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In this document, the main hypotheses will be outlined, for sake of registering these before the analyses start. This is done to prevent possible hypothesizing after the results are known (i.e. HARKing; Kerr, 1998) by the researchers, and to ensure readers of what is confirmatory testing and what is exploratory testing. In our analysis we will limit ourselves to studies using Cyberball (Williams, Cheung & Choi, 2002) and using a between subjects design. That is, the typical design that we will investigate has a Cyberball manipulation (inclusion vs. ostracism) and a moderator factor (e.g., ingroup vs. outgroup). Below we outline the confirmatory hypotheses, which make up the main part of the meta-analysis, and several aspects we would like to explore in addition to the research question.

Confirmatory

The main hypotheses are derived from a temporal need threat model of ostracism(Williams, 2009). This model postulates that responses to ostracism can be categorized across a reflexive, reflective and resignation stage. The model assumes a chronological relation such that immediate responses are likely to be reflexive and more delayed responses would be reflective and ultimately fall into the resignation stage. In the current meta-analysis we focus on the reflexive and reflective stages. Two related assumptions are tested. The first assumption is that the relative impact of ostracism on a dependent variable decreases over time. The second assumption is that the relative impact of a moderating factor increases over time. More specification of these hypotheses is given below

Hypothesis 1 Does the effect size of ostracism decrease over time? In other words, this meta-analysis looks into the question whether time decreases the effects of ostracism on variables that are expected to be affected by an (Cyberball) ostracism manipulation. More formally,

$$H_0: \delta_{T1} = \delta_{T2}$$

$$H_A: \delta_{T1} \neq \delta_{T2}$$

where δ represents the effect size[1]between the ostracism and inclusion conditions;[2] T1 represents the first dependent measure and T2 the last dependent measure expected to be affected by ostracism. The time element is operationalized by counting the number of different measures used. For example, a study measures fundamental needs (belonging, control, meaning, esteem), mood (positive, negative), aggression, and prosocial helping behavior. Given this is the order in which they are measured; included measures are fundamental needs and prosocial helping behavior. The number of measures would be 8.

Hypothesis 2 The *second* main hypothesis of the meta-analysis is related to the moderation of ostracism. More specifically, it is related to the time effects of moderators. Following from the need-threat model, moderation is predicted to be smaller at T1 than at T2. In other words, there is an

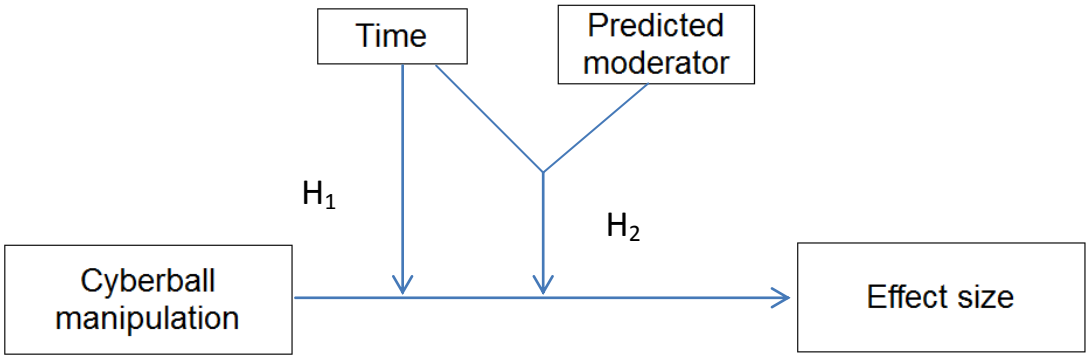
[1] Note that all the effect sizes are calculated as Hedge's g, to correct for small sample sizes.
[2] The second main hypothesis regards itself with an interaction effect on the time and predicted moderator variables (explained in next paragraph), but this hypothesis only considers the simple effect of ostracism in the no moderator condition.

interaction between the moderator and the time variables, with regards to the effect size found. More formally,

$$H_0: \Delta_{T1} = \Delta_{T2}$$
$$H_1: \Delta_{T1} \neq \Delta_{T2}$$

where Δ represents the size of the interaction effect between the social status (i.e. ostracized versus included) and a predicted moderator (i.e. present or absent) on T1 and T2 (i.e. first and last measure). This is, in other words, an interaction between moderators that are used as a predictor of the effect size found. In short, the second main hypothesis tests whether predicted moderators increase in their effectiveness over time.

For a more rudimentary graphical representation of the two main hypotheses, a conceptual model is included below.



Exploratory

Given the meta-analytic nature of the study, there is an opportunity to look into meta-effects within the Cyberball paradigm. To do this, several aspects will be explored within the data. More specifically, composition of the sample, composition of the measures and composition of the Cyberball manipulation will be explored. Below, a more detailed outline is given. Please note that all of these exploratory analyses can only be done if there are sufficient observations and are called exploratory because they do not directly relate to the main research question of the meta-analysis.

Sample composition Within Cyberball studies, several have tested whether the effects of ostracism differ across gender (e.g. Hawes et al., 2012) or across age groups (e.g. Pharo, Gross, Richardson, & Hayne, 2011). We like to inspect these same aspects, on a meta-analytic level with more power, to see whether they influence the effect size found and to what degree. In other words, we will

test whether the proportion of males and average age in a study has an effect on the predicted effect size.

Measure composition We will explore whether the nature of the dependent measure influences the predicted effect size of ostracism. More specifically, the fundamental needs scale will be looked into, whether there is a difference in effect between intrapersonal (e.g. self-report) and interpersonal (e.g. helping behaviors), and whether there is a difference between the predicted effects for pro- and anti-social measures.

The fundamental needs are often measured within the Cyberball paradigm and within the ostracism field. However, many different scales are used to measure the satisfaction or threat of these needs(i.e. Van Beest & Williams, 2006; Williams et al., 2002; Zadro, Williams, & Richardson, 2004). We will inspect whether the predicted effect differs across the most commonly used scales (i.e. the aforementioned papers).

All dependent measures will be coded into an intra- or interpersonal category. The intrapersonal category represents all measures that do not relate to other persons (e.g. mood, anger, physiological measures). The interpersonal category represents the measures that do relate to other people (e.g. desire to retaliate, pro-social behavior). It will be inspected whether there are differences between these categories. Also, a comparison will be made between pro-social and anti-social interpersonal measures, to see whether the effects of ostracism are equal or possibly non-equal across these types measures.

Cyberball composition Cyberball is a manipulation that is used frequently, but with some minor differences across experiments. To inspect whether such subtleties cause differences in effect sizes, exploration is done on some of the key aspects in Cyberball studies. More specifically, we will inspect whether the number of players, player-matching, and percent of total ball tosses received influences the predicted effect size. For example, one study might use a Cyberball game where the participant plays against three other players, who have the same gender and where the participant receives five tosses before being excluded on the remaining 25 tosses (i.e. total of 30 tosses). Another study might have only three players in total, with mixed gender ‘opponents’ and where the participant receives no ball tosses and is excluded for all 30.

References

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