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## On-line ostracism affects children differently from adolescents and adults

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This research examines adults', and for the first time, children's and adolescents' reaction to being ostracized and included, using an on-line game, 'Cyberball' with same and opposite sex players. Ostracism strongly threatened four primary needs (esteem, belonging, meaning, and control) and lowered mood among 8- to 9-year-olds, 13- to 14-year-olds, and adults. However, it did so in different ways. Ostracism threatened self-esteem needs more among 8- to 9-year-olds than older participants. Among 13- to 14-year-olds, ostracism threatened belonging more than other needs. Belonging was threatened most when ostracism was participants' first experience in the game. Moreover, when participants had been included beforehand, ostracism threatened meaning needs most strongly. Gender of other players had no effect. Practical and developmental implications for social inclusion and on-line experiences among children and young people are discussed.

There are multiple reasons why people may be excluded from social relationships (Abrams & Christian, 2007; Abrams, Hogg, & Marques, 2005). Psychologically, an especially salient manifestation of exclusion is ostracism – being ignored and excluded from participating in social activity (Williams & Zadro, 2005). This research examines the previously untested questions of whether and how inclusion and ostracism affects children and adolescents differently from adults.

Williams (2007) proposes that four fundamental needs are reflexively affected by ostracism: belonging, self-esteem, control, and meaningful existence. When the satisfaction of these needs is reduced by ostracism, the immediate effect should be a more negative mood. These needs are interconnected but have distinct psychological characteristics. In adults, the *need to belong* (Baumeister & Leary, 1995) is affected strongly by ostracism (Zadro, Williams, & Richardson, 2005). *Self-esteem*, an important component of positive mental health, is threatened by ostracism if victims infer something about them is wrong or socially devalued. Self-esteem is linked to belonging because it can serve as an index of being accepted and valued by others (Leary, Tambor, Terdal, & Downs, 1995).

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Ostracism undermines the sense of *meaningful existence* by making victims feel invisible to others (Williams, 2007). Feelings of uncertainty are uncomfortable and may prompt a more active search to define and categorize oneself (e.g. Hogg, 2007). People's sense of *control* is also weakened when they are given the 'silent treatment' (Williams, Shore, & Grahe, 1998), potentially creating feelings of hopelessness or helplessness that may prompt strategies to regain control (Bandura, 2000; Metalsky, Halberstadt, & Abramson, 1987).

Williams (2007) theorizes that need threats and mood are 'hard wired' reflexive responses to ostracism that, in a subsequent reflective stage, are linked to different coping responses. Esteem and belonging threats are associated with prosocial responses whereas control and meaning threats relate to aggression and antisocial behaviour (Warburton, Williams, & Cairns, 2006), possibly being implicated in school shootings (Leary, Kowalski, Smith, & Phillips, 2003).

Primarily using student participants, researchers have explored different modes of ostracism, ranging from being left out of a ball-tossing game, to being ignored on a train (Zadro *et al.*, 2005). Direct ostracism from Internet chat rooms affects the four needs (Williams *et al.*, 2002), as does impersonal on-line ostracism when the ball-tossing game is played as a computer game labelled 'Cyberball' (Williams, Cheung, & Choi, 2000; Williams & Jarvis, 2006), even when people feel they are playing a computer rather than other people (Zadro, Williams, & Richardson, 2004), and regardless of whether they are playing with in-group or with despised out-group members (Gonsolkorale & Williams, 2007; Williams *et al.*, 2000).

However, ostracism can occur even during preschool years (Crick, Casas, & Ku, 1999). Over and Carpenter (2009) showed indirectly that 5-year-old children are sensitive to ostracism. Children who were primed with videos in which one shape ostracized another subsequently imitated the actions of a model more closely than did children in a control condition.

Social cliques during school years create potential for frequent and unavoidable ostracism. From around the age of 7 years children begin to grasp the social dynamics involved in inclusion and exclusion from social groups (Abrams, Rutland, Pelletier, & Ferrell, 2009), so they should also be sensitive to ostracism. Given the serious psychological consequences of being excluded from social networks in childhood and adolescence (Buhs, Ladd, & Herald, 2006; Hymel, Vaillancourt, McDougall, & Renshaw, 2002), it is important to examine whether ostracism has a similar effect on children and adolescents as it does on adults. No previous research has addressed this issue directly.

The rise of Internet social networking sites may increase children's vulnerability to ostracism. Computers are used commonly from the age of 7 years in many schools, so it is important to establish whether children respond to cyberostracism in the same way as adolescents and adults. Previous research on cyberbullying has focused on direct manifestations of abuse and insults (Li, 2006) rather than the more indirect, and perhaps common, form of exclusion through ostracism.

Valkenburg and Peter (2007) showed that Internet communication is especially important for preadolescents' and adolescents' social relationships. With a sample of 794 participants aged 10-16 years, self-disclosure via Internet peaked at around the age of 15 years, consistent with the idea that social connection and belongingness are especially focal at this stage of development. At present, there is little clear evidence about whether adolescents will respond to cyberostracism in the same way as adults, and whether needs are threatened differently. Insight into these issues has implications

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for theories about the psychology of social exclusion and has practical implications for strategies to deal with social exclusion during the school years.

As well as extending the reach of Williams' theory, a practical ambition for the present research was to devise a version of Cyberball for use with children from middle childhood as well as with adults. We therefore examined effects of cyberostracism among 8- to 9-year-olds, 13- to 14-year-olds, and introductory level undergraduate students aged around 20 years. Establishing the viability of the Cyberball paradigm across this age range offers a valuable tool for social developmental researchers. Traditional techniques for studying peer exclusion often rely on labour-intensive methods such as evaluation of peer networks and peer nomination techniques. As well taking substantial time, these approaches entail significant practical, ethical, confidentiality, and data protection hurdles. Moreover, these techniques are not very amenable to manipulating the source or form of exclusion. The Cyberball paradigm circumvents these problems, is convenient and engaging for the participants, and allows us to examine responses to ostracism without referring to pre-existing relationships.

We examine four theoretically driven questions. First, are the four need states threatened equally by ostracism among children, adolescents, and adults? This has not been tested before. Adult research often aggregates the four needs into a single index (e.g. van Beest & Williams, 2006), obscuring the possibility that each need is affected distinctively, and ignoring the original conceptual distinction among the needs (Williams *et al.*, 2000). Cyberostracism is likely to affect need states and mood among all three age groups, but we contend that different needs may be affected to different degrees during pre-adult development.

Children may experience stronger esteem need threat from peer ostracism than do adolescents and adults because children's self-esteem may be less stable and less well rooted in their other social relationships outside the context of the experiment. Children may also be more likely to interpret ostracism with uncertainty, indicating that they have done something wrong or made a mistake.

Prior research shows that early adolescents' affective responses to peer rejection are clearly negative (Reijntjes, Dekovic, Vermande, & Telch, 2007; Reijntjes, Stegge, Terwogt, Kamphuis, & Telch, 2006). It seems likely that adolescents aged 13-14 may find ostracism especially threatens their need to belong because they have a strong focus and dependency on peer acceptance (Harris, 1995; Valkenburg & Peter, 2007). Consistent with this idea, a recent study of cyberostracism effects among a small sample of female adolescents and students revealed that adolescents showed stronger affective reactions (Sebastian, Viding, Williams, & Blakemore, 2010). That study did not specifically compare differences in levels of threat to different needs, but the effect size of ostracism was highest for belonging need threat, in line with the present theorizing. Secondary schools in the UK place adolescents in multiple classes whose membership changes from lesson to lesson, depending on the subject matter. This may result in a less controllable or stable network of social relationships compared with primary schools (8- to 9-year-olds typically have remained with their classmates for all lessons throughout the preceding 4 years).

University students often have romantic partners, well-established ex-school peer networks, and opportunities to choose their group affiliations from a wide array. Thus, age differences can be expected in the need threats following ostracism.

A second new question is whether need threat depends on whether the person has previously been included. It is extremely surprising that this has not been explored systematically in the social psychological literature on ostracism. We expect that, in the absence of alternative inclusive relationships in a particular situation, ostracism during

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the first encounter with other people may most strongly threaten belonging needs. However, if inclusion has occurred first, ostracism may raise levels of uncertainty about what is happening, threatening meaning. We test these ideas by comparing responses when ostracism either precedes or follows inclusion – a distinctive feature of the present research. It is also conceivable that children, adolescents, and adults might respond differently to the sequence of ostracism versus inclusion. Although we do not have a strong developmental hypothesis regarding this issue, the present research will reveal whether there is an empirical basis for this possibility.

Third, we investigate how need threats relate to mood (specifically enjoyment). Although ostracism is an aversive experience, adult, and adolescent research shows no consistent connection between need threat and mood (Sebastian *et al.*, 2010; Williams, 2007). This could be attributable to the nature and timing of measurement or to participants' coping strategies. Adults may be able to enjoy themselves even when cyberostracized because they may treat it as 'just a game', and recognize that needs can be satisfied beyond the game. Thus, there could be a closer relationship between need threats and mood among younger than older participants.

A fourth question is whether ostracism from in-group and out-group members has similarly negative impacts on children and adolescents. Previous research on adults suggests that ostracism is equally painful regardless of whether is perpetrated by in-group or out-group members. We varied whether the game was played with females or with males. Younger children are known to show greater gender in-group preference than older children (Powlishta, Serbin, Doyle, & White, 1994; Verkuyten & Thijs, 2001). Thus, we might expect larger effects for same-gender ostracism among 8- to 9-year-olds than among adolescents and adults.

## Method

### *Participants*

Sixty-eight males and ninety-eight females participated, of whom 41 were 8- to 9-year-olds, 79 were 13- to 14-year-olds, and 46 were introductory psychology students (mean age = 20 years). Gender was balanced within the younger age groups. There were more females (34) than males (12) among the students. Participants completed the Cyberball game in a university or school computer room. Participants were ethnically homogeneous, White middle class from the south-east of England. For the 8- to 9-year-olds, the procedure was introduced verbally as well as on-screen so that the (female) experimenters could ensure children understood the instructions.<sup>1</sup>

### *Design and materials*

The design was 4 (needs) × 3 (trial: first inclusion, second inclusion, ostracism) × 3 (age group) × 2 (sequence of ostracism: first trial, second trial). Age group and sequence were between-participants factors with random assignment to condition. Needs and trial were within-participants factors. Additionally, gender of participant was treated as a factor and gender of excluder was varied with random assignment.

Williams *et al.*'s (2000) Cyberball game was redesigned for children as well as adults. Specifically, the original game is displayed in a small area of the computer screen which

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<sup>1</sup> Two children, four adolescents, and thirteen students were excluded from the study because of non-completion due to time constraints (lessons starting). Five students were excluded because they were more than 3SD above the age range.

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might have been difficult for some children to view. The new version is set in a larger format that fills the screen. The original presents amorphous figures to represent the players whereas in the new version the other players are depicted by their names to reduce children's possible inference that the other players are not real people (a question that arose during pilot work). The presentation of names also makes it easier to incorporate gender information about the other players unobtrusively and continuously while the game is played.

Participants were asked to sit silently at a computer, viewing a demonstration screen showing three players passing the ball to each other. Two players were positioned centre left and right hand, the third was positioned centre bottom of the screen. A yellow ball was ostensibly thrown between the players in a looping movement to mimic throwing. After a brief demonstration, participants were asked to enter their age in a box on screen and to check a box showing their gender. They were informed that they would be playing the game with two people who were using computers elsewhere. The left- and right-hand player's positions were populated with names (both male or both female), while the centre player was labelled 'YOU'. Participants were shown how to left-mouse-click the player to whom they intended to throw the ball. Having checked that they could operate this effectively, the game began.

Three rounds of the game (trials) were presented, in the sequence ostracism-inclusion-inclusion, or inclusion-ostracism-inclusion, ensuring that the experiment concluded with an inclusion experience. In line with the methods used by Williams and colleagues, trials involved 12 tosses of the ball among the three players. In inclusion trials, participants (and the other players) each received the ball four times evenly spread across the trial. In the ostracism trial, participants only received the ball one-sixth of the time (twice from each player) at the start of the trial, following which the other players only passed the ball to each other. At the end of each trial separate screens presented items for the manipulation check, a question about each of the four needs, and about their enjoyment. Response scales were depicted using icons rather than a numeric scale, because previous research established that iconic scales were understood easily by 8- to 9-year olds (e.g. Abrams *et al.*, 2009).

The manipulation check simply asked 'how much did they throw you the ball', where the icons ranged to denote *a lot* (1) to *not at all* (scored as 5). Following pilot work to ensure children could comprehend the measures, the remaining items were adapted from past research (van Beest & Williams, 2006; Zadro, Boland, & Richardson, 2006; Zadro *et al.*, 2004). Participants were asked how they felt during the game. As in Williams *et al.* (2000), each need was assessed using a single item, the order of which was randomized in each trial. Self-esteem was measured by the question 'I felt good about myself', belongingness was measured by the question 'I felt like the odd one out', control was measured by the question 'I felt in charge during the game' and meaningful existence was measured by the question 'I felt invisible'. Next, mood was measured with the item, 'I enjoyed playing the game'. Responses were made by selecting an icon that ranged from 1 (*very much*) to 5 (*very little*).<sup>2</sup>

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<sup>2</sup> *Enjoyment is not a pure measure of mood. However, comparable to Williams et al., in another data set involving children aged 8 (N = 81), we measured both sadness and enjoyment. Within inclusion and ostracism trials these were quite highly correlated (rs = .64 and .57, respectively) giving us good grounds for assuming the enjoyment measure partially taps mood more generally.*

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## Results

### **Overall effects of ostracism versus inclusion**

Table 1 shows that the manipulation of ostracism was effective. Participants experienced receiving the ball significantly less in the ostracism than the inclusion trials. All four needs states were higher, and mood was worse, following ostracism than inclusion. As hypothesized, these differences were significant within all three age groups. Overall, control need threat was significantly higher than all others ( $ps < .001$ ), esteem need threat was higher than threats to belonging and meaning ( $ps < .01$ ) and belonging and meaning need threat did not differ significantly. Because there were no differences between need threats on the two inclusion trials we averaged these for subsequent analyses. However, as a precaution, we also conducted analyses comparing the ostracism trials only with the inclusion trial that followed ostracism. These yielded precisely the same pattern of significant findings and are available on request from the first author.

### *Need threats*

We conducted a 4 (needs)  $\times$  2 (type of trial: inclusion vs. ostracism) within-participants, by 3 (age) by 2 (sequence: ostracism first, inclusion first) between-participants ANOVA. There were significant main effects of age,  $F(2, 160) = 5.15$ ,  $p < .01$ ,  $\eta^2 = .06$ , and sequence,  $F(1, 160) = 5.20$ ,  $p < .05$ ,  $\eta^2 = .03$  but not their interaction. There were significant main effects of trial,  $F(1, 480) = 305.03$ ,  $p < .001$ ,  $\eta^2 = .66$ , need,  $F(3, 480) = 37.87$ ,  $p < .001$ ,  $\eta^2 = .191$ , and their interaction,  $F(3, 480) = 14.14$ ,  $p < .001$ ,  $\eta^2 = .08$ . The trial by need interaction indicates that size of the effects of ostracism versus inclusion trials differed significantly depending on which need threat was measured. Specifically, ostracism increased esteem need threat less than belonging, meaning, or control, (all  $ps < .001$ ), but these three did not differ among themselves ( $ps > .60$ ).

Focal to our hypotheses are interactions involving trial and need either with age or sequence. Directly relevant to our hypotheses, both the trial by need by age, and trial by need by sequence, interactions were significant;  $F(6, 480) = 4.23$ ,  $p < .001$ ,  $\eta^2 = .050$ ,  $F(3, 480) = 6.13$ ,  $p < .001$ ,  $\eta^2 = .037$ , respectively. Separate analysis for each type of trial revealed that need interacted significantly with age and with sequence on the ostracism trials ( $ps < .01$ ), but only with age on the inclusion trial ( $p < .001$ ). All other effects, including the four-way interaction,  $F(6, 480) = 2.02$ ,  $p = .062$ ,  $\eta^2 = .025$ , were non-significant.

Given that inclusion versus ostracism trial comparisons are significant for all four need threats, the interactions involving trial are described here in terms of the size of increases in need threat and mood in responses to ostracism compared with the baseline of the participant's responses to inclusion. Scores on each measure (ostracism trial minus the mean of the two inclusion trials) can potentially range from  $-4$  to  $+4$ . A higher number indicates a higher level of need threat and less positive mood. Given statistical reservations about interpreting difference scores (i.e. that they do not take account of variations in the baseline position of the first score) we also regressed mean inclusion scores on to ostracism scores and then analysed the effects of independent variables on the residuals. This approach accounts statistically for the baseline differences in individuals' needs on the inclusion trials, and confirmed the need by sequence interaction,  $F(3, 480) = 5.54$ ,  $p < .001$ ,  $\eta^2 = .033$ , and the need by age interaction,  $F(6, 480) = 3.28$ ,  $p < .005$ ,  $\eta^2 = .039$ . Substantively, the same findings are

**Table 1.** Effects of trial type on perceptions of receiving the ball, four need threats and mood

Measure	Effect of trial		Ostracism <sup>b</sup>	Type of trial		
	$F(2, 312, df)^a$	Partial $\eta^2$		First inclusion	Second inclusion	Mean <sup>c</sup>
Manipulation check	185.45	.543	3.98 (1.08)	1.95 (1.12)	1.96 (1.18)	2.96 (0.73)
Need threats						
Esteem	52.25	.251	3.46 (1.30)	2.43 (1.30)	2.36 (1.25)	2.88 (0.95)
Belonging	131.23	.457	3.61 (1.38)	1.69 (1.12)	1.80 (1.25)	2.65 (0.90)
Meaning	127.88	.450	3.49 (1.42)	1.62 (1.13)	1.77 (1.25)	2.58 (0.92)
Control	118.49	.432	4.23 (1.12)	2.59 (1.35)	2.39 (1.28)	3.33 (0.81)
Mean	303.03	.656	3.68 (0.97)	2.07 (0.86)	2.08 (0.97)	2.86 (0.68)
Mood	47.06	.232	3.78 (1.34)	2.72 (1.59)	2.69 (1.44)	3.24 (1.06)

<sup>a</sup> All  $p < .001$ .<sup>b</sup> Ostracism mean differs significantly from both inclusion means ( $p < .001$ ).<sup>c</sup> Mean of ostracism trial score and the average of the two inclusion trials.

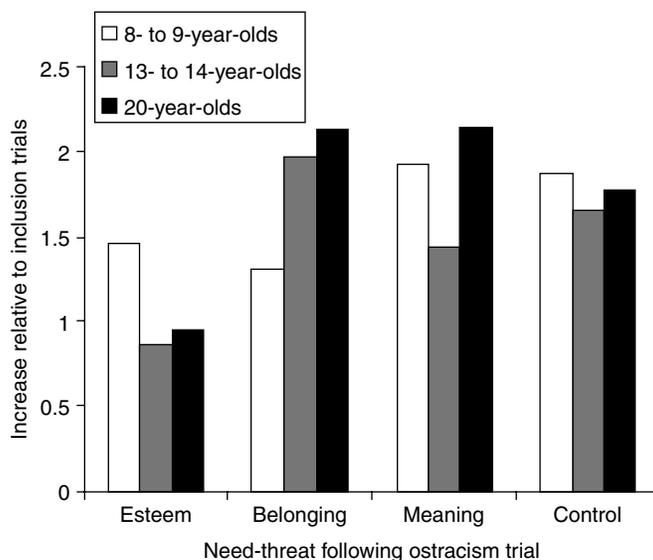
obtained when using inclusion trial responses as covariates and ostracism trial need threats as dependent variables. Details of these analyses and of the full four-way ANOVA table are available on request from the first author.

For the interaction between need threat and age, pairwise comparisons showed that esteem need threat was increased significantly more among 8- to 9-year-olds than among 13- to 14-year-olds ( $p < .05$ ) and marginally less than among adults ( $p < .10$ ). In contrast, belonging need threat was increased significantly less among 8- to 9-year-olds than either 13- to 14-year-olds or adults ( $p$ 's  $< .05$ ). Meaning need threat was increased significantly less among 13- to 14-year olds than adult participants ( $p < .05$ ), whereas control need threat was increased to a similar degree within all three age groups (see Figure 1).

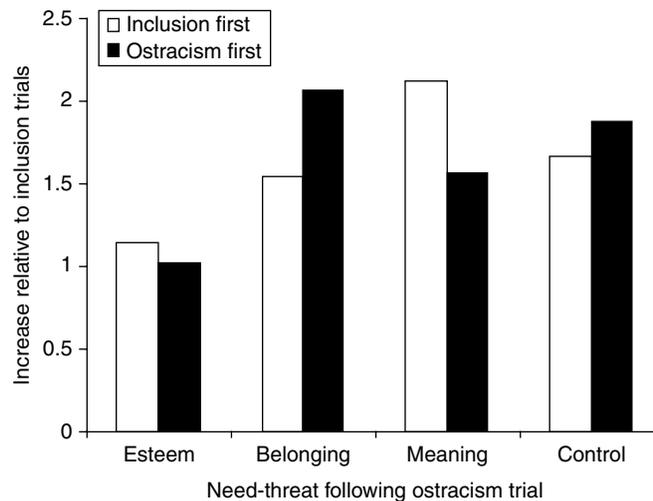
Comparing increases in need threat within age groups, among 8- to 9-year-olds esteem need threat increased marginally less than meaning or control ( $p < .10$ ) and belonging need threat was affected significantly less than either meaning or control ( $p < .05$ ), but did not differ from esteem.

Among the 13- to 14-year-olds and adults esteem need threat was affected significantly less than each of the other needs ( $p$ s  $< .01$ ). In addition, among 13- to 14-year-olds meaning need threat was affected less than belonging ( $p < .01$ ) but among adults there were no differences between belonging, meaning, and control need threats.

Next, we examined the interaction between need threat and sequence. This revealed significant effects of sequence on belonging,  $F(1, 160) = 4.49$ ,  $p < .05$ , partial  $\eta^2 = .027$ , and meaning,  $F(1, 160) = 4.56$ ,  $p < .05$ , partial  $\eta^2 = .028$ , but not esteem or control (see Figure 2). When ostracism preceded inclusion, belonging need threat increased the most (described as difference scores,  $M = 2.07$ ,  $SD = 1.48$ ). Pairwise comparisons also showed that meaning need threat increased significantly less ( $M = 1.56$ ,  $SD = 1.61$ ) than belonging ( $p < .01$ ). However when ostracism followed inclusion, meaning need threat increased most strongly ( $M = 2.12$ ,  $SD = 1.68$ ), and significantly more than each of the other needs (all  $M$ s  $< 1.66$ ,  $SD$ s  $< 1.68$ ;  $p$ s  $< .01$ ).



**Figure 1.** Increase in need threat following ostracism, as a function of participants' age group.



**Figure 2.** Increase in need threat following ostracism, as a function of whether participants are ostracized before or after being included.

#### Mood

Change in mood was also analysed using an age by sequence ANOVA but this revealed no significant effects of either factor ( $F_s < 1.20$ ,  $p_s > .30$ ). In sum, whereas different needs are threatened differently by the sequence of ostracism and within different age groups, change in mood is not affected by these variables.

Because ostracism affected needs differently among participants of different ages, we decided to explore potential age differences in the relationship between the need threats and mood (cf. Williams *et al.*, 2000).<sup>3</sup> Within each age group, we regressed change in need threat following ostracism (vs. inclusion) on to the change in mood. As a precaution, we also verified that the same results were obtained when we used inclusion trial need threats as covariates and ostracism trial need threats as independent variables, or when we used residual ostracism trial scores as independent variables. Among 8- to 9-year-olds, the four need threats together significantly predicted lowered mood,  $R^2 = .23$ ,  $F(4, 161) = 2.69$ ,  $p < .05$ . However, only meaning was a significant individual predictor ( $\beta = 0.43$ ,  $t = 2.25$ ,  $p < .05$ ). Among 13- to 14-year olds the need threats also significantly predicted mood,  $R^2 = .32$ ,  $F(4, 74) = 8.33$ ,  $p < .001$ . Both esteem ( $\beta = 0.29$ ,  $t = 2.37$ ,  $p < .05$ ) and meaning ( $\beta = 0.43$ ,  $t = 3.85$ ,  $p < .001$ ) were significant individual predictors. However, among adults the overall regression model was non-significant,  $R^2 = .15$ ,  $F(4, 41) = 1.82$ , ns.

#### In-group versus out-group ostracism

Analysis of the effect of sex of participant and the sex of the other players revealed only a sex by need interaction,  $F(3, 462) = 2.98$ ,  $p < .05$ , partial  $\eta^2 = .021$ . Males showed greater change in self-esteem need threat ( $M = 1.34$ ,  $SD = 1.47$ ) than did females ( $M = 0.82$ ,  $SD = 1.0$ ), whereas all other needs were affected similarly. There were no

<sup>3</sup> Zero-order correlations among need states were all positive and significant but below  $r = .45$ . There was no sign of multicollinearity in any of the regression analyses. All tolerances  $> .50$  and VIF  $< 2.0$ .

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significant effects of the relative gender of the other players or the interaction between sex of players and sex or age of participant. There were no effects of sex or other player's sex on change in mood following ostracism.

## Discussion

The present research set out to establish for the first time whether a version of Cyberball can be used effectively with children and adolescents as well as adults. It tested, (i) whether there are age differences in the impact of ostracism on different needs, (ii) whether the sequence of ostracism threatens needs differently, (iii) whether need threats relate to mood differently among different age groups, and (iv) whether gender of ostracizer makes a difference. The answers to all but the last question are affirmative.

Participants of all ages responded to ostracism by showing substantial increases in the four need threats and lowered mood. There is considerable value in establishing an easily adaptable paradigm suitable for children and adults, both in terms of measurement and procedure. For example, differences in method and measurement have dogged the interpretation of social developmental studies of intergroup attitudes and exclusion (Bennett & Sani, 2004; Levy & Killen, 2008; Quintana & McKown, 2008; Rutland, Cameron, Milne, & McGeorge, 2005). In the present research, no participants had difficulties with the procedure or expressed any concerns about the response formats. The paradigm is also efficient in terms of participants' time and potential disruption to schools, as compared with more intensive methods needed to study pre-existing peer exclusion via peer nomination techniques and interviews.

This is among the first studies of ostracism to evaluate *changes* in need states between inclusion and ostracism trials as a within-participant variable (cf. Eisenberger, Lieberman, & Williams, 2003; Zadro *et al.*, 2004). This methodology adds considerable control and precision to the evaluation of the impact of ostracism on individuals.

From the point of view of meeting ethical requirements for studying peer exclusion with children, the results show this paradigm is safe because children's as well as adults' need levels return to baseline after they have experienced an inclusion trial. Moreover, because the exclusion does not involve direct interactions with real people the procedure does not affect or imperil any existing relationships the children might have. These features are important for reassuring Institutional Review Board panels that the procedure does not cause any psychological harm.

This research also yielded important and interesting findings that bear on theories about social exclusion. First, it has extended cyberostracism evidence to adolescence and childhood, supporting the generality of Williams's (2007) model. That ostracism affects all four needs, even from the age of 8 years, seems consistent with the idea that signals of social exclusion may have powerful evolutionary origins (Kerr & Levine, 2008; Kurzban & Leary, 2001). Further research is required to investigate the development of children's sensitivity to ostracism cues and whether some needs are activated earlier in childhood than others. It would be worthwhile to extend the paradigm for earlier childhood and pre-literate children, though this will require non-verbal measures that can differentiate among the four needs and be administered with sufficient immediacy.

Williams' theory and evidence from adults suggested that none of the four needs should take priority reflexively, or be affected differently by ostracism. This may need to be revisited in the light of this new developmental evidence showing that there are meaningful age differences in responses to cyberostracism. Esteem was generally

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affected less than other needs. Moreover, the impact of ostracism on esteem was relatively greater among 8- to 9-year-olds than other age groups. This suggests that adolescents and adults have established better buffers against short-term threats to self-esteem, perhaps through their larger number of established social relationships (see Leary *et al.*'s (1995) idea that self-esteem acts as a general gauge of one's overall level of social acceptance). Conversely, the fact that belonging was affected particularly strongly among 13- to 14-year-olds suggests that adolescents may place a higher value on short-term inclusion in peer networks than do either younger children or adults (Harris, 1995; Killen & Stangor, 2001).

A further discovery from the present research is that the *sequence* of ostracism affects primary needs differently. Being ostracized from the outset highlights belongingness, whereas ostracism that follows inclusion highlights meaning, perhaps because it raises uncertainty and search for reasons for the ostracism. These different reactions suggest that different coping responses are likely to follow – efforts to be included when ostracism is immediate, but efforts to find a reason for ostracism if it happens after inclusion.

Mood was depressed by ostracism, regardless of the sequence of ostracism or age of participant. However, in line with the idea that different needs may be focal at different ages, the need threats related differently to mood among the three age groups. Need threat predicted a substantial amount of variance in mood among children and adolescents, but this was primarily associated with meaning or esteem threat rather than belonging or control threat. Although van Beest and Williams (2006) found cyberostracism effects on mood were mediated by esteem and belonging threat, in the present research adults' need threat did not relate reliably to mood even though both sets of variables were strongly affected by ostracism. This seems consistent with the idea that adults may be able to distinguish between their enjoyment of the game and the need states aroused by the game, whereas making this distinction is more difficult for children and adolescents (Durkin & Barber, 2002; Yan, 2005).

The present evidence consolidates the, perhaps surprising, conclusion that ostracism has similarly negative impact regardless of whether it is from an in-group or out-group (cf. Gonsolcorale & Williams, 2007). We had expected children to be more affected by gender in-group ostracism because children tend to have stronger gender in-group biases, and hence prioritize inclusion by their gender in-group (see Killen & Stangor, 2001). The absence of intergroup effects in the present research suggests that differential sensitivity to ostracism may be more likely when the excluders are known members of a specific gender in-group (e.g. same-gender peers in a classroom) than when they are anonymous members of one's gender category.

The present research has some limitations. It would be ideal to have more extensive measures of the need threats, and to employ non-self-report measures. It would also be interesting to explore behavioural responses in the reflective stage following ostracism. The ethical requirements of ensuring all participants were included at the end of the experiment, and the time and physical constraints of the testing context meant that it would have been difficult, and perhaps premature, to pursue these avenues. However, we are reassured that the already extensive volume of research on ostracism and cyberostracism indicates fairly clearly how the proxy self-report measures of need threat are likely to relate to other types of measures and outcome (Williams, 2007).

In conclusion, cyberostracism powerfully threatens the primary needs and the mood state of children and adolescents as well as adults. However, their needs may be threatened differently. Children may find that ostracism especially threatens self-esteem

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needs, whereas adolescents may experience greater threat to belongingness needs. In practical terms, it is valuable to know that an inclusion experience can quickly restore the needs of children, adolescents, and adults to baseline levels (cf. Zadro *et al.*, 2004).

Further research is needed to establish whether, among children, the inclusion experience has to involve the original ostracizers or whether inclusion by an alternative set of people is sufficient to restore these needs. There may be important differences that depend both on developmental and social contextual factors. For example, the size of the person's potential social network may have an impact on whether it is important to be included by the ostracizers or sufficient to be included by others. If a person has access to a large network (e.g. as a university student), it may be relatively easy to meet needs following ostracism by pursuing inclusive relationships with other individuals or groups. In childhood, social networks may be more constrained and so it may be more critical to regain acceptance from the original ostracizers. It is also conceivable that when people move into middle and later adulthood their social networks become more constrained again, friendships are more stable and consolidated, but are also more limited by specific roles and working environments. The present research contributes to both social and developmental psychology, showing that ostracism can affect the needs of people from as young as 8 to over 20 years of age, but may do so differently. Using the Cyberball paradigm, suitably adapted, future research can now pursue further questions regarding how people respond dynamically to ostracism as function of their social development and social context.

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