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Too cynical to reconnect: Cynicism moderates the effect of social exclusion on prosociality through empathy

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Abstract: Extant findings are mixed on whether social exclusion impacts prosociality. We propose one factor that may underlie the mixed results: Cynicism. Specifically, cynicism may moderate the exclusion-prosociality link by influencing interpersonal empathy. Compared to less cynical individuals, we expected highly cynical individuals who were excluded to experience less empathy and, consequently, less prosocial behavior. Using an online balltossing game, participants were randomly assigned to an exclusion or inclusion condition. Consistent with our predictions, the effect of social exclusion on prosociality through empathy was contingent on cynicism, such that only less-cynical individuals responded to exclusion with greater empathy, which, in turn, was associated with higher levels of prosocial behavior. We further showed this effect to hold for cynicism, but not other similar traits typically characterized by high disagreeableness. Findings contribute to the social exclusion literature by suggesting a key variable that may moderate social exclusion?s impact on resultant empathy and prosocial behavior and are consistent with the perspective that people who are excluded try to not only become included again but to establish alliances characterized by reciprocity.

Keywords: Social exclusion, Cynicism, Prosocial behavior, Empathy, Reciprocity

1. Introduction

Being excluded, rejected, or ostracized by others—the hallmarks of social exclusion—hurts. By threatening one's fundamental psychological needs (e.g., need for belonging), social exclusion triggers feelings of distress and pain. Beyond directly inducing such unpleasant states, social exclusion also leads to various psychological consequences in areas such as cognitive functioning and self-regulation (Williams, 2007).

Although social exclusion has been shown to lead to various negative outcomes, exclusion may nonetheless prompt positive responses, such as prosociality—behaviors that benefit another individual or a group (Telle & Pfister, 2016; van Lange, 2008). However, past findings on the effects of social exclusion on prosocial behavior have been decidedly mixed (e.g., DeWall & Baumeister, 2006; Lee & Shrum, 2012; Twenge, Baumeister, DeWall, Ciarocco, & Bartels, 2007; see Ferris, Chen, & Lim, 2017). On the one hand, some findings indicate that social exclusion can reduce prosocial orientation by inhibiting one's emotional capacities. Specifically, the blow to psychological well-being that social exclusion delivers is so powerful that it can trigger a shutdown of one's emotional capacities, thereby preventing an excluded individual from experiencing further social pain (DeWall & Baumeister, 2006); in turn, when one becomes emotionally numb, their capacity for behaving in a prosocial manner is inhibited (Twenge et al., 2007). On the other hand, some research suggests that social exclusion can activate a prosocial orientation. In particular, when excluded, individuals take a psychological hit and are motivated to restore their sense of security; from this perspective, a prosocial orientation motivates behaviors that help restore one's threatened inclusionary status and sense of connectedness (Williams, 2007).

Furthermore, both personal and situational factors seem to modulate an individual's reaction(s) to social exclusion. For instance, individuals who score higher (compared to lower) on trait openness also behave more prosocially in response to social exclusion, potentially because such individuals more frequently attempt to take their excluders' perspectives (Coyne, Gundersen, Nelson, & Stockdale, 2011). As another example, excluded individuals behave less prosocially towards those with whom future interactions are deemed unlikely (Balliet & Ferris, 2013; Maner, DeWall, Baumeister, & Schaller, 2007). This latter finding

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suggests that reactions to social exclusion are motivated by aims to establish reciprocal alliances (Simpson & Beckes, 2010; Trivers, 1971)—especially when the likelihood of reciprocity is perceived as high—which may be an adaptive response to being cut off from a group (see Wesselmann, Ren, & Williams, 2015).

To make sense of these varied findings, it is instructive to consider the key role that empathy may play. Empathy is defined as the ability to understand and share the emotions of others and is a key antecedent of cooperative and prosocial behaviors (Telle & Pfister, 2016; van Lange, 2008). As such, feeling empathy in response to exclusion may facilitate prosocial behavior, which opens up reciprocal alliances and helps restore social connectedness. Importantly, though, not everyone who is excluded may experience empathy and thus, not all excluded individuals will behave prosocially.

1.1. The moderating role of cynicism

In particular, cynical individuals have negative generalized beliefs (or a worldview) that others are fundamentally self-interested and morally bankrupt. Believing that others will further their self-interest by any means necessary, highly cynical individuals are typically distrusting and suspicious, and tend to view others as having malicious and selfish intentions even when none exist (Singelis, Hubbard, Her, & An, 2003; Stavrova & Ehlebracht, 2016; Stavrova, Ehlebracht, & Vohs, 2020). Because their perception of a dog-eat-dog world shapes a view that the concerns and emotions of others are ingenuine (Kaplan, Bradley, & Ruscher, 2004; Leung et al., 2002), highly cynical individuals tend to be less empathic (e.g., Dinca & Iliescu, 2009). Moreover, these perceptions of others as self-interested and untrustworthy and of themselves as vulnerable to exploitation (Stavrova & Ehlebracht, 2016) likely engender a belief that attempts to (re)establish reciprocal alliances are detrimental to their own welfare (Axelrod, 1984). Thus, cynicism seems to shape a sense of distrust that inhibits one's faith in, and desire to understand, the perspectives and intentions of others. Accordingly, we reason that, among excluded individuals, cynicism may shape a perception of reconnection as unlikely, potentially leading highly cynical individuals who are socially excluded to respond with muted (or even decreased) levels of empathy and, hence, less prosocial behaviors.

1.2. The current study

The current study examines the role of empathy as a mediator of the effect of social exclusion on prosocial behavior, and how this process is moderated by cynicism. When individuals are socially included, cynicism is not expected to affect their empathy and prosociality. When socially excluded, however, individuals who are high versus low on cynicism are expected to differ in their responses. Specifically, when excluded, less cynical individuals will experience greater levels of empathy towards others than will highly cynical individuals. In turn, lower levels of empathy from highly cynical individuals will lead to lower levels of prosocial behavior from these individuals versus less cynical individuals. Conceptually, we theorize a first-stage moderation model (Edwards & Lambert, 2007; see Fig. 1).

Notably, cynicism is one of several traits—including Machiavellianism, psychopathy, and social dominance orientation (SDO)—characterized by disagreeableness. Machiavellians are often characterized as cold, manipulative strategists, while psychopathic individuals are distinguished by their callousness and lack of concern for others (Paulhus, 2014); in contrast, high-SDO individuals view the world as competitive in nature, and the lack of egalitarianism and hierarchy in society as natural and preferable (Ho et al., 2015). To examine discriminant validity for cynicism's hypothesized role in the moderation of social exclusion, we conducted ancillary analyses by measuring and comparing the influence of these variables in our hypothesized model.

2. Method

2.1. Participants

Undergraduate participants (N = 232, 30.6% men; M_{age} = 21.3 years, SD_{age} = 1.7 years; 82.8% Chinese, 8.6% Indian, 2.6% Malay, 6.0% Others) from a public university in Singapore completed an online study for either course credits or SGD5 (≈USD3.6). We recruited as many participants as possible for two academic terms. We aimed to collect at least 200 participants. This sample size was to detect the key interaction between exclusion and cynicism on empathy in multiple regression with 80% power for a small to medium effect size (f^2 = 0.04; α = 0.05).

2.2. Procedure and measures

2.2.1. Cynicism

Our key moderator of interest, cynicism, was assessed as a composite score of the eight-item cynical distrust scale (e.g., Most people make friends because friends are likely to be useful to them), which was originally a subset of Cook and Medley's (1954) 50-item hostility scale that measured aspects of hostility such as cynicism, aggressive behavior, and open hostility. Compared to the full 50-item scalethe cynical distrust scale provides a cleaner measure of cynicism that does not capture unrelated aspects of social behavior (e.g., aggressive behavior; see Greenglass & Julkunen, 1989). Such an approach views cynical distrust and cynicism as interchangeable and is consistent with conceptualizations of cynicism as an attitude towards one's social environment (Stavrova et al., 2020). Cynicism was measured pre-manipulation on a five-point scale (*strongly disagree* to *strongly agree*), α = 0.76.

2.2.2. Ancillary moderator variables

Thereafter, participants completed measures for the three constructs that we posited as plausible replacements for cynicism. These included Machiavellianism, assessed as a composite score of the four-item subscale (e.g., I tend to exploit others towards my own end) in the Dirty

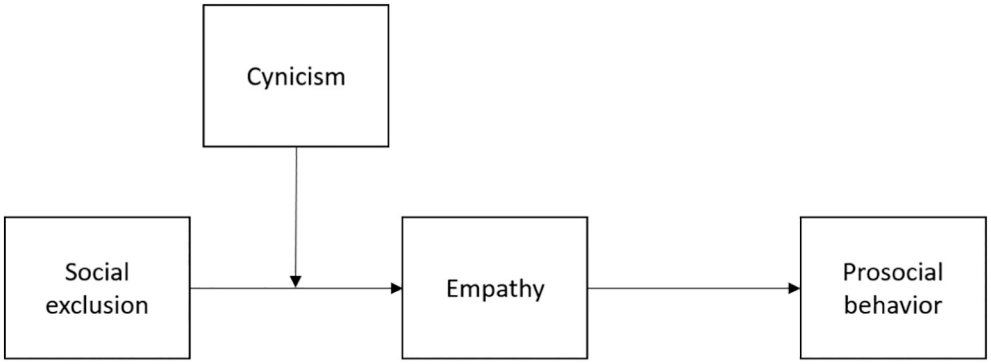

Fig. 1. Conceptual diagram of the theorized first-stage moderation model.

Dozen dark triad scale (Jonason & Webster, 2010), measured on a nine-point scale (*strongly disagree* to *strongly agree*), α = 0.84; psychopathy, assessed as a composite score of the four-item subscale (e.g., I tend to be callous or insensitive) in the Dirty Dozen scale, measured on a nine-point scale (*strongly disagree* to *strongly agree*), α = 0.81; the dominance and egalitarianism facets of the Social Dominance Orientation, both assessed as a composite score of their corresponding four-item subscales in the short-form SDO_7 scale (Ho et al., 2015), (for dominance, e.g., "An ideal society requires some groups to be on top and others to be on the bottom", α = 0.60; for egalitarianism, e.g., "Group equality should not be out primary goal", α = 0.61), measured on a seven-point scale (*strongly oppose* to *strongly favor*). Items were reverse coded where required.

2.2.3. Social exclusion manipulation

For the social exclusion (vs. inclusion) manipulation, participants played an online ball-tossing game called Cyberball (Williams & Jarvis, 2006) with two other players. Participants could throw the ball to anyone else and were told that other players could do the same. In reality, the "other players" were controlled by a preset computer algorithm, where all sessions lasted for 30 throws. In the exclusion condition, participants received two throws (around 7% of 30 available throws) at the beginning of the game, after which other "players" stopped throwing to the participant. In the inclusion condition, participants roughly received 10 throws (one-third of 30 available throws) throughout. As a manipulation check, participants estimated the proportion of throws they received, and rated the extent to which they felt excluded on a five-point scale (*not at all* to *very much so*). Afterwards, participants completed the 12-item need-threat scale (Jamieson, Harkins, & Williams, 2010), which measures participants' perceived threat to their fundamental needs, including control (e.g., I felt somewhat frustrated during the Cyberball game, α = 0.72), self-esteem (e.g., I felt somewhat inadequate during the Cyberball game, α = 0.74), belonging (e.g., I felt poorly accepted by the other participants, α = 0.72), and meaningful existence (e.g., I felt non-existent during the Cyberball game, α = 0.63) on a nine-point scale (*not at all* to *very much so*).

2.2.4. Empathy and prosocial behavior

Post-manipulation, empathy and prosocial behavior were measured. Participants were told that as bonus compensation, two selected winners would receive $10 and they had been randomly-selected as a *decider* who decides how to distribute 10 raffle tickets between themselves and the next participant, who would start out with zero tickets. Every ticket equated to one chance at winning one of two $10 prizes (e.g., Feinberg, Willer, & Keltner, 2012). Empathy was assessed with a composite score of participants' compassion, sympathy, empathy, sadness, and concern towards the *next* participant (e.g., to what extent are you currently feeling compassion for the next participant?), measured on a seven-point scale (*not at all* to *extremely*), α = 0.89. Prosocial behavior was measured by the number of tickets (0–10) distributed to the next participant; a higher number of distributed tickets indicated a greater display of prosociality.

3. Results

Participants assigned to the inclusion ($M = 3.23$, $SD = 0.68$) and exclusion ($M = 3.29$, $SD = 0.62$) conditions reported similar cynicism scores, $t(230) = -0.68$, $p = .500$, 95% CI [−0.23, 0.11]. Consistent with our manipulation, included participants estimated receiving a significantly higher proportion of throws (35.97% of throws) than excluded participants did (8.37% of throws), $t(181) = 23.21$, $p < .001$, 95% CI [25.26, 29.95]. Compared to included participants (2.61), excluded participants (4.46) also reported a greater sense of exclusion, $t(229) = 13.63$, $p < .001$, 95% CI [−2.12, −1.58]. Excluded participants also reported greater threats to measures of all four fundamental needs (i.e., control, self-esteem, belonging, and meaningful existence) than included participants did (all ts > 8.28, all ps < 0.001). Key to our main hypothesis, cynicism did not moderate the effect of exclusion on perceived threat to any fundamental need, or their composite score (for all interaction terms, Bs < 0.59, SEs < 0.34, $p > .068$). Thus, social exclusion increased threats to fundamental needs to the same degree, regardless of cynicism scores. We also examined the indirect effect of social exclusion on prosociality through empathy—the indirect effect was not significant, $B = 0.10$, $SE = 0.10$, 95% CI [−0.10, 0.31].

3.1. Cynicism as moderator

Table 1 reports the regression coefficients and 95% confidence intervals (CI) of the analyses here. First, we tested our hypothesized first-stage moderation model (Fig. 1) using the SPSS PROCESS macro (model 7; Hayes, 2018). Consistent with the model, there was a significant interaction between the independent variable (exclusion) and moderator (cynicism) on our proposed mediator (empathy), $B = -0.66$, $SE = 0.31$, $p = .032$, 95% CI [−1.26, −0.06] (see Table 1, Model a). When socially included, there was no difference in empathy between less-cynical and more-cynical individuals, $B = 0.18$, $SE = 0.21$, $p = .390$, 95% CI [−0.23, 0.59] (see Fig. 2). However, when socially excluded, less-cynical individuals reported greater empathy than more-cynical individuals, $B = -0.48$, $SE = 0.23$, $p = .034$, 95% CI [−0.92, −0.04].

Table 1
Regression analyses for hypothesized first-stage moderation model.

Outcome	Model a	Model b	Model c
	Empathy	Prosociality	Prosociality
Predictors			
Constant	3.79 (0.10)*** [3.60, 3.99]	1.76 (0.29)*** [1.19, 2.32]	3.69 (0.12)*** [3.46, 3.93]
Exclusion	0.21 (0.20) [−0.18, 0.60]	−0.18 (0.21) [−0.59, 0.24]	−0.07 (0.24) [−0.53, 0.40]
Cynicism	−0.15 (0.15) [−0.46, 0.15]		−0.08 (0.18) [−0.44, 0.28]
Exclusion × Cynicism	−0.66 (0.31)* [−1.26, −0.06]		−0.07 (0.36) [−0.79, 0.65]
Empathy		0.51 (0.07)*** [0.37, 0.65]	
R^2	0.02	0.19	0.00
F	4.64	26.75	0.03
Indirect effect		0.10 (0.10) [−0.10, 0.31]	
Conditional effects of	Exclusion on Empathy at	Exclusion on prosociality mediated through Empathy at	
Low Cynicism	0.64 (0.28)* [0.08, 1.19]	0.33 (0.14) [0.05, 0.63]	
Mean Cynicism	0.21 (0.20) [−0.18, 0.60]	0.11 (0.10) [−0.09, 0.32]	
High Cynicism	−0.22 (0.28) [−0.77, 0.33]	−0.11 (0.17) [−0.46, 0.20]	

Note. Unstandardized regression coefficients are reported with SEs in parentheses and 95% CI in square brackets. All indirect effect SEs and 95% CIs were computed with 10,000 bootstrapped sampling iterations.
* $p < .05$.
*** $p < .001$.

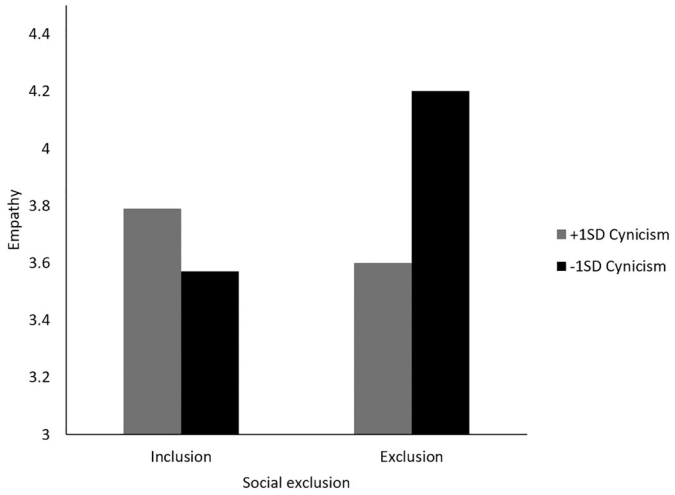

Fig. 2. Empathy predicted by social exclusion and cynicism.

Viewed differently, social exclusion predicted greater empathy for less-cynical (−1 SD below the mean), $B = 0.64$, $SE = 0.28$, $p = .024$, 95% CI [0.08, 1.19], but not for more-cynical individuals (+1 SD above the mean) ($p = .433$).

Our proposed mediator (empathy) in turn significantly predicted the dependent measure (prosocial behavior) (see Table 1, Model b). Consistent with our model, empathy positively predicted prosocial behavior, $B = 0.51$ $SE = 0.07$, $p < .001$, 95% CI [0.37, 0.65]. Together, the moderated mediation index was significant, $B = -0.34$, $SE = 0.18$, 95% CI [−0.71, −0.02]. We examined the mediating relationship between exclusion and prosocial behavior via empathy at different levels of cynicism (i.e., conditional indirect effects). Exclusion impacted prosocial behavior through empathy for less-cynical individuals, $B = 0.32$, $SE = 0.14$, 95% CI [0.05, 0.63] but not more-cynical individuals, $B = -0.11$, $SE = 0.17$, 95% CI [−0.46, 0.20]. In other words, when excluded, only less-cynical individuals experienced higher levels of empathy, which, in turn, led to greater prosocial behavior (see Supplementary materials for exploratory analyses on the moderation of cynicism on the relationship between empathy and prosocial behavior).

Using the SPSS PROCESS macro (model 1; Hayes, 2018), we also explored the interaction between our independent variable (social exclusion) and moderator (cynicism) on the dependent variable (prosocial behavior). The interaction was not significant, $B = -0.07$, $SE = 0.36$, $p = .853$, 95% CI [−0.79, 0.65] (see Table 1, Model c). Thus, cynicism did not directly moderate the effect of social exclusion on prosocial behavior. We discuss this lack of a significant interaction in the Discussion section.

3.2. Ancillary analyses

We then ran four sets of analyses, replacing cynicism with each of our identified alternative moderator in turn. In contrast to cynicism, there was little support that any of the proposed alternative moderators fit our hypothesized model.

We first examined the interaction between the independent variable (exclusion) and each alternative moderator on our proposed mediator (empathy). No significant interactions were yielded ($-0.25 \leq Bs \leq 0.05$; all $ps > 0.297$). We also examined the interaction between exclusion and each alternative moderator on the dependent variable, prosocial behavior. No significant interactions were found ($-0.14 \leq Bs \leq 0.26$; all $ps > 0.053$). Finally, none of the moderated mediation indices were significant (95% confidence intervals for all indices bounded zero) when alternative moderators were included in replacement of cynicism (see Supplementary materials for full statistics). Thus, when cynicism was replaced by each alternative moderator, the hypothesized model no longer held.

4. Discussion

Previous findings suggested that social exclusion may both promote and inhibit prosociality. Our findings highlight the role of empathy as a mediator of this process as well as that of cynicism in modulating empathic responses to exclusion. When socially included, individuals reported the same level of empathy regardless of their cynicism. In contrast, when excluded (versus included), only individuals low on cynicism indicated greater empathic responses, which then led to greater prosociality. For individuals high on cynicism, being excluded did not influence the levels of empathy and in turn, did not affect their prosociality. Additionally, Machiavellianism, psychopathy, and SDO—traits apparently related to cynicism—did not play significant moderating roles in the hypothesized model.

Consistent with the existing social exclusion literature, we found that being excluded imposed significant costs on one's fundamental psychological needs (Williams, 2007). Cynicism scores did not moderate the influence of exclusion on perceptions of threats to fundamental needs (i.e., both less- and more-cynical individuals equally perceived exclusion-induced threats). Importantly, however, the reactions to social exclusion differed according to people's cynicism. These findings align with evidence elsewhere that responses to social exclusion are dependent on individual difference factors (e.g., Coyne et al., 2011).

4.1. Implications and future directions

Additionally, together with previous studies, the findings further support arguments that behaviors aimed at regaining inclusion—such as prosociality—are contingent on the likelihood of such actions successfully generating social reconnection (Maner et al., 2007; Williams & Nida, 2011). Indeed, a key reason why excluded individuals seek re-inclusion may be to establish reciprocal-exchange relations, as being excluded from reciprocal relations may have been disastrous for survival in ancestral times (Simpson & Beckes, 2010). Along these lines, highly-cynical individuals may expect the probability of regaining inclusion and establishing reciprocal relations to be low—and the possibility of incurring further losses to be high—and hence choose not to behave prosocially. Ironically, the lack of prosociality may often beget less prosociality from others, inadvertently trapping cynics in a vicious cycle bereft of prosociality and reciprocity (Stavrova et al., 2020). More broadly, a fruitful avenue of future research will be to examine the boundary conditions of highly cynical individuals' reactions to social exclusion; for instance, when are they likely to behave more versus less prosocially, antisocially, or even retaliatorily?

Relatedly, it is worth noting that we examined empathy towards strangers with whom participants would not expect future interactions. It is a situation when prosociality is less likely to be observed in general given that there is no chance for reciprocity (Maner et al., 2007). Our finding that even in such a situation, less-cynical individuals showed increased empathy after exclusion suggests that empathy and prosociality in response to exclusion do not occur solely based on the likelihood of reciprocity in a given situation, but can occur based on general beliefs regarding reciprocity associated with their worldview. Future work is needed to examine how the individual difference by cynicism found in the current study manifests in a social situation in which the chance of forming reciprocal relationships with others is offered.

While others have proposed that empathy may be reflexively inhibited upon exclusion (DeWall & Baumeister, 2006; Twenge et al., 2007), our findings indicate that this process of inhibition—at least for empathy—may be more flexible than previously thought. If reflexive, individuals would have shown a similar level of empathy regardless of cynicism. That highly- and less-cynical individuals displayed different levels of empathy indicates that some other processes are in play. Our interpretation is that the process through which empathy is exhibited or inhibited may depend on one's appraisals of the physical and social situation.

Importantly, unlike cynicism, other similarly disagreeable dispositional traits such as Machiavellianism, psychopathy, and SDO did not modulate the empathy-mediated link between social exclusion and prosociality. This suggests that cynicism is conceptually different from other traits of a seemingly negative nature. Indeed, whereas cynics may hold a negative view of the intentions of others around them, Machiavellians are characterized by a negative view of others' competence and a pragmatic and strategic approach to social interactions (Jones, 2016). Similarly, whereas cynics view others' emotions as ingenuine, psychopathic individuals are further distinguished by their high levels of callousness and impulsivity (Paulhus, 2014). Likewise, whereas cynics may view the world as inherently competitive, they may not display the same preference for hierarchy that high-SDO individuals do (Ho et al., 2015). Thus, despite the similarities between these traits, our findings affirm their substantive differences from cynicism.

Indeed, these differences are consistent with the Dark Triad traits (and social dominance) reflecting an exploitative social strategy (Jonason, Li, Webster, & Schmitt, 2009) whereas cynicism's main function may be to protect individuals *from* such exploitation. An idea for future research to clarify cynicism's function and relation to empathy and cooperation is to examine social interactions between individuals differing in cynicism and those differing on exploitative traits by using an iterated economic game (prisoner's dilemma). Across time, highly cynical individuals (via their empathic responses or lack thereof) may perform equally as well as less cynical individuals when facing cooperative partners and worse when facing partners who defect but resume cooperation, but better than less cynical individuals against consistently exploitative individuals.

While a direct moderation by cynicism of social exclusion's effect on prosociality was not the focus of our model per se, it may nonetheless have been reasonable to expect it. After all, if highly-cynical people experience higher levels of distrust and lower levels of reconnection desires than less-cynical people after being excluded, then cynicism may directly lead to lower prosociality regardless of what mechanism is involved. While our study found no evidence of a direct moderating effect of cynicism, this may reflect the inherent complexity of prosocial behavior as a decision-making process. For instance, other mediating mechanisms that were unaccounted for in the current analyses may have suppressed the direct moderating effect (Rucker, Preacher, Tormala, & Petty, 2011). Identification and testing of other candidate mechanisms can clarify the conceptual linkages between social exclusion and prosociality. Relatedly, well-powered studies that experimentally induce in participants high or low levels of cynical beliefs can simultaneously induce larger interaction and simple effects that emerge despite the presence of suppressing factors, while providing causal evidence on the moderating role of cynicism. Furthermore, including control conditions will help identify whether the moderating effect of cynicism is driven by increased or decreased cynicism, or both.

Future research can examine the generalizability of the reported findings. As shown here, cynicism suppresses empathic responding; hence, while we report an overall null effect of social exclusion on empathy and prosociality consistent with overall pattern of mixed findings, we expect that in samples where general levels of cynicism are lower (higher), there may be a stronger positive (negative) relationship between exclusion and empathy or prosociality. Cross-cultural studies may provide a suitable test of such a possibility (e.g., Stavrova & Ehlebracht, 2016). Finally, although we had no theoretical reasons to expect gender differences in the substantive findings (and, indeed, found no evidence for it), the gender imbalance of our sample may nonetheless reduce the generalizability of findings; future research should employ more gender-balanced samples.

4.2. Conclusion

Our research highlights the role that both empathy and cynicism play in people behaving prosocially in response to social exclusion. Cynicism may be a key factor in determining the extent to which people experience empathy and help others when social interactions fail. For cynics, their negative worldview may protect themselves from exploitation but may also limit their chances of regaining lost social connections and establishing reciprocal relations, inadvertently perpetuating an experience of the world as being filled with malice and deprived of kindness.

CRediT authorship contribution statement

Bryan K.C. Choy: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data curation, Writing – original draft. **Kimin Eom:** Conceptualization, Methodology, Validation, Formal analysis, Writing – review & editing, Visualization, Funding acquisition. **Norman P. Li:** Conceptualization, Methodology, Validation, Writing – review & editing, Visualization, Supervision, Funding acquisition.

Appendix A. Supplementary analyses

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2021.110871.

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