, Golub, Bimbi, & Parsons, 2012; Whitley, 2001; Salvati, Ioverno, Giacomantonio, & Baiocco, 2016). Despite the fact that heterosexuals do not hold a monolithic stereotype of gay men or lesbian women, stereotypes about gay men as more feminine than masculine are particularly pervasive (Brambilla et al., 2011a, 2011b; Fingerhut & Peplau, 2006). Also, stereotypes assigned to gay men are commonly more negative and more likely to be associated with immorality and promiscuity (Krulewitz & Nash, 1980). Instead, stereotypes towards lesbians are more articulate and somewhat more ambivalent. In particular, lesbians can be perceived to be more masculine ("*butch lesbians"*) or more feminine ("*feminine lesbians*"). Butch lesbians are usually considered as more competent, while feminine lesbians as warmer (Brambilla, et al., 2011a).

Linking these stereotypes with traditional gender roles, a great deal of literature reported that heterosexuals – and in particular heterosexual men – are more prejudiced towards gay men who are stereotypically perceived as feminine (vs. non feminine), as they violate traditional gender roles. Similarly, lesbians who are stereotypically perceived as masculine are targets of higher levels of prejudice than those perceived as non-masculine (e.g., Carr, 2007; Glick et al., 2007; Salvati, Pistella, Giacomantonio, & Baiocco, 2018; Steffens, Jonas, & Denger, 2015).

1.2.2 Heterosexual men and sexual prejudice

As outlined above, the violation of traditional gender roles is a key factor shaping sexual prejudice and stereotypes against gay men and lesbians, especially for straight men. In fact, they are more likely to engage in traditional gender-role beliefs for several reasons: for

example, they receive more strict socialisation (Huston, 1984), they are granted greater power and privilege than women from traditional gender-roles (Lingiardi et al., 2016), and violations are more severe for men than for women (Bem, 1993). As a consequence, men who do not conform to gender role expectations face negative consequences, including being labelled homosexual (Bosson, Prewitt-Freilino, & Taylor, 2005; Bosson, Taylor, & Prewitt-Freilino, 2006; Bosson & Vandello, 2011) and can face antigay aggression (Parrott, 2009; Parrott, Peterson, & Bakeman, 2011). Thus, men express sexual prejudice not only to distance themselves from men who do not meet cultural expectations about gender-roles and are considered feminine, but also to establish and reaffirm their own masculinity (Falomir-Pichastor & Mugny, 2009; Herek & McLemore, 2013; Jetten & Spears, 2003). Research on masculinity threat has, in fact, shown that heterosexual men react with anxiety (Bosson, Vandello, Burnaford, Weaver, & Wasti, 2009), negative affects towards effeminate men (Glick et al., 2007), and aggression towards gay men (Talley & Bettencourt, 2008) when their masculinity is questioned.

Lesbians, on the contrary, face less prejudice and discrimination (see e.g., Herek & Capitanio, 1996; Fasoli, Paladino, et al., 2016), at least at a more blatant level: heterosexual men are less likely to perceive them as a threat (Herek, 2002). In this sense, sexual prejudice towards lesbians has been linked to sexism (Cunningham & Melton, 2013; Ioverno et al., 2018; Rye & Meaney, 2010; Pietrantoni & Prati, 2011; Salvati et al., 2018): they can be perceived as masculine and sexually unattractive women, or extremely feminine, attractive, provocative women that are hypersexualised and then accused of rejecting their complementary counterpart – heterosexual men (Chauvin & Lerch, 2016). The sexualisation and eroticisation of lesbians and lesbian sex relationships is considered to be a result of the influence of media and pornography, promoting a representation of lesbians as hypersexual or bisexual, that is

mainly targeted to heterosexual men (Brosius, Weaver, & Staab, 1993; Louderbak & Whitley, 1997; Reiss, 1986; Whitley, Wiederman, & Wryobeck, 1999).

1.2.3 Heterosexual women and sexual prejudice

Differently from straight men, women do not face the same social pressure with their feminine identity: they do not need to conform to cultural gender norms to preserve social status (Glick & Fiske, 2001), or clearly maintain gender boundaries (Herek & McLemore, 2013), but have greater flexibility than men in expressing their identity (Basow & Johnson 2000, Eagly, Diekman, Johannesen-Schmidt, & Koenig, 2004). Furthermore, being heterosexual is a central trait in men's gender identity but not in women's (Rich, 1980). Consequently, women do not feel threatened from homosexuality *per se* and do not need to engage in negative attitudes to affirm their femininity (Falomir-Pichastor & Mugny, 2009; Herek, 2000a; Herek & McLemore, 2013; Vandello, Bosson, Cohen, Burnaford, & Weaver, 2008), are more tolerant towards sexual minorities (Herek, 2003; Kite & Whitley, 1996; Negy & Eisenman, 2005; Baiocco et al., 2014) and gender-nonconformity (LaMar & Kite, 1998). Women, in fact, seem to feel comfortable around gay men (Basow & Johnson, 2000; Herek, 2003; Whitley, 2001) and their prejudice towards lesbians, when observed, tends to be more subtle and less overt (Hamilton, 2007; Lingiardi et al., 2012; Parrott & Zeichner, 2008).

1.3 Explicit and implicit measures of sexual prejudice

Scientific research has produced over time a proliferation of terminology that is reflected in a proliferation of self-report measures (Rye &Meany, 2010), based on both traditional (e.g., the Index of Homophobia, Hudson & Ricketts, 1980) and more modern theories of prejudice (e.g., Modern Homonegativity Scale, Morrison & Morrison, 2002). Recent

changes in Western cultures, in fact, resulted in a reduction of hostility towards religious, sexual, and ethnic minorities (Herek & McLemore, 2013; Manganelli, Canova, & Bobbio, 2008) that is taken into account in recent theories on prejudice, distinguishing subtle from more overt forms of discrimination (e.g., Pettigres & Meertens, 1995). However, self-report measures of sexual prejudice tend to highly correlate with more traditional ones (see Morrison & Morrison, 2011). Another issue with self-report measures is that they usually do not distinguish between gay men and lesbians (Herek, 2000a), but they measure general attitudes "towards homosexuals or homosexuality" (Kite, 1984; Kite & Whitley, 1996, 1998), also, "homosexual" is often interpreted by participants as referring to men and not to women (Herek, 2000a).

Based on recent theories on attitudes (e.g., Gawronski & Bodenhausen, 2006) that distinguish between explicit prejudice and implicit bias, other scholars developed implicit measures of sexual prejudice, as individuals may intentionally distort their responses or not be able to access them (e.g., Fazio & Towles-Schwen, 1999; Strack & Deutsch, 2004; Teige-Mocigemba, Klauer, & Sherman, 2010; Wilson, Wiederman, & Wryobeck, 2000), such as physiological measures (e.g., accelerated heart-rate, Shields & Harriman, 1984), and adaptations of the Implicit Association Test (IAT; Anselmi, Vianello, Voci, & Robusto, 2013; Dasgupta & Rivera, 2006; Gabriel, Banse, & Hug, 2007; Inbar, Pizzarro, Knobe, & Bloom, 2009; Jellison, McConnell, & Gabriel, 2004; Steffens, 2005; Steffens & Buchner, 2003). Adaptations of the IAT have been employed alone (e.g., Anselmi et al., 2013; Dasgupta & Rivera, 2006; Inbar et al., 2009) as well as in association with self-report scales (e.g., Gabriel et al., 2007; Jellison et al., 2004; Steffens & Buchner, 2003). When employed together, correlations – if detected – were low (e.g., Gabriel et al., 2007; Jellison et al., 2004; Steffens, 2005), indicating a general inconsistency and dissociation between implicit and explicit measures that is often observed

in other domains (Greenwald & Nosek, 2001; Nosek, 2007), as IAT and self-report are related but they differ in the conceptualisation of attitudes and therefore measure distinct constructs: while IAT measures the strength of the association between concepts, self-report scales may refer to multiple concepts (Cunningham, Nezlek, & Banaji, 2004; Nosek & Smyth, 2007).

Studies including implicit measures, however, still tend not to consider differences between gay men and lesbians: separate assessment of attitudes towards lesbians and gay men have been rare (Herek, 2000a; but see Steffens, 2005), even if heterosexuals' attitudes towards lesbians often differ from their attitudes towards gay men (Herek, 2000a, 2000b; Norton & Herek, 2012). For this main reason and to extend previous literature on this field, in the present work we paid particular attention to this distinction by employing specific (implicit and explicit) measures of sexual prejudice (for a detailed description about these measures, see Chapter 3 & 4) towards gay men and lesbians, and considered the presumable effects of sexual prejudice on nonverbal behaviours in separate studies, that specifically examined the relation between straight participants vs. gay men (Study 1 & 3) and vs. lesbian women (Study 2).

2 – NONVERBAL BEHAVIOUR IN INTERPERSONAL AND INTERGROUP CONTEXTS: NATURE, MEANING, AND MEASUREMENT

2.1 Definition and classification of nonverbal behaviour

Nonverbal behaviour (NVB) refers to those aspects of nonverbal communication that humans, more or less intentionally, act without speech. Through NVB, interactants create and share the meaning of the conversation by conveying information in the absence of verbal communication, but through body expressions and gestures (Ambady & Weisbuch, 2010; Bonaiuto & Maricchiolo, 2009; Knapp, 2011). NVB is particularly important because people use it to infer information about emotions, attitudes, personality, and relational intimacy (Ekman, 1964; Ekman & Friesen, 1969; Knapp & Hall 2009; Mehrabian, 1972). Also, not only such inferences are often accurate, but most individuals rely on the nonverbal content of the message to interpret the interlocutor's feelings and behaviour, especially when there is an inconsistency between verbal and nonverbal behaviour (Argyle & Cook, 1976; Ekman & Rosenberg; 1997; Mehrabian, 1972; Kendon, 2000; Richmond & McCroskey, 2004).

Dual-process theories (e.g., Fazio, 1990; Strack & Deutsch, 2004) distinguish between automatic (implicit) and controlled (explicit) processes. Such distinction is particularly useful to better understand how verbal and nonverbal communication work: despite the fact that verbal communication always requires a certain level of awareness and control, and nonverbal communication is often spontaneous, automatic, and hard to effectively monitor, people can use some of their cognitive resources to try and control their NVB (DePaulo, 1992). Many scholars theorised a connection between implicit and explicit processes of our attitudes and the aspects of human communication. Chen and Bargh (1997), for example, postulated that

the activation of implicit associations can influence NVB, often without the individual's awareness or intention. Similarly, Wilson and colleagues (2000) posited that explicit attitudes influence deliberative responses, while implicit attitudes influence responses that are difficult to monitor and control. For instance, as outlined below, research on ethnic prejudice suggests that explicit prejudice predict more controlled and deliberative behaviours, whilst implicit bias should predict more spontaneous NVBs (Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997).

NVB encompasses a wide variety of communicative processes: physical characteristics, use of space (interpersonal distance, physical contact, orientation, body posture), body movements, facial expression, gaze, and eye contact. Several classifications of NVBs have been proposed (see Ekman & Friesen, 1969), and some NVBs have been studied in connection with explicit attitudes and implicit bias. Below are described in detail the proxemic and kinesics, the most salient forms of NVBs that commonly characterise face-to-face dyadic interactions and that are tightly related to the empirical purposes of the present work.

2.1.1 Major types of nonverbal behaviours: meaning and empirical evidence

Proxemic refers to the different spatial aspects of the interaction. Despite that the use of space between the interactants is often influenced by culture and environmental factors, Hall (1966) argued that the interpersonal distance is informative about the interactants' relational intimacy and intentions. Four distinct zones were identified: intimate space (less than 45 cm), personal space (45 cm – 1.20 m), social space (1.20 m – 3.60 m), and public space (more than 3.60 m). Thereby, reducing the physical distance during a dyadic interaction is interpreted as a desire to interact, while increasing the distance is perceived as a desire to

interrupt the communication: the more the interactants distance themselves, the less intimacy they share (La Varvera, 2013).

The *immediacy hypothesis* (Mehrabian, 1968a, 1968b, 1968c, 1971) also claims that nonverbal immediacy behaviours are perceived as closeness and involvement in the interaction: the physical immediacy represents the psychological immediacy, and people use NVB to communicate approachability or avoidance. For example, they reduce the physical distance in order to reduce the psychological distance when they like someone or something, and they move away when they dislike or evaluate negatively someone or something. Humans can also manifest their immediacy by maintaining eye contact and regulating their body posture, for example, by leaning forward and having open-arms pose to manifest interest and trust (Lee, Knox, & Breazeal, 2013). Ekman & Friesen (1969), in particular, described the "closed" posture (i.e., any position that involves covering part of the body and/or crossing of hands, arms, or legs) as an indicator of reduced immediacy and lack of trust or cooperation between the interactants. The open posture, conversely, would represent confidence, openness, or desire to be involved in the interaction. Closed and opened postures have also been found to be connected to anxiety, stress and discomfort: the closed posture may also be a self-comforting behaviour and may not be connected to the desire to end the interaction (Carney, Cuddy, & Yap, 2010; Reddy & Wasserman, 1997).

Kinesics refers to the facial expressions, gestures, body motion, and positions that individuals assume during the interaction (Birdwhistell, 1970; Burgoon, Guerrero, & Manusov, 2011; Ekman & Friesen 1969). Ekman and Friesen (1969) organised gestures, body, and head movements in five different categories: i) emblems; ii) illustrators; iii) regulators; iv) emotional expressions; v) adaptors. Emblems are conventional gestures, with a direct and well known verbal translation (e.g., the nonverbal sign for "OK"); illustrators (e.g., nods, headshake) are

used to complement, reinforce, or emphasise verbal communication; regulators are nonverbal messages that include gaze and or head movements with the purpose of regulating the conversation (e.g., nodding to indicate understanding of the speech); emotional expressions, mainly conveyed by facial movements, typically reflect emotions (Ekman, 2003; Ekman & Friesen, 1969); adaptors are gestures that usually involve part of the face or body manipulations, often enacted without awareness. Ekman and Friesen (1969) described two different kinds of adaptors: alter-directed adaptors, that are directed to the other person or touching objects; and self-adaptors, i.e., self-touches that convey emotional or attitudinal information (e.g., face touches, hair grooming, and clothing adjustments). Specifically, a closed posture with crossed arms or legs may represent closeness towards the interaction, repetitive movements can represent the desire to end the conversation, and posture adjustments may indicate restlessness. Some scholars also suggested that these movements may be connected to anxiety, stress, and discomfort (Knapp & Hall, 2009; Mastronardi, 1998; Meadors & Murray, 2014; Reddy & Wasserman, 1997).

Besides these two major types of NVB, psychological literature has identified and defined the haptics, which refers to any type of communication involving touch between the interactants: intensity, duration, and frequency of touching seem to reveal relevant information about individuals' attitudes, the type of relationship, and their status (Andersen, Gannon, & Kalchik, 2013). Also, physical touch is culturally regulated: each culture is equipped with specific social norms about what is permitted depending on the type of relationship – actual or desired – between the interactants. Hence, there might be cultures in which touching someone conveys immediacy, whereas in other cultures such NVB might be considered a violation of personal space that may not be accepted or tolerated (Anolli, 2002; Bonaiuto & Maricchiolo, 2009).

Lastly, chronemics is a part of nonverbal communication – but not a form of NVB – that refers to how people handle time during the conversation, e.g., the use of silence, pauses, and speech rate (La Varvera, 2013; McGrath & Tschan, 2004; White, Valk, & Dialmy, 2011).

2.1.2 The evolutive (vs. social) origins of nonverbal behaviour and gender differences in nonverbal behaviour

Researchers on NVB have tried to understand its origins, components, and consequences starting from different frameworks (DePaulo & Friedman, 1998). Many scholars have argued in favour of an evolutionary perspective and considered NVB as adaptive mechanisms with universal aspects (Floyd, 2006), others focused on cultural differences and individual variations (Birdwhistell, 1970; Klingberg, 1935; Matsumoto, 2006). Research has demonstrated that both biological and social factors can influence different NVBs and that it is important to integrate biology and culture (Ekman, 1977; Montepare, 2003). For example, emblems are usually culture-specific (Ekman & Friesen, 1969), and the use of distance and contact vary across cultures (Andersen et al., 2013). Differently, research on facial expression of emotions highlighted the importance of both biological and cultural factors: while facial expression of primary emotions are considered to be universally distinguished and recognised (Ekman, 1972, 1973, 1994; Russel, 1994), culture provides with display rules about what is appropriate and guides emotional expression (Matsumoto & Juang, 2013).

Of particular interest for this theoretical debate are the gender differences in NVB: in fact, gender affects the expression of NVB in various ways (Briton & Hall, 1995; Hall, 1984; Knofler & Imhof, 2007; Stier & Hall, 1984). For example, research has consistently demonstrated that women have greater encoding and decoding abilities than men: they are more expressive than men and more accurate when interpreting NVB (Buck, Miller, & Caul,

1974; Hall, 1987; Meadors & Murrey, 2014; Rosenthal & DePaulo 1979; Schmid, Schmid Mast, Bombari, & Mast, 2011; Wagner, Buck, & Winterbotham, 1993; Zuckerman, DeFrank, Spiegel, & Larrance, 1982). Specifically, women are not only able to more effectively manifest their emotions, but they also have superiors skills in understanding other's emotional state (Antill, 1987; Bonaiuto & Maricchiolo, 2009; Brody & Hall, 1993; Broverman, Vogel, Broverman, Clarkson & Rosenkrantz, 1972; Hall, 1984; Rosenkrantz, Vogel, Bee, Broverman & Broverman, 1968; Rosenthal, Hall, DiMatteo, Rogers & Archer, 1979; Zuckerman & Larrance, 1979). Men and women also differ in proxemic, kinetics, and haptics. That is, women tend to stay closer to the interlocutor and use physical contact more frequently than men (Bull, 2002; Cozzolino, 2003; Henley & LaFrance, 1997; Suwelack & Wengler, 1995), while men more frequently adopt an open posture (Hall, 1984). Women are also more friendly and warm compared to men: they smile more (Bugental, Love & Gianetto, 1971; Kramer, 1977; Rosenfeld, 1966) use eye contact more often (Argyle & Dean, 1965; Bente, Donaghy, & Suwelack, 1998; Knapp & Hall, 2009; Merten, 1997) and maintain a stable gaze for longer periods of time (Suwelack & Wengler, 1995). Some research also found gender differences in fidgeting: while men tend to use leg jiggling and posture adjustments to manifest anxiety and restlessness (Briton & Hall, 1995), women use other adaptors to manifest discomfort, i.e. hair grooming and face touch (Hall, 1984; Knapp & Hall, 2009).

Differences in NVB between men and women have been mainly explained in connection with gender roles and socialisation: men and women receive a different education and develop different strategies to interact and influence each other. However, it is always hard to understand whether such differences could be interpreted as expressions of dominance or affiliation (Hall, 1984). For example, physical closeness and smiling may be interpreted as submissive behaviours that women enact as opposed to dominant behaviours

or may be considered caring behaviour women learned through early socialisation (Bonaiuto & Maricchiolo, 2009).

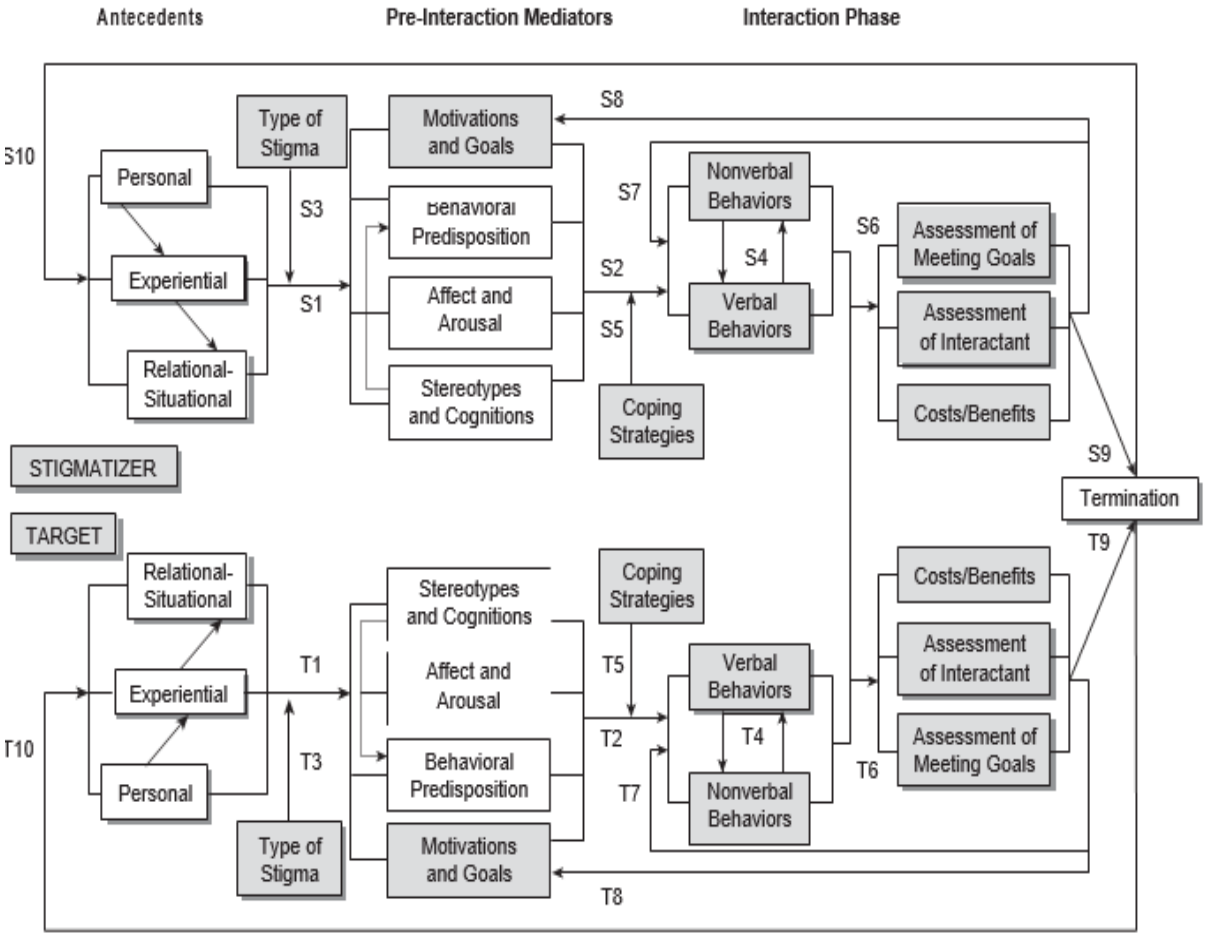
2.2 Intergroup Nonverbal Behaviour

Intergroup nonverbal behaviours (INVB) refers to those NVBs that individuals enact when interacting with members of a different social group. Despite that NVB is an important part of the communication process (Birdwhistell, 2010; DePaulo & Friedman, 1998), INVB, even if receiving increasing attention, remains understudied (Dovidio, Hebl, Richeson, & Shelton, 2006; Palazzi et al., 2016). NVB can convey a rich and wide variety of information that is of particular interest when studying intergroup interactions: according to Mehrabian (1972), NVB is used to express emotions, attitudes, motivations, and personality. Furthermore, when people interact with members of a different group, expectations, stereotypes, and prejudice are activated and manifested through specific NVB, hence NVB can shape impression formation and, in turn, affect intergroup interactions (Dovidio et al., 2006; Hebl & Dovidio, 2005; Patterson, 1982). For example, so far research has demonstrated that individuals tend to distance themselves when stereotypical representations of the interlocutor are activated (Macrae, Bodenhausen, Milne, & Jetten, 1994), and use immediacy behaviours (Mehrabian, 1968a, 1968b) to manifest interest in the conversation: the more they appreciate the interaction, the more they reduce their distance and engage in eye contact (Kleinke, 1986). Moreover, intergroup interactions are stressful events and people can experience intergroup anxiety (Stephan, 2014) resulting in anxious responses expressed through NVB (Blascovich, Mendes, Hunter, Lickel, & Kowai-Bell, 2001): research has, in fact, demonstrated that during intergroup interactions NVB is perceived as conveying negative attitudes by external coders (see e.g., Dovidio, Kawakami, & Gaertner, 2002).

Given the importance of NVB within intergroup exchanges, some scholars developed comprehensive models of INVB (Hebl & Dovidio, 2005), trying to explain how people manifest and interpret NVB in intergroup dyadic interactions. These models have been inspired by Patterson's (1982) Sequential Functional Model of Nonverbal Exchange, that specifically focused on changes in nonverbal involvement during the interaction. In particular, this model identifies antecedents of NVB (such as personal variables, relational-situational variables, and experiential variables) that trigger pre-interaction variables (e.g., cognition and affective reactions) and that, in turn, determine the involvement in the interaction and then the outcome (consequences): in other words, people have prior experiences, beliefs, and resources that they bring into the interaction and express through NVB. In turn, the NVB that they enact during the interaction will determine whether they will enjoy the communication or prefer to terminate it.

Hebl and Dovidio (2005) expanded the Patterson's model by adapting it to the complex setting of intergroup relations. In particular, these scholars broaden the model and included the type of stigma that characterise majority- and minority-group relations as an additional variable (see Figure 1).

Figure 1. Hebl and Dovidio (2005) Model of Mixed Social Interactions (shaded areas) based on Patterson's (1982) Sequential Functional Model of Nonverbal Exchange (white areas)[1].



2.2.1 Antecedents

Personal variables include differences in attitudes and beliefs towards other groups and may lead to different behaviour in terms of NVB during an interaction. The vast majority of the research on this field has focused on ethnic prejudice (see paragraph 2.2.4) and, for example, has demonstrated that White participants who are more biased behave less friendly when

[1] From Dovidio, J. F., Hebl, M., Richeson, J. A., & Shelton, J. N. (2006). Nonverbal communications, race, and intergroup interaction. In V. Manusov & M. L. Patterson (Eds.), The Sage handbook of nonverbal communication (pp. 481-500). Thousand Oaks, CA: Sage.

interacting with Black people (Dovidio et al., 2002) or may distance themselves during an interaction (Goff, Steele, & Davies, 2008; Palazzi et al., 2016; Word, Zanna, & Cooper, 1974).

Experiential variables can also affect INVB: for example, positive previous experiences of intergroup contact can lead to positive attitudes and reduce the level of anxiety in intergroup interactions, manifested through the reduction of interpersonal distance and minor use of self-adaptors (Pettigrew & Tropp, 2000).

Relational-situational variables refer to differences in power and the type of relationship between the interactants. For example, people in power are more likely to show greater variability in their NVB than less powerful people (Guinote, Judd, & Brauer, 2002) that are more likely to inhibit their NVB (Keltner, Gruenfield, & Anderson, 2003).

Lastly, the type of stigma associated with a specific group can lead to different INVB. For example, some types of intergroup biases trigger stronger emotional responses than others (Stangor, Sullivan, & Ford, 1991), and some biases are more inhibited than others depending on the social norms of a particular context (e.g., ethnic prejudice compared to heterosexism; Crandal & Eshleman, 2003).

2.2.2 Pre-interaction mediators

Antecedents influence pre-interaction states that, in turn, affect NVB enacted during the interaction. Hebl and Dovidio (2005) describe four categories of pre-interaction states: stereotypes and cognitions, affective reactions, behavioural predispositions to act, and motivations and goals.

Stereotypes and cognitions are the most studied components of the model, especially within interethnic interactions (Dovidio et al., 2006). Research highlighted that White participants often react negatively to Black people (Dovidio et al., 2002), and have beliefs about

how they will be perceived during the interaction that can affect their NVB (Shelton, Richeson, & Salvatore, 2005; Vorauer & Turpie, 2004).

Affect and arousal, especially negative affect, can also influence INVB (Dovidio et al., 2006; Hebl, Tickle, & Heatherton, 2000; Stephan & Stephan, 2000). Negative emotional reactions may be connected to intergroup anxiety, a type of anxiety that people experience when expecting or engaging in intergroup interactions (Stephan, 2014). Research on ethnic prejudice, in fact, has demonstrated that intergroup interactions can be perceived as a threat and elicit anxiety reactions (e.g., fidgeting, closed posture, gaze avoidance, and creating distance) in both majority and minority groups (McConnel & Leibold, 2001; Shelton, 2003; Trawalter, Adam, Chase-Lansdale, & Richeson, 2012; Trawalter & Richeson, 2008; Trawalter, Richeson, & Shelton, 2009). White individuals often feel anxious and uncomfortable during interethnic interactions (Amodio, 2009), and their anxiety may be related to the desire of not wanting to appear biased (Dovidio & Gaertner, 2004; Richeson & Shelton, 2003; Richeson & Trawalter, 2005; Shelton, 2003; Trawalter et al., 2012). Similarly, Black individuals might feel anxious when they expect to face prejudice and discrimination (Hyers & Swim, 1998; Tropp, 2003).

Predispositions or behavioural tendencies are the result of past experiences and intentions and may be activated automatically in response to social categorisation.

Lastly, motivations and goals shape the interactants' responses to each other. For example, the motivation to appear nonprejudiced (Plant & Devine, 1998) can influence White participants' NVB during interethnic interactions (Shelton, 2003).

2.2.3 Consequences

During the conversation majority and minority members interpret and influence each other through verbal and nonverbal communication, trying to manage the interaction. Minority members might have to cope with actual or anticipated discrimination, whilst majority members might try to act properly and in a nonprejudiced manner (Dovidio et al., 2006; Hebl & Dovidio, 2005). Research on ethnic interactions has suggested that White individuals may be concerned about acting prejudiced or in an inappropriate way (Gaertner & Dovidio, 1986), and, in turn, may focus on controlling their verbal responses, leading to inconsistencies in verbal communication and NVB (Hebl & Dovidio, 2005). This inconsistency is typically observed in a divergence between positive explicit attitudes and negative implicit bias/NVB (Crosby, Bromley, & Saxe, 1980) and contributes to miscommunication between majority and minority members (Shelton, West, & Trail, 2009). Even when White individuals show positive NVB, such as smiling and nodding (Mendels & Koslov, 2013), Black partners can still perceive the presence of negative implicit cues (Dovidio et al., 2002). The ultimate decision of the communication is to continue or terminate the interaction, and both verbal and NVB influence the decision. NVB can be a critical element that can facilitate intergroup interactions or contribute to intergroup misunderstandings (Dovidio et al., 2006; Hebl & Dovidio, 2005).

2.2.4 Ethnic prejudice and INVB

The vast majority of the research on INVB has focused on interethnic interactions, investigating the relation between ethnic prejudice and NVB. As already mentioned in Chapter 1, explicit prejudice and implicit bias are often dissociated (Nosek, 2007) as they especially commonly diverge for socially sensitive issues (Dovidio & Fazio, 1992) and are hypothesised to influence behaviour in different ways (Bargh, 1999; Dovidio & Fazio, 1992; Fazio, 1990).

Dovidio and colleagues (1997) proposed that explicit prejudice should predict deliberative forms of behaviour, and implicit bias should predict more spontaneous behaviours.

Research on ethnic prejudice provided some evidence supporting this hypothesis. For example, White participants often show less nonverbal intimacy when interacting with Black compared to White partners (Crosby et al., 1980; Feldman, 1985; Weitz, 1972; Word et al., 1974), and increase interpersonal distance (Goff et al., 2008; Hendricks & Bootzin, 1976; Word et al., 1974). Also, in one study, Dovidio and colleagues (1997) found that White participants' explicit prejudice predicted their personal evaluation of the interaction with the Black partner, while implicit bias predicted their NVB in terms of eye blinking and gaze aversion: higher levels of self-reported prejudice were associated with more negative evaluations of the interaction, whilst higher levels of implicit bias were associated with NVB signals of discomfort (e.g., higher rate of eye blinking and less eye contact). In another study, White participants' explicit attitudes predicted their verbal behaviour and self-perceived friendliness during the interaction, whilst implicit bias predicted White participants' NVB and the Black confederate evaluation of the interaction (Dovidio et al., 2002). Furthermore, McConnel and Leibold (2001) reported that White participants with higher implicit bias spoke less, committed more speech errors and speech hesitations during an interaction with a Black confederate, while their explicit attitudes did not correlate with the same NVBs. More recently, Palazzi and colleagues (2016) found that White participants with higher implicit bias kept a larger distance and used a smaller amount of gestures when interacting with a Black confederate compared to a White one. Conversely, Hofmann and colleagues (2008) reported more complex results: in two studies, implicit bias predicted INVBs (e.g., higher implicit bias predicted gaze aversion), especially when participants were cognitively depleted, but also explicit prejudice had an impact on NVB, and participants with lower levels of explicit prejudice used a higher amount

of self-adaptors during the conversation with the African confederate, interpreted as a sign of comfort.

2.2.5 Sexual prejudice, sexual orientation, and NVB

Research on INVB involving gay/straight dyadic interactions is relatively sparse. Cuenot and Fugita (1982) investigated the relation between explicit attitudes towards gay men and lesbians and NVB. In their study, heterosexual male and female participants interacted with a male or a female confederate portrayed as gay or straight depending on the condition. Results indicated that participants had similar visual interaction patterns with both the gay and the straight confederate, but, regardless of the level of explicit prejudice, spoke faster to the gay one, a sign that was interpreted as anxiety (e.g., Hobson, Strongman, Bull, & Craig, 1973).

In another study, Dasgupta and Rivera (2006) tested the relation between implicit bias, measured with an IAT (Greenwald, McGhee & Schwartz, 1998), and NVB in dyadic interactions between a straight participant and a confederate presented as gay or straight depending on the condition, and showed that implicit measures can better predict NVB than do explicit measures. In two experiments, the authors also tested the moderating role of conscious processes (i.e., activation of conscious egalitarian beliefs and/or behavioural control), and demonstrated that although implicit bias can affect NVB, people can be motivated to correct potential bias and try to control it: implicit bias predicted NVB only when participants were not motivated or were unable to control their behaviour (e.g., they smiled less, used less eye contact, and relaxed body posture).

Other studies considered gay/straight dyadic interactions without measuring implicit bias or explicit prejudice towards gay men or lesbians, but still found subtle forms of discrimination or different patterns of NVB. Hebl, Foster, Mannix, and Dovidio (2002)

investigated the behaviour of potential employers towards gay men and lesbian women: confederates, portrayed as gay or straight men and women depending on the condition, applied for several job positions and arranged interviews with the potential employers. Results indicated that employers spent less time and used fewer words when interacting with the gay applicants than the straight applicants. Also confederates, despite unaware of the experimental condition they were assigned to, evaluated the employer's behaviour more negatively when they were portrayed as gay than straight.

Knöfler and Imhof (2007) explored the impact of sexual orientation on NVB in dyadic interactions between actually gay and lesbian participants and actually straight participants, and found a different pattern of NVB in dyads with at least a gay person involved in the interaction compared to purely straight dyads in terms of touch, body posture, body orientation, and gaze. For example, mixed dyads and purely gay dyads preferred to avoid a direct, full face body orientation. Also, participants in mixed dyads enacted a greater amount of self-adaptors (e.g., face-touch) and fewer and shorter gazes at the partner. In this study, regardless of the presence of explicit prejudice or implicit bias, the mere presence of a gay man or a lesbian led to a different pattern of NVB.

Lastly, Gabriel and colleagues (2007), although not investigating specifically any INVB, found that both explicit prejudice and implicit bias can impact prejudice-relevant behaviours, such as donating money and signing a petition to support a local gay organisation.

2.3 Measuring nonverbal behaviours: old and new methods

Traditional research on NVB and intergroup interactions employed non-systematic measures of NVB, which typically consist of video recording of dyadic interactions and human coding conducted by "hand": after videotaping the interactions, multiple coders are instructed to manually rate NVBs. Despite the technical advances in recording devices making it relatively easy to record NVB, most of the research on INVB still relies on manual annotations by human raters (e.g., see Dagsupta & Rivera, 2006; Dovidio et al., 1997; Hofmann et al., 2008; McConnell & Leibold, 2001; Meadors & Murray, 2014). Human coding is a complicated and time-consuming procedure that requires multiple raters to be trained, and, nevertheless, can lead to inaccurate and subjective evaluations (Fujiwara & Daibo, 2014; Frauendorfer, Schmid Mast, Nguyen, & Gatica-Perezche, 2014; Palazzi et al., 2016). For these reasons, during the last years methodologists have focused on finding reliable and less time-consuming ways of detecting NVB. A first alternative consists of using wearable sensing technologies, such as eye-tracking devices (Junker, Amft, Lukowicz, & Toster, 2008). Wearable devices, however, are disadvantaged because they interfere with the interaction and, sometimes, with the NVB that is measured. For example, wearing an eye tracker can affect a person's gaze (Frauendorfer et al. 2014).

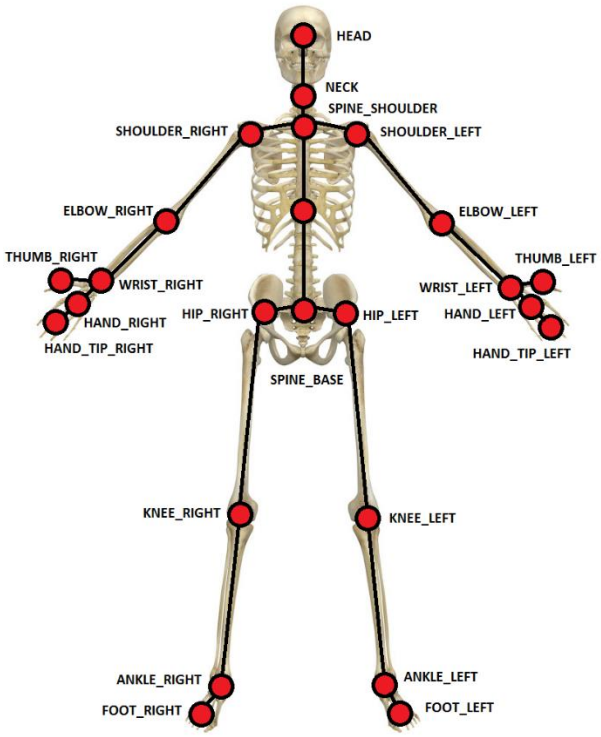
However, the exponential growth of digital technologies is providing researchers with new opportunities and alternatives to wearing devices: software like *The Observer* (Noldus et al., 2000) or THEME (see Burgoon, Proudfoot, Schuetzler, & Wilson, 2014) can record and automatically code patterns of NVBs (for a complete review on emerging automated motion analysis see also Metaxas & Zhang, 2013; Montepare, 2014). Besides, RGB-depth cameras also have several advantages: these devices are cheaper, faster, and more accurate and robust than

human coders; they allow researchers to automatically and continuously capture several NVBs, increasing the number of measures; and are non-invasive – they do not interfere with the interaction and do not restrict movements during the conversation, preserving spontaneity of nonverbal communication (Burba, Bolas, Krum, & Suma, 2012; Frauendorfer et al. 2014; Metaxas & Zhang, 2013; Montepare, 2014; Palazzi et al., 2016).

2.3.1 Microsoft Kinect Sensor

In the present research, we take advantage of these recent developments and employ a specific RGB-depth camera – the Microsoft Kinect V.2 Sensor – in order to obtain exact quantitative measures of body movements. The Kinect was originally developed as a gaming device, and it is now used in many research fields. It contains a depth sensor, a colour camera, and four-microphone array, providing full-body 3D motion capture, facial recognition, and voice recognition. The most interesting part of the Kinect sensor is its depth camera, that consists of an infrared projector combined with an infrared camera: such a combination allows continuous and unobtrusive recording of body motion thanks to its skeletal tracking system (Zhang, 2012): the Kinect sensor continuously records 3D coordinates of 25 body joints, that represents body parts such as head, neck, arms, and legs (see Figure 2). Each joint is represented by its 3D coordinates, and the coordinates of the 25 joints are used to extract a wide range of pattern of NVBs. After the recording phase, algorithms are applied to the coordinates in order to obtain measures of specific movements (Gatica-Perez, Guillaume, Odobez & McCowan. 2007; Palazzi et al., 2016). Thereby, even if the automated extraction of NVB requires computer scientists to develop robust algorithms, collecting and analysing data remains quicker and easier than human coding (Frauendorfer et al., 2014).

Figure 2 Representation of the 25 body joints tracked by a Microsoft Kinect V2.



In the last few years, the Kinect sensor has been increasingly employed in empirical researches, and several algorithms have been developed and validated to extract NVBs. Burba and colleagues (2012), for example, developed measures of respiratory rate by estimating the visual expansion and contraction of the chest cavity, and an index of leg jiggling, by measuring high-frequency vertical oscillations of the participant's knees. In 2013, Baur and colleagues presented NovA (NOnVerbal behavior Analyzer), a software that employs the Microsoft Kinect to automatically record and interpret behavioural cues such as gestures, body postures, and facial expressions. Lee, Knox, and Breazeal (2013) developed a measure of body posture (i.e., leaning-backwards and leaning-forward) in connection with the level of interpersonal trust during human-robot interactions. In 2015, Stratou and colleagues successfully employed the Microsoft Kinect to detect nonverbal cues associated with depression, such as slow body

motion and low rates of eye contact. Frauendorfer and colleagues (2014), simulated job interviews and obtained measures of nonverbal immediacy (i.e., smiling, eye contact, and nodding) that predicted hiring decisions. Won and colleagues demonstrated the importance of gestures, body posture, and nonverbal synchrony among teacher-learner interactions, and identified nonverbal cues that predict learning and creativity (Won, Bailenson, & Janssen, 2014; Won, Bailenson, Stathanos, & Dai, 2014). Zhang, Huo, Wu, Yang, & Pang (2014), exploited the Kinect sensor to detect facial expressions and body motion and developed an interactive learning platform for the study of the English language.

Palazzi and colleagues (2016), used the Kinect to capture NVB associated with implicit bias during dyadic interactions. In their study, first explicit prejudice and implicit bias towards Black people were assessed. Participants were then asked to interact with both Black and White confederates about two different topics. During the conversation, participants' behaviour was recorded with a Microsoft Kinect sensor. Two different algorithms were created to capture the mutual distance between the interactants: a linear one, considering the distance between the participant and the confederate's centroids – i.e., the area located in the centre of the skeleton – and a 3D one ("volume"), including the proportion of space that the participants used during the interaction with their entire body (for more details about this index, see paragraph 3.2). Another algorithm was created to capture the participants' amount of movements. Results indicated that both the Distance and Volume were correlated with the IAT score: participants with higher implicit bias kept a larger distance from the black confederate compared to the White one. Regarding body motion, movements made with head, arms, and torso ("upper body motion") appeared to be related to the comfort and the appreciation of the interaction, with participants producing a greater amount of movements

as an expression of comfort, and participants with higher levels of implicit bias freezing with the Black confederate.

This latter work is particularly relevant to present research project. In fact, as better described in the next chapters, we employed a similar procedure and same NVB indexes (i.e., volume and upper body motion algorithms) to systematically investigate the relation between explicit prejudice vs. implicit bias and INVB during gay/straight dyadic interactions.

3 – STUDIES OVERVIEW

3.1 Aims and hypotheses

The present research project aims to investigate INVB within gay/straight dyadic interactions through automated analyses of such behaviours. Research on INVB, in fact, has mainly focused on ethnic prejudice (e.g., between Black and White people) and involved non-systematic measures of NVB. Sexual prejudice, however, not only remains partially unexplored within this field of research, but also differ from other types of prejudice. For example, it is more accepted and easily expressed (Herek & McLemore), and differently from ethnicity, sexual orientation is not visible (Cox & Devine, 2014) due to the lack of physical markers, but requires self-disclosure (Tskhay & Rule, 2013). The Microsoft Kinect sensor, a recent technology that provides automated and reliable NVB indexes, was employed to record and extract INVBs, allowing us to overcome the several flaws of the traditional measures (see Chapter 2). In particular, we designed and conducted three experimental studies that involved heterosexual participants and confederates presented as gay (Studies 1, 3) or lesbian (Study 2). Because prejudice towards gay men and lesbians often differs (e.g., Herek, 2000a, 2002; Herek & Capitanio, 1996; see also Chapter 1), we decided to analyse these forms of sexual prejudice separately.

We specifically considered two NVBs broadly reflecting, respectively, aspects of the interactants' proxemic and kinesics (see Chapter 2): interpersonal distance and upper body motion. As discussed in Chapter 2, intergroup interactions can be considered stressful events (Trawalter et al., 2009) and individuals can manifest their internal status and their attitudes through different NVBs (Dovidio et al., 1997; Ekman & Friesen, 1969; Mehrabian, 1968a, 1968b,

1968c, 1971). Despite influence by gender (e.g., Bull, 2002; Cozzolino, 2003) and culture (Hall, 1966), the interpersonal distance between the interactants is considered an important cue of nonverbal immediacy, as people tend to keep a larger distance towards out-group members compared to the distance they keep towards in-group members (e.g., Novelli, Dury, & Reicher, 2010).

In fact, increased distance between the interactants has been consistently linked to prejudice and bias (e.g., Crosby et al., 1980; Feldman, 1985; Goff et al., 2008; Palazzi et al., 2016), while its reduction has been interpreted as interest in the conversation (Kleinke, 1986) and associated with diminished anxiety (Pettigrew & Tropp, 2000). This link has been mainly investigated and reported within interethnic settings (see Chapter 2's literature review). However, other studies do reveal a similar pattern when considering different intergroup relations and outgroup targets, such as for overweight people (e.g., Bassenoff & Sherman, 2000; Wolfgang & Wolfgang, 1971).

Further, recent research has also suggested that the upper body motion can convey important information about people's attitudes and emotions during intergroup interactions: people tend to move their head, torso, and hands to manifest comfort, whilst they freeze when they are biased and/or feel uncomfortable (Palazzi et al., 2016; Trawalter & Richeson, 2008; Trawalter et al., 2009).

Due to the lack of specific literature on sexual prejudice and INVB, we formulated our hypotheses drawing from research on other domains, especially ethnic prejudice and INVB. Specifically, Dovidio and colleagues (1997) hypothesised that implicit bias can predict INVB to a greater extent than explicit prejudice. During intergroup interactions, higher levels of implicit bias (but not explicit prejudice) have been found to predict a larger interpersonal distance and

freezing (e.g., Bessenoff & Sherman, 2000; Hendricks & Bootzin, 1976; Palazzi et al., 2016; Richeson & Shelton, 2003).

Importantly, such effects should especially emerge during intergroup-related discussions (controversial topics) in comparison with neutral ones. In other words, the conversation topic should moderate the causal link between implicit bias and INVB. In fact, talking about LGB issues should interact with individual levels of implicit bias in shaping INVB, as this topic can be perceived as threatening and elicit avoiding or discomfort NVB reactions, such as increased distance and freezing (Mendes, Blascovich, Hunter, Lickel, & Jost, 2007; Palazzi et al., 2017; Trawalter & Richeson, 2006; Trawalter et al., 2009).

Accordingly, we initially hypothesised that:

H1: heterosexual participants' implicit bias (vs. explicit prejudice) should predict a larger interpersonal distance when they interact with a confederate presented as gay (vs. straight), especially when they discuss a controversial topic (related to LGB issues) compared to a neutral one;

H2: heterosexual participants' implicit bias should predict their freezing behaviour – i.e., a smaller amount of upper body motion – when interacting with a confederate presented as gay (vs. straight), especially when they discuss a controversial topic compared to a neutral one.

After analysing and interpreting data for the previous two studies (see pp. 56-57), we put forward a third hypothesis for Study 3:

H3: the different amount of interpersonal distance that heterosexual participants assume when interacting with the gay confederate (vs. straight) would affect their cognitive resources, especially when they display high (vs. low) implicit bias and when discussing a controversial topic (vs. neutral).

Because research has demonstrated that the mere perception that someone is gay or lesbian can arise sexual prejudice *per se* (e.g., Herek, Cogan, & Gillis, 2002; Lick & Johnson, 2014; Lick., Johnson, & Gill, 2014), in the first two studies the confederate's sexual orientation was manipulated, and straight collaborators were involved and presented as gay to the participants. Study 3 was designed to extend and replicate the results of Study 1, by involving confederates whose actual sexual orientation (gay vs. straight) was revealed to the participants.

3.2 Methods

All of the studies were conducted at the University of Genoa (Italy), followed a similar procedure and employed similar measures. For this reason, Chapter 3 will provide a general overview of the research and will focus on the similarities among the three studies. Details and differences will be discussed in Chapter 4, along with the results of each study.

Participants and experimental design

All of the studies involved a 2 (confederate's sexual orientation: gay vs. straight) × 2 (conversation topic: neutral vs. controversial) experimental design, with one between groups independent variable – the confederate's sexual orientation – and one within subjects independent variable – the conversation topic. Sample size was based on the experimental design and determined a priori. A power analysis was conducted using G*Power 3.1.9.4 (Faul, Erdfelder, Lang, & Buchner, 2007), adopting the "ANOVA: Repeated measures, between factors" method, revealing that we needed at least 82 participants to observe a medium effect size ($f = 0.25$), with $\alpha = .05$, power = .80, and with 2 groups and 4 repetitions. Nearly 100 participants per study were recruited, as participants belonging to sexual minorities were expected to take part in the studies, and data loss was likely to occur due to equipment

failure, a common risk when using automated recording devices (see Chen, Leong, Feng, Lee, & Somasundaran, 2015; Palazzi et al., 2017; Won, Bailenson, & Janssen, 2014).

Recruitment

In all of the studies, participants were recruited on voluntary basis by research assistants via e-mail or private message on social networks. A snowball sampling strategy was employed, with the initial participants recruited through the experimenters' friendship networks.

Exclusion criteria

Research assistants were instructed not to recruit undergraduates attending psychology courses, as we assumed that it would have been easy for psychology students to unveil deception strategies involved in our experiments.

When analysing data, participants were excluded for at least one of the following reasons: a) they did not declare their sexual orientation or they belonged to sexual minorities; b) they were not able to recall the confederate's sexual orientation; c) equipment failure or missing data.

Compliance with ethical standards

All of the studies were conducted after receiving ethical approval from the local Ethics Committee. All of the study's procedures were performed in accordance with the AIP and APA ethical guidelines, and with the 1964 Helsinki Declaration and its later amendments. Full informed consent was obtained from the participants before they took part in the studies.

Procedure

Participants were told they would take part in research focusing on attitudes towards different groups and impression formation during dyadic interactions. The studies consisted of

two main phases: first, participants had to complete measures of explicit prejudice and implicit bias, and then they were asked to have two brief conversations with a confederate, who was presented as another participant. Every conversation was recorded by a Microsoft Kinect v2 in order to capture body motion and INVB.

Phase 1

Participants were individually conducted in a first laboratory and, after giving informed consent, they were administered one measure of explicit prejudice towards gay men (Studies 1-3) or lesbians (Study 2) along with other self-report scales assessing attitudes towards other minorities with the online app *LimeSurvey*. Measures of prejudice towards other minority groups were included in order to prevent participants from immediately focusing on sexual prejudice. Afterwards, participants completed an adapted version of the IAT (see below for more details) administered with *Inquisit 4 Lab* (Millisecond, 2015) aimed to detect implicit bias towards gay men (Studies 1-3) or lesbians (Study 2).

Manipulation of confederate's sexual orientation

Hence, participants were randomly assigned to one of two experimental conditions: they were induced to think they were going to have two brief conversations with another participant, who was, instead, a confederate. Depending on the experimental condition, he/she was presented as gay (Studies 1-3) or lesbian (Study 2) vs. straight. In all of the studies, two confederates were employed per experimental condition in order to increase the generalisability of our hypothesised effects.

To manipulate (Studies 1, 2) or make salient (Study 3) the confederates' sexual orientation, we created a series of fake Facebook profiles portraying them as engaged in a same-sex vs. opposite-sex relationship. These profiles were presented to the participants right

before the two conversations. Participants were required to read them in order to gain familiarity with the interactant they were going to meet. Therefore, all of the participants were explicitly aware of their partner's sexual orientation, as this was disclosed on the confederates' fake Facebook profiles.

Phase 2

Participants were then brought by the experimenter into another room to converse with the confederate. All confederates received instructions to act naturally, support the conversation, and not to judge the participants but rather to help them expose their ideas. As our research mainly focused on the participants' NVB, confederates were asked to stand in a particular area of the room in order to allow the Kinect sensor to easily record the participants' movements.

Participant and confederate were asked to talk about two different topics, a neutral one (*non-salient for the intergroup relation*) and a controversial one (*salient for the intergroup relation)* for approximately three minutes each. The order of the conversation topics (neutral vs. controversial) was randomised across participants.

After receiving instructions about the conversation topic, participant and confederate were left alone in the room, standing, and free to move within the recording stage. All conversations were recorded by the Microsoft Kinect v2 sensor. Following the second conversation, participants were asked to complete a small questionnaire and give information about their gender, age, and sexual orientation. Eventually, all participants were completely debriefed, during which we revealed the real identity of the confederate and discussed the aims of the study.

Measures

Explicit prejudice was measured using the Attitudes Toward Lesbians and Gay men scale (ATLG; Herek, 1988), adapted in Italian. The ATLG scale consists of two separate subscales: the Attitude Toward Gay men scale (ATG), and the Attitude Toward Lesbians scale (ATL). Specifically, in Study 1 and 3 participants had to show their level of agreement or disagreement with the 10 statements of the ATG scale (e.g., "Male homosexuals are disgusting", "Sex between two men is just plain wrong") using a 7-step Likert scale (1 = *not at all;* 7 = *extremely*); in Study 2, 9 items from the ATL scale were used (e.g., "Female homosexuality is a sin", "Lesbians can't just fit in our society"). Total scores were obtained by averaging the items of the two different subscales. Higher scores indicated higher explicit prejudice towards gay men (ATG) or lesbians (ATL).

Implicit bias was measured by adapting the Sexuality Implicit Association Test (Sexuality-IAT; Nosek et al., 2006), a specific version of the IAT widely used as an implicit measure of attitudes towards gay men and lesbians (e.g., Anselmi et al., 2013; Dasgupta & Rivera, 2006; Inbar et al., 2009), retrieved from https://www.millisecond.com/download/library/. The Sexuality-IAT is a computerised two-choice discrimination task in which participants have to categorise stimuli belonging to the target categories *Heterosexual* and *Homosexual* or to the attribute categories *Good* and *Bad* by pressing as quickly and accurately as possible one of the two response keys on the keyboard: *E* or *I*.

The original version of the Sexuality IAT uses the category labels *Heterosexual* and *Homosexual* along with positive and negative words belonging to the attribute categories *Good* (e.g., "pleasure", "joy") and *Bad* (e.g., "agony", "horrible"). Stimuli regarding the category *Homosexual* include words and images regarding both gay men and lesbians. Similar to Steffens

(2005), in our studies we created two versions of the Sexuality IAT: in Study 1 and 3 only stimuli regarding gay men were used (Sexuality IAT – Gay version), and in Study 2 only stimuli related to lesbians were adopted (Sexuality IAT – Lesbian version). All the stimuli were translated to Italian.

Both versions of the Sexuality-IAT consisted of 7 blocks: three practice blocks, in which participants have to categorise stimuli of either the target categories (e.g., *Heterosexual* by pressing the *E* key, and *Gay* by pressing the *I* key), or the attribute categories (e.g., positive words by pressing *E* and negative words by pressing *I*), and four critical blocks, involving the simultaneous categorisation of stimuli representing the four categories. The order of the critical blocks was counterbalanced across participants.

A *d*-score (Greenwald, Nosek, & Banaji, 2003) was obtained as measure of the strength of the association between concepts. Positive *d*-scores support a stronger association between *Heterosexual-Good* and *Gay* (or *Lesbian*)-*Bad* compared to the opposite pairings, indicating an implicit preference for *Heterosexual* people over *Gay* men (or *Lesbian* women). Negative *d*-scores support a stronger association between *Gay* (or *Lesbian)-Good* and *Heterosexual-Bad* compared to the opposite pairings, showing an implicit preference for *Gay* men (or *Lesbian* women) over *Heterosexual* people.

Nonverbal behaviour of both the participant and the confederate was continuously recorded during the two three-minutes conversations by a Microsoft Kinect device, set on a table, approximately 1.5 metres from the interactants. Data computing and feature extraction were obtained in collaboration with the University of Reggio Emilia's Engineering unit.

A 3D-measure of the distance kept by the participant towards the confederate was calculated using the Volume feature algorithm[2] provided by Palazzi et al. (2017). It captured simultaneously the interpersonal distance between the interactants and the movements of the participant towards the confederate by including the spatial coordinates of the participant (all 25 body joints) and the confederate's centroid (Figure 3). The algorithm was applied frame by frame to the registration and allowed us to obtain detailed repeated measures of volume during both interactions. These measures were then averaged over time windows of 50 seconds. Further, a total measure of the amount of upper body movements was calculated using the upper body motion algorithm[3] provided by Palazzi et al. (2017), including all participants' movements made with the arms, head, and spine during the interaction. Again, the algorithm was applied frame by frame to the registration and then averaged over time windows of 50 seconds each.

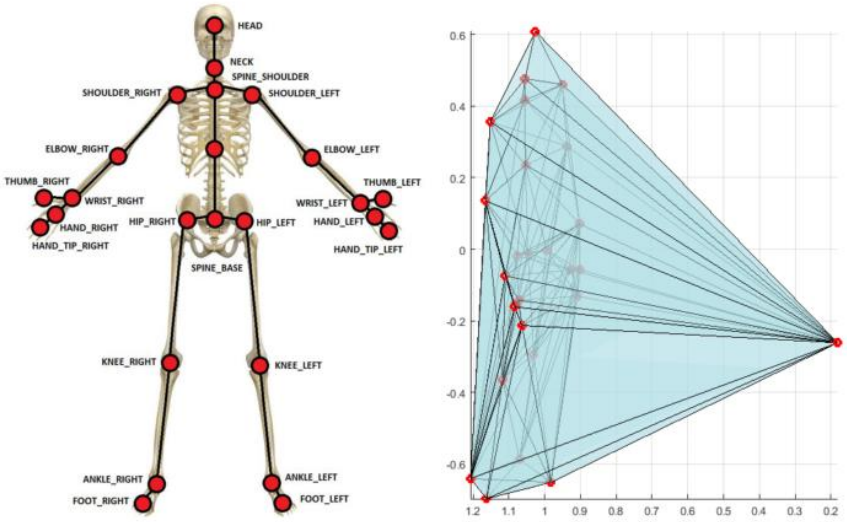
The indexes of NVBs derived from the algorithms are pure numbers. They indicate, respectively, the distance kept by the participant towards the confederate (the higher the index, the larger the distance) and the amount of movements made by the participant during the interaction (the higher the index, the more the participant moved).

Attentional check items were included at the end of the experimental session. Right after the two conversations, participants were asked to recall the fake Facebook profile page viewed before the interactions, and the sexual orientation of the confederate (gay vs. straight).

[2] Volume algorithm: Fvol(f) = Vol(DT(P(f))); From Palazzi, A., Caldarera, S., Bicocchi, N., Vezzali, L., di Bernardo, G. A., Zambonelli, F., Cucchiara, R. (2016). Spotting prejudice with nonverbal behaviours. In *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp '16*). ACM, New York, NY, USA, 853-862.

[3] Upper body motion (participant's movements) algorithm: Mp(f) = ∑ mi(f)

Figure 3. Representation of the 25 body joints tracked by a Microsoft Kinect V2 (left); Spatial representation of the Volume index (right)[4]



3.3 Data analyses

Data analyses followed the same strategy across the three studies and were performed using jamovi (The jamovi project, 2019, version 1.1.5.0), a free-source software built on top of R language.

Preliminary analyses were first run on independent variables. A total score of explicit prejudice (ATG or ATL subscale) was obtained by averaging the items, and an IAT *d*-score was calculated using the algorithm described in Greenwald and colleagues (2003). Data were subjected to a one-sample *t*-test in order to detect the presence of implicit bias.

[4] From Palazzi, A., Caldarera, S., Bicocchi, N., Vezzali, L., di Bernardo, G. A., Zambonelli, F., Cucchiara, R. (2016). Spotting prejudice with nonverbal behaviours. In *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp '16*). ACM, New York, NY, USA, 853-862

As described in Chapter 1, research has demonstrated that attitudes towards lesbians and gay men often diverge (e.g., Herek, 2000a): thus, gender differences in both explicit and implicit attitudes were examined with an independent sample *t*-test with the participants' gender as the independent variable.

Main analyses

We tested our main hypotheses about sexual prejudice and NVB using the linear mixed modelling procedure (LMM; Baayen, Davidson, & Bates, 2008) through the GAMLj package (Gallucci, 2019) in jamovi. The LMM procedure, in fact, provides several advantages when analysing repeated measures, allowing us to: a) separately treat the effects caused by the experimental manipulation (fixed effects) and those that are not (random effects); b) account for individual differences and non-independence of observations; c) analyse the entire data set despite the presence of missing data (Baayen et al., 2008; Pinhero & Bates, 2000).

The LMM procedure requires data to be structured in the "long format" instead of the "wide format": multiple observations per subject must be reported in different rows instead of different columns. Hence, repeated measures of NVB were tabulated in rows instead of columns: each row represents one measure of NVB, summarising the volume (or the upper body motion) over a time window of 50 seconds, resulting in 4 measures (rows) of INVB per conversation in Studies 1 and 3. Due to equipment failure, registrations are shorter in Study 2, resulting in 3 measures (rows) of INVB per conversation.

The data was then checked for normality and outliers. Outlier analysis was performed on the dependent variables, and measures deviating more than 2 *SD* from the mean were removed from the analysis. This procedure led to the exclusion of a small amount of measures of NVB instead of excluding participants: the LMM procedure, in fact, is robust in dealing with

missing data (Baayen et al., 2008) and allowed us not to lose participants with missing values. A Kolmogorov-Smirnov test was then used in order to conduct a normality check on the residuals of our indexes of INVB (i.e., volume and upper-body motion). When data violated assumptions of normality, distributions were transformed using the natural logarithm.

Afterwards, four models were run per study, in order to test the moderating role of explicit prejudice and implicit bias on interpersonal distance (volume) and upper-body motion. All four LMMs included the experimental condition (confederate's sexual orientation: 1 = gay vs. 2 = straight), the conversation topic (1 = neutral vs. 2 = controversial)[5], and the intercept as fixed effects. An independent random intercept was included for each participant, in order to control the individual variability on the dependent variables. Participants' gender, confederate, and the Kinect registration time window (from 1 to 4 in Studies 1 and 3, and from 1 to 3 in Study 2) were entered as covariates.

As mentioned, the LMM procedure has several advantages: due to the fact that parameter estimates are based on "Restricted Maximum Likelihood" (ReML), instead of Ordinary Least Square (OLS) used with ANOVA and regression analyses, the LMM procedure can easily handle missing values, account for non-independence of observations, and individual differences. On the other hand, there is no agreement among statisticians about the best way to compute the appropriate degree of freedoms (Baayen et al., 2008) and how to report effect sizes (Lorah, 2018), as the presence of multiple variance components in LMMs (e.g., within-group variance, intercept variance…) complicates the estimation of these statistics. For these reasons, the most common effect size in LMMs is the explained variance. Therefore, R-squared Marginal (variance explained by fixed factors) and R-squared Conditional (variance

[5] GAMLj package in jamovi does not necessarily require effect coding, and can use simple contrast coding that compares the reference group to each of the other groups. However, it centres the contrast to 0 (i.e., the average of the sample), meaning the other variables' effects are computed on average.

explained by both fixed and random factors) are reported for each model as an estimation of the effect sizes.

4 – INTERGROUP NONVERBAL BEHAVIOUR AND SEXUAL PREJUDICE TOWARDS GAY MEN AND LESBIANS: STUDY RESULTS

4.1 Study 1

The purpose of the first study was to explore the relationship between sexual prejudice towards gay men and NVB. Drawing from literature on ethnic prejudice and INVB, we hypothesised that implicit bias, rather than explicit prejudice, would be a main predictor of participants' INVB. In particular, we expected a three-way interaction between implicit bias, the confederate's sexual orientation, and the conversation topic. We hypothesised that the participants' implicit bias would predict a larger interpersonal distance (i.e., interpersonal volume), during the interaction with the confederate presented as gay (vs. straight), especially when discussing a topic related to the intergroup relation (vs. a neutral topic). A similar three-way interaction was expected for freezing behaviour, which we anticipated would emerge especially when the confederate was presented as gay and when participants were discussing a topic concerning the intergroup relation.

Methods

Participants and experimental design. The initial sample consisted of 95 participants that volunteered to take part in the study. Depending on the experimental condition, participants were asked to talk with a confederate who was presented as gay or straight about a neutral vs. controversial topic. As outlined in the previous Chapter, a 2 (confederate's sexual orientation: gay vs. straight) x 2 (conversation topic: neutral vs. controversial) mixed design was adopted, with the confederate's sexual orientation as a *between-subjects* factor and the

conversation topic as a *within-subjects* factor. Participants belonging to sexual minorities (N = 6) and participants who were not able to recall the confederate's sexual orientation (N = 7) in the attentional check items were excluded from the analyses. Due to equipment failure, another 4 participants were excluded from the analyses, leaving a final sample of 78 participants (40 males and 38 females). Participants' ages ranged from 18 to 29 (M_{age} = 21.30; SD = 2.02).

Procedure. Following the procedure described in Chapter 3, in the first phase of the experiment participants were asked to complete measures of explicit prejudice and implicit bias towards gay men. Afterwards, they were led to think that, in the second part of the experiment, they were going to converse with another participant. This person was instead a confederate, portrayed intentionally as gay or straight. Participants received information about the confederate's sexual orientation right after completing measures of sexual prejudice and implicit bias: they were shown a fake Facebook profile page portraying the confederate as engaged to a man (gay relationship) or a woman (straight relationship), and they were asked to memorise the information.

Two heterosexual male students were involved in the experiment as confederates; they played both roles (gay vs. straight) and they were always unaware of the condition they were assigned. The confederates did not know whether they would be perceived as gay or straight until the end of the experimental session. Thus, four fake Facebook profile pages were created (two per confederate) portraying them as gay or straight (see Figure 4 for examples of Facebook profiles).

In the second phase, participants were asked to have two brief conversations of three minutes each with the confederate, one regarding a neutral topic (traffic and public transport in Genoa) and one regarding a controversial topic (the situation of the gay and lesbian

community in Italy). Both conversations were recorded with a Microsoft Kinect v2 sensor in order to extract NVBs. Following the last conversation, participants were asked to complete the attentional check items and to give information about their gender, age, and sexual orientation. Eventually, all participants were thanked and fully debriefed.

Figure 4. Examples of the confederate's gay (left) and straight (right) Facebook profiles used in Study 1.

Measures

The ATG subscale of the ATLG scale (Herek, 1988) was used to assess **explicit prejudice**. A total score was obtained by averaging the 10 items (α = .846).

Implicit bias was measured with the Sexuality-IAT (Nosek et al., 2007) – Gay version. A *d*-score was computed, with positive scores indicating an implicit preference for straight men over gay man, and negative scores indicating an implicit preference for gay men over straight men.

Both the participant's and the confederate's movements were recorded during the two three-minute interactions (200 seconds) by a Microsoft Kinect v2 sensor. Four measures (each summarising 50 seconds of interaction) of **volume** were obtained per conversation, with higher

numbers indicating a higher distance kept by the participant. Four measures (50 seconds each) of upper body motion were also obtained per conversation, with higher numbers indicating a larger amount of movements made by the participant.

At the end of the experimental session, attentional check items (as described in Chapter 3) were presented to the participant. These checked whether participants paid attention to the fake Facebook profile page and remembered the sexual orientation of the interactant.

Results

Preliminary analyses

Explicit prejudice. ATG scores ranged from 1 to 6.40 (M = 1.71; SD = 0.85). Male participants showed higher prejudice towards gay men (M = 1.93; SD = 1.04) compared to female participants (M = 1.48; SD = 0.52), $t(76) = 2.40$, p = .019, Cohen's d = 0.54.

Implicit bias. IAT d-scores ranged from -0.68 to 1.21 (M = 0.45; SD = 0.39), and the average score was positive and statistically greater than zero, indicating the presence of implicit bias towards gay men, $t(77) = 10.30$, $p < .001$, Cohen's d = 1.17. Male participants (M = 0.49; SD = 0.39) did not show statistically different levels of implicit bias compared to female participants (M = 0.41; SD = 0.38), $t(76) = 0.98$, p = .329, Cohen's d = 0.22.

Main Analyses

An outlier analysis was performed on the dependent variables (volume, upper-body motion). Values deviating more than 2 SD from the mean were removed from the analysis, leading to the exclusion of 4 measures of volume and upper body motion. A Kolmogorov-Smirnov test indicated that the volume values of our samples were not normally distributed ($Z = 0.08$, $p < .001$). Hence, data were transformed using the natural logarithm to achieve

normality. The Kolmogorov-Smirnov test for the transformed values indicated a normal distribution (Z = 0.05, p = .133).

Explicit prejudice and volume

A first LMM was run entering explicit prejudice (ATG) as the moderator variable and volume as the dependent variable. The model has an R^2 Marginal of 0.40 and an R^2 Conditional of 0.87.

Table 1. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic and ATG on volume.

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = gay; 2 = straight)	0.203	1	71.4	0.654
Conversation topic (1 = neutral; 2 = controversial)	**8.817**	**1**	**528.0**	**0.003**
Participant gender (1 = male; 2 = female)	**35.096**	**1**	**71.4**	**<.001**
Explicit prejudice (ATG)	1.225	1	71.4	0.272
Confederate	**11.966**	**1**	**71.5**	**<.001**
Kinect time window	0.350	3	527.6	0.789
Confederate's sexual orientation ✻ Conversation topic	0.193	1	528.0	0.661
Confederate's sexual orientation ✻ ATG	1.642	1	71.4	0.204
Conversation topic ✻ ATG	2.212	1	527.8	0.138
Confederate's sexual orientation ✻ Conversation topic ✻ ATG	0.151	1	527.8	0.697

Note. Satterthwaite method for degrees of freedom
Participants' gender, confederate and Kinect time window were entered as covariates.

As shown in Table 1, results indicated a main effect of the conversation topic. Regardless of the confederate's sexual orientation, interpersonal volume between the participant and confederate was smaller when they discussed the controversial topic (*M* = 0.200; *SD* = 0.065) compared to the neutral topic (*M* = 0.204; *SD* = 0.063). Furthermore, a main

effect of participants' gender also emerged as significant. Overall, female participants (*M* = 0.171 ; *SD* = 0.042) compared to male participants (*M* = 0.233; *SD* = 0.063) tended to stay closer to the confederate. Finally, the covariate type of confederate had a significant effect on the index of volume. This indicates that, during the conversation, the interpersonal volume was different depending on the individual confederate. Instead, neither the main effect of the confederate's sexual orientation nor a main effect of ATG significantly affected the interpersonal volume. Furthermore, the three-way confederate's sexual orientation × Conversation topic × ATG interaction did not have a significant effect on this NVB.

Implicit bias and volume

A second LMM was run entering implicit bias (IAT) instead of explicit prejudice (ATG) as the moderator variable and volume as the dependent variable. The model has an R^2 Marginal of 0.40 and an R^2 Conditional of 0.87.

As shown in Table 2, the critical three-way confederate's sexual orientation × conversation topic × IAT interaction was significant.

Table 2. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic and IAT on volume.

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = gay; 2 = straight)	0.239	1	71.5	0.626
Conversation topic (1 = neutral; 2 = controversial)	**7.949**	**1**	**528.0**	**0.005**
Participant gender (1 = male; 2 = female)	**33.857**	**1**	**71.5**	**<.001**
Implicit bias (IAT)	0.005	1	71.5	0.941
Confederate	**13.888**	**1**	**71.5**	**<.001**
Kinect time window	0.355	3	527.7	0.785
Confederate's sexual orientation ✻ Conversation topic	0.254	1	528.0	0.614
Confederate's sexual orientation ✻ IAT	0.737	1	71.5	0.393
Conversation topic ✻ IAT	3.337	1	528.1	0.068
Confederate's sexual orientation ✻ Conversation topic ✻ IAT	**8.615**	**1**	**528.1**	**0.003**

Note. Satterthwaite method for degrees of freedom.
Participants' gender, confederate and Kinect time window were entered as covariates.

We interpreted this interaction through a simple slope analysis (Aiken & West, 1991). In Figure 5, simple slope analyses for the gay condition (graph on the left) and for the straight condition (graph on the right) are reported. As shown in Table 3, contrary to our hypotheses, when talking with the gay confederate, participants with high levels of implicit bias (+1SD) tended to stay closer to the confederate when discussing the controversial topic compared to the neutral one. Conversely, participants with low levels of implicit bias (-1SD) kept a similar distance with the confederate when talking about the controversial topic or the neutral one. In the straight condition, participants with lower levels of implicit bias (-1SD) tended to stay closer to the confederate when discussing the controversial topic compared to the neutral one, whilst participants with high levels of bias (+1SD) kept a similar distance with the confederate while talking about the controversial topic or the neutral one.

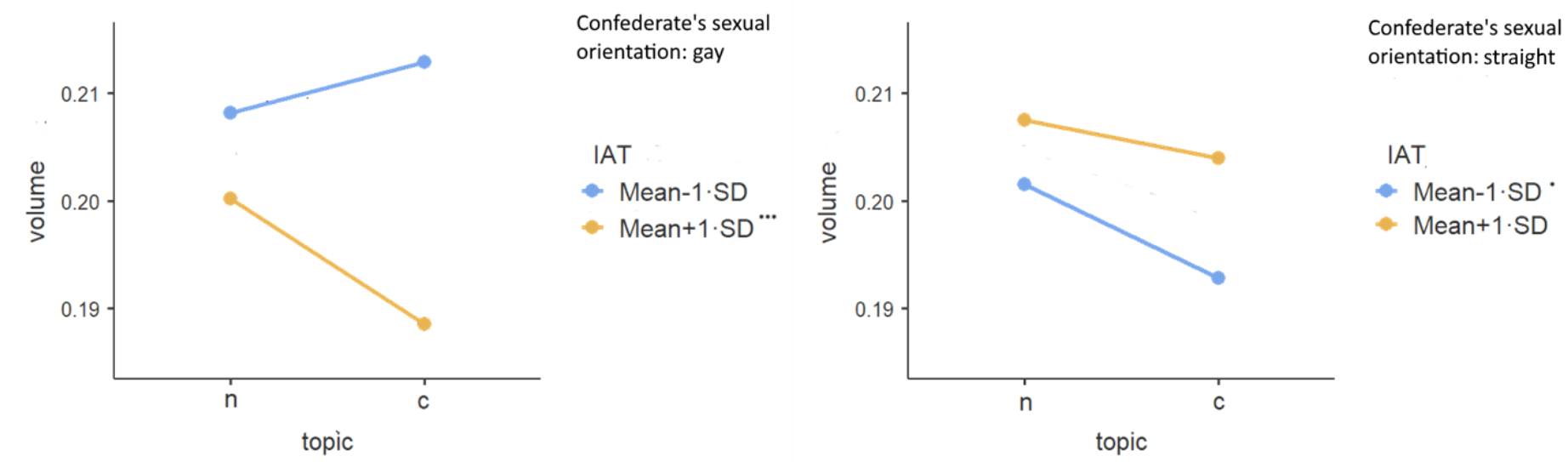
Table 3. Simple effects of topic on volume depending on confederate's sexual orientation and levels of implicit bias.

Simple effects of topic : Parameter estimates

Moderator levels					95% Confidence Interval				
Confederate's sexual orientation	IAT	contrast	Estimate	SE	Lower	Upper	df	t	p
Gay	Mean-1·SD	c - n	0.0232	0.0201	-0.0164	0.06278	529	1.15	0.250
	Mean+1·SD	**c - n**	**-0.0663**	**0.0187**	**-0.1031**	**-0.02959**	**528**	**-3.55**	**<.001**
Straight	**Mean-1·SD**	**c - n**	**-0.0414**	**0.0175**	**-0.0758**	**-0.00701**	**528**	**-2.36**	**0.018**
	Mean+1·SD	c - n	-0.0205	0.0184	-0.0568	0.01567	528	-1.11	0.266

Note. Simple effects are estimated keeping constant other independent variable(s) in the model

Figure 5. Simple slope analyses for the gay condition (graph on the left) and for the straight condition (graph on the right).



Explicit prejudice and upper body motion

Third LMM was run entering explicit prejudice (ATG) as the moderator variable and upper body motion as the dependent variable. The model has an R^2 Marginal of 0.04 and an R^2 Conditional of 0.53. As shown in Table 4, no main effect emerged. Furthermore, no interaction was significant.

Table 4. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic and ATG on upper body motion.

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = gay; 2 = straight)	0.038	1	72.1	0.845
Conversation topic (1 = neutral; 2 = controversial)	2.867	1	529.6	0.091
Participant gender (1 = male; 2 = female)	1.563	1	72.1	0.215
Confederate	1.907	1	72.2	0.172
Kinect time window	2.599	3	528.7	0.052
Explicit prejudice (ATG)	0.181	1	71.9	0.671
Confederate's sexual orientation ✻ Conversation topic	2.322	1	529.6	0.128
Confederate's sexual orientation ✻ ATG	0.823	1	72.0	0.367
Conversation topic ✻ ATG	0.673	1	529.1	0.412
Confederate's sexual orientation ✻ Conversation topic ✻ ATG	2.46e-4	1	529.1	0.988

Note. Satterthwaite method for degrees of freedom.
Participants' gender, confederate and Kinect time window were entered as covariates.

Implicit bias and upper body motion

The last model included implicit bias (IAT) as the moderator variable and upper body motion as the dependent variable, and has an R^2 Marginal of 0.05 and an R^2 Conditional of 0.54. Again, no main effect emerged, and no interaction was fully significant.

Table 5. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic and IAT on upper body motion.

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = gay; 2 = straight)	0.026	1	72.1	0.872
Conversation topic (1 = neutral; 2 = controversial)	3.229	1	529.7	0.073
Participant gender (1 = male; 2 = female)	1.331	1	72.1	0.252
Confederate	0.966	1	72.2	0.329
Kinect time window	2.620	3	528.7	0.050
Implicit bias (IAT)	1.543	1	72.1	0.218
Confederate's sexual orientation ✻ Conversation topic	2.052	1	529.7	0.153
Confederate's sexual orientation ✻ IAT	0.696	1	72.1	0.408
Conversation topic ✻ IAT	0.994	1	529.9	0.319
Confederate's sexual orientation ✻ Conversation topic ✻ IAT	3.661	1	529.9	0.056

Note. Satterthwaite method for degrees of freedom.
Participants' gender, confederate and Kinect time window were entered as covariates.

Discussion

Overall, results for Study 1 showed that implicit bias – but not explicit prejudice – affected participants' INVB, at least when considering the volume index. This finding confirms previous literature in this field, that shows how implicit bias has a more predominant role in predicting INVB than explicit prejudice. However, the pattern of findings that emerged for this peculiar INVB was contrary to our expectations and to previous literature. We found that the high implicitly biased participants, instead of keeping a larger distance, tended to stay closer to the confederate presented as gay, especially when discussing the controversial (vs. neutral) topic. A possible interpretation of these findings could depend on the nature of this peculiar NVB. We reasoned that the physical distance is an NVB that people can perhaps intentionally control more easily than other NVB (e.g., body motion). At least within gay/straight interactions,

it is possible that high implicitly biased people intentionally used their distance to manage their self-presentation and to appear non-prejudiced in view of the gay interactant. Participants' scores on ATG were in fact very low, indicating that did not explicitly report negative attitudes towards gay men and may not want to appear prejudiced. However, as mentioned above, this finding goes against the previous research that considered physical distance within intergroup contexts. It is also noteworthy these previous works mainly considered interethnic interactions, especially those between White and Black people. In other words, results of Study 1 provide first evidence suggesting that the nonverbal dynamics featuring dyadic interactions between straight and gay people have a peculiar nature and, thus, could lead to different outcomes in terms of INVB.

By taking a closer look at the effects of the conversation topic, the post hoc analyses also revealed that participants with low levels of implicit bias tended to stay closer to the straight confederate when discussing the controversial (vs. neutral) topic. As we did find a main effect of the conversation topic, it is possible that participants showed nonverbal immediacy when discussing the controversial topic, reducing their distance to show closeness and involvement in the conversation, because they were interested in the conversation topic *per se*.

Data analyses revealed no significant effects for implicit bias, confederate's sexual orientation and conversation topic on the participants' amount of upper body motion. Furthermore, neither the two- or three-way interactions significantly affected this INVB.

In Study 2, we aimed to verify whether a similar pattern of findings would emerge when considering explicit prejudice and implicit bias towards lesbian women. Hence, we involved female straight confederates who were presented as lesbians.

4.2 Study 2

Methods

Participants and experimental design. 94 participants volunteered to take part in the study. As in Study 1, a 2 (confederate's sexual orientation: lesbian vs. straight) x 2 (conversation topic: neutral vs. controversial) experimental design was adopted. The design had one between groups independent variable (the confederate sexual orientation) and one within subjects independent variable (all participants discussed both topics). Participants belonging to sexual minorities (N = 11) and participants who did not remember the confederate's sexual orientation (N = 10) were excluded from the analysis. Another participant was excluded from the analysis due to equipment failure. The final sample consisted of 72 participants (40 males and 32 females), with an age range of 19 to 29 years (M_{age} = 21.60; SD = 2.35).

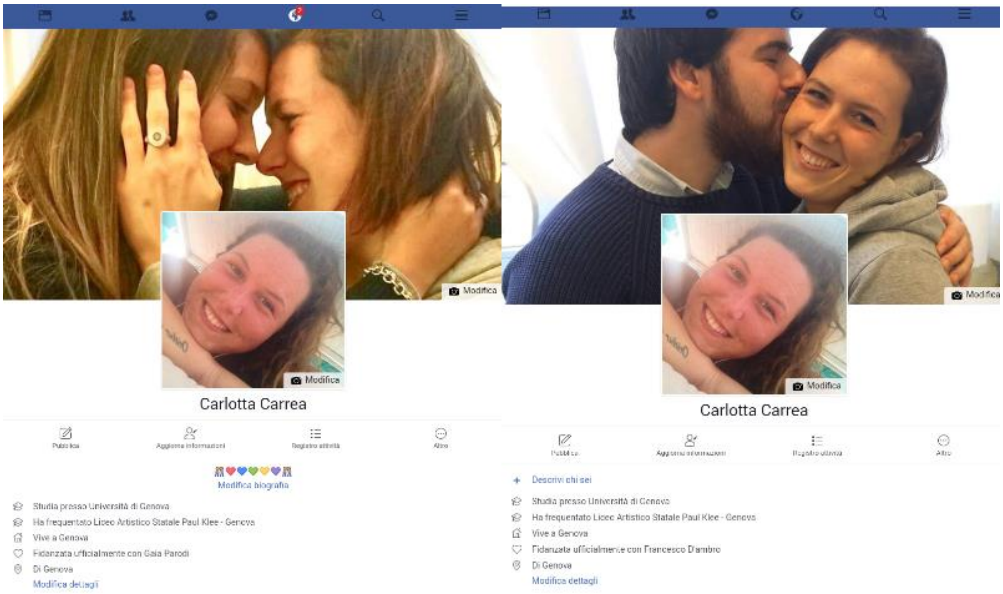
Procedure. As per Study 1, participants completed measures of explicit prejudice and implicit bias towards lesbians. Afterwards, they were led to think they were going to talk with another participant, who was instead a confederate. Participants received information about the confederate through a fake Facebook profile page. In Study 2, two heterosexual female students were involved in the experiment as confederates. As well as in Study 1, they played both roles (lesbian vs. straight). The confederates were always unaware of the condition they were assigned and they did not know whether they were perceived as lesbians or straight until the end of the experimental session. Thus, four fake Facebook profile pages were created, two per confederate, portraying them as lesbians or straight (Figure 6).

Participants were then asked to have two three-minute conversations with the confederate, one regarding the same neutral topic used in Study 1 (traffic and public transport

in Genoa) and one regarding a slightly different controversial topic (the situation of lesbians and gay men in Italy).

As in Study 1, both conversations were recorded with a Microsoft Kinect v2 sensor in order to extract NVBs. Following the last conversation, participants were asked to complete a small questionnaire and give information about their gender, age, and sexual orientation. Eventually, all participants were thanked and fully debriefed.

Figure 6. Examples of the confederate's lesbian (left) and straight (right) Facebook profiles used in Study 2.



Measures

Explicit prejudice was assessed using the ATL subscale of the ATLG scale (Herek, 1988). 9 items (α = 0.67) were averaged to obtain a total score.

Implicit bias was measured with the Sexuality IAT (Nosek et al., 2007) – Lesbian version. Similar to Study 1, positive *d*-score scores indicated an implicit preference for straight women over lesbian women, and negative *d*-score scores indicated an implicit preference for lesbian women over straight women.

Both participant and confederate's movement were recorded during the two three-minutes interactions by a Microsoft Kinect v2 sensor. Compared to Study 1, conversations were shorter (150 seconds instead of 200 seconds) due to equipment failure. Thus, three measures (each summarising 50 seconds of interaction) of **interpersonal distance** (volume) were obtained per conversation, and three measures (50 seconds each) of **upper-body motion** were obtained per conversation.

Right after the two conversations, participants completed **attentional check** items similar to the ones administered in Study 1.

Results

Preliminary analyses

Explicit prejudice. ATL scores ranged from 1 to 3.33 (M = 1.39; SD = 0.50). Male participants did not show statistically higher prejudice towards lesbian women (M = 1.47; SD = 0.51) compared to female participants (M = 1.29; SD = 0.48), $t(70) = 1.53$, p = .130, Cohen's d = 0.36.

Implicit bias. IAT d-scores ranged from -.95 to 1.17 (M = 0.15; SD = 0.47), and the average score was positive and statistically greater than zero, indicating the presence of implicit bias towards lesbian women, $t(71) = 2.62$, p = .011, Cohen's d = 0.31. Male participants (M = 0.30; SD = 0.52) showed statistically higher implicit bias compared to female participants (M = -0.04; SD = 0.31), $t(70) = 3.25$, p = .002, Cohen's d = 0.77.

Main Analyses

Data was first checked for outliers and normality. A Kolmogorov-Smirnov test indicated that both the volume (Z = .08, p = .003) and the upper body motion values (Z = 0.14, p < .001)

of our samples were not normally distributed, thus data was transformed using the natural logarithm to achieve normality. The Kolmogorov-Smirnov test for the transformed values indicated a normal distribution for both the volume (Z = 0.05, p = .180) and the upper body motion index (Z = 0.03, p = .904).

Explicit prejudice and volume

We performed the same LMM as in Study 1, and we entered explicit prejudice (ATL) as the moderator variable and volume as the dependent variable. The model has an R^2 Marginal of 0.45 and an R^2 Conditional of 0.84.

Table 6. LMM Results – main and interactive effects of confederates' sexual orientation, Conversation topic and ATL on volume.

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = lesbian; 2 = straight)	2.338	1	66.0	0.131
Conversation topic (1 = neutral; 2 = controversial)	0.567	1	354.0	0.452
Participant gender (1 = male; 2 = female)	**50.638**	**1**	**66.0**	**<.001**
Explicit prejudice (ATL)	1.674	1	66.0	0.200
Confederate	**14.300**	**1**	**66.0**	**<.001**
Kinect time window	1.872	2	354.0	0.155
Confederate's sexual orientation ✻ Conversation topic	0.338	1	354.0	0.561
Confederate's sexual orientation ✻ ATL	0.701	1	66.0	0.406
Conversation topic ✻ ATL	**7.205**	**1**	**354.0**	**0.008**
Confederate's sexual orientation ✻ Conversation topic ✻ ATL	**8.577**	**1**	**354.0**	**0.004**

Note. Satterthwaite method for degrees of freedom.
Participants' gender, confederate and Kinect time window were entered as covariates.

As shown in Table 6, results indicated a main effect of the participants' gender and a main effect of the confederate. Female participants (*M* =0.17; *SD* = 0.04), compared to male participants (*M* =0.24; *SD* = 0.06), stood closer to the confederate. Participants kept a smaller distance towards one of the confederates compared to the other. Conversely, the main effects of confederate's sexual orientation, the conversation topic and explicit prejudice were not significant. The two-way conversation topic x ATL interaction (see Table 7) emerged as significant. Participants with higher levels of ATL (+1SD) kept a smaller distance towards the confederate when discussing the controversial topic (vs. neutral; see Figure 7).

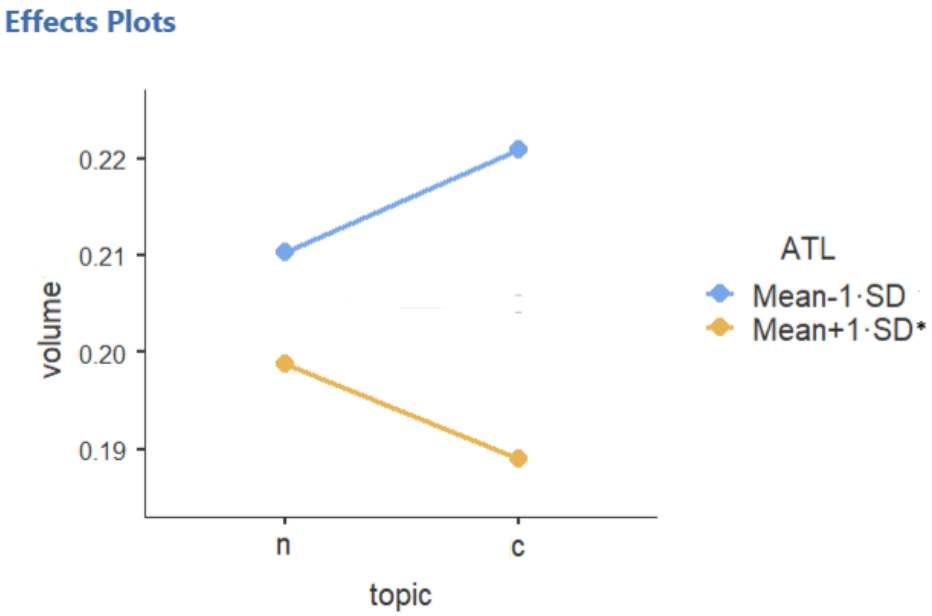
Table 7. Simple effects of the conversation topic on volume depending on the levels of explicit prejudice (ATG).

Simple effects of topic : Parameter estimates

Moderator levels				95% Confidence Interval				
ATL	contrast	Estimate	SE	Lower	Upper	df	t	p
Mean-1·SD	c – n	0.0338	0.0174	-3.34e−4	0.06803	354	1.947	0.052
Mean+1·SD	**c - n**	**-0.0525**	**0.0229**	**-0.0975**	**-0.00752**	**354**	**-2.295**	**0.022**

Note. Simple effects are estimated keeping constant other independent variable(s) in the model

Figure 7. Simple slope analysis of the interactive effect of conversation topic x explicit prejudice (ATL).



This two-way interaction was qualified by the three-way confederate's sexual orientation × conversation topic × IAT interaction, that was also significant, and was interpreted through a simple slope analysis (reported in Figure 8).

Post hoc analysis (see Table 8) showed that participants talking to the lesbian confederate, regardless of their level of explicit prejudice, kept a similar distance whether they discussed the controversial topic or the neutral one. In contrast, participants with lower levels of explicit prejudice (-1SD) stood closer to the straight confederate when discussing a neutral topic compared to the controversial one. Participants with higher levels of explicit prejudice (+1SD) stood closer to the straight confederate while discussing the controversial topic compared to the neutral one.

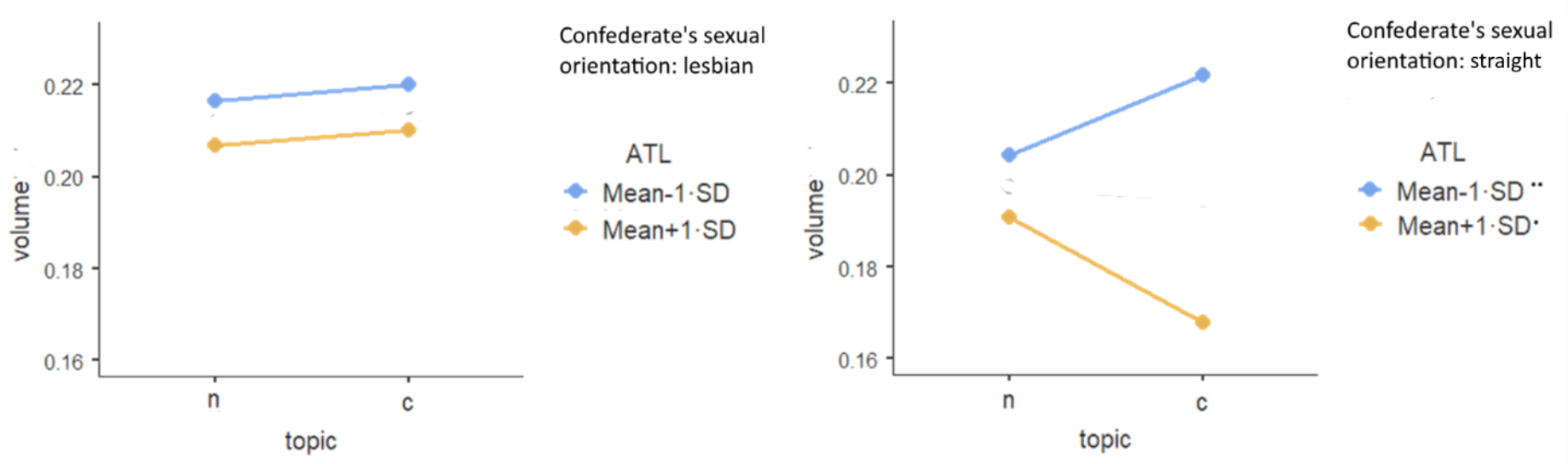
Table 8. Simple effects of topic on volume depending on confederate's sexual orientation and levels of explicit prejudice.

Simple effects of topic: Parameter estimates

Moderator levels					95% Confidence Interval				
Confederate's sexual orientation	ATL	contrast	Estimate	SE	Lower	Upper	df	t	p
Lesbian	Mean-1·SD	c – n	-0.016	0.023	-0.052	0.039	354	-0.261	0.794
	Mean+1·SD	c – n	0.002	0.018	-0.034	0.038	354	0.099	0.921
Straight	**Mean-1·SD**	**c – n**	**0.074**	**0.026**	**0.023**	**0.125**	**354**	**2.848**	**0.005**
	Mean+1·SD	**c – n**	**-0.107**	**0.042**	**-0.189**	**-0.024**	**354**	**-2.549**	**0.011**

Note. Simple effects are estimated keeping constant other independent variable(s) in the model

Figure 8. Simple slope analyses for the lesbian condition (graph on the left) and for the straight condition (graph on the right).



Implicit bias and volume

A second LMM was preformed entering implicit bias (IAT) as moderator variable and volume as dependent variable. The model has an R^2 Marginal of 0.46 and an R^2 Conditional of 0.84.

Table 9. LMM *Results – main and interactive effects of confederates' sexual orientation, conversation topic and IAT on volume.*

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = lesbian; 2 = straight)	1.012	1	66.0	0.318
Conversation topic (1 = neutral; 2 = controversial)	0.275	1	354.0	0.600
Participant gender (1 = male; 2 = female)	**41.378**	**1**	**66.0**	**<.001**
Implicit bias (IAT)	0.042	1	66.0	0.837
Confederate	**14.919**	**1**	**66.0**	**<.001**
Kinect time window	1.825	2	354.0	0.163
Confederate's sexual orientation ✻ Conversation topic	0.208	1	354.0	0.648
Confederate's sexual orientation ✻ IAT	2.882	1	66.0	0.094
Conversation topic ✻ IAT	0.138	1	354.0	0.710
Confederate's sexual orientation ✻ Conversation topic ✻ IAT	0.076	1	354.0	0.782

Note. Satterthwaite method for degrees of freedom.
Participants' gender, confederate and Kinect time window were entered as covariates.

The results (Table 9) show that there was no significant relationship between implicit bias and volume. Also, none of the interactions with implicit bias was significant, included the hypothesised three-way confederate's sexual orientation × conversation topic × IAT interaction.

Explicit prejudice and upper body motion

The third LMM was performed including explicit prejudice (ATL) as moderator variable and upper body motion as dependent variable. The model has an R^2 Marginal of 0.14 and an R^2 Conditional 0.67.

Tab 10. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic and ATL on upper body motion

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = lesbian; 2 = straight)	**5.411**	**1**	**66.0**	**0.023**
Conversation topic (1 = neutral; 2 = controversial)	0.043	1	353.0	0.835
Participant gender (1 = male; 2 = female)	**6.728**	**1**	**66.0**	**0.012**
Explicit prejudice (ATL)	0.864	1	66.0	0.356
Confederate	3.222	1	66.0	0.077
Kinect time window	0.647	2	353.0	0.524
Confederate's sexual orientation ✻ Conversation topic	0.204	1	353.0	0.652
Confederate's sexual orientation ✻ ATL	0.213	1	66.0	0.646
Conversation topic ✻ ATL	0.737	1	353.1	0.391
Confederate's sexual orientation ✻ Conversation topic ✻ ATL	0.149	1	353.1	0.700

Note. Satterthwaite method for degrees of freedom.
Participants' gender, confederate and Kinect time window were entered as covariates.

The results (Table 10) show a main effect of the confederate's sexual orientation and a main effect of the participant gender. Participants who interacted with the lesbian confederate moved their head, torso, and arms more (*M* = 0.011; *SD* = 0.008) compared to the participants who interacted with the straight confederate (*M* = 0.009; *SD* = 0.005). Female participants (*M* = 0.011; *SD* = 0.005) moved more than male participants (*M* = 0.009; *SD* = 0.008). On the other hand, neither explicit prejudice nor the conversation topic significantly affected the upper body motion, and none of the interactions was significant.

Implicit bias and upper body motion

The last model included implicit bias (IAT) as the moderator variable, and upper body motion as the dependent variable. The model has an R^2 Marginal of 0.15 and an R^2 Conditional of 0.67.

As shown in Table 11, contrary to our hypothesis, implicit bias did not significantly affect the participants' upper body motion, and the three-way confederate's sexual orientation × conversation topic × IAT interaction was not significant. Again, only the main effects of the confederate's sexual orientation and participants' gender emerged. Participants that interacted with the lesbian confederate (vs. straight) enacted a greater amount of movements, and female participants moved more than male participants.

Table 12. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic and IAT on upper body motion.

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = lesbian; 2 = straight)	**5.617**	**1**	**66.0**	**0.021**
Conversation topic (1 = neutral; 2 = controversial)	0.021	1	353.0	0.883
Participant gender (1 = male; 2 = female)	**5.273**	**1**	**66.0**	**0.025**
Implicit bias (IAT)	1.214	1	66.0	0.275
Confederate	3.087	1	66.0	0.084
Kinect time window	0.643	2	353.0	0.526
Confederate's sexual orientation ✻ Conversation topic	0.455	1	353.0	0.501
Confederate's sexual orientation ✻ IAT	1.773	1	66.0	0.188
Conversation topic ✻ IAT	0.555	1	353.0	0.457
Confederate's sexual orientation ✻ Conversation topic ✻ IAT	0.734	1	353.0	0.392

Note. Satterthwaite method for degrees of freedom.
Participants' gender, confederate and Kinect time window were entered as covariates.

Discussion

Study 2 was designed to investigate whether a similar pattern of INVB found in Study 1 would emerge when considering interactions between straight participants and lesbian confederates in the place of gay male confederates. Compared to Study 1, Study 2 shows a different pattern of results.

In fact, regarding the volume index, contrary to our hypothesis and differently from Study 1, not only implicit bias had no impact on this INVB, but neither the two- nor the three-way interactions were significant. Similar to Study 1, the confederate's sexual orientation did not affect the volume between the interactants, but unlike in Study 1, in Study 2 we did not find a main effect of the conversation topic.

Furthermore, and unlike in Study 1, explicit prejudice affected the volume between the interactants, but only in the straight condition. When talking to the confederate presented as straight, participants with lower levels of explicit prejudice stood closer to the confederate when discussing the neutral topic (vs. controversial), whilst participants with higher levels of explicit prejudice stood closer to the confederate while discussing the controversial topic (vs. neutral). Instead, participants talking to the lesbian confederate kept a similar distance regardless of their level of prejudice and the nature of the conversation. In interpreting these findings, it is also important to note that our sample was overall characterised by very low levels of prejudice towards lesbians.

Regarding the upper body motion index, differently from findings in Study 1, a main effect of the confederate's sexual orientation emerged, with participants enacting a greater amount of movements when talking to the confederate presented as a lesbian (vs. straight). But, similarly to Study 1, neither implicit bias nor explicit prejudice affected the participants' upper body motion.

Overall, results for Study 2 did not replicate those of Study 1, in which the intergroup relationship between straight and gay men was considered. This discrepancy suggests that the nonverbal dynamics characterising lesbians and straight women have a peculiar nature, distinguishable from those between straight and gay men. Further to this, findings of Study 2 suggest that (straight) participants' gender played a more prominent role in shaping prejudice towards lesbians and consequent INVB than it played in Study 1. In fact, the independent sample *t*-test highlighted that while male participants showed positive scores, indicating an implicit preference for straight women over lesbians, straight women showed negative scores, indicating an implicit preference for lesbians over straight women. Only male participants were biased, while female participants manifested an implicit preference for lesbians.

For explorative purposes, we ran supplementary analyses, considering the participants' gender as a further moderator. These analyses revealed that straight women stood closer to the interactant, regardless of their level of implicit bias and the confederate's sexual orientation. Furthermore, they reduced their distance towards the lesbian confederate when discussing the controversial (vs. neutral) topic whilst male participants enlarged their distance towards the lesbian confederate when discussing the controversial topic. For a more detailed discussion about the role of gender, see supplementary analyses.

4.3 Study 3

As described above, the main findings and supplementary analyses of Study 2 seem to suggest that heterosexuals' gender – more than individual levels of explicit prejudice or implicit bias – plays a key role in shaping INVB and driving dyadic interactions between straight and lesbian women. As the main purpose of the present research project was focusing on the link

between sexual prejudice and INVB, in Study 3 we opted for deepening the nature of this link by still considering the intergroup relation between straight and gay men.

Study 3 was designed to replicate and extend the results of Study 1. In particular, the relationship between implicit bias and interpersonal distance in gay/straight dyadic interactions. First, in this study, instead of manipulating the confederates' sexual orientation, we considered four confederates who were not just presented as gay vs. straight (as in Study 1), but who were indeed two gay men and two straight men. We explored whether a pattern of results similar to Study 1 would emerge when participants interacted with confederates who truly identified as gay men. Second, to increase the generalisability of our hypothesised effects, in this study we considered a different neutral topic than the previous studies. In this condition, interactants were asked to talk about the activities and attraction for young people in their towns. Similar to previous studies, in the controversial topic participants and confederates were asked to discuss was the situation of gay men and lesbians in Italy.

Third, and more importantly, in Study 3 we employed a measure of cognitive performance (i.e., a *Stroop colour-naming task*) aimed at measuring the participants' cognitive depletion following each conversation. This outcome variable was introduced to empirically corroborate the unexpected main finding (and the consequent interpretation) that emerged in Study 1. In fact, in this previous study and unlike in previous literature on INVB, we mainly found that participants who were high implicitly biased stood closer to the gay confederate, especially when discussing the controversial topic (vs. neutral). We reasoned that high implicitly biased participants could control their interpersonal distance to show closeness and involvement during the conversation with the gay confederate and, thus, they managed their self-presentation as a non-prejudiced individual.

However, in order to control this INVB, participants would have to invest their cognitive resources and, as a result, they may be cognitively depleted and have worse performance on a cognitive task. This theoretical rationale is also somewhat consistent with research on ethnic prejudice that documented how White participants (especially if they are higher in implicit bias) are often cognitively depleted after interethnic interactions and they perform more poorly on cognitive tasks, such as the Stroop task (e.g., Richeson & Shelton, 2003; Richeson & Trawalter, 2005; Richeson, Trawalter, & Shelton, 2005).

We therefore assumed that for participants interacting with the gay confederates (vs. straight), their reduced interpersonal distance with the interactant would be associated with greater cognitive depletion and, thus, with worse cognitive performance after the interaction. Crucially, we expected these effects to be moderated by individual levels of implicit bias (vs. explicit prejudice) and conversation topic (see also H3, Chapter 3).

Methods

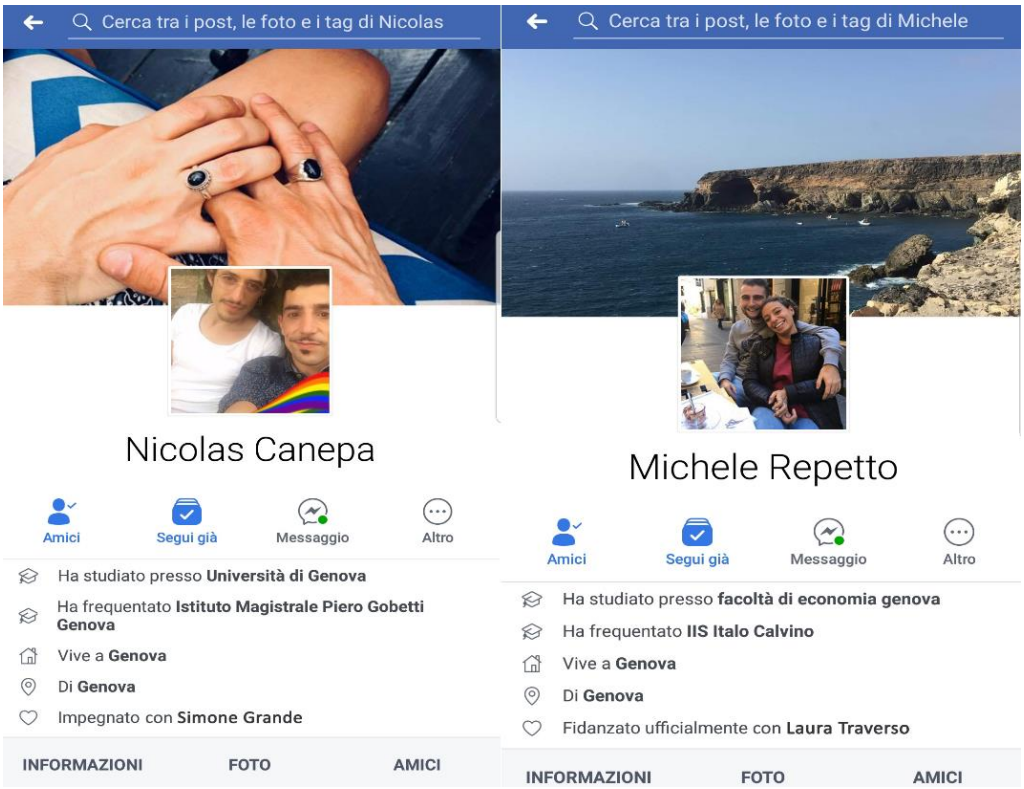
Participants and experimental design. A 2 (confederate's sexual orientation: gay vs. straight) x 2 (conversation topic: neutral vs. controversial) experimental design was adopted, with one between groups independent variable (the confederate's sexual orientation) and one within subjects independent variable (all participants discussed both topics). The initial sample consisted of 95 participants that volunteered to take part in the study. Participants were randomly assigned to one of two experimental conditions. They were asked to talk with a male confederate, who was straight or gay depending on the condition. Participants belonging to sexual minorities (N = 9) and participants who failed to remember the confederate's sexual orientation (N = 1) were excluded from the analysis. In addition, another 13 participants were excluded from the analysis as, due to equipment failure, we were not able to extract their NVBs

from the Kinect records. The final sample consisted of 72 participants (35 males and 37 females), with ages ranging from 18 to 29 (M_{age} = 23.30; *SD* = 2.64).

Procedure. Similar to Studies 1 and 2, participants were first asked to complete measures of explicit prejudice and implicit bias towards gay men, and then they were led to believe they were going to converse with another participant (the participant being a confederate; gay or straight depending on the condition). Participants received information about the confederate's sexual orientation through a fake Facebook profile page. In Study 3, four male confederates were involved: two straight men and two gay men. In contrast to Study 1 and Study 2, confederates were not required to play roles that were incongruent to their real sexual orientation. In other words, they did not play both roles (gay confederates were always portrayed as gay men, straight confederates were always portrayed as straight men). Hence, they were always aware of the experimental condition the participant was assigned. Four fake Facebook profiles were created, one per confederate, in order to reveal their real sexual orientation (Figure 9).

Participants were then asked to have two brief conversations – three minutes each – with the confederate; one regarding a neutral topic and one regarding a controversial topic. Like in Studies 1 and 2, both conversations were recorded with a Microsoft Kinect v2. After each conversation, participants completed the Stroop task, and following the last conversation they were asked to complete a small questionnaire and give information about their gender, age, and sexual orientation. Eventually, all participants were thanked and fully debriefed.

Figure 9. Examples of the confederate's gay (left) and straight (right) Facebook profiles used in Study 3.



Measures

The ATG subscale of the ATLG scale (Herek, 1988) was used to assess **explicit prejudice**. The 10 items (α = .91) were averaged to obtain a total score.

Implicit bias was measured with the Sexuality IAT (Nosek et al., 2007) – Gay version.

Both the participant's and the confederate's movements were recorded during the two three-minutes interactions (200 seconds) by a Microsoft Kinect sensor. Four measures (each summarising 50 seconds of interaction) of **interpersonal distance** (volume) were obtained per conversation. Similar to previous studies, **upper body motion** measures were also obtained. However, since the main focus and hypotheses for this study concerns the volume index, below are reported only the main analyses considering this index. Results for the upper body motion index are reported in supplementary analyses.

Stroop task. Cognitive depletion was measured with a *Stroop colour-naming task*, conducted with a colour-coded keyboard. Participants were instructed to indicate, as quickly and as accurately as possible, the colour of various texts that appeared on the computer screen by pressing one of the four colour-coded keys. The task consisted of 20 practise trials, followed by 144 experimental trials. Incongruent trials consisted of colour words appearing in a font colour other than its semantic meaning (e.g., "blue" in a green font colour), whilst congruent trials consisted of colour words in the corresponding font colour (e.g., "blue" in a blue font colour). Aligning with the cognitive literature in this area (e.g., MacLeod, 1991), we considered the mean response latency (in milliseconds) for incongruent trials as the main index measure of cognitive depletion (i.e., Stroop interference), with higher values indicating greater cognitive depletion. In fact, in these trials participants have to control their own responses, by inhibiting the reading response and reporting the one matching with the font colour.

Right after the two conversations, participants completed attentional check items similar to the ones administered in Studies 1 and 2.

Results

Preliminary analyses

Explicit prejudice. ATG scores ranged from 1 to 6.60 (M = 1.79; SD = 1.14). Male participants showed statistically higher explicit prejudice towards gay men (M = 2.09; SD = 1.33) compared to female participants (M = 1.52; SD = 0.86), $t(70) = 2.17$, p = 0.033, Cohen's d = 0.51.

Implicit bias. IAT d-scores ranged from -0.34 to 1.22 (M = 0.41; SD = 0.35), and the average score was positive and statistically greater than zero, indicating the presence of implicit bias towards gay men, $t(71) = 9.90$, $p < .001$, Cohen's d = 1.17 . Male participants (M =

0.43; *SD* = 0.34) did not show statistically higher implicit bias towards gay men compared to female participants (*M* = 0.39; *SD* = 0.37), *t*(70) = 0.47, p = .64, Cohen's *d* = 0.11.

Main analyses

Data was first checked for outliers and normality: no outlier was detected, and a Kolmogorov-Smirnov test indicated that the volume values were normally distributed (Z = 0.04, p = .233).

Explicit prejudice and volume

The first LMM included explicit prejudice (ATG) as moderator variable and volume as the dependent variable. The model has R^2 Marginal of 0.29 and an R^2 Conditional 0.82.

As well as in Study 1 and Study 2, results (see Table 13) indicated a main effect of the participants' gender. Female participants (*M* = 0.152; *SD* = 0.036) kept a smaller distance towards the confederate, compared to male participants (*M* = 0.199; *SD* = 0.046). While explicit prejudice did not significantly affect the volume index, and none of the interactions with ATG were significant, the two-way confederate's sexual orientation x conversation topic interaction emerged as significant.

Table 13. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic and ATG on volume.

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = gay; 2 = straight)	3.190	1	66.0	0.079
Conversation topic (1 = neutral; 2 = controversial)	0.024	1	497.0	0.876
Participant gender (1 = male; 2 = female)	**27.861**	**1**	**66.0**	**<.001**
Confederate	2.057	1	66.0	0.156
Kinect time window	0.171	3	497.0	0.916
Explicit prejudice (ATG)	1.223	1	66.0	0.273
Confederate's sexual orientation ✻ Conversation topic	**20.030**	**1**	**497.0**	**<.001**
Confederate's sexual orientation ✻ ATG	0.082	1	66.0	0.775
Conversation topic ✻ ATG	2.985	1	497.0	0.085
Confederate's sexual orientation ✻ Conversation topic ✻ ATG	1.932	1	497.0	0.165

Note. Satterthwaite method for degrees of freedom.
Participants' gender, confederate and Kinect time window were entered as covariates.

Post hoc analyses (see Table 14) showed that participants who interacted with the gay confederate kept a smaller distance when discussing the neutral topic compared to the controversial one. Participants who interacted with the straight confederate kept a smaller distance when discussing the controversial topic compared to the neutral one (see Figure 10).

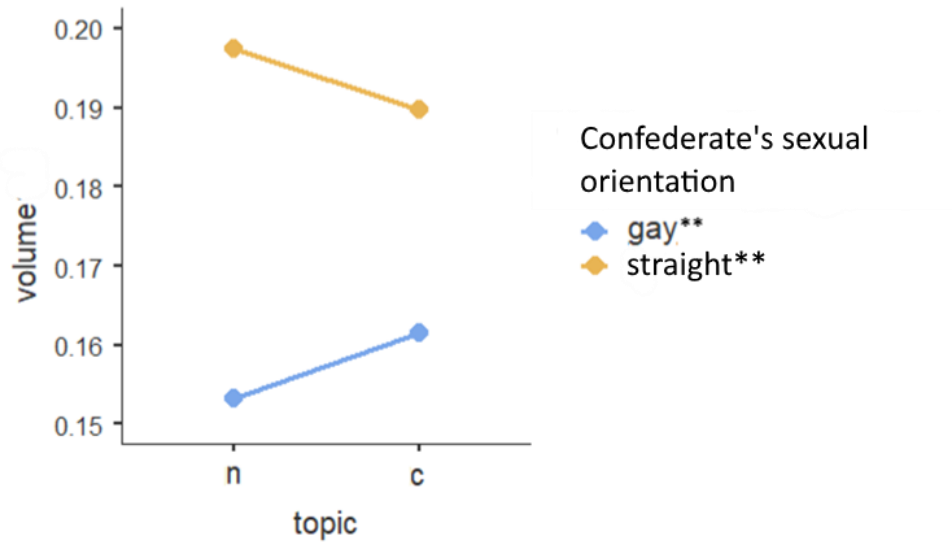
Table 14. Simple effects of the conversation topic on volume depending on the confederate's sexual orientation.

Simple effects of topic: Parameter estimates

Moderator levels				95% Confidence Interval				
Confederate's sexual orientation	Contrast	Estimate	SE	Lower	Upper	df	t	p
Gay	c – n	0.0082	0.00259	0.00312	0.01330	497	3.17	0.002
Straight	c – n	-0.0076	0.00242	-0.01241	-0.00290	497	-3.16	0.002

Note. Simple effects are estimated setting higher order moderator (if any) in covariates to zero and averaging across moderating factors levels (if any)

Figure 10. Simple slope analysis of the interactive effect of the confederate's sexual orientation and the conversation topic on volume



Implicit bias and volume

The second LMM included implicit bias (IAT) as the moderator variable and volume as the dependent variable. The model has an R^2 Marginal 0.29 of and an R^2 Conditional of 0.82.

Results, reported in Table 15, did not differ from the first LMM. This indicates a main effect of the participants' gender: female participants stayed closer to the confederate. In the

same two-way confederate's sexual orientation x conversation topic interaction, participants stayed closer to the gay confederate when discussing the neutral topic (vs. controversial) and kept a smaller distance towards the straight confederate when discussing the controversial topic (vs. neutral).

Unlike in Study 1 and our hypothesis, implicit bias did not significantly affect the volume between the interactants, and the expected three-way confederate's sexual orientation x conversation topic x IAT interaction was not significant.

Table 15. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic and IAT on volume.

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = gay; 2 = straight)	3.601	1	66.0	0.062
Conversation topic (1 = neutral; 2 = controversial)	0.015	1	497.0	0.901
Participant gender (1 = male; 2 = female)	**35.846**	**1**	**66.0**	**<.001**
Confederate	2.901	1	66.0	0.093
Kinect time window	0.170	3	497.0	0.916
Implicit bias (IAT)	0.411	1	66.0	0.519
Confederate's sexual orientation ✻ Conversation topic	**23.957**	**1**	**497.0**	**<.001**
Confederate's sexual orientation ✻ IAT	1.505	1	66.0	0.224
Conversation topic ✻ IAT	0.144	1	497.0	0.706
Confederate's sexual orientation ✻ Conversation topic ✻ IAT	3.57e-4	1	497.0	0.985

Note. Satterthwaite method for degrees of freedom.
Participants' gender, confederate and Kinect time window were entered as covariates.

Interpersonal distance (volume) and cognitive depletion (Stroop interference)

Data was first checked for outliers and normality. A Kolmogorov-Smirnov test indicated that the Stroop interference scores of our samples were not normally distributed (Z = 0.07, p = .005). Hence, data were transformed using the natural logarithm to achieve normality. The Kolmogorov-Smirnov test for the transformed values indicated a normal distribution (Z = 0.04, p = .166).

We then tested our hypothesis (H3) regarding the interpersonal distance (volume) and cognitive depletion (Stroop interference) using an LMM. The Stroop interference was entered as the dependent variable of the model. Intercepts across participants were the random coefficients of the model, that allowed capturing the intra-individual variability due to the repeated-measure nature of the design. With regard to the fixed effects, we entered the experimental condition (confederate's sexual orientation: 1 = gay vs. 2 = straight), the conversation topic (1 = neutral vs 2 = controversial), implicit bias (IAT) and interpersonal distance (volume). Because the latter two predictors were intended to be moderators of the experimental effects, we also included the interactions between IAT, volume, and the experimental factors, as well as all three-way and one four way-interaction.

In addition, the Stroop task administration time (1 = first administration; 2 = second administration of the Stroop task) was also included in the model in order to control for possible learning effect (i.e., improved performance due to repetition). Overall, the model has R^2 Marginal of 0.05 and an R^2 Conditional 0.92.

The results (Table 16) show a main effect of the Stroop task administration time. Not surprisingly, latencies were longer in the first administration of the Stroop task (*M* = 807; *SD* = 160) when compared to the second one (*M* = 757; *SD* = 122), indicating a learning effect, with participants having a better performance and becoming quicker in the second administration.

Furthermore, both two-way confederate's sexual orientation x conversation topic and conversation topic x IAT interactions emerged as significant. Crucially, they were qualified by the three-way confederate's sexual orientation x IAT x volume interaction.

Table 16. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic, volume and IAT on Stroop interference

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = gay; 2 = straight)	0.028	1	67.8	0.867
Conversation topic (1 = neutral; 2 = controversial)	1.366	1	494.7	0.243
Implicit bias (IAT)	0.131	1	68.3	0.718
Volume	0.678	1	537.9	0.410
Stroop task administration time (1 = first; 2 = second)	**134.604**	**1**	**492.7**	**<.001**
Confederate's sexual orientation ✻ Conversation topic	**7.073**	**1**	**494.6**	**0.008**
Confederate's sexual orientation ✻ IAT	0.355	1	68.4	0.553
Conversation topic ✻ IAT	**4.454**	**1**	**494.6**	**0.035**
Confederate's sexual orientation ✻ Volume	3.763	1	537.8	0.053
Conversation topic ✻ Volume	0.583	1	494.1	0.445
IAT ✻ Volume	0.417	1	549.6	0.519
Confederate's sexual orientation ✻ Conversation topic ✻ Volume	2.169	1	494.5	0.141
Confederate's sexual orientation ✻ IAT ✻ Volume	**3.847**	**1**	**542.6**	**0.050**
Conversation topic ✻ IAT ✻ Volume	2.949	1	494.1	0.087
Confederate's sexual orientation ✻ Conversation topic ✻ IAT ✻ Volume	0.107	1	493.6	0.744

Note. Satterthwaite method for degrees of freedom.
Stroop task administration time was entered as covariates.

This three-way interaction was interpreted through a simple slope analysis (Table 17). This analysis provided important support for our hypothesis (H3): high implicitly biased participants (+1SD) who stood closer (+1SD) to the gay confederate during the interaction displayed a greater cognitive depletion (i.e., higher levels of Stroop interference) after the conversation. Instead, low implicitly biased participants (-1SD) had similar performances on

the Stroop task regardless of the distance they kept from the gay confederate (see Figure X, graph on the left). Conversely, after talking to the straight confederate, both high implicitly biased (+1SD) and low implicitly biased participants did not show Stroop interference regardless of the distance they kept from the confederate (see Figure 11, graph on the right).

Finally, the four-way interaction was not significant, suggesting that the conversation topic did not moderate the above effects.

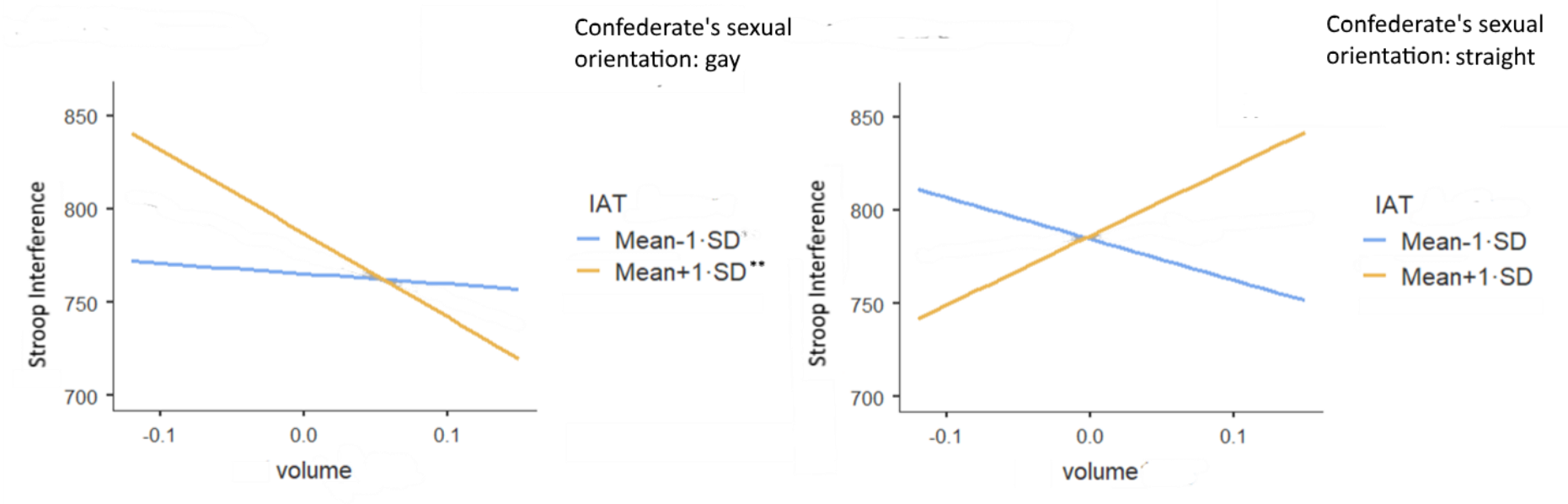
Table 17. Simple effects of the volume on Stroop interference depending on confederate's sexual orientation and levels of implicit bias.

Simple effects of volume: Parameter estimates

Moderator levels				95% Confidence Interval				
Confederate's sexual orientation	IAT	Estimate	SE	Lower	Upper	df	t	p
Gay	Mean-1·SD	-0.227	0.276	-0.76903	0.3149	550	-0.823	0.411
	Mean+1·SD	**-0.460**	**0.195**	**-0.84356**	**-0.0761**	**553**	**-2.354**	**0.019**
Straight	Mean-1·SD	-0.288	0.266	-0.81087	0.2342	524	-1.084	0.279
	Mean+1·SD	0.516	0.265	-0.00440	1.0354	534	1.948	0.052

Note. Simple effects are estimated keeping constant other independent variable(s) in the model.

Figure 11. Simple slope analyses for the gay condition (graph on the left) and for the straight condition (graph on the right).



Discussion

Study 3 was designed to replicate and extend Study 1 results, especially by focusing on the relationship between implicit bias and interpersonal distance in gay/straight dyadic interactions. In particular, the main goal of this last study was to provide an empirical explanation about the main unexpected finding that emerged in Study 1: high (vs. low) implicitly biased participants stood closer to (instead of more distant from) the gay confederate, especially when discussing the controversial topic compared to the neutral one.

In doing so, we adopted a similar procedure to that employed in previous studies, but we involved confederates whose sexual orientation was actually gay (or straight). Most importantly, we assessed the participants' cognitive depletion after the interaction with the confederate. In fact, this outcome variable allowed us to verify whether high implicitly biased participants voluntarily controlled their (close) interpersonal distance with the gay (vs. straight) confederate. More clearly, we assumed (see H3) that the willingness to control this NVB would require these participants to utilise more cognitive resources that would then result in a greater cognitive depletion. Overall, results confirmed this assumption. Only participants whose bias scores were above the mean and that stood closer to the gay confederate revealed greater Stroop interference after the conversation. Notably, these effects emerged regardless of the topic of the conversation. Thus, unlike in our hypothesis, the topic of conversation did not have any effect.

With regard to the role of the conversation topic, a secondary finding emerged, one that apparently is in contrast to Study 1. In Study 3, participants stood closer to the gay confederate when discussing the neutral topic compared to the controversial one, while in

Study 1 high implicitly biased participants stood closer to the gay confederate when discussing the controversial topic compared to the neutral one.

For an appropriate interpretation of this result, it is first important to take into account that we considered a different "neutral" topic in Study 3 than in the first two studies. That is, while in Studies 1 and 2 we asked participants and confederates to talk about the traffic and public transport in their town, in this last study we asked them to talk about activities and attractions for young people in their town. Whilst the neutral topic we used in Study 1 did not refer to social activities, the neutral topic we used in Study 3 explicitly referred to social interactions among young people and, hence, may have activated the "young people" intergroup category. Therefore, it is possible that in this study the topic we perceived to be neutral was not interpreted as such by participants. It is plausible to imagine that for heterosexual participants, talking about fun activities (e.g., going to pubs or clubs) with a gay peer could have elicited unexpected affective reactions.

Indirectly supporting this interpretation, it is noteworthy that in contrast to Study 1 we did not find a main effect of the conversation topic. In Study 1, participants stood closer to the confederate when discussing the controversial topic (vs. neutral), regardless of the level of implicit bias and the confederate's sexual orientation. Considering the three-way interaction we found in Study 1, it is possible that high implicitly biased and low implicitly biased participants reduced their distance when discussing the controversial topic for different reasons. While high implicitly biased participants possibly reduced their distance towards the gay confederate to manipulate their self-presentation and hide their prejudice, low implicitly biased participants perhaps stood closer to the straight participants because of their interest in that particular topic.

5 – GENERAL DISCUSSION

NVBs represent a relevant part of the communication process, conveying information about emotions, motivations, attitudes, and personality (Ekman & Friesen, 1969; Mehrabian, 1972). NVBs are often enacted spontaneously and without awareness (DePaulo, 1992) and, in case of inconsistency with the verbal and conscious content of the message, are usually considered more reliable and informative of individuals' feelings and attitudes (Ekman & Rosenberg, 1997; Mehrabian, 1972). For these reasons, NVBs are particularly important when studying intergroup interactions: when interacting with members of a different group, stereotypes and prejudice are activated and manifested through verbal and nonverbal communication. This can influence the outcome of the interaction and affect intergroup relations (Dovidio et al., 2006; Hebl & Dovidio, 2005). So far, research on INVBs has mainly focused on ethnic prejudice and interethnic relations, and employed non-systematic measures of NVB, i.e., seating distance (e.g., Novelli et al., 2010) or video recording of dyadic interactions and human coding: a time-consuming procedure that often leads to inaccurate and subjective evaluations (Frauendorfer et al., 2014; Palazzi et al., 2016).

The main purpose of the present work was to extend empirical research on INVB, by investigating for the first time in literature the relation between sexual prejudice and different patterns of INVB through an automated analysis of these behaviours. Studying the relationship between sexual prejudice and INVB appears particularly relevant for different reasons. From a social perspective, such prejudice is still pervasive in most of today's societies. From a more theoretical perspective, this form of prejudice has important peculiarities compared to the well-studied interethnic prejudice. In fact, the type of stigma attached to a specific group also affects intergroup interactions, as some biases are inhibited more strongly by social norms and

others are more tolerated (Dovidio et al., 2006; Hebl & Dovidio, 2005). Sexual prejudice, in particular, not only remains accepted and more easily expressed compared to other types of prejudice (Herek & McLemore, 2013), but also the defining features of homosexuals group membership are not visible (Cox & Devine, 2014; Cox, Devine, Bischmann, & Hyde, 2015) and prejudice towards gay men and lesbians often differ (Herek, 2002). Thus, INVBs characterising this intergroup domain may differ from those enacted in interethnic interactions.

In the present research, we explored the NVB dynamics enacted in dyadic interactions between straight and gay/lesbian people – a relevant relationship, but still partially unexplored in terms of INVB – by employing new technologies that provided automated recording and extraction of NVB indexes. Specifically, we obtained a 3D measure of interpersonal distance (volume) and upper body motion. We elected to focus on these two main NVBs because previous literature on INVB reported that both are particularly meaningful for comprehending people's comfort (or discomfort) during a dyadic interaction and their nonverbal immediacy with the interactant.

In contrast to previous literature on sexual prejudice, we analysed implicit bias and explicit prejudice towards gay men (Studies 1 and 3) and lesbians (Study 2) in separate studies. In all of the studies, heterosexual participants were first asked to complete measures of explicit prejudice and implicit bias, and then their NVBs were automatically recorded during dyadic interactions involving a confederate whose sexual orientation was manipulated (Studies 1 and 2) or disclosed (Study 3).

In the sections below we resumed our hypotheses and discussed the main findings emerged across the three studies.

5.1 Sexual prejudice towards gay men and interpersonal distance (volume)

Thus far, literature on (I)NVB has argued (and generally found) that the greater the psychological distance towards another person, the larger the interpersonal distance during a dyadic interaction. Similarly, the greater the psychological immediacy towards the other person, the smaller the interpersonal distance when interacting. Thus, for example, within interethnic relations White people tend to stay more distant when interacting with a Black confederate, especially when they have high levels of implicit bias (rather than explicit prejudice) and/or the conversation is focusing around a topic that is relevant for the intergroup relation (Dovidio et al., 1997; Dovidio et al., 2002; Palazzi et al., 2016; Trawalter & Richeson, 2006; Trawalter, Richeson, & Shelton, 2009).

Overall, our studies documented an inverse pattern of findings, at least when considering dyadic interactions involving heterosexual participants and gay confederates (Studies 1 and 3). In fact, in Study 1 we found that instead of keeping a larger distance, participants stood closer to the gay (vs. straight) confederate, especially when they were highly implicitly biased and discussed with the confederate on a controversial (vs. neutral) topic. This unexpected (but intriguing) finding has been replicated in Study 3, despite some important differences. Again, participants stood closer to the gay confederate than the straight one, although in this study it was especially apparent when discussing the neutral (vs. controversial) topic. A possible explanation of this result put forward when interpreting such findings for Study 1 is that the physical distance, if compared with other forms of NVB, is a behaviour that people may intentionally control. In other words, people may be inclined to stay closer to the interactant to manifest nonverbal immediacy and, thus, appear non-prejudiced in the gay confederate's eyes. To empirically verify such an assumption, in Study 3 we also introduced a

measure of cognitive depletion that allowed us to verify whether this presumable tendency to control interpersonal distance would result in greater use of cognitive resources and, thus, in worse performance on a cognitive task after the interaction. Consistent with Study 1, we expected that such effects would hold especially true for participants with high (vs. low) implicit bias and when speaking with the gay confederate about a controversial topic (vs. neutral). Overall, results of this Study confirmed our assumption: high implicitly biased participants that stood closer to the gay confederate performed worse on a Stroop task. Instead, low implicitly biased participants and participants who interacted with the straight confederate displayed similar performance on the Stroop task, regardless of the interpersonal distance that they assumed with the confederate.

We believe that this main finding shed important new light on the meaning of interpersonal distance during dyadic intergroup interactions, by highlighting how the link between interpersonal distance and psychological immediacy is somewhat more complex than what researchers have found so far. More specifically, through our studies we revealed that (at least within straight and gay men interactions) interpersonal distance is an INVB that highly biased people can intentionally control, and possibly convey a positive self-image in the interactant's eyes. However, such willingness to control has its costs for an individual, by leading to greater cognitive resource depletion. This latter finding is also in line with previous literature on ethnic prejudice that documented how White participants, especially if implicitly biased, are often cognitively depleted after interethnic interactions and have worse performances on cognitive tasks (e.g., Richeson & Shelton, 2003; Richeson & Trawalter, 2005; Richeson et al., 2005). Further in line with previous literature, we also found that implicit bias, rather than explicit prejudice, is a significant predictor of this form of INVB (Crosby et al., 1980; Goff et al., 2008; Novelli et al., 2010; Palazzi et al., 2016).

As mentioned above, we found mixed results about the moderator role of the conversation topic across our studies. Indeed, some inconsistencies about the role of the content of the interaction in shaping INVB have been documented in research on ethnic prejudice (e.g., Palazzi et al., 2016; Trawalter & Richeson, 2008), intergroup-related (vs. neutral) topics are considered to be threatening and thus elicit avoiding NVB reactions, such as increased interpersonal distance (Trawalter et al., 2009). In both Studies 1 and 3, the conversation topic had an impact on the interpersonal distance. However, in Study 1 participants stood closer to both the gay and the straight confederates when discussing the controversial topic, furthermore, high implicitly biased participants stood closer to the gay confederate, and low implicitly biased participants stood closer to the straight confederate. As we did find a main effect of the conversation topic, we reasoned that in Study 1 participants were involved in the conversation when discussing the controversial topic, but for different reasons: while high implicitly biased participants possibly controlled their distance to manage their self-presentation as non-prejudices, low implicitly biased participants could possibly manifest a genuine interest in the conversation. Research on ethnic prejudice, in fact, has demonstrated that discussions that are salient for the intergroup relation may activate prejudice-related concerns about appearing prejudiced and the desire to make a good impression (Richeson & Shelton, 2006; Trawalter et al., 2009).

In contrast to Study 1, in Study 3 participants stood closer to the gay confederate when discussing the neutral topic and stood closer to the straight confederate when discussing the controversial topic. This unexpected finding may be due to the content of the neutral topic. While in Study 1 participants had to talk about traffic and public transport, in Study 3 they discussed activities and attractions for young people in their town, an issue that might lead to discussing activities and places associated with the LGB community, hence may be perceived

as not completely neutral and, again, activate prejudice-related concerns and the desire to make a good impression.

5.2 Sexual prejudice towards gay men and upper body motion

The second INVB we examined was the amount of upper body motion, an NVB that is considered to convey information about participants' levels of bias or comfort. Within interethnic interactions, participants with higher levels of implicit bias have been found to express their discomfort with freezing behaviours (Palazzi et al., 2016; Trawalter & Richeson, 2008; Trawalter et al., 2009). Overall, for this index we found mixed and difficult to interpret results across our studies. These also did not provide any evidence that corresponds with previous literature. In fact, in any our Study we did not find freezing behaviours in high implicitly biased participants: in Study 1 implicit bias did not affect the amount of upper body motion, in Study 3 only participants with lower (but not with higher) levels of implicit bias manifested a different amount of upper body motion, presumably reflecting their comfort or discomfort during the interaction, depending on the confederate's sexual orientation and the conversation topic. In fact, low implicitly biased participants that interacted with the gay confederate enacted a greater amount of movement when discussing the controversial topic (hence, froze when discussing the neutral one), while low implicitly biased participants who interacted with the straight confederate enacted a greater amount of movement when discussing the neutral topic (and froze when discussing the controversial one).

Despite the lack of results regarding participants with high levels of implicit bias, we believe that it is still possible to interpret the amount of movements made with head and arms as a cue of the level of comfort. Perhaps depending on the confederate's sexual orientation

and the content of the conversation, low implicitly biased participants may feel more or less comfortable when discussing a certain topic. Possibly, they felt more comfortable when discussing LGB issues with the gay confederate and, similarly, they felt more comfortable when discussing fun activities for young people with the straight confederate. Freezing behaviour is, in fact, considered an inhibitory response to a threat that is enacted when people do not have enough resources to face it (Trawalter et al., 2009; Apfelbaum & Sommers, 2009).

5.3 Sexual prejudice towards lesbian women and gender differences in INVB

In Study 2 we investigated whether a similar pattern of results would emerge when considering confederates presented as lesbians (vs. straight) instead of gay men. Lesbian women, in fact, often face less prejudice compared to gay men, from both heterosexual men and women (Herek & Capitanio, 1996; Fasoli, Paladino, et al., 2016). Overall, compared to Studies 1 and 3, Study 2 shows a different pattern of results, with the participant's gender playing a more relevant role in interpersonal distance and upper body motion than implicit bias. In fact, in line with previous research on sexual prejudice we found very low levels of explicit prejudice (e.g., Fasoli, Mazzurega, et al., 2016). More importantly, and different to findings in Studies 1 and 3 we also found gender differences in implicit bias: female participants compared to male participants manifested very low levels of implicit bias.

Considering the interpersonal distance, we found a main effect of the participant's gender. In line with previous research (Bull, 2002; Cozzolino, 2003; Henley & LaFrance, 1997) and as well as in Studies 1 and 3, female participants stood closer to the confederate, regardless of their implicit bias, the confederate's sexual orientation and the conversation topic. As we did not find an impact of implicit bias on the volume index, we ran supplementary analyses including the participant's gender as a further moderator. Heterosexual women stood

closer to the lesbian confederate when discussing the controversial (vs. neutral) topic, whilst heterosexual men kept a larger distance towards the lesbian confederate when discussing the controversial topic (vs. neutral). On the contrary, both female and male participants kept a similar distance toward the straight confederate, regardless of the content of the conversation.

With regard to the upper body motion, again we found a different pattern of results compared to Studies 1 and 3. The participant's gender and the confederate's sexual orientation affected this NVB: female participants moved more than men, and both male and female participants moved more with the lesbian (vs. straight) confederate. The main effect of the participants' gender is in line with previous research on gender differences in NVB that documented how women are more expressive than men (Buck et al., 1974; Hall, 1987; Meadors & Murrey, 2014). But as similar to Studies 1 and 3, we did not find freezing behaviours: as lesbians are less likely to be perceived as a threat from both heterosexual men and women (Herek, 2002; Herek & McLemore, 2013; Vandello et al., 2008), it is possible that they rarely elicit freezing reactions.

Taken together these results highlight that, in line with previous research, prejudice towards gay men and lesbians differ, which also manifests in terms of NVB dynamics. The different pattern of results and the lack of impact of implicit bias on our NVBs may be due to different reasons. First, lesbians are more tolerated than gay men (e.g., Herek, 2002; Herek & Capitanio, 1996) and gender differences in implicit bias suggest that men and women may behave differently when interacting with lesbian. Also, the participant's gender directly affects participants' NVB: women stay closer to the interactant, and may move more when interacting with other women. The participant's gender can also shape the interaction, especially when considering same-sex interactions: perhaps even when presented as lesbians, our

confederates may not be considered as completely dissimilar others by the female participants. Rather, they could still be seen as fellow women and, in that sense, ingroup members.

5.4 Limitation and future directions

Our research presents noteworthy limitations that could be addressed through future research.

First, results regarding the upper body motion index present inconsistencies across the three studies that may be due to the relatively coarse measure we employed. The algorithm approximately summarises movements made with arms, head, and torso, and does not allow us to identify specific gestures (e.g, nodding and shaking). Future research should focus on implementing more accurate, specific, and reliable algorithms. On the contrary, the volume algorithm can be considered a more reliable measure. In fact, across all of the studies we found gender effects that are in line with previous research, with women (compared to men) staying closer to the interactant (e.g., Cozzolino, 2003; Henley & LaFrance, 1997). Hence, in order to validate the procedure, human coding should be employed along with automated extraction of NVB features to verify possible convergencies about these different measurements.

Second, in our research we did not assess the perceived quality of the interaction. Detecting that could be especially relevant, especially among the minority group members. As NVB can deeply shape the perceived quality of the interaction, understanding how (and if) the pattern of INVBs that we studied is associated with these perceptions could be particularly informative to better interpret our results. For example, it is plausible that the small interpersonal distance that our highly implicitly biased participants assumed during the interaction could be perceived as a physical threat by our confederates, with a consequently decreased perceived quality of the interaction.

Third, for practical reasons we chose to assess implicit bias and explicit prejudice right before the interaction. Although a similar procedure has been employed also in previous studies and we included filler items to cover our manipulation, it may have triggered participants' social desirability. Future studies might consider including separate experimental sessions and more convincing cover stories.

5.5 Conclusions

Despite the above limitations, we believe that the present work contributes to the scientific literature on INVB, from both a theoretical and methodological point of view.

From a methodological point of view, we employed automatic extraction of NVB, particularly relevant in this field, allowing researchers to quickly collect and analyse data. From a theoretical point of view, our findings suggest that sexual prejudice INVB dynamics may differ from those enacted within interethnic dyadic interactions, at least when considering the use of interpersonal distance between straight and gay men. Moreover, gender differences appear to be particularly relevant, especially when considering interactions between straight and lesbian women. Our studies suggest that sexual prejudice towards gay men and lesbians also differ in terms of NVB enacted during gay/straight dyadic interactions. Given the importance of NVBs in intergroup communication, results from these first studies contribute to expanding knowledge on the role of NVB on gay/straight intergroup interactions.

6 – SUPPLEMENTARY ANALYSES

6.1 Study 2 – The main and interactive effects of participants' gender on volume index

Participants' gender and volume

In this LMM volume was entered as the dependent variable, and intercepts across participants were the random coefficients of the model to control for individual variability on the dependent variable. The experimental condition (confederate's sexual orientation: 1 = gay vs. 2 = straight) and the conversation topic (1 = neutral vs. 2 = controversial) were entered as fixed effects, and the participants' gender was entered as moderator variable. In order to explore the effect of participants' gender, we also included the interactions with the confederate's sexual orientation and the conversation topic. Confederate, Kinect registration time window and implicit bias (IAT) were entered as covariates.

The model has R^2 Marginal of 0.45 and an R^2 Conditional 0.82.

As shown in Table 18, results indicate a main effect of the participants' gender: heterosexual female participants (*M* =0.17; *SD* = 0.04) compared to heterosexual male participants (*M* =0.24; *SD* = 0.06) stood closer to the confederate. The two-way participants' gender x conversation topic interaction also emerged as significant and was qualified by the three-way participants' gender x confederates' sexual orientation x conversation topic interaction.

Table 18. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic and participants' gender on volume.

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = gay; 2 = straight)	1.080	1	66.0	0.302
Conversation topic (1 = neutral; 2 = controversial)	0.035	1	354.0	0.852
Participant gender (1 = male; 2 = female)	**44.864**	**1**	**66.0**	**<.001**
Confederate	14.417	1	66.0	<.001
Kinect time window	1.895	2	354.0	0.152
Implicit bias (IAT)	0.243	1	66.0	0.624
Confederate's sexual orientation ✻ Conversation topic	0.925	1	354.0	0.337
Confederate's sexual orientation ✻ Participant gender	1.460	1	66.0	0.231
Participant gender ✻ Conversation topic	**3.868**	**1**	**354.0**	**0.050**
Participant gender ✻ Confederate's sexual orientation ✻ Conversation topic	**9.880**	**1**	**354.0**	**0.002**

Note. Satterthwaite method for degrees of freedom.
Implicit bias (IAT), confederate and Kinect time window were entered as covariates.

Post hoc analyses (Table 19) revealed that when talking to the lesbian confederate, male participants stood closer when discussing the neutral topic compared to the controversial one, while female participants stood closer when discussing the controversial topic compare to the neutral one. Conversely, both male and female participants kept a similar distance towards the straight confederate regardless of the conversation topic (Figure 12).

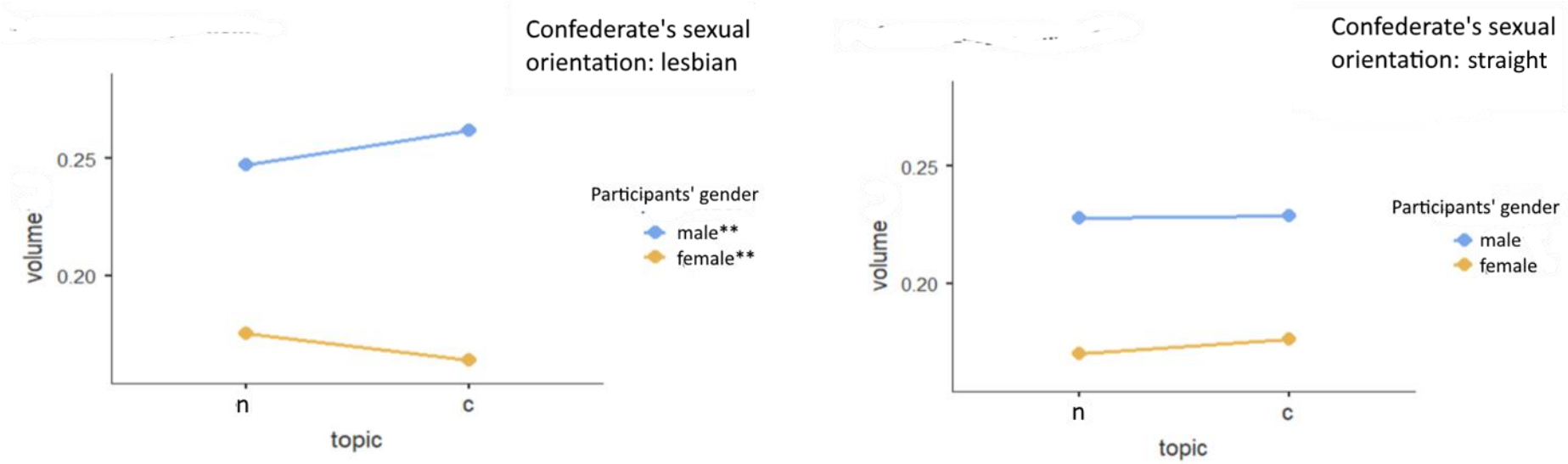
Table 19. Simple effects of topic on volume depending on the confederate's sexual orientation and the participants' gender

Simple effects of topic: Parameter estimates

Moderator levels					95% Confidence Interval				
Confederates' sexual orientation	Participants' gender	contrast	Estimate	SE	Lower	Upper	df	t	p
Lesbian	m	c – n	0.0492	0.0209	0.00816	0.0903	354	2.3573	0.019
	f	c - n	-0.0668	0.0239	-0.11383	-0.0198	354	-2.7930	0.006
Straight	m	c – n	-3.18e−4	0.0219	-0.04348	0.0428	354	-0.0145	0.988
	f	c - n	0.0264	0.0239	-0.02064	0.0734	354	1.1035	0.271

Note. Simple effects are estimated keeping constant other independent variable(s) in the model.

Figure 12. Simple slope analyses for the lesbian condition (graph on the left) and for the straight condition (graph on the right).



6.2 Study 3 – Main analyses when considering the upper body motion as outcome variable

Data was first checked for outliers and normality. No outlier was detected, and a Kolmogorov-Smirnov test indicated that the upper body motion values were normally distributed (Z = 0.04. p = .219).

Explicit prejudice and upper body motion

The LMM included explicit prejudice (ATG) as the moderator variable and the participant's upper body motion as the dependent variable. The model has an R^2 Marginal of 0.09 and an R^2 Conditional of 0.62.

As shown in Table 20, no main effect emerged. Instead, the two-way confederate's sexual orientation interaction and the three-way confederate's sexual orientation x conversation topic x ATG interaction emerged as significant.

Table 20. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic and ATG on upper body motion.

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = gay; 2 = straight)	0.013	1	66.0	0.908
Conversation topic (1 = neutral; 2 = controversial)	3.613	1	497.0	0.058
Participant gender (1 = male; 2 = female)	2.824	1	66.0	0.098
Confederate	0.406	1	66.0	0.526
Kinect time window	1.957	3	497.0	0.120
Explicit prejudice (ATG)	0.591	1	66.0	0.445
Confederate's sexual orientation ✻ Conversation topic	**6.095**	**1**	**497.0**	**0.014**
Confederate's sexual orientation ✻ ATG	2.293	1	66.0	0.135
Conversation topic ✻ ATG	0.006	1	497.0	0.939
Confederate's sexual orientation ✻ Conversation topic ✻ ATG	**9.749**	**1**	**497.0**	**0.002**

Fixed Effect Omnibus tests

	F	Num df	Den df	p

Note. Satterthwaite method for degrees of freedom.
Participants' gender, confederate and Kinect time window were entered as covariates.

Post hoc analysis (see Table 21) showed that participants that interacted with the gay confederate enacted a smaller amount of movement when discussing the neutral topic compared to the controversial one, whilst participants that interacted with the straight confederate enacted the same amount of movement regardless of the conversation topic (Figure 13).

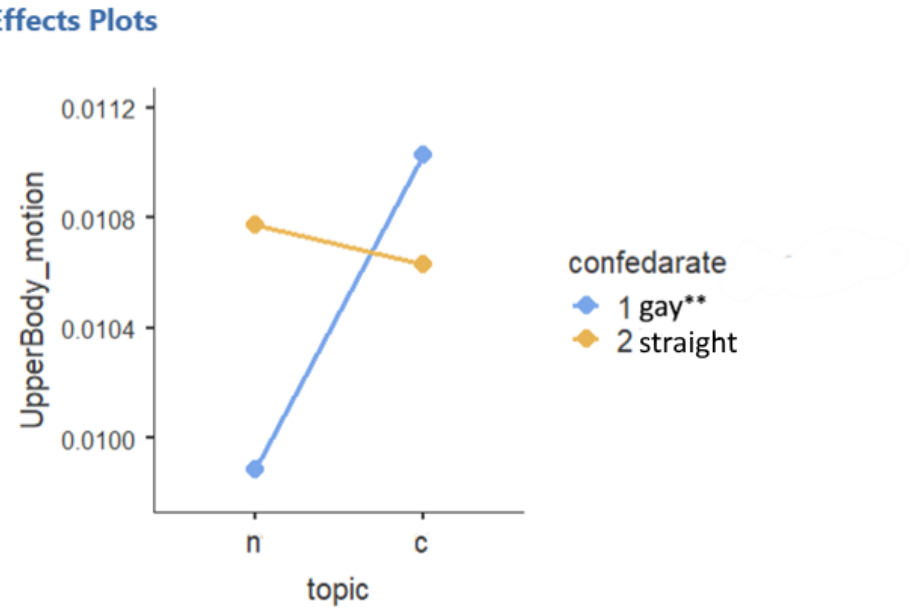
Table 21. Simple effects of the conversation topic on upper body motion depending on the confederate's sexual orientation.

Simple effects of topic: Parameter estimates

Moderator levels				95% Confidence Interval				
Confederate's sexual orientation	contrast	Estimate	SE	Lower	Upper	df	t	p
Gay	c - n	0.00114	3.82e-4	3.92e-4	0.00189	497	2.990	0.003
Straight	c - n	-1.49e−4	3.57e-4	-8.50e−4	5.53e-4	497	-0.416	0.678

Note. Simple effects are estimated setting higher order moderator (if any) in covariates to zero and averaging across moderating factors levels (if any).

Figure 13. Simple slope analysis of the interactive effect of confederate's sexual orientation x conversation topic.



The two-way interaction was qualified by the three-way confederate's sexual orientation x conversation topic x ATG interaction. Simple slope analyses for the gay condition (graph on the left) and the straight condition (graph on the right) are reported in Figure 14. As shown in Table 22, when talking with the gay confederate, participants with lower levels of explicit prejudice (-1SD) enacted a smaller amount of movement when discussing the neutral topic (vs. controversial), while participants with higher levels of explicit prejudice (+1SD) enacted the same amount of movement regardless of the conversation topic. Also, when talking with the straight confederate, participants with lower levels of explicit prejudice (-1SD) enacted a greater amount of movement when discussing the neutral topic (vs. controversial), whilst participants with higher levels of explicit prejudice (+1SD) enacted the same amount of movements regardless of the conversation topic.

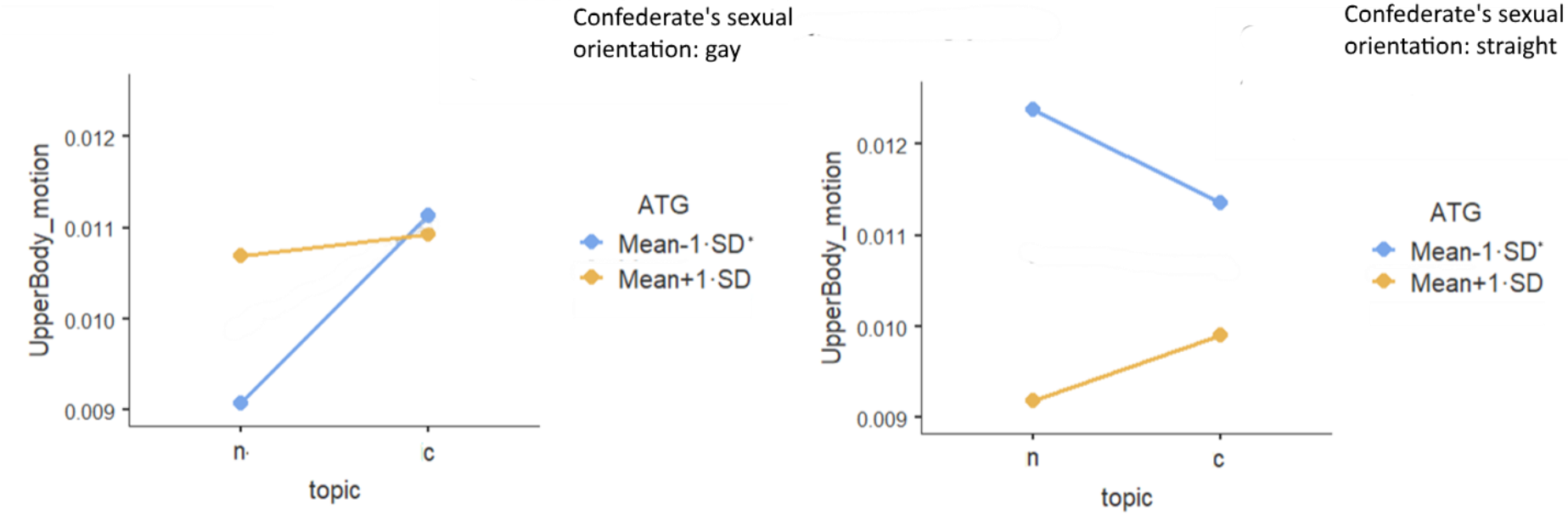
Table 22. Simple effects of topic on upper body motion depending on the confederate's sexual orientation and levels of explicit prejudice (ATG).

Simple effects of topic: Parameter estimates

Moderator levels					95% Confidence Interval				
Confederate's sexual orientation	ATG	contrast	Estimate	SE	Lower	Upper	df	t	p
Gay	Mean-1·SD	H - N	0.00205	5.35e-4	0.00100	0.00310	497	3.838	<.001
	Mean+1·SD	H - N	2.34e-4	4.47e-4	-6.44e−4	0.00111	497	0.524	0.600
Straight	Mean-1·SD	H - N	-0.00101	5.18e-4	-0.00203	4.47e-6	497	-1.956	0.050
	Mean+1·SD	H - N	7.16e-4	6.62e-4	-5.85e−4	0.00202	497	1.082	0.280

Note. Simple effects are estimated keeping constant other independent variable(s) in the model

Figure 14. Simple slope analyses for the lesbian condition (graph on the left) and for the straight condition (graph on the right).



Implicit bias and upper body motion

The LMM included implicit bias (IAT) as the moderator variable and the participant's upper body motion as the dependent variable. The model has an R^2 Marginal of 0.07 and an R^2 Conditional of 0.61.

As shown in Table 23, no main effect emerged. Also, in contrast to our hypothesis, implicit bias had no impact on the upper body motion and the expected three-way confederate's sexual orientation × conversation topic × IAT interaction did not have a significant effect on this NVB. Also different to findings in Studies 1 and 2, the same two-way confederate's sexual orientation × conversation topic interaction emerged as significant: participants that interacted with the gay confederate enacted a smaller amount of movement when discussing the neutral topic compared to the controversial one, whilst participants that interacted with the straight confederate enacted the same amount of movements regardless of the conversation topic.

Table 23. LMM Results – main and interactive effects of confederates' sexual orientation, conversation topic and IAT on upper body motion.

Fixed Effect Omnibus tests

	F	Num df	Den df	p
Confederate's sexual orientation (1 = gay; 2 = straight)	3.43e-4	1	66.0	0.985
Conversation topic (1 = neutral; 2 = controversial)	1.732	1	497.0	0.189
Participant gender (1 = male; 2 = female)	2.806	1	66.0	0.099
Confederate	0.707	1	66.0	0.403
Kinect time window	1.918	3	497.0	0.126
Implicit bias (IAT)	0.024	1	66.0	0.877
Confederate's sexual orientation ✻ Conversation topic	**5.969**	**1**	**497.0**	**0.015**
Confederate's sexual orientation ✻ IAT	0.684	1	66.0	0.411
Conversation topic ✻ IAT	0.035	1	497.0	0.851
Confederate's sexual orientation ✻ Conversation topic ✻ IAT	1.800	1	497.0	0.180

Fixed Effect Omnibus tests

	F	Num df	Den df	p

Note. Satterthwaite method for degrees of freedom.
Participants' gender, confederate and Kinect time window were entered as covariates.

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