Abstract

Objective

Acute changes in social belonging are important triggers for alterations in health and well-being, yet research has emphasised the negative effects of 'exclusion' at the expense of evaluating the potentially positive effects of 'inclusion'. This study examined the impact of acute belonging on physiological and psychological outcomes.

Design & Main Outcome Measures

A healthy population (*n*=138) were randomly allocated to 'included' or 'excluded' task conditions. Condition-dependent differences in pre/during-task heart rate, and pre/post-task self-reports of negative/positive mood, and social self-esteem, were assessed.

Results

Included participants showed decreased heart-rate and negative mood, and increased social self-esteem. No inclusion-related increase in positive mood was shown. An increase in heart rate was observed in excluded participants. However, although excluded participants showed nominal increases in negative mood and decreases in positive mood, these changes were muted, suggesting a protective exclusion-related response. Likewise, no exclusion-related change in social self-esteem was shown. Shifts in social self-esteem acted as a mechanism through which inclusion/exclusion impacted upon negative and positive mood alterations. Results remained significant in presence of covariates (gender, global self-esteem, rumination, and social anxiety).

Conclusion

Findings suggest that acting to enhance belonging through 'inclusion' resulted in adaptive physiological and psychological outcomes.

Keywords: Belonging, Inclusion, Heart-rate, Mood, Self-esteem

Benefits of belonging: experimental manipulation of social inclusion to enhance psychological and physiological health parameters

That the social environment has the power to influence health and well-being is universally recognised. The belongingness hypothesis highlights the importance of social belonging, placing the 'fundamental' human need to belong at the centre of an individual's social world (Baumeister & Leary, 1995). This fundamental need is critical to healthy psychological well-being and physical functioning. A measure or gauge of belonging is argued by sociometer theory to be provided by self-esteem, which continuously monitors the environment for acute changes in the way individuals relate to one another and passing on these changes to influence responses or outcomes (Leary & Downs, 1995).

The evolutionary and practical benefits of inclusion in the naturalistic environment are widely accepted (Leary, 2010). Yet experimental manipulation of belonging has primarily focused on the acute effects of exclusion, often ignoring the positive impact of inclusion. This is not surprising since acute exclusion has been linked to a number of adaptive and maladaptive psychological and behavioural outcomes (DeWall & Bushman, 2011; Levinson, Langer & Rodebaugh, 2013; Williams, 2007). Furthermore, excluded individuals also reduce the likelihood of re-inclusion after a period of being excluded, by the use of self-defeating behaviours, aggression, and social withdrawal (Baumeister, Brewer, Tice & Twenge, 2007). However, alternative responses to exclusion can include an enhanced opportunity to re-establish inclusion through affiliative information processing biases and prosocial behaviours. Such responses are similar to the social bonds sought following stressful experiences, driven by affiliative hormones such as oxytocin.

These potential opportunities for enhancing acute belonging through inclusion have remained largely neglected (Blackhart, Nelson, Knowles & Baumeister, 2009). In the limited

number of studies where they have been considered, evidence suggests that inclusion increases trust (Hillebrant, Sebastian, Blakemore, 2011) and reduces the impact of prior exclusion (DeWall, Twenge, Bushman, Im & Williams, 2010) with consequent health benefits. In social belonging research, retrospective designs, often focusing on post-manipulation testing have failed to address the question of whether inclusion merely equates to an absence of exclusion, or whether the psychological impact of inclusion has benefits in the form of effects over and above the consistent negative effects of exclusion.

Belonging and psychophysiological responses

Links between threat to belonging and psychophysiological responses have been observed experimentally. Effects of socio-evaluative-threat (SET) have consistently shown increases in physiological arousal indicative of stress responses. SET has been linked to increased heart-rate (HR) and systolic/diastolic blood pressure (e.g. Chatkoff, Maier & Klein, 2010), and glucocorticoid rise (Dickerson, 2008). Where SET has been followed by negative social feedback suggestive of potential exclusion, an increase in HR has also been shown (Mendes, Major, McCoy & Blascovich, 2008). Research applying more overt forms of exclusion through the use of direct inclusion/exclusion manipulations is limited, and has provided contradictory evidence regarding associated autonomic responses. Where overt exclusion scenarios have been applied in which participants have no prior expectations of inclusion or exclusion; increases in HR in response to exclusion have been reported (Sommer, Kirkland, Newman, Estrella & Andreassi, 2009). However, where participants have been invited to state prior expectations of their likely inclusion, a decrease in HR has been observed when those expectations were confounded by subsequent overt exclusion (Gunther-Moor, Crone & Molen, 2010). Furthermore, although no glucocorticoid responses to overt exclusion have been observed (Seidel et al, 2013); where exclusion is primed prior to

SET, a blunted response to SET has been reported in female populations (Weik, Kuepper, Hennig & Deinzer, 2013).

Belonging and mood responses

The effects of social belonging on mood have been a particular source of controversy. Theoretically, the perspective that exclusion or ostracism acts as a source of social pain (Eisenberger, 2012; MacDonald & Leary, 2005) is widely accepted. However, whilst acute exclusion has been experimentally linked to emotional distress (Williams, 2007), emotionally neutral responses have also been reported. This latter experience of emotional numbness, termed a 'deconstructed state' (DeWall & Baumeister, 2006), is thought to serve as a form of social analgesia, or defence, against the immediate effects of exclusion. Whilst both reactive and neutral mood responses might be deemed adaptive in mitigating the immediate impact of exclusion, no clear distinction between these two response states has emerged in relation to psychological or physical parameters. In meta-analyses assessing mood responses following exclusion, Gerber and Wheeler (2009) and Blackhart et al. (2009) reached opposing conclusions. Gerber and Wheeler (2009) reported that social exclusion was linked to a worsening of mood associated with emotional distress. However, Blackhart et al. (2009) argued that any worsening of mood was relatively minor and did not equate to a state of distress, but rather to a relatively neutral state which did not exceed everyday mood levels. Bernstein and Claypool (2012) suggested that discrepancies in mood response might, in part, be dependent on the belongingness manipulation used.

Where the impact of inclusion is discernible within exclusion-focused research, evidence relating specific mood change is just as uncertain. Inclusion-related decreases in negative mood (Blackhart, Eckel & Tice, 2007), anger, and depression (Zöller, Maroof, Weik & Deinzer, 2010) have been shown, alongside increases in positive mood (Blackhart et al., 2007). However, when mood has been measured continuously throughout the experimental

manipulation of belonging, an absence of inclusion-related mood response has also been reported (Wesselmann, Wirth, Mroczek & Williams, 2012).

Belonging and self-esteem

Against the backdrop of theoretical debate regarding the utility of self-esteem, which is beyond the scope of the current text (e.g. see Crocker & Park, 2004); the impact of belonging on self-esteem has been difficult to interpret. Whilst some research suggests that exposure to acute exclusion has been linked to lower self-esteem (Leary, 2007; Gerber et al. 2009) yet other research by Blackhart et al. (2009) observed neutral effects, which were not indicative of an exclusion-self-esteem link. Blackhart et al. (2009) suggested that differences in self-esteem following manipulation of belonging might be driven by the effects of inclusion rather than exclusion.

The function of self-esteem in response to acute belongingness levels is also unclear. Responses are thought to be immediate (reflexive) and rooted in an underlying motivation to maintain belongingness levels; though the mechanisms underlying these responses are yet to be fully understood. A substantial portion of literature targets self-esteem as a fundamental need (Williams, 2007). Accordingly, any threat to self-esteem, incurred through exposure to exclusion and reflected as state self-esteem, is treated as an immediate threat to well-being. Alternatively, sociometer theory would argue that state self-esteem functions as an adaptive gauge of social belonging, constantly monitoring the social environment and linking belongingness levels to outcome responses (Leary, 2010).

Given that the concept of self-esteem as a gauge of social belonging is dependent on identification of discernible self-esteem responses, evidence for sociometer theory is limited. Where no belonging-related self-esteem responses are observed, any function of self-esteem as a mediating mechanism linking belonging to well-being outcomes lacks support (Baumeister, DeWall, Ciarocco & Twenge, 2005). Where self-esteem has been linked to

belonging, a mediating action of self-esteem linking belonging to aversive impact has been shown (Williams, Cheung & Choi, 2000). Mediating relationships are rarely tested however, and associations between self-esteem and mood (e.g. Nezlek & Plesko, 2003) suggest that the effects of belonging on negative and positive mood might be mediated by self-esteem responses. Whether such effects are influenced by the impact of inclusion (Blackhart et al., 2009); a negative bias towards exclusion-detection posited by sociometer theory (Leary & Guadagno, 2010); or a combination of these outcomes, has yet to be ascertained.

In summary, there has been a propensity for research to emphasise the psychological and physiological impact of 'exclusion', rather than considering the enhancing effects of belonging through 'inclusion'. Crucially, there is scope for understanding the psychological mechanisms which drive the impact of belonging on psychological and physiological health parameters.

Study overview

The current study aimed to assess individuals' physiological responses, mood, and self-esteem as a result of inclusion and exclusion within an experimental environment using the Cyberball manipulation (Williams et al., 2000; Williams & Jarvis, 2006). To assess the effects of experimentally induced social belonging on physiological arousal, $HR_{(bpm)}$ was monitored before and during the task. Given that participants had no expectations of inclusion or exclusion prior to the task, it was expected that included individual's $HR_{(bpm)}$ would return to pre-task levels following an initial rise, and that $HR_{(bpm)}$ would remain raised in excluded individuals as an indicator of exclusion as a continuing social stressor. The effects of experimentally induced belonging on mood were measured pre and post task. Negative mood (NA) was expected to decrease in included participants, and increase in excluded individuals, whilst positive mood (PA) was expected to remain stable in socially included participants, and to decrease for those who were excluded. The role of self-esteem

was considered before and after the task and based on sociometer theory rationale. Self-esteem levels were expected to increase in included participants, and decrease for excluded individuals. Pre/post differences in self-esteem were expected to mediate the relationship between inclusion/exclusion and pre/post mood differences.

Method

Participants

One hundred and thirty-eight participants (male=44; female=94) attending a university in England, UK, volunteered to take part in the research (mean age=21.23 years; *SD*=2.55). Following approval from the departmental ethical review panel, participants were recruited from a range of faculties across the University.

Manipulation of social belonging: Cyberball

Participants were randomly allocated to 'included'/'excluded' conditions and completed the three-person cyber-ostracism program Cyberball. In line with the Cyberball cover-story (Williams et al., 2000) participants were informed that they were taking part in an online 'mental visualisation task' using an 'interactive ball-tossing game' played alongside two other (virtual) participants. Participants were assured that visualisation of the task was paramount, and their performance in the task was not important. Basic Cyberball (v3.0) avatars were applied, and no names/photographs of virtual participants included. Sixty ball-throws were generated per session, with a delay of 2 seconds per throw and additional variable delays ranging between .5-3 seconds. 'Included' participants received the ball 33% of the total time (3 minutes approximately). 'Excluded' participants were allowed 4 throws before being excluded 48 seconds into the task for the game's duration (3 minutes approximately).

Background and control variables

Participants provided personal and demographic details including their age, gender, marital status and number of children, and accommodation circumstances; as well as degree course, year, and level of study. As part of a wider study linking everyday belonging to health which will be reported elsewhere, participants also completed measures of their physical health, belonging, global self-esteem (Rosenberg, 1965); rumination (Treynor, Gonzalez & Nolen-Hoeksema, 2003), interaction, and social anxiety (Leary, 1983) 'over the previous month'. Of these measures; gender, global self-esteem, rumination and social anxiety were assessed as control variables based on reported associations between these factors and physiological, mood, or self-esteem responses in relation to acute inclusion/exclusion (Kashdan et al, 2014; Weik et al, 2010; Zadro, Boland & Richardson, 2006).

Dependent variables

Heart-rate. Heart-rate ($HR_{(bpm)}$) was measured continuously over a 15-minute period using a Polar© RS800d heart-rate-monitor (record-rate 5). The monitor comprised of a transmitter attached via a strap around the participant's chest, and a 'running-computer' placed out of the participant's sight. Two 60-second time-periods, 'pre' (2m 38s-3m 37s) and 'during' (5m 48s - 6m 47s) the experimental task, were used in analysis.

Mood. Mood was measured pre and post task on the basis of participant experiences 'right now' using the 20-item Positive and Negative Affect Schedule (PANAS; Watson, Clarke & Tellegen, 1988). The scale comprised 10 NA items (e.g. 'distressed'; α=.86$_{pre,}$ α=.85$_{post}$) and 10 PA items (e.g. 'interested'; α=.88$_{pre}$, α=.79$_{post}$) rated on a 5-point scale (1='Very slightly or not at all' to 5='Extremely').

Social self-esteem. Taken from Heatherton and Polivy's (1991) State Self-Esteem Scale, social self-esteem was measured pre and post task on the basis of participant experiences 'right now'. The 7-item subscale, consisting of self-statements (e.g. 'I feel

displeased with myself'; α=.87$_{pre}$ and α=.91$_{post}$), was rated on a 5-point scale (1='Not at all' to 5='Extremely'). All items were reverse scored, with a higher score indicating higher social self-esteem levels.

Manipulation checks. Standard Cyberball manipulation-checks were completed post-task as a retrospective measure of participants' experiences during the game. Six-items assessing belongingness levels and mood (e.g. 'I felt like an outsider') (Zadro, Williams & Richardson, 2004) were answered on a 9-point scale (1='not at all' to 9='very much'). Participants also approximated their percentage inclusion within the game (Williams et al., 2000).

Procedure

Each participant attended an individual experimental-session and was given information regarding physiological/psychosocial measures and the Cyberball cover-story before providing consent. The HR monitor was fitted 30-minutes prior to testing in order to acclimatise participants. Background details, control measures, and pre-task measures of mood and social self-esteem were completed during this time. To provide pre-task $HR_{(bpm)}$ values, participants were then informed of a short delay and advised to relax and familiarise themselves with Cyberball instructions. $HR_{(bpm)}$ was continuously monitored thereafter, outside the knowledge of participants. After a delay of 5 minutes the participant was informed that 'other participants' were ready to start. Following Cyberball completion, participant post-task mood and social self-esteem were assessed in line with pre-task measures; and manipulation-checks were completed. Participants were fully debriefed to ensure understanding of the true experimental aims, and random allocation of inclusion/exclusion conditions.

Statistical Analysis

Data was screened in order to meet normality assumptions. Outlying scores for NA_{pre} (*n*=3), NA_{post} (n=1), and PA_{post} (*n*=1), were corrected using 'one unit larger than the next most extreme score', and positive distribution skews in pre/post NA were corrected to normal via log_{10} transformations (Tabachnick & Fidell, 2013, pp. 77, 89). Due to technical malfunction, HR data from *n*=8 participants was excluded, resulting in a final HR sample of *n*=130.

Data was analysed using t-tests to confirm the effects of the experimental condition (included versus excluded). Physiological and psychological responses were analysed via mixed analysis of covariance, using the within-subjects factor 'time' (HR during/post manipulation; NA, PA & social self-esteem pre/post manipulation), between-subjects factor 'condition' (included/excluded) and covariates (gender, global self-esteem, rumination & social anxiety). Interactions between 'time' and 'condition' were analysed using simple effects analysis. Tests for indirect and full mediation effects of condition (included/excluded) on mood outcomes (pre/post mood differences) via social self-esteem as a mediator (pre/post social self-esteem differences) were analysed using x5000 bootstrapped-estimates and assessment of bias-corrected-confidence-intervals (BCCI) (Preacher & Hayes, 2008).

Results

Manipulation checks

Included participants reported receiving a greater percentage of Cyberball throws (*M*=33.78, *SD*=8.28) than excluded participants (*M*=7.71, *SD*=5.25), ($t(136)=22.09$; $p<.001$), and experienced higher levels of inclusion in the game (*M*=14.43, *SD*=4.58) than excluded individuals (*M*=5.03, *SD*=4.70), ($t(136)=11.91$; $p<.001$). Recalling emotions experienced during the game, included participants experienced higher overall levels of positive mood (*M*=22.74, *SD*=6.20), than excluded participants (*M*=16.20, *SD*=7.04), ($t(136)=5.79$; $p<.001$).

Responses to the Cyberball manipulation

There were no significant baseline or pre-task differences between participants allocated to the inclusion versus the exclusion conditions for any of the outcome variables [HR (t(128)=0.72; p>.1); NA (t(136)=0.084; p>.1); PA (t(136)=0.15; p>.1); social self-esteem (t(136)=-1.400; p>.1)] indicating successful random allocation to conditions. Similarly, there were no significant pre-task differences between participants allocated to the inclusion versus the exclusion conditions for control variables [global self-esteem (t(136)=-0.303; p>.1); rumination (t(136)=0.498; p>.1); social anxiety (t(136)=0.279; p>.1)] indicating that groups were comparable prior to testing. Descriptive data for dependent variables in included and excluded conditions is summarised in Table 1. This shows DV means and standard deviations for both groups at baseline/pre-test and during/post task and indicates significant interaction effects of group

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Insert table 1 about here

Heart rate. A significant time x condition interaction was evident for $HR_{(bpm)}$ responses (F(1,128)=115.52; p<.001; η_p^2=.474) (figure 1). 'Included' participants showed a decrease in $HR_{(bpm)}$ during the task (M pre-task/during-task diff =-6.70). Conversely an increase in $HR_{(bpm)}$ was shown in 'excluded' participants (M pre-task/during-task diff =3.23). The time x condition interaction remained significant (F(1,124)=110.35; p<.001; η_p^2=.471) in the presence of covariates (gender, global self-esteem, rumination & social anxiety), which did not significantly influence the model (all p's <.05). Simple effects analysis suggested that pre/post differences in $HR_{(bpm)}$ responses were significant for 'included' (F(1,124)=101.52; p<.001; η_p^2=.450) and 'excluded' participants (F(1,124)=23.16; p<.001; η_p^2=.157).

Insert figure 1 about here

Mood. Comparison of condition-based (included/excluded) NA values pre/post-task indicated a significant time x condition interaction ($F(1,136)=7.888$; $p<.005$; $\eta_p^2=.055$). Differences between pre/post levels for 'included' participants revealed a decrease in NA post-task (*M* pre/post diff =-1.57). Pre/post NA differences in the 'excluded' condition showed that increased NA was reported post-task (*M* pre/post diff=0.48). The time x condition interaction remained significant ($F(1,132)=7.50$; $p<.01$; $\eta_p^2=.054$) in the presence of gender ($p>.05$), global self-esteem ($F(1,132)=9.97$; $p<.01$; $\eta_p^2=.070$), rumination ($F(1,132)=9.57$; $p<.01$; $\eta_p^2=.068$), and social anxiety ($p>.05$), as covariates. Simple effects analysis suggested that pre/post NA differences were significant for 'included' participants ($F(1,132)=8.68$; $p<.005$; $\eta_p^2=.062$) but not for 'excluded' participants ($F(1,132)=0.87$; $p>.05$; $\eta_p^2=.007$).

No significant main effects of condition (included/excluded) or time x condition interaction ($p=.053$) was shown for pre/post PA differences. Whilst there was an anticipated fall in PA amongst 'excluded' participants (*M* pre/post diff =-2.32), PA levels also declined for 'included' participants (*M* pre/post diff =-0.08).

Social self-esteem. A significant time x condition interaction was evident for social self-esteem responses ($F(1,136)=24.05$; $p<.001$; $\eta_p^2=.150$). 'Included' participants showed an increase in social self-esteem post-task when compared with pre-task levels (*M* pre/post diff =3.52). However, although social self-esteem in 'excluded' participants showed a small decrease, pre/post differences were negligible (*M* pre/post diff =-0.08). The significant time x condition interaction remained ($F(1,132)=23.55$; $p<.001$; $\eta_p^2=.151$) in the presence of

gender (p>.05), global self-esteem (F(1,132)=12.01; p<.01; η_p^2=.083), rumination (F(1,132)=5.27; p<.05; η_p^2=.038), and social anxiety (F(1,132)=27.17; p<.001; η_p^2=.171) as covariates. Simple effects analysis suggested that pre/post differences in social self-esteem were significant for 'included' participants (F(1,132)=46.077; p<.001; η_p^2=.259) but not for 'excluded' participants (F(1,132)=0.007; p>.05; η_p^2<.001).

The mediating role of self-esteem. Controlling for covariates (gender, global self-esteem, rumination & social anxiety), Figure 2 illustrates pre/post differences in social self-esteem as a mediator of the relationship between inclusion/exclusion conditions and pre/post NA differences. A significant mediation effect of condition (included/excluded) on pre/post NA differences acting via pre/post differences in social self-esteem (Indirect effect=1.8057, *SE*=.5966, 99% BCCI=0.6288 to 3.8348) was shown.

Insert figure 2 about here

Pre/post differences in social self-esteem also acted as an indirect route linking inclusion/exclusion conditions to pre/post PA differences. Analysis revealed a significant effect of condition (included/excluded) on pre/post PA differences working through pre/post differences in social self-esteem (Indirect effect=-.9912, *SE*=.5359, 95% BCCI=-2.1878 to -0.0949).

Discussion

In a departure from the dominant climate focusing on the effects of social exclusion, the current study sought to examine the potentially beneficial effects of social inclusion for psychological and physiological outcomes. Results indicate that responses to the Cyberball manipulation were not solely driven by adverse reactions to social exclusion but also by the

beneficial effects of social inclusion. Whilst other studies have considered inclusion, this is usually as the antithesis of exclusion and the beneficial contribution of inclusion is frequently assigned less importance.

Heart-rate ($HR_{(bpm)}$), responses to inclusion went beyond those initially predicted. As anticipated, an increase in $HR_{(bpm)}$ was shown in excluded participants. However, in included individuals, $HR_{(bpm)}$ levels did not merely return to pre-task levels, but instead showed a further decrease in $HR_{(bpm)}$. This latter finding suggests a reduction in physiological arousal for participants whose social belonging was boosted via inclusion. Alternative interpretations of these findings are acknowledged. Although participants were acclimatised to the HR-monitor and were unaware of when monitoring commenced, it is possible that the decrease in $HR_{(bpm)}$ observed during inclusion was due to an anticipatory pre-task rise in $HR_{(bpm)}$ and subsequent habituation to the task. This scenario is unlikely given the increase in $HR_{(bpm)}$ from pre-task levels observed amongst excluded participants. However, comparison applying a non-social control condition alongside inclusion/exclusion would be necessary in order to clarify findings further.

Acute changes in mood in response to inclusion indicated the positive effects of increased belonging. The experience of belonging through inclusion was associated with decreased negative mood (NA), suggesting an improvement in emotional well-being through NA reduction. Although exclusion was associated with a rise in NA, changes in NA were primarily driven by responses to inclusion. Exclusion-related NA did not constitute a significant change that would imply emotional distress; but rather, was suggestive of a neutral NA response of protective, emotional numbing associated with a deconstructed state. Given suggestions that neutral versus reactive NA exclusion responses might be manipulation-dependent (Bernstein & Claypool, 2012; Leary, 2010) further research applying alternative

(non-Cyberball) inclusion/exclusion paradigms is necessary to explore this question more fully.

In the case of positive mood (PA), a similar beneficial effect was not observed. Whilst an anticipated lowering of PA following exclusion was shown, this response was limited and indicative of a neutral rather than reactive emotional state. There was no commensurate rise in PA following inclusion. Findings were consistent with Wesselmann, Bagg & Willams' (2009, p.1310) speculation that the Cyberball cover-story led participants to 'expect' inclusion, with expectations resulting in a neutral effect, the absence in PA increase.

Increased social self-esteem in response to 'inclusion' also highlighted the protective role of belonging. Exposure to exclusion resulted in a neutral self-esteem response, rather than the anticipated self-esteem decrease. This was consistent with the relatively nominal NA and PA responses to exclusion exhibited by participants, and suggested a numbed state in the immediate aftermath of exclusion. Although the potential for a defensive reaction to more probing self-esteem enquiries is one possible explanation (Blackhart et al., 2009), it is likely that this initial muting of response may be functional, acting protectively to foster adaptive, or maladaptive, cognitive and behavioural outcomes.

Uniquely, and in line with the concept of self-esteem as a gauge of social belonging, social self-esteem acted as a route through which inclusion/exclusion impacted NA and PA levels. In contrast to the concept of a negatively-biased, exclusion-detecting gauge of belonging as posited by sociometer theory, these effects appeared to be largely driven by the effects of inclusion rather than exclusion.

More broadly, findings indicate that the effects of belonging on well-being outcomes are not solely influenced by social exclusion responses. Building upon post-task only assessments which emphasise the deleterious effects of exclusion on NA and self-esteem

(Williams, 2007), current findings accounting for pre-task levels allow for more nuanced interpretations. These suggest that the potential benefits of inclusion are of paramount importance in explaining post-task NA and self-esteem levels.

Interpretation of findings must be tempered with recognition of study limitations. $HR_{(bpm)}$ rise during exclusion was explained as indicative of a 'threat' response, and the corresponding fall in $HR_{(bpm)}$ during inclusion suggested that this might be the case. However, this $HR_{(bpm)}$ rise could equally be attributed to physiological arousal as a response to 'challenge' rather than 'threat' (Mendes et al., 2008). Research measuring physiological responses specific to 'threat' would be necessary to extend findings further.

The current study did not employ the standard post-task measures of belonging, self-esteem, control and meaningful existence which are commonly associated with the Cyberball paradigm (Zadro et al, 2004). The use of alternative measures was deemed appropriate because the research focused on pre/post task changes in mood and self-esteem and the interplay between these changes. The use of standard Cyberball measures at the pre-task stage also presented a realistic possibility of compromising the Cyberball cover-story prior to testing. However, findings could be extended further if standard Cyberball measures were also included at post-task assessment, alongside the pre/post task measures applied within the current study.

Whilst the protective effects of increasing belonging through inclusion are discussed in the current findings, conceptual overlap between inclusive belonging and social support were not directly addressed within the study. Given the wealth of evidence linking social support to psychological and physical health outcomes (Uchino, 2006), it is possible that inclusion was acting as a component of social support. This would seem unlikely, given that the Cyberball manipulation is designed specifically to manipulate inclusion and exclusion, although support may have been implicitly inferred by participant. Whether inclusion might

be perceived as a precursor for tapping into future social support resources, remains to be explored.

More generally, because research into social belonging has focused primarily on the impact of exclusion, there is scope for future work to systematically examine the effects of increasing belonging through inclusion. Research that tests the viability of applying the inclusive properties of the Cyberball paradigm as an intervention design is called for. Individual differences which might present barriers to perceptions of inclusion also require further attention. For example, whilst not the focus of the current study; gender, global self-esteem, rumination, and social anxiety, were included as covariates based on literature associating these factors with exclusion-related outcomes. Whether such individual differences have the potential to impair or enhance perceptions of inclusion and to impact on resultant psychological and physiological outcomes, as they do with exclusion, have yet to be fully understood.

In conclusion, building upon extensive work linking social exclusion to well-being, the present study sought to refocus belongingness research by emphasising the impact of social inclusion on psychological and physiological health parameters. Most importantly, findings highlight the potentially protective effects of manipulating belonging by increasing social inclusion, and suggest the need for more extensive use of multiple time-point measures to fully account for belongingness-dependent change (Wesselmann et al., 2012). Extending the theory to highlight the mediating role of self-esteem, results provide unique support for the action of self-esteem as a mechanism through which inclusion impacts to enhance well-being. Further work in this area will be invaluable in identifying the potentially positive effects of inclusion for a range of cognitive, behavioural, emotional and health variables. In turn, this work might be used to inform intervention design in order to enhance belonging through inclusion across a range of populations.

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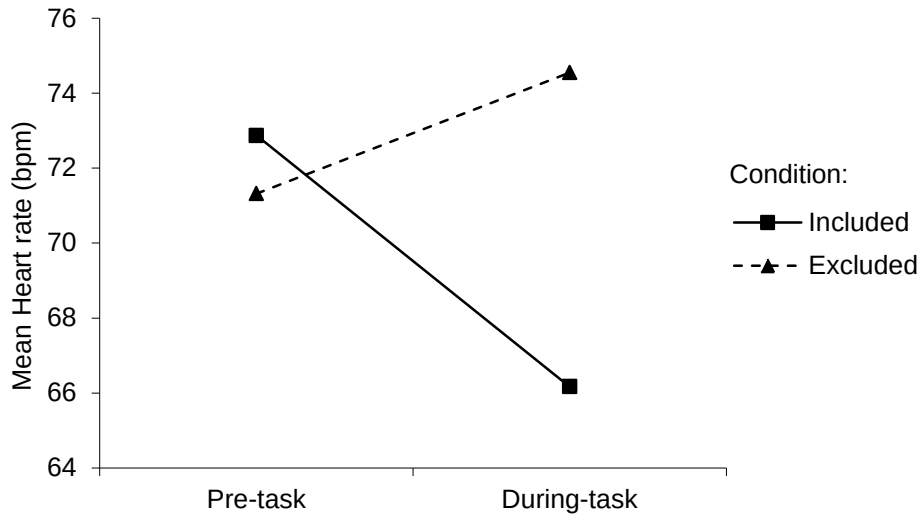
Table 1

Descriptive statistics for dependent variables in included and excluded Cyberball conditions

Dependent variable	Included condition Mean (SD)	Excluded condition Mean (SD)
Continuous HR baseline	72.87 (11.44)	71.32 (13.00)
Continuous HR during task***	66.17 (11.40)	74.55 (13.33)
Negative mood pre task	14.00 (5.42)	13.75 (4.57)
Negative mood post task**	12.43 (3.72)	14.23 (4.73)
Positive mood pre task	26.91 (8.40)	26.71 (7.15)
Positive mood post task	26.83 (9.07)	24.39 (8.40)
Social self-esteem pre task	24.10 (6.07)	*25.54 (5.96)*
Social self-esteem post task ***	27.62 (5.42)	25.46 (6.69)

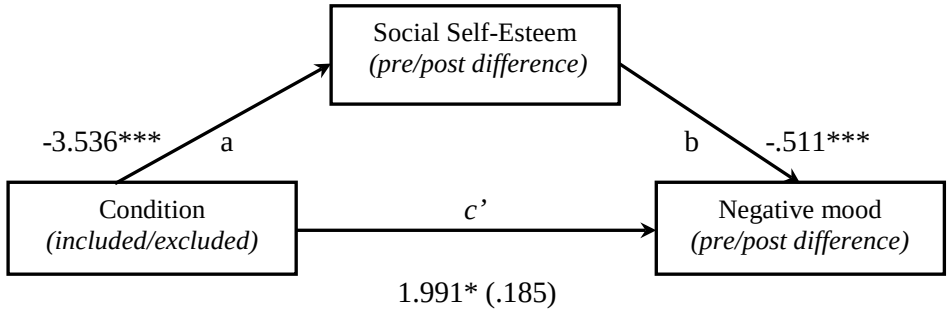
Note: For HR: Included n=65, excluded n=65; for self-report measures Included n=69; excluded n=69

Significant effects of time x condition revealed in ANOVA analyses are indicated as **p<.01; *** p<.001 (effects adjusted for covariates of gender, global self-esteem and rumination.



Mean HR (bpm) values over 60 s at baseline = 2min 38s - 3min 37s;
and over 60 s during task= 5min 48s - 6min 47s

Figure 1. Interactive effects of condition (included/excluded) on heart rate 'pre' & 'during' Cyberball task (*n*=130)



*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$ (unstandardised *B*'s shown)

Figure 2. Pre/post task change in social self-esteem as a mediator between condition (included/excluded) and pre/post negative mood differences