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SHORT PAPER

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Social exclusion lowers working memory capacity in gay-men but not in heterosexual-men

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Summary

Because sexual orientation is a crucial factor in social discrimination, this study assessed how the working memory capacity of gay-men and heterosexual-men is affected by a social exclusion event (N = 88). To manipulate the experience of social exclusion participants were included or excluded from a game of Cyberball. To assess working memory capacity, participants had to recall a series of letters while performing math problems in an automated version of the operation span task. The results of this small study, showed the sexual orientation of participants interacted with variations in belonging such that being ostracized (but not being included) lowered the working memory capacity of gay-men relative to heterosexual-men. Implications for research on belonging, social exclusion, and stereotype threat are discussed.

KEYWORDS

Cyberball, gay-men, sexual orientation, social exclusion, working memory

1 | INTRODUCTION

People are social beings who are strongly motivated to belong to social groups in order to gain and preserve security, well-being, and high self-esteem (Baumeister & Leary, 1995). When their belongingness to groups is threatened, for instance by exposure to a brief social exclusion event, strong negative reactions follow (Williams & Jarvis, 2006). Many studies based on a computerized ball-toss game—Cyberball (Williams, Cheung, & Choi, 2000)—indicate that participants report strong negative effects after less than a few minutes of exclusion (see meta-analysis, Hartgerink, van Beest, Wicherts, & Williams, 2015). Specifically, excluded individuals reported several negative consequences (Williams, 2009; Williams & Nida, 2011; see also Paolini, 2019), such as negative mood and low levels of basic psychological needs satisfaction (i.e., belongingness, self-esteem, control, and meaningful existence; Zadro, Williams, & Richardson, 2004).

While literature on prejudice suggests that being a target of discrimination could lead both an internal attribution for the negative treatment that induces in distress consequences (Ong, Fuller-Rowell, & Burrow, 2009; Williams, Neighbors, & Jackson, 2003; see also Aquino et al., 2015) and an external attribution that elicits a self-esteem protection (Crocker & Major, 1989; Crocker, Voelkl, Testa, & Major, 1991); research on reactions to social exclusion instead evidences that being a member of a racially stigmatized group exacerbates the negative intrapersonal effect of exclusion (e.g., Goodwin, Williams, & Carter-Sowell, 2010). In the present study, we sought to extend previous findings by (a) examining whether negative consequences of social exclusion are also amplified by belongingness to a group that is stigmatized on the basis of sexual orientation, and (b) by assessing the consequences of social exclusion by considering changes in participants' working memory capacity.

1.1 | Social exclusion and social categorization

Several efforts have been devoted to understand how social factors affect the consequences for social exclusion. When examining non-stigmatized groups (e.g., Caucasian or Republican), prior research has provided mixed evidence. On one hand, individuals are equally hurt when excluded by in-group or by out-group members (Smith &

Williams, 2004; Williams et al., 2000), as well as when exclusion is perpetrated by members of both despised or favored political parties (Gonsalkorale & Williams, 2007). On the other hand, social exclusion appears to be more detrimental when perpetrated by an in-group member. Specifically, a greater negative psychological response (Bernstein, Sacco, Young, Hugenberg, & Cook, 2010), an increase in dACC activation (Krill & Platek, 2009) and an increase in the facial temperature (Paolini, Alparone, Cardone, van Beest, & Merla, 2016)—are reported by people who are excluded by in-group rather than by out-group.

Importantly, Goodwin et al. (2010) demonstrated that belongingness to a stigmatized racial group amplified the reaction to social exclusion as measured by self-reported assessment of social pain. This effect was mediated by attribution to racial prejudice. That is, black, but not white, participants attributed exclusion to racial prejudice both when they were excluded by out-group and by in-group members.

Stigma and its detrimental effects are not limited to racial groups but also affect sexual minority members (Lingiardi et al., 2016; Salvati, Pistella, Giacomantonio, & Baiocco, 2018; Salvati, Piumatti, Giacomantonio, & Baiocco, 2019). Lesbian-women, gay-men, and bisexual and transgender people (LGBT+) continue to face discrimination and social exclusion across Europe in all spheres of life (ILGA, 2019). According to the Minority Stress Model (Meyer, 2003), LGBT+ individuals routinely encounter stressful events not usually experienced by heterosexual people. According to Meyer (2003), minority stress processes in lesbian-women and gay-men are caused by (a) external objective events and conditions; (b) expectations of such events and the vigilance that such expectations bring; and (c) internalized sexual stigma (i.e., internalization of negative representations and attitudes toward lesbian-women and gay-men and among themselves).

We reasoned that sexual orientation is a highly essentialized social category and that this might moderate how excluded people reacted.

1.2 | Social exclusion and executive functions

Working memory is a key executive function involved in a great variety activity (Barrett, Tugade, & Engle, 2004). For example, working memory is important in adjusting attention for various social task or cognitive abilities, such as the ability to inhibit both proactive interference and unwanted thoughts and to reasoning (Brewin & Beaton, 2002; Brewin & Smart, 2005; Kane & Engle, 2000; Konig, Buhner, & Murling, 2005; Oberauer, Süß, Wilhelm, & Sander, 2007). In our opinion, working memory thus plays a particular role in those who suffer a social stigma as they need to face the aversive social context and have an appropriate self-regulation.

In line with neuroimaging research that showed increased activation of areas involved in executive functioning during social exclusion (Baird, Silver, & Veague, 2010; Eisenberger, Lieberman, & Williams, 2003), several studies have started to investigate the impact of social exclusion on executive functions, providing mixed results. On the one hand, research has provided evidence that social exclusion (vs. inclusion) increases eye-gaze orientation (Böcklev, Hömke, & Sebanz, 2013; Wilkowski, Robinson, & Friesen, 2009), the ability to recall events (Gardner, Pickett, & Brewer, 2000) and experimental stimuli (Xu et al., 2017). It also increases the ability to categorical perception (Sacco, Wirth, Hugenberg, Chen, & Williams, 2011), the detection of conflict experimental stimuli (Otten & Jonas, 2013) and the capacity to recall social stimuli (Du et al., 2019). On the other hand, research has also provided evidence that being excluded (vs. included) decreases the logic reasoning skills of participants (Baumeister, Twenge, & Nuss, 2002), the ability to recall experimental stimuli, the decision making, and task persistence (Buelow, Okdie, Brunell, & Trost, 2015), and the capacity to correctly recall visual stimuli (Xu et al., 2017).

In line with stereotype threat literature (Steele, 1997; Steele & Aronson, 1995), stigmatized individuals devote part of their mental capacity to cope with the threat to their identity and the concomitant negative emotions. This interferes with their cognitive resources, thus reducing attentional capacities available to appropriately perform unrelated tasks (Schmader, Johns, & Forbes, 2008). Inzlicht, McKay, and Aronson (2006), for example, showed that performance of a task requiring a proper use of executive functioning (i.e., Stroop task) was hindered by making stigmatized participants aware of the stereotype concerning their group.

Building on both the stereotype threat literature (Steele, 1997; Steele, Spencer, & Aronson, 2002) and the social exclusion literature (Chester & DeWall, 2014; Riva, Romero Lauro, DeWall, Chester, & Bushman, 2015), the aim of the present study was to investigate differences in working memory capacity between heterosexual-men and gay-men after being exposed to a social exclusion. We built our rationale starting from the assumption that gay-men participants (vs. heterosexual-men) supposedly deployed more resources to regulate the negative feelings induced by social exclusion (vs. inclusion), leaving fewer cognitive resources to correctly perform a working memory task. Consequently, we expected that gay-men (relative to heterosexual-men) would be negatively affected in terms of their working memory capacity after being excluded than after being included.

2 | METHODS

2.1 | Participants and design

The sample consisted of 88 male participants who were approached via LGBT+ organizations or the local university and selected on their answer to the Kinsey measure (i.e., "*How do you define yourself?*") ranging from 0 "*Completely heterosexual*" to 6 "*Completely not-heterosexual*" (Kinsey, Pomeroy, & Martin, 1948). We only invited participants to the experiment who scored high (5 or 6) or low (0 or 1) on this scale and ensured that we ended up with an equal number of participants who declared themselves to be gay-men (N = 44) or heterosexual-men (N = 44). Participants' ages ranged from 18 to 35 (M = 23.44, SD = 3.21) and were randomly assigned to either an inclusion or

exclusion condition. As a result, the present study used a 2 (Cyberball: exclusion vs. inclusion) × 2 (Sexual orientation: gay-men vs. heterosexual-men) between subjects design."

2.2 | Procedure

All participants volunteered to participate in a study of about 30–40 min concerning attitudes and opinions about social issues, including sexual orientation. After providing written informed consent according to the Declaration of Helsinki (World Medical Association Declaration of Helsinki, 2001), participants were seated in front of a computer, and the manipulation of social exclusion was then carried out. Assistant researchers explained to participants that the upcoming task involved mental visualization and asked participants to try to mentally visualize all the events described in the game.

In order to manipulate social exclusion, we employed the Cyberball task, a computerized procedure specifically designed to this purpose (Williams et al., 2000). The Cyberball consists of a ball-tossing game in which a participant is involved together with two other alleged players represented on a computer screen via two avatars. In line with previous work (Williams & Jarvis, 2006), the game consisted of a total of 30 throws. In the inclusion condition, participants received about one-third of all tosses during the entire game. In the exclusion condition, participants received only four tosses in the very initial phase and were subsequently excluded for the remaining part of the game.

Immediately after the Cyberball, the participants' working memory capacity was measured. To assess working memory capacity we followed the procedure outlined by Unsworth, Heitz, Schrock, and Engle (2005) who introduced a computerized version of the operation span task (OSPAN). During the operation span task participants have to solve a math problem after which a letter is presented for a fixed period of time (i.e., 800 ms) that needs to be correctly recalled at a later moment (depending on trial type after 3, 4, 5, 6, or 7 math problem/letter sequences). Participants are instructed to correctly recall the letter whilst maintaining a math accuracy of at least 85%.

Participants complete every trial type (i.e., recall after 3, 4, 5, 6, or 7 math/letter sequences) in three sets of trials. The order in which the trial types are presented was randomized within every participant in each of the three sets. In total, every participant thus completes 75 math/letter combinations, resulting in a maximum recall score of 75 and a minimum recall score of 0.

Finally, in order to check the adequacy of the exclusion manipulation, we asked participants to rate on a 5-point scale (1 = *not at all*, 5 = *very much*) to what extent they felt *excluded*, *rejected*, *accepted* (reverse scored), and *considered* (reverse scored). Ratings were averaged into an overall score of perceived exclusion (α = .74).

3 | RESULTS

The data that support the findings of this study are available from the corresponding author upon reasonable request.

3.1 | Manipulation Check

A 2 (Cyberball: inclusion vs. exclusion) × 2 (Sexual orientation: gay-men vs. heterosexual-men) ANOVA revealed that participants felt more excluded, rejected, unaccepted, and unconsidered when they were excluded (M = 2.96, SD = 0.95), rather than included (M = 2.26, SD = 0.65), from Cyberball, F (1, 84) = 16.13, p < .001, η^2 = 0.16. The main effect of sexual orientation, F (1, 84) = 0.01, p = .92, η^2 < 0.001 ($M_{\text{heterosexual-men}}$ = 2.60, SD = 0.79; $M_{\text{gay-men}}$ = 2.62, SD = 0.97) and the interaction F (1, 84) = 1.16, p = .28, η^2 = 0.01, were not significant. This finding confirmed the effectiveness of our manipulation.

3.2 | Working memory

On the basis of Tabachnick and Fidell (2001), we excluded from the analyses three participants because their operation span scores were 2 or more SD below the mean. More specifically, two participants failed to report any correct sequence of letters, thus obtaining a 0 score on the operation span task. The other participants only reported correctly one string of three letters (score 3 on the operation span task).

The 2 (Cyberball: inclusion vs. exclusion) × 2 (Sexual orientation: gay-men vs. heterosexual-men) ANOVA on working memory capacity showed no significant main effects neither for Cyberball, F (1, 81) = 0.15, p = .70, η^2 = 0.002 nor for Sexual orientation, F (1, 81) = 0.58, p = .45, η^2 = 0.01, indicating no difference in participants' working memory capacity between inclusion (M = 36.67, SD = 14.37) and social exclusion (M = 35.29, SD = 15.46) and between gay-men (M = 34.81, SD = 15.21) and heterosexual-men (M = 37.19, SD = 14.55). Importantly, a significant two-way interaction emerged, F (1, 81) = 4.54, p = .036, η^2 = 0.05. The results can be found in Figure 1.

Simple effect analysis revealed that the working memory capacity score of gay-men (M = 38.90, SD = 13.65) and heterosexual-men (M = 34.55, SD = 15.02) did not statistically differ, F (1, 81) = 0.95, p = .33, η^2 = 0.01 in the social inclusion conditions. Instead, in the

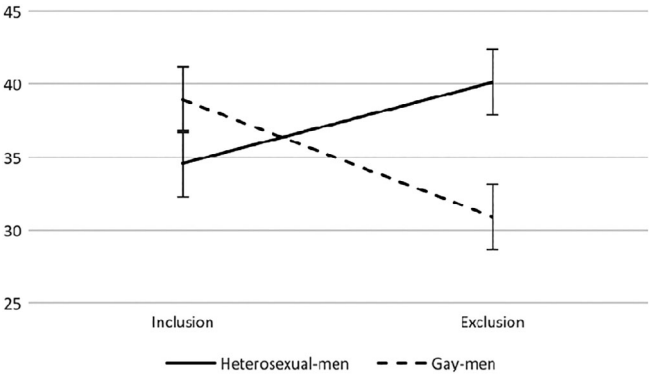

FIGURE 1 Means and errors standard of working memory capacity as a function of sexual orientation and social exclusion (vs. inclusion)

social exclusion conditions, the gay-men (M = 30.91; SD = 15.89) had a lower working memory capacity than heterosexual-men (M = 40.10, SD = 13.79), F (1, 81) = 4.12, p = .046, η^2 = 0.05. Furthermore, the working memory capacity of gay-men participants was marginally lower in the exclusion condition, than in the inclusion condition, F (1, 81) = 3.20, p = .077, η^2 = 0.04. Among heterosexual-men participants, no differences emerged between the exclusion and the inclusion condition, F (1, 81) = 1.51, p = .223, η^2 = 0.02.

4 | GENERAL DISCUSSION

In this experiment we set out to assess how the working memory of gay-men and heterosexual-men is affected by variations in belonging. We predicted that gay-men would be more negatively affected by our manipulation of belonging than heterosexual-men and that this would thus increase the impact of sexual orientation on working memory capacity in conditions that would threat belonging relative to conditions that do not. Consistent with this reasoning, in this small study, we found support that sexual orientation had an impact on working memory capacity in the exclusion conditions than in the inclusion conditions. As predicted, gay-men had a lower working memory capacity than heterosexual-men in the exclusion condition. Moreover, excluded gay-men appeared to have a lower working memory capacity than included gay-men, although we acknowledge that this comparison was not statistically significant at $p < .05$.

Our findings align with previous work on racial stigma and responses to social exclusion. Goodwin et al. (2010) asked both African-Americans and whites to participate in Cyberball. They manipulated whether the participants were included or excluded and also whether the other group members belonged to the same race or not. Their most important finding was that racial stigma reduced self-reported recovery in need fulfillment from social exclusion. We add to this that sexual stigma may also moderate the negative impact of ostracism on participants' executive functions. Interestingly, Goodwin et al. (2010) provided information about the racial composition of the other group members, whereas we did not provide any information about the sexual orientation of the other group members. The fact that we observed our findings in the absence of providing information of the sexual orientation of the other Cyberball players would suggest that the increased sensitivity to exclusion of sexually stigmatized individuals does not need strong contextual cues (e.g., being excluded by a person of a different sexual orientation) to be triggered.

One possible explanation that we already obtain effect without providing information about the sexual orientation of the other players is that sexual minority people endorse a heteronormative viewpoint of social interaction (Salvati, Pistella, & Baiocco, 2018). That is, they assume that every group is composed by heterosexual-men if they do not have more information about them. Consequently, gay-men involved in the present study could have taken for granted that the other participants in the Cyberball game were heterosexual-men. However, it could also be possible that the enhanced sensitivity to social exclusion originating from daily exposure to social exclusion is permanently activated and applies to cases in which people are not excluded because of their sexual orientation. Overgeneralization and sensitivity to exclusion beyond the boundaries of stigma could represent one of the routes through which everyday discrimination leads to harmful long-term consequences (Williams et al., 2003; Williams & Williams-Morris, 2000).

4.1 | A self-fulfilling prophecy?

Working memory is a fundamental executive function involved in basically all mental complex activities including self-regulation and self-control (Engle, 2002; Hofmann, Schmeichel, & Baddeley, 2012). Even a transitory impairment in working memory can produce undesired outcomes and behaviors that might involve the interpersonal domain as well (Hofmann et al., 2012). This sets the stage for a self-fulfilling prophecy. Stigmatized individuals may experience a reduction in cognitive function when they are socially excluded. This will hurt their ability to successfully cope, and may in fact reinforce the social stigma. This in turn may actually increase their chances of being excluded, which in turn causes a further reduction in performance. Notice that this reasoning is similar to insights on stereotype threat. This research shows that making the stereotype accessible, may indeed make people behave in line with the stereotype because they are so occupied not to behave in line with the stereotype (Steele, 1997; Steele et al., 2002).

4.2 | Limitations and further research

Although our results provide initial support for our reasoning, we also want to stress that the generalizability of our findings may be limited by the low sample size of our experiment. This challenge to obtain large samples is common in LGBT+ research as people are not willing to disclose that they belong to a stigmatized minority group (Meyer & Wilson, 2009). To address this challenge, future research could rely on a repeated measurement design. A challenge, however, is that it may prove difficult to repeatedly include or exclude participants without creating expectations. Instead, we call upon scholars to join forces in a multi-lab experiment. To facilitate this endeavor, we have made our data and stimulus materials ready to share.

We collected data from two different populations: University students for the heterosexual-men sample and people belonging to LGBT+ association for gay-men sample. Hence, it may be possible that our observed differences between heterosexual-men and gay-men in the exclusion condition are not only due to differences in sexual orientation but also due to other differences that are associated with student and nonstudent sample. However, we also point out that there were no differences in working memory capacity between heterosexual- and gay-men in the inclusion condition, suggesting that possible differences associated with a student or nonstudent sample are not strong enough to already cause differences in working memory capacity.

Moreover, we tested how the working memory capacity of gay-men and heterosexual-men would be affected by a belonging threat. We classified the participants into two groups. We acknowledge that

sexual orientation is a matter of degree and that one could also test whether this matter of degree would thus moderate our findings such that an impaired working memory should be more observed among gay-men who are more (vs. less) identified as sexual minority members. However, such a test is only warranted if there is enough variance in identification. This was not the aim of our experiment. Future research interested in testing this more nuanced view is needed but would need to navigate the difficulty of obtaining a large enough sample to maximize spread in variance. We also acknowledge that we focused on gay-men and that further research is needed if the effects of sexual orientation and associated stigma are also present in lesbian-women, bisexual, and transgender people. Moreover, social exclusion literature suggests that observing social exclusion hurts (Wesselmann, Williams, & Hales, 2013). People actively recognize and indeed feel what the target of social exclusion experiences (Paolini, Pagliaro, Alparone, Marotta, & van Beest, 2017). The vicarious perspective should be investigated in future research in order to understand of how sexual stigma affects both direct and indirect reactions to social exclusion (see Salvati, Paolini, & Giacomantonio, 2019).

5 | CONCLUSION

Although further experimental confirmations of this study are needed, the present research attempted to illustrate that sexual orientation increases the sensitivity to social exclusion, which translates into a decrement of working memory capacity. Potential self-regulatory and interpersonal consequences of such possible reduced executive functioning could impact the life of stigmatized individuals well beyond a temporary reduction of the basic psychological needs. We think that our findings may be essential not only to a more complex understanding of this phenomenon but also to provide indication for social prevention and awareness programs.

CONFLICT OF INTEREST

No competing financial interests exist.

AUTHOR CONTRIBUTIONS

All the authors equally contributed to develop the present research and to write the paper.

ETHICS STATEMENT

All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional and national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. This article does not refer to any studies with animals performed by any of the authors.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTE

[1]Participants of this study participated in an unrelated study prior to the current experiment. The reason for running two experiments with the same sample is that a sample of sexual minorities was difficult to obtain. In this experiment participants read a scenario that depicted either a gay-man with masculine traits or feminine traits after which they were asked to rate the target person on several dimensions. To minimize the possibility of cross-over effects, we ensured that the presentation of the scenarios was orthogonal to the manipulation of belonging of the current study.

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