Overblown Implications Effect: A Prevalent Metaperception Error. A Replication and Extension Study

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Abstract

Intuitive metacognitive processes such as metaperception surprisingly have a lot more influence on the intersectionality between interpersonal relations and health than one thinks. Of the many forms of metaperception, this paper aims to further explore the overblown implications effect (OIE), which is a prevalent metaperception error where one overestimates how much other people think of their successes or failures. We conducted a mixed ANOVA analysis and found further support for the statistically significant discrepancy between actors' metaperception ratings and observers' social perception ratings. For the extension, we continue to explore whether a longer rating duration for the actors would result in more accurate predictions of observers' ratings compared to observers' actual ratings by running a mixed ANOVA analysis. We hypothesized that increasing the rating duration would decrease the difference between the actors' metaperception ratings and the observers' social perception ratings, but our results show that there is no statistical significance between the two variables. However, it is important to note that we could not use the whole data provided due to statistical limitations. Hence, this makes it even more essential that future studies work with more representative samples to further understand the correlative factors that influence the OIE.

Keywords: overblown implications effect, metaperception, mixed ANOVA, working trait definitions, focalism

1. Introduction

To present oneself in any way in front of others elicits self-consciousness and we can see this manifest in many different social situations such as raising one's hand in class or performing on stage. However, many are not usually aware of the pervading presence of this highly intuitive phenomenon in their everyday lives: metaperception. Metaperception is the set of beliefs that one has regarding how others view them. It powerfully shapes how people view themselves and informs decisions on their interpersonal relationships, serving as an "implicit map that people use to navigate their social worlds" (Carlson, 2015). Although metaperception is a subject worth delving deep into, research regarding this prevalent phenomenon is quite scant in scientific literature due to its subliminal, elusive nature. Hence, it is pivotal to study metaperception further to inform future research projects that aim to explore its derivative social effects and consequences.

To further explore metaperception, it is valuable to first examine previous studies done so far. One study conducted by Malloy et al. (1997) explores how metaperception is observed and evaluated in non-overlapping social groups. Targets picked informants that formed three distinct social groups (family, friends, co-workers). Informants were asked to judge their target based on five variables, which were averaged and compared across groups. The results were stable across the groups, with the consensus of the family group being the greatest (Malloy et al., 1997). These results suggest that people may be more aware of how they were judged by family members, following friends, and less aware when it came to the judgments of their co-workers. Despite these discrepancies, the underlying commonality is that metaperception can still be a motivating factor for people to be more concerned with assimilating with the group rather than their

individualism. People often feel less inclined to regard themselves as unique individuals when thinking of themselves as group members (Frey et al., 2006).

In another study conducted by Gilovich, Medvec, and Savitsky (2000), the "spotlight effect" was observed in various experiments. The general methodology of these experiments involved a target participant wearing a potentially embarrassing t-shirt in front of 4-6 observers, later comparing the difference between the percentage of observers the target assumed noticed the shirt vs. the actual percentage of observers that paid attention. The study found that the targets believed that more observers had noticed their shirts than actually did when they were asked immediately without a delay (Study 1). Study 3 followed a different methodology to examine the difference between a speaker's assumed attention to detail of the observer vs. observers' true weighing of one's speech. The speakers overestimated the extent of others' attentiveness when it came to their addition to the discussion, whether positive or negative (Gilovich et al., 2000). In Study 4, participants were asked to estimate the number of observers that noticed their embarrassing shirt design and then provide the logic behind their estimation; this resulted in a higher estimated number of observers before the participants' explanation, following a lower number after they rationally considered their estimations. When participants were asked to fill out a survey prior to presenting, their estimated number of observers noticing their shirts was lower than the group that presented without the delay (Study 5); the preoccupation may have led the participants to focus less on how noticeable their shirts were, further assuming that observers focused less on their shirts as well. Given the varying discrepancies in the results from each study, this all suggests that metaperception is rather a context-dependent phenomenon than a singular, fixed response to social situations.

Out of the many different subsets of metaperception, we attempt to further explore the overblown implications effect (OIE), a psychological effect where the actors overestimate how much the observers will judge their overall competencies based on their performances. A study done by Moon, Gan, and Critcher (2020) focused on the OIE, which researchers theorized to explain differences in human perspectives during social interactions. The researchers proposed that the "working trait definition" – the definition of what behaviors indicate more about a person's general competency in that specific aspect – accounts for the differences between how actors and observers view the actors' performances (Moon et al., 2020). In this paper, eight sub-studies were done about the OIE, addressing its implications under different conditions and scenarios.

The OIE paper builds on previous research in that it proposes a new mechanism, the working trait definitions, to explain why metaperception may deviate from observers' actual evaluation. The researchers also calculated the means of different ratings to better quantify such deviations, showing whether an actor's metaperception about an observer is greater or lesser than the observer's actual impression. Furthermore, many previous studies focused on performance focalism, which suggests that the actors and the observers may focus excessively on the social blunder. Cooper et al. (2009) showed that no matter how empathic an individual may be, their perception of another's experience will be dependent, to some extent, on the other's actions and characteristics. In contrast, Moon et al. (2020) proposed the idea of definitional focalism, which pointed out that the observers may recognize the limitation to evaluate the actors' larger competency solely based on one specific event. Hence, in this study, the researchers focused on the exhibition of definitional focalism, how observers and metaperceivers look at the same situation without context and various situations where OIE occurs. In Study 1, the researchers

looked at two specific details in the overarching umbrella of the overblown implications effect: (1) whether the overblown implications effect would occur for only social failures or for social successes as well (2) whether it was possible to separate the overblown implications effect from examples of focalism. The operational definition that the researchers set for focalism is the instance where actors would focus too heavily on one instance or fail to recognize how little observers also focus on that one instance.

Through replicating and extending the original study, we can gain a better understanding of the causes and effects of OIE on daily life activities. This work also dispels negative views that surround the anxiety formed from social interactions, which found that those with social anxiety tend to view ambiguous social events in either a negative or catastrophic fashion (Christesen et al., 2003). It is important to understand the effects of OIE on social relationships because this can have cascading effects on other important domains in one's life such as mental and physical health - research suggests that depressed individuals behave in certain ways that elicit negative interactions from non-depressed individuals (Moritz et al., 2020). Whether such effects are positive or negative, the OIE leads people to misjudge a given social situation and instead introduces biases that are misleading at best and damaging at worst.

Our research aims to revalidate Moon et al.'s (2020) data analysis while trying to understand the results from a different point of view, which may offer some new insights into OIE and metaperception. Extensive coding was done through RStudio to recreate Figure 4 and the ANOVA tests in Study 1. We found that actors' metaperception ratings were significantly worse than the observers' ratings of likability when assigned to a failure condition, whereas the metapercpetion ratings for actors assigned to a success condition were significantly higher. Previous studies have looked into correlations between extended survey times and lower actor

metaperception ratings (Gilovich et. al, 2000). Curious if there were likewise relations between time and ratings in our study, we explored whether a longer duration time in surveys would result in actors' metaperception ratings being closer to the observers' social perception ratings through correlation tests in our extension. We hypothesized that increasing the rating duration would decrease the difference between the actors' metaperception ratings and the observers' social perception ratings. However, we found there was no statistical significance in the relationship between the duration and the accuracy of the actors' predictions in relation to the observers' ratings.

2. Replication

In the original overblown implications effect study done by Moon, Gan, and Critcher (2020), Study 1 focused on two primary goals: (1) to test whether actors express the OIE during both social failures and social successes and (2) to separate the OIE from focalism. The researchers randomly assigned the participants as actors or observers. The study had those assigned as actors answer different interview questions with the scenario that the interviewer would decide if they would like to work with the actor later on. The actors were to judge themselves based on their own performance during an interview while also taking into account how the observers will rate them. The observers were chosen to observe the actors and make judgments based on their performances during the interview. Examples of questions used included listing and describing three of their best qualities or listing and describing three values that are important to them under a time constraint. The actors first practiced with the question format, wrote down their three important values, and provided their baseline self-perception and meta-perception ratings. Then, the observers read the actors' answers to the interview questions

and provided their baseline social-perception ratings. In the actual interview, actors were randomly assigned to a condition (acceptance/success or rejection/failure) indicating whether the interviewer would like to work with them. The success condition is defined as the actor passing the interview, whereas the failure condition means that the actor did not. The actors were asked to rate their performance (self-perception) in the interview and rate how they imagined the observers would rate them (meta-perception). Observers were randomly paired with the actors and asked to watch the interviews and the results of each interview, which indicates social acceptance or rejection. They were also asked to complete measures of likability (social perception) both before and after hearing the actor's interview results. The global ratings indicate how the observers think about the actors based on the overall performance (before hearing results), whereas the feedback-informed ratings indicate how the interview results of the actor may affect observers' judgment of the actors' likability (after hearing results). Figure 4 summarized the findings of Study 1 by comparing three main variables (global vs. feedback-informed, meta-perception vs. social perception vs. self-perception, success vs. failure) in two bar graphs. Now given the methodology of the original experiment, our objective in the replication part of the study was to remake Figure 4 in Study 1 of the original paper and replicate the corresponding mixed ANOVA analysis calculated in the study.

2.1. Methods and Materials

2.1.1. Figure 4 Replication

We imported the datasets provided by the original researchers into RStudio (Moon et al., 2020). We first worked with the observer dataset since it contains the condition (success or failure) for each participant. Because there were more observers than actors, some actors were

rated several times by different observers. We aggregated actors' participant identifications (PID) by calculating the mean ratings between observers who provided ratings for the same actor. For each rating period (global social, feedback-informed social, and baseline/first social), we took the means of the observers' scores for each question.

We separated the modified data by condition (success or failure) and calculated the difference between the observers' ratings for the actual interview and the practice round to determine if there was a change in the observers' perceptions after seeing the interview. This requires us to subtract the baseline from the feedback-informed ratings and subtract the baseline from the global ratings. We then created a table for each condition (Appendix A) that contains the following four columns: PID, condition, informed minus baseline, and global minus baseline.

We then started analyzing the actor dataset. We isolated the condition and PID columns from the observer dataset because the actor dataset didn't include which condition the actors were assigned to. After that, we merged the isolated columns with the actor dataset by PID, forming a complete dataset with each actor's PID, condition, and ratings. We followed a similar procedure to process the actor's dataset as the observer's dataset where we separated by the type of perception ratings (meta-perception vs. self-perception) and the condition (success vs. failure), followed by computing the average for each type of perception. Like the observer dataset, we calculated the difference between the baseline ratings after the practice round and after the actual interview for both self and meta ratings (global self minus baseline, informed self minus baseline, global meta minus baseline, informed meta minus baseline). As a result, we got two tables each for self-ratings and meta-ratings (Appendix A). For each rating, we have a table for the success and failure conditions, each with four columns: PID, condition, informed minus baseline, and global minus baseline.

Finally, we used the tables created previously to plot the data into bar graphs. To do this, we divided the tables into six categories and then computed the mean and the standard error for each category: success observer social ratings, failure observer social ratings, success actor self-perception ratings, failure actor self-perception ratings, success actor meta-perception ratings, and failure actor meta-perception ratings. The means report how each group of participants in each rating period would rate themselves (the actors' self-perception) or others (the actors' meta-perception, the observers' social perceptions both globally and feedback-informed) based on the actors' performance on average. On the other hand, the standard error indicates how likely the means we calculated for each of these ratings are the "true means" of our dataset and helps us account for variability in our values.

We then created two new tables (Appendix B) - one for global, and one for informed - to condense our data so it can be easily graphed. Each table contained a column for the conditions (success = 1, failure = -1), a column for each category, a column including all the corresponding means, and a column for the corresponding standard errors. Lastly, by using the R graphing function "ggplot" from the package "ggplot2", we graphed the data into two bar graphs containing all the above information.

2.1.2. ANOVA Replication

Using the original datasets, we refined the data and prepared it for ANOVA. We grouped the ratings for each participant by the perception type (social, self, meta) and rating period/time (global, feedback-informed) while displaying the condition they were assigned to (success or failure). This table format helps ANOVA identify the variables of importance, which allows us to combine the actors' and observers' datasets into a single data frame. First, we mutated the datasets in the same way as we did in replicating Figure 4. Once again, we calculated the means

for each rating period of each participant, aggregated participants that have more than one set of ratings, and then merged the actors' and the observers' datasets by PID and relabeled the columns based on their corresponding rating period and perception type. We split the dataset into global and informed datasets and applied ANOVA to each dataset.

2.1.2.1. Global final impression ANOVA

The first set of ANOVA tests has two between-subject variables – condition (success/failure) and perception types (meta/self/social) – and one within-subject variable – rating period (baseline and global). We wanted to have a table where each PID has three rows with three perceptions, with each row having the baseline and final (global) scores for the individual (Appendix C). To create this table, we used the *melt* R function to group the ratings for each participant but R automatically combined the perception and time columns so we needed to separate them. Hence, we separated the dataset by Baseline measures and Global measures and recombined them together so the two types of ratings are displayed in different columns. We then reformatted the data so the three types of perception (social/meta/self) and the two rating times (baseline/global) are in long-format instead of wide-format. The condition, time, and perception had to be converted into factor forms to ensure that R properly recognized them as categories to group values. Finally, we performed a series of ANOVA tests on this table using the R functions "aov" and "summary" to obtain the F-values, partial eta values (η_p^2), and p-values.

We performed one (2 x 3 x 2) ANOVA, three (2 x 2 x 2) ANOVAs, and three (2 x 2) ANOVAs. For the (2 x 3 x 2) ANOVA, we took the table from above and ran the R functions "aov" and "summary" to get the ANOVA table. For each of the (2 x 2 x 2) ANOVAs, we selected certain pairs of perception types and compared each pair individually using the "aov" and

"summary." functions. Lastly, we selected each type of perception to calculate a two-way ANOVA analysis using the same functions.

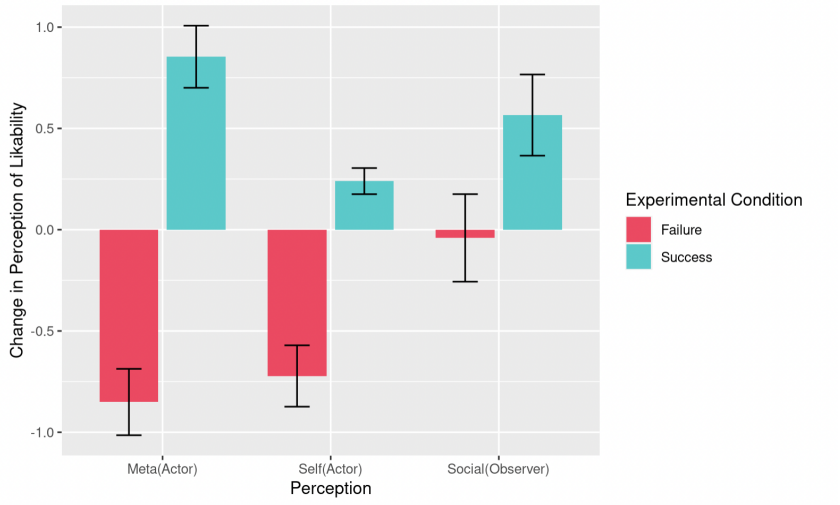
2.1.2.2. Feedback-informed final impression

The second set of ANOVA tests also has two between-subject variables – condition (success/failure) and perception types (meta/self/social) – and one within-subject variable – rating period (baseline and feedback-informed). The second table is structured and created the same way as the global ANOVA table but instead of using the global ratings, we used the feedback-informed ratings (Appendix D). The same ANOVA tests as the ones discussed in the section above were also performed with the global ratings replaced by feedback-informed ratings.

2.2. Results

2.2.1. Figure 4 Replication

(A)



(B)

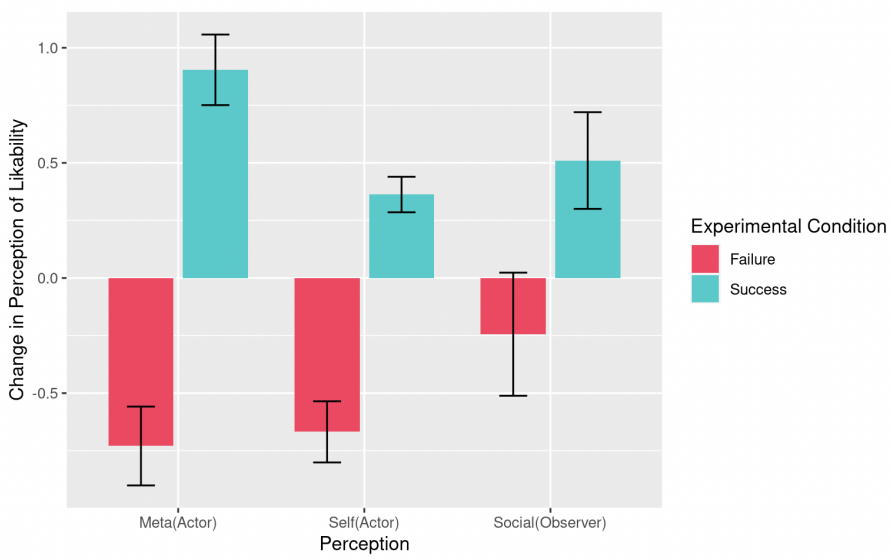


Fig. 1. Panels A and B show the difference in the baseline and final perception values of actors' likability by performance condition and perception type. Panel A depicts the global final perceptions whereas Panel B depicts the feedback-informed perceptions. For each panel, the OIE is reflected by the larger gap between the two meta-perception bars compared with the two social perception bars (Moon et al., 2020). The error bars in both panels display 1 standard deviation.

Figure 1 showed that when the actors were assigned to failure, they rated themselves lower than the observers rated them. Actors also rated their expected ratings for observers to be even lower than their own ratings themselves. For actors who were assigned to success, they rated themselves as lower than how the observers rated them. However, the actors rated their expected ratings from the observers to be much higher than their own ratings for themselves and the actual ratings by the observers. The same pattern is observed for the feedback-informed perception.

In addition, actors expected that their success or failure will affect the ratings of the observers significantly when in actuality, the observer ratings were not significantly affected. We

see that the observers' perception of the actor's overall performance is affected somewhat by the success/failure condition. However, the actors believed that this condition would have a greater effect on the observers' overall perception of their likability than the observers thought. Although we used several different R functions when cleaning up and organizing the datasets, we were able to obtain similar results as the original study and replicate Figure 4 successfully.

2.2.2. ANOVA Replication

In this section, we will present the ANOVA test results we got by following the categories the original study compared together.

2.2.2.1. Global final impression

After calculating the ANOVA values, we are left with an F value, p-value, and a η_p^2 value for each (2 x 3 x 2), (2 x 2 x 2), and (2 x 2) ANOVA. Performing the mixed ANOVA allows us to accept or reject the null hypothesis to conclude if the difference in means we observed is statistically significant.

The 2 (performance: success or failure) x 3 (perception: meta, self, social) x 2 (time: baseline, global) ANOVA values came out to be $F(2, 224) = 6.374$, $p = 0.00203$, $\eta_p^2 = 0.054$.

The 2 (success or failure) x 2 (meta or social) x 2 (baseline, global) ANOVA values came out to be $F(1, 112) = 10.22$, $p = 0.0018$, $\eta_p^2 = 0.0836$.

The 2 (success or failure) x 2 (self or meta) x 2 (baseline, global) ANOVA values came out to be $F(1, 112) = 9.199$, $p = 0.00301$, $\eta_p^2 = 0.0759$.

The 2 (success or failure) x 2 (social or self) x 2 (baseline, global) ANOVA values came out to be $F(1, 112) = 1.115$, $p = 0.29332$, $\eta_p^2 = 0.009806$.

The 2 (success or failure) x 2 (baseline, global) ANOVA values for meta perception came out to be $F(1, 112) = 57.74$, $p < 0.001$, $\eta_p^2 = 0.34015$.

The 2 (success or failure) x 2 (baseline, global) ANOVA values for self came out to be $F(1, 112) = 34.164$, $p = < 0.001$, $\eta_p^2 = 0.2338$.

The 2 (success or failure) x 2 (baseline, global) ANOVA values for social came out to be $F(1, 112) = 4.019$, $p = 0.0474$, $\eta_p^2 = 0.03464$.

2.2.2.2. Feedback-informed final impression

The following results were obtained through performing mixed ANOVA on feedback-informed final impressions, which suggest the significance of the relationship between the variables specified in each model.

The 2 (performance: success or failure) x 3 (perception: meta, self, social) x 2 (time: baseline, feedback-informed) ANOVA values came out to be $F(2, 224) = 3.451$, $p = 0.0334$, $\eta_p^2 = 0.02987$.

The 2 (success or failure) x 2 (meta or social) x 2 (baseline, informed) ANOVA values came out to be $F(1, 112) = 5.206$, $p = 0.0244$, $\eta_p^2 = 0.04441$.

The 2 (success or failure) x 2 (meta or self) x 2 (baseline, informed) ANOVA values came out to be $F(1, 112) = 6.777$, $p = 0.010$, $\eta_p^2 = 0.05706$.

The 2 (success or failure) x 2 (self or social) x 2 (baseline, informed) ANOVA values came out to be $F(1, 112) = 0.544$, $p = 0.462$, $\eta_p^2 = 0.34015$.

The 2 (success or failure) x 2 (baseline, informed) ANOVA values for meta came out to be $F(1, 112) = 50.538$, $p = < 0.001$, $\eta_p^2 = 0.3109$.

The 2 (success or failure) x 2 (baseline, informed) ANOVA values for self came out to be $F(1, 112) = 45.05$, $p = < 0.001$, $\eta_p^2 = 0.2869$.

The 2 (success or failure) x 2 (baseline, informed) ANOVA values for social came out to be $F(1, 112) = 4.663$, $p = 0.0329$, $\eta_p^2 = 0.04$.

2.3. Discussion

2.3.1. Figure 4 Replication Discussion

We were able to replicate the results in the original paper, which summarizes the main findings in Study 1 in a visual format. We used multiple different methods and functions in R for data pre-processing, which could result in slightly different final means for each category. However, this minor difference is not significant enough to affect the final results and all of our group members were able to create similar graphs.

The results support that the overblown implications effect occurs regardless of the social conditions. For both global and informed ratings, actors failed to accurately predict the observers' ratings when asked to rate their likability even more when they were assigned to a social failure condition rather than a social success condition. These findings suggest that people exaggerate how they are perceived during failure rather than success.

Another interpretation of this exaggerated difference could be that the observers tend to change their perception ratings more when the actors succeed than when they fail regardless of global (focus on the entire performance) or feedback-informed (focus on the final result). We see a similar phenomenon where there is a bigger difference between actor self-perception when they fail than when they succeed, regardless of global or feedback-informed ratings. This could be explained in a more intuitive sense: observers may feel less moral pressure when they rate

someone positively than when they rate someone more negatively. Thus, they would be less willing to drastically change their perception when a person does worse than when they do well. On the other hand, actors may want to be more humble and appear less arrogant when they succeed, but they may be more affected when they commit a social failure and exaggerate their final scores, thus creating this phenomenon. In addition, for the actors' meta-perception, we did not see a noticeable difference in the change in perception ratings between those who were assigned to positive or negative conditions regardless of global or informed. This means that actors exaggerate their ratings similarly regardless of the condition they were in. It could be due to the possibility that the actors think their positive performance will impress others as much as their failures would disappoint others.

Our interpretations of the graphs in Figure 1 showed that there could be potential relationships between how much individuals change their perceptions of themselves or of others based on their social condition, but we were unable to reach a conclusion as to why these differences would occur. Future research could attempt to isolate reasons for these differences and whether these differences in the change in perception would happen simultaneously on the same individual when they reverse roles or act as both the actor and the observer.

Another method of analyzing the results requires a comparison with existing theories on actor-observer asymmetry (Malle, 2006). Previous studies on this phenomenon have demonstrated the tendency for actors to justify their performance and attribute any influence to external factors, whereas observers tend to believe that the actors' performance is more impacted by their internal qualities (Taylor & Koivumaki, 1976; Eisen, 1979). Many variations of the study were tested in different types of interactions, tasks, and abilities. Various results were found while key differences between actors' and observers' perspectives remain substantial

(Malle, 2007). However, one meta-analysis of 173 studies about the actor-observer bias indicates that such a phenomenon doesn't exist (Malle, 2006). Such controversial and contradictory findings on the actor-observer difference could be used as an entry point to understand our findings and raise new questions regarding these discrepancies. Although metaperception and actor-observer differences seem to be related by separate ideas, our study could potentially contribute to informing the association between the two.

Our replication and the original study focused on the difference between actors' meta-perception and observers' social perception ratings as well as how it demonstrated the overblown implications effect, but we paid less attention to actors' self-perception ratings. Figure 1A and Figure 1B indicate that the actors consistently have a bigger rating difference between metaperception and baseline ratings than how the observers rate them for both the global/feedback-informed ratings and the success/failure conditions. This information does not necessarily contradict the actor-observer bias since we do not exactly know how observers or actors would justify their ratings and whether they attribute the actors' performance to dispositional or to environmental factors, regardless of success or failure. However, if we were to expect some actor-observer difference in this study, then we should observe that the actors associate their single-time performance with their overall likability less than the observers since actors are more likely to attribute their performance to outside factors. The fact that we did not observe this pattern potentially raises the question as to how the overblown implications effect that Moon et al. (2020) theorized complement or challenge the existing theories on actor-observer biases. We do not yet know what specific reasons or factors could account for this alternative or lack of display of actor-observer difference. This could reaffirm that there may be more complexity that goes into how observers and actors perceive single-time successes and

failures and that more specific correlative factors need to be thoroughly researched to better understand why participants provided ratings as they did.

This contradiction also provides future researchers a chance to compare and explore how the overblown implications effect and the actor-observer difference may work together to explain human judgment as well as what potential limitations or boundaries there are for these theories. Therefore, our study's results not only contribute to the study of metaperception but could also be related to other aspects of human behavior. However, the intersectionality between these aspects still requires further investigation.

2.3.2. ANOVA Replication Discussion

A comparison of our replication with the original study indicated slight differences, including slightly lower F-values which resulted in slightly higher p-values. This could be due to differences in data pre-processing techniques. However, such differences do not affect the statistical significance or the final results.

Among fourteen ANOVA tests, two tests did not report a statistically significant difference between the observers' social ratings and the actors' self-perception ratings for both the global and informed ratings. We interpret this lack of statistical significance by understanding that both the observers and actors were rated from their own perspectives as opposed to actors trying to understand the observers' perspectives in metaperception. Henceforth, this might imply that all participants share a similar state of mind for the actors' performances. Another possible interpretation for the lack of statistical significance could be that these perspectives could be independent of each other since the social and self-perception ratings come from separate perspectives of either the actor or observer. However, more research is needed to explain why this phenomenon occurs. Another important note was that the duration of survey time was

recorded but not used when analyzing the data. Therefore, we investigated the potential relationship between the actors' survey duration and the accuracy of their meta-perception ratings compared to the observers' social ratings. This investigation is conducted in the extension discussed below.

3. Extension

We continued to work with the data to determine if increasing the survey duration of actors would affect the relationship between their meta-perception ratings and observers' social perception ratings. We hypothesized that an increase in duration time would decrease the gap between the two ratings.

3.1. Methods and Materials

In RStudio, the original datasets were refined using similar data-cleaning methods as our replication. The observers' data was then aggregated by taking the mean ratings by the PID to avoid participant data duplication. Afterward, we used the *transmute* R function to create a related data frame that only contained the observers' PID and condition. This data frame would then be merged to the actors' data frame to add the condition column to the actors' dataset later. The actors' and observers' datasets were merged by PID. We made a new variable called "Time" by subtracting the value and quality time from the survey duration time. This was done because the survey duration given from the raw data included the time taken when writing the qualitative parts of the study but we only wanted to focus on the time used to fill out the survey. A data frame was then created that included the variable "Time" inside. To simplify the graph, the means for all the meta values and observers' social values were found.

Once the values were calculated, the actors' metaperception and duration time and the observers' social perception data were merged, thereby collecting and organizing all the information we needed for each participant into one data frame. To find the difference between actors' predictions and the observers' actual ratings, the meta and social values were subtracted from one another. With these differences per value, scatterplots could be graphed to see the possible effect of the longer duration time on the actors' meta-perception ratings, further examining whether it is closer to the observers' social perception ratings (Appendix E). Scatterplots were graphed for a difference between first meta and first social, global meta and global social, and informed meta and informed social, with the y-axis being the difference in values and the x-axis being time in seconds.

After graphing the scatterplots, we needed to find out if the correlation between Time and the difference between the actors' meta perceptions and the observers' social perceptions are statistically significant. We used the Pearson's product-moment correlation - which finds the strength of the correlation through t-values - on all three scatterplots to determine if any of them had statistically significant results. We tested to see if there would be a statistically significant p-value between rating time and the following rating differences: the difference between actors' first metaperception and observers' first social perception, the difference between actors' global metaperception and observers' global social perception, and the difference between actors' feedback-informed metaperception and observers' feedback-informed social perception.

3.2. Results

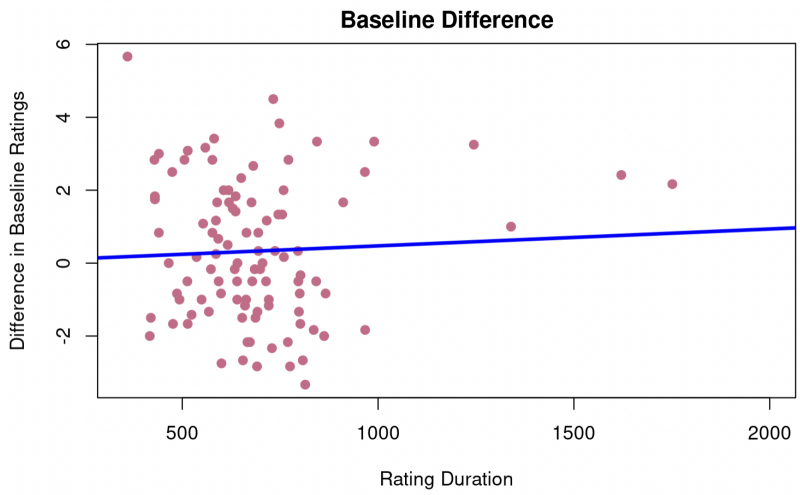


Fig. 2. The scatter plot graph plots the actor's survey duration (in seconds) with the difference between the actors' baseline meta-perception and the observers' baseline social rating. The majority of the data is grouped around 500-1000 seconds. Outliers above 2000 seconds are not included. The slope of the line of best fit is 0.0004, and the y-intercept of the line of best fit is 0.011. (r-value = 0.0514)

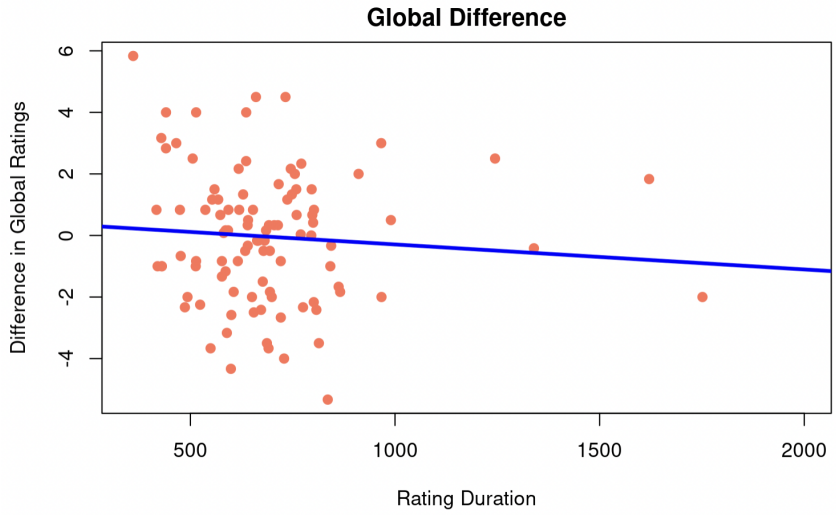


Fig. 3. The scatter plot graph plots the actors' survey duration (in seconds) and the difference between the actors' global meta-perception and the observers' global social rating. The majority of the data is grouped around 500-1000 seconds. Outliers above 2000 seconds are not included. The slope of the line of

best fit is -0.0008, and the y-intercept of the line of best fit is 0.520. (r-value = -0.0812)

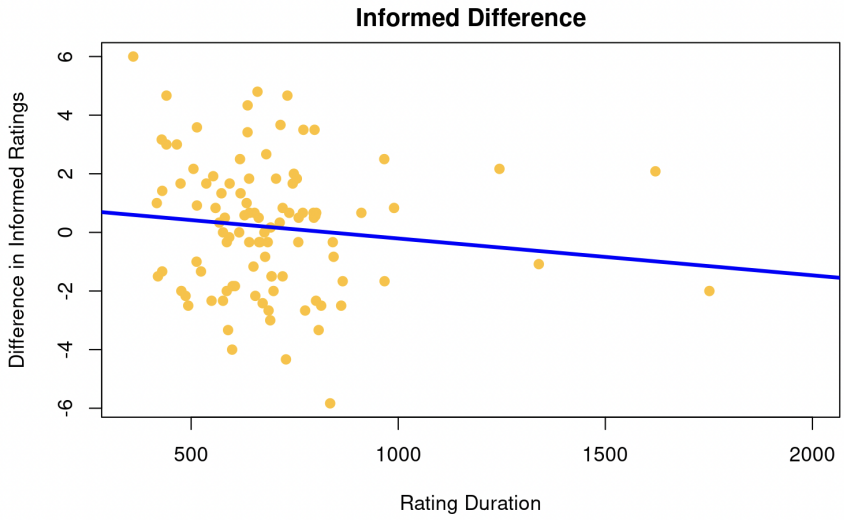


Fig. 4. The scatter plot graph shows the relationship between the actors' survey duration (in seconds) and the difference between the actors' feedback-informed meta-perception and the observers' feedback-informed social rating. The majority of the data is grouped around 500-1000 seconds. Outliers above 2000 seconds are not included. The slope of the line of best fit is -0.0012, and the y-intercept of the line of best fit is 1.047. (r-value = -0.0197)

The three different scatterplots for the three rating periods (baseline, global, feedback-informed) revealed no correlation between how long the actors used to put down their ratings on average and how accurate their predictions were compared to the observers' actual ratings of likeability. To see if these results were significant, we applied Pearson's product-moment correlation to each of these graphs. For Figure 2, the t-value was 0.51021, the p-value was 0.6111, and the r-value was 0.0514. For Figure 3, the t-value was -0.909525, the p-value was 0.3679, and the r-value was -0.0812. For Figure 4, the t-value was -1.19, the p-value was 0.23, and the r-value was -0.0197.

Using a p-value cutoff of 0.05, we found that our acquired p-values were significantly greater than 0.05. Furthermore, we used an r-value of 0.2 to assess the strength of our correlations, and we found that all of our r-values were less than 0.2, thereby suggesting that there is no correlation. Due to this lack of correlation, our initial hypothesis for the extension is not supported by the data. Hence, we cannot draw any reliable conclusions regarding how survey duration times affect the accuracy of the actors' predictions compared to the observers' ratings.

3.3. Discussion

In our linear models, we were not able to find any correlation between actors' survey time and the difference between actors' meta-perceptions and observers' social perceptions. Keeping the insignificance of the results in mind, we still believe that there is value in discussing the underlying mechanisms that may account for the observations we have noticed. Specifically, we attempt to explain the participants' potential metacognitive processes that led to their ratings depending on the rating duration.

Since the y-intercept and the slope were positive for our baseline model, this may suggest that the actors rated themselves higher than what the observers rated on average. This might be because these baseline ratings were from a practice interview, so the actors may have not felt as pressured as they would with an actual interview. Actors may also have had a relatively positive emotional experience in comparison to the other ratings. Jingyi Lu et al. (2018) point out how positive emotions can produce metaperceptions that are optimistic in nature (Lu et al., 2018). Hence, the actors could have started feeling more optimistic about the interview and imagined that the observers would also feel the same way.

The y-intercepts are positive while the slopes are negative for both the global model and the feedback-informed model depicted in Figure 3 and Figure 4, respectively. Compared to the positive correlation we observed in the baseline model, the negative slopes in the global and feedback-informed models could indicate that the longer an actor took, the more negative they imagined the observers would feel about them possibly due to the pressure of the actual interview and being put under the spotlight. “The spotlight effect” (Gilovich, Medvec & Savitsky, 2000) has been studied further and correlations were found between the effect and the symptoms of social anxiety (Lipton, Weeks, Daruwala, Reyes, 2016) which could propose that actors may think of themselves in a negative light relatively more noticeably in those circumstances. The positive y-intercepts for the final models could indicate that the actors started off feeling confident about how others would perceive them. However, due to the tendency to feel anxious under the spotlight and the effects that stressful situations have on decision making (Yu, 2016), the actors might have overthought this when they took more time and exaggerated how the observers might negatively judge their performances. In an overall sense, there appeared to be an optimal period where the actors’ metaperception became more accurate compared to the observers’ social perception in both models (around 600-800 seconds).

We found no significant relationship between Time and rating accuracy. A reason for this lack of relationship could be that we were not exactly sure how long it specifically took them to complete the meta-perception ratings since we only used the total amount of time used for completing all parts of the ratings for the actors. Therefore, the specific time it took the actors to complete the meta-perception may have been longer or shorter than when they completed other parts of the ratings. This suggests that it may be inaccurate to infer that a longer total duration necessarily signifies a longer average rating time for meta-perception. The original study did not

give infinite amounts of time for the actors to complete the survey during the experiment, so there might not have been enough data to observe a significant relationship to start with. Since time was only indirectly researched in this study, further research could use time as one of their main independent variables and test to see if the OIE and metaperceptions of actors could become more or less accurate given more or less time.

Furthermore, one limitation of this extension was that we took out all of the participants that took longer than 2,000 seconds (~ 33 minutes) to complete the survey. We observed that most of the participants were centered around 500-1,000 seconds, but there was another small group of participants around the 3,000-4,000 second time mark. This small cluster significantly skewed the correlation tests and the slopes of our lines of best fit compared to those from our data without the omitted participants. Hence, our data do not necessarily represent the whole participant cohort due to these omissions. Regardless, more research could be done to compare these different clusters of survey times and decipher what sorts of changes these different clusters could make.

As proposed previously, prioritizing time as a key component when observing how an actor weighs their performance could reveal patterns regarding a globalized behavior. It then begs the question of whether other factors can be measured in the same manner. Perhaps the initial stage of describing one's values as done in Study 1 could play a role by observing if certain traits show correspondence with either a lower or higher meta-perception rating. In past studies, individuals with certain traits such as self-awareness have shown greater sensitivity to social examination in real or hypothetical situations (Fenigstein, Scheier & Buss, 1975). Instead of describing their values, actors could be asked to rank themselves on standardized traits such as honesty, social awareness, confidence, etc. These traits can then be treated as another column in

the data set, following the comparison of individuals' given traits and their ratings. Yet, limitations such as the likeliness of individuals providing a biased sense of self and the impacts of the environment on the individual should be considered.

In this extension, we analyzed potential correlations between the actors' survey duration and the accuracy of their meta-perception rating. However, we did not use the observers' survey durations which might have impacted the observers' perceptions of the actors to change. Future research could combine both actors' and observers' survey durations and compare their combined impacts on the differences in their ratings.

4. Conclusion

The OIE and our research ultimately assert the notion that preoccupation with the judgment of others may not need to be taken into grave consideration since such preoccupation could be an erroneous catastrophization of other people's perceptions. Our results for the replication are consistent with this notion, and that the OIE can manifest in both failures and successes of an individual's performance. For the extension, the question of whether the duration of time it takes to make a metaperception of one's performance affects the accuracy of the actual perceptions of others requires further investigation. However, our research can be applied to further inform future research that studies the OIE in the context of mental health and social justice issues such as racial discrimination, gender inequalities, etc.

Appendix

Appendix A

Success_selfactors (success_selfactors.csv) and failure_selfactors (failure_selfactors.csv) contain actors' changes in self-perception ratings for those assigned to success and failure conditions, respectively. Success_metaactors (success_metaactors.csv) and failure_metaactors (failure_metaactors.csv) include actors' changes in meta-perception ratings for those assigned to success and failure conditions, respectively.

Appendix B

Panel A (Panel A.csv) contains global perception rating data used for graphing Panel A in Fig. 1. Panel B (Panel B.csv) contains informed-feedback perception rating data used for graphing Panel B in Fig. 1.

Appendix C

Global ANOVA (Global ANOVA.csv) contains the finalized table used to perform all the ANOVA tests for analyzing global final impressions.

Appendix D

Feedback-informed ANOVA (Feedback-Informed ANOVA.csv) contains the finalized table used to perform all the ANOVA tests for analyzing feedback-informed final impressions.

Appendix E

Extension_data (extension_data.csv) contains the table with actors' PID, condition, survey duration, and difference in actors' metaperception and observers' social perception ratings used to graph the scatter plots.

Author's Note

Editors

Jefferson Ortega was a graduate student mentor that acted as a resourceful guide in navigating and helping the team with various aspects of this project. The ULAB EBoard members also helped revise this paper throughout the publication process.

Contributions

All authors contributed to writing and revising every section. Specifically, the coding and analysis of data were provided by Cady He and Katharine Wang. The literature reviews were mainly provided by Jessica Liu and Deniz Ercingöz.

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Note

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References

Aggregate: Compute summary statistics of data subsets. RDocumentation. (n.d.). Retrieved April 3, 2022, from https://www.rdocumentation.org/packages/stats/versions/3.6.2/topics/aggregate

Christensen, P. N., Stein, M. B., & Means-Christensen, A. (2003, April 30). *Social anxiety and interpersonal perception: A social relations model analysis*. Behaviour Research and Therapy. Retrieved April 3, 2022, from https://www.sciencedirect.com/science/article/abs/pii/S0005796703000640

Cooper, M. (2007). Interpersonal perceptions and metaperceptions. *Journal of Humanistic Psychology*, *49*(1), 85–99. https://doi.org/10.1177/0022167808323152

DataCamp. (n.d.). *Cor.test: Test for association/correlation between paired samples*. RDocumentation. Retrieved April 3, 2022, from https://www.rdocumentation.org/packages/stats/versions/3.6.2/topics/cor.test

Eisen, S. V. (1979). Actor–observer differences in information inference and causal attribution. *Journal of Personality and Social Psychology, 37*(2), 261–272. https://doi.org/10.1037/0022-3514.37.2.261

Fenigstein, A., Scheier, M. F., & Buss, A. H. (1975). Public and private self-consciousness: Assessment and theory. *Journal of Consulting and Clinical Psychology*, *43*(4), 522–527. https://doi.org/10.1037/h0076760

Garcia, C. (2019, August 7). *How to find outliers in a data set*. Humans of Data. Retrieved April 3, 2022, from https://humansofdata.atlan.com/2017/10/how-to-find-outliers-data-set/

Gilovich, T., Medvec, V. H., & Savitsky, K. (2000). The spotlight effect in social judgment: An egocentric bias in estimates of the salience of one's own actions and appearance. *Journal of Personality and Social Psychology*, *78*(2), 211–222. https://doi.org/10.1037/0022-3514.78.2.211

Kabacoff, R. I. (2017). *Reshaping data*. Quick-R: Reshape. Retrieved April 3, 2022, from https://www.statmethods.net/management/reshape.html

Kassambara, A. (2019, November 29). *ANOVA in R: The ultimate guide*. Comparing Multiple Means in R. Retrieved April 3, 2022, from https://www.datanovia.com/en/lessons/anova-in-r/#three-way-independent-anova

Kumar, U. (2020, June 12). *Melting and casting in R programming*. GeeksforGeeks. Retrieved April 3, 2022, from https://www.geeksforgeeks.org/melting-and-casting-in-r-programming/

Lipton, M. F., Weeks, J. W., Daruwala, S. E., & De Los Reyes, A. (2016). Profiles of social anxiety and impulsivity among college students: A close examination of profile

differences in externalizing behavior. *Journal of Psychopathology and Behavioral Assessment*, *38*(3), 465–475. https://doi.org/10.1007/s10862-015-9531-9

Lu, J., Duan, H., & Xie, X. (2018). Eagerness and optimistically biased metaperception: The more eager to learn others' evaluations, the higher the estimation of others' evaluations. *Frontiers in Psychology*, *9*, 715. https://doi.org/10.3389/fpsyg.2018.00715

Malle, B. F. (2006). The actor-observer asymmetry in attribution: A (surprising) meta-analysis. *Psychological Bulletin, 132*(6), 895–919. https://doi.org/10.1037/0033-2909.132.6.895

Malle, B. F., Knobe, J. M., & Nelson, S. E. (2007). Actor-observer asymmetries in explanations of behavior: New answers to an old question. *Journal of Personality and Social Psychology, 93*(4), 491–514. https://doi.org/10.1037/0022-3514.93.4.491

Malloy, T. E., Albright, L., Kenny, D. A., Agatstein, F., & Winquist, L. (1997). Interpersonal perception and metaperception in nonoverlapping social groups. *Journal of Personality and Social Psychology*, *72*(2), 390–398. https://doi.org/10.1037/0022-3514.72.2.390

Moon, A. (2019, March 21). *Materials*. OSF. Retrieved April 3, 2022, from https://osf.io/4vzy3/?view_only=c303412bdab842c493958c069aeac7ef

Moon, A., Gan, M., & Critcher, C. R. (2020). The overblown implications effect. *Journal of Personality and Social Psychology*, *118*(4), 720–742. https://doi.org/10.1037/pspi0000204

Moritz, D., & Roberts, J. E. (2020). Depressive symptoms and self-esteem as moderators of metaperceptions of social rejection versus acceptance: A truth and bias analysis. *Clinical Psychological Science*, *8*(2), 252–265. https://doi.org/10.1177/2167702619894906

Oltmanns, T. F., Gleason, M. E. J., Klonsky, E. D., & Turkheimer, E. (2005). Meta-perception for pathological personality traits: Do we know when others think that we are difficult? *Consciousness and Cognition*, *14*(4), 739–751. https://doi.org/10.1016/j.concog.2005.07.001

Priyank, M. (2021, December 19). *How to change axis scales in R plots?* GeeksforGeeks. Retrieved April 3, 2022, from https://www.geeksforgeeks.org/how-to-change-axis-scales-in-r-plots/#:~:text=To%20change%20the%20axis%20scales,axis%20and%20y%2Daxis%20respectively

ProgrammingR. (2022). *How to use Rowmeans in R (with examples)*. ProgrammingR. Retrieved April 3, 2022, from https://www.programmingr.com/tutorial/rowmeans-in-r/

R merge - how to merge two R data frames. ProgrammingR. (2022). Retrieved April 3, 2022, from https://www.programmingr.com/examples/r-dataframe/merge-data-frames/

Scatter plots - R base graphs. STHDA. (n.d.). Retrieved April 3, 2022, from http://www.sthda.com/english/wiki/scatter-plots-r-base-graphs#:~:text=A%20scatter%20plot%20can%20be,using%20the%20function%20loess()

STHDA. (n.d.). *GGPLOT2 barplots: QUICK START GUIDE - R software and Data Visualization*. STHDA. Retrieved April 3, 2022, from http://www.sthda.com/english/wiki/ggplot2-barplots-quick-start-guide-r-software-and-data-visualization

Taylor, S. E., & Koivumaki, J. H. (1976). The perception of self and others: Acquaintanceship, affect, and actor-observer differences. *Journal of Personality and Social Psychology, 33*(4), 403–408. https://doi.org/10.1037/0022-3514.33.4.403

Wei, Y. (2021, December 11). *Colors in R*. Department of Biostatistics. Retrieved April 4, 2022, from http://www.stat.columbia.edu/~tzheng/files/Rcolor.pdf

Wickham, H., Chang, W., Henry, L., Pedersen, T. L., Takahashi, K., Wilke, C., Woo, K., Yutani, H., & Dunnington, D. (n.d.). *Bar charts*. ggplot2. Retrieved April 3, 2022, from https://ggplot2.tidyverse.org/reference/geom_bar.html

Yu, R. (2016). Stress Potentiates Decision biases: A stress induced deliberation-to-intuition (Sidi) model. *Neurobiology of Stress*, *3*, 83–95. https://doi.org/10.1016/j.ynstr.2015.12.006

Zach. (2020, August 18). *How to use mutate to create new variables in R*. Statology. Retrieved April 3, 2022, from https://www.statology.org/how-to-use-mutate-to-create-new-variables-in-r/#:~:text=%20How%20to%20Use%20Mutate%20to%20Create%20New,function%20modifies%20all%20of%20the%20variables...%20More%20

Zach. (2021, August 30). *The difference between T-values and p-values in statistics*. Statology. Retrieved April 3, 2022, from https://www.statology.org/t-value-vs-p-value/#:~:text=For%20each%20test%2C%20the%20t,null%20hypothesis%20is%20actually%20true

Zach. (2021, December 8). *Long vs. wide data: What's the difference?* Statology. Retrieved April 3, 2022, from https://www.statology.org/long-vs-wide-data/#:~:text=A%20wide%20format%20contains%20values%20that%20do%20not,the%20exam%20same%20data%20expressed%20in%20different%20formats%3A

Zach. (2021, March 1). *What is partial Eta Squared? (definition & example)*. Statology. Retrieved April 3, 2022, from https://www.statology.org/partial-eta-squared/

Zach. (2021, May 17). *The Complete Guide: How To Report ANOVA Results*. Statology. Retrieved April 3, 2022, from https://www.statology.org/how-to-report-anova-results/#:~:text=When%20reporting%20the%20results%20of%20a%20one-way%20ANOVA%2C,post-hoc%20comparisons%20%28if%20the%20p-value%20was%20statistically%20significant%29