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The Effects of Social Comparison on Immediate Mood and Reaction Time Performance

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Abstract

Context: Being compared to others in social situations is commonplace, whether at work, school, or sport. For example, athletes typically receive feedback on performance from a coach in front of their teammates. Likewise, during lab experiences, students often receive feedback from their instructors in front of their peers. While feedback has been shown to affect mental health, mood, and self-confidence both positively and negatively, the effects of feedback given as a social comparison have not been studied. Therefore, the purpose of this study was to assess how both positive and negative social comparison affects individuals' immediate mood and reaction time performance. **Methods:** Sixty-four participants 18-30 years old were recruited for participation in this research. Participants completed the testing session in pairs, sitting across a table from one another. Each participant was given an iPad in which they completed the UWIST Mood Adjective Checklist (UMACL) and Rosenberg's Self Esteem Survey (RSES) at the beginning of the testing session. Next participants completed the Online Reaction Time Test (ORTT) consisting of 5 trials. Between each trial participants were consistently given either a positive or negative comparison of their speed to their competitors. The positive or negative comparison was randomly pre-designated by the researcher ahead of the testing session and not based on their true performance. Following the ORTT, participants then completed the UMACL a second time to assess mood change. **Results:** Sixty-four individuals (46 females/14 males) completed this study. Both the positive and negative social comparison groups demonstrated a significant change ($p=0.01$) in UMACL score pre to post, with both increasing on average 2+ points. While all other analyses of mood and reaction time data were not statistically significant, there was a trend noted for self-esteem's effect on mood. With participants sorted by self-esteem category (low, normal, high), it was noticed that those with low self-esteem demonstrated the

greatest change in mood, followed by those with normal self-esteem, and lastly high self-esteem demonstrated the smallest change. **Conclusions:** Feedback given as a social comparison, regardless of being positive or negative in nature, has a positive effect on an individual's mood. This may be due to it being perceived as constructive for self-improvement. Self-esteem did show a trend toward significance in its effect on mood, indicating that those in the different self-esteem categories are affected to a different degree by the social comparison. Reaction time performance was not found to be affected by social comparison feedback type; however, given the low stakes of this study it is unclear if higher stakes situations would produce different results. Future research should further examine self-esteem's effect on mood, performance on high vs. low stakes tasks, as well as feedback sources effect (authority figure vs. peer). **Word Count:** 450

Introduction

As humans, we constantly strive for increasing effectiveness, whether in how tasks are conducted or in more personal self-competence. This often hinges on understanding outcomes and receiving feedback for improvement. This not only has an external effect on how we do things, but also internally on our mental and emotional health. Success or affirmations in performance on a task has been shown to have a positive impact on mental health, mood, and self-confidence (Shimizu et al., 2021; Ilies et al., 2007). Likewise, if unsuccessful or given negative feedback on a task, this can have a negative effect on mental health, mood, and self-confidence (Shimizu et al., 2021). Additionally, self-esteem has shown to have a direct connection to the person's overall mental health, mood, and physical health (Shimizu et al., 2021; Ilies et al., 2007). This likely affects how one interprets and uses the feedback given them.

Furthermore, an added dimension to providing and receiving feedback is social comparison. We live in a social environment and therefore, comparison to others in social situations is commonplace, whether at work, school, or sport. While living, learning, working, and engaging in leisure activities we often find ourselves immersed with others, which leads to much feedback being given publicly and in comparison, to a standard. For example, athletes typically receive feedback on performance from a coach in front of their teammates. Likewise, during lab experiences, students often receive feedback from their instructors in front of their peers. Adding the context of social comparison oftentimes increases an individual's self-consciousness (Dvash et al., 2010). Being socially compared to someone can either benefit your mood by making you feel more successful than the other person, or negatively impact mood by making you feel less than the other person. Research has shown that when in a social environment completing a performance task, individuals' natural response is to compare

themselves directly to their opponent instead of focusing on their own performance (Suls et al., 2002). This demonstrates the value placed on social comparison, which likewise may have a more profound effect on performance and mood compared to simple feedback.

There have been multiple studies exploring how feedback impacts an individual, demonstrating positive and negative effects on mental health, mood, and self-confidence (Shimizu et al., 2021; Ilies et al., 2007). However, the effects of feedback given as a direct social comparison have not been studied. Therefore, the purpose of this study was to assess how both positive and negative social comparison affects individuals' immediate mood and performance on a simple reaction time test. By better understanding social comparisons and their effect, this may help inform athletic coaches, teachers, and work supervisors on when and how social comparisons should be used when providing feedback.

Methods

Participants

A total of 64 students (n=14 males, 46 females) between the ages of 18-30 years were recruited for participation in this study through email, fliers, and word of mouth. Recruited individuals were screened for inclusion, with anyone colorblind or having auditory processing disorders being excluded from participation. Participants reviewed and signed a consent form prior to starting the study. The institutional review board at the university approved of this study prior to data collection of participants.

Instrumentation

Rosenberg's Self Esteem Survey (RSES)

RSES is a self-reported survey that captures the participant's overall self-esteem. Participants used a 4-point Likert scale to rate each item from 1- strongly disagree to 4- strongly

agree. The RSES has an internal consistency of 0.77 and a minimum coefficient of reproducibility of 0.90. The RSES was completed through Qualtrics. This was done so that statistical analysis was prepared and organized. Participants have only completed this survey once, at the beginning of the study to get an overall rating of the participants general self-esteem level. This survey categorizes participants as low, normal, or high self-esteem. Those in the low category scored <15, normal category scored 15-25, and high category scored >25.

UWIST Mood Adjective Checklist (UMACL)

The UMACL measures mood at the time of the survey's completion. It builds on a dimensional factor structure for mood and measures 3 categories including energetic arousal, tense arousal, and hedonic tone. The survey contains a list of twenty-nine adjectives, eight in each mood category and five for anger-frustration. It is scored on a likert scale from 1-definitely to 4-definitely not, of how the person feels in that moment. Participants completed the UMACL twice on Qualtrics, once at the beginning of the study and once after completing the ORTT to understand if the social comparison led to a change in their immediate mood. The reliability for this test ranges in each category from 0.86 to 0.88 in the original research.

Online Reaction Time Test (ORTT)

The ORTT is a tool used to measure an individual's reaction time. The test is constructed as a stoplight and measures the speed at which participants click it when it changes from a red light to a green light. It involves clicking on a stop light when the light goes from red to green. This tool has five trials, and then an average reaction time score is taken from the total trials. The ORTT has been used within previous literature.

Procedures

Two participants attended each session which lasted approximately 30 minutes. Before participants arrived at their session, the researcher added both of their names into the Wheel of Names online tool to randomize comparison group assignments. By clicking, spin the wheel, the researcher then determined who would receive the positive and negative comparison with whoever the spinner landed on being the participant receiving the positive comparison. When participants arrived at their testing session, they first reviewed and completed the consent form. Then participants were instructed to sit down on opposite sides of a table facing each other. Participants were then handed a research iPad with the UMACL Qualtrics survey pulled up and were asked to complete it first. Following this survey the researcher then pulled up the RSES Qualtrics survey for participants to complete. Following these two surveys, participants completed the ORTT on its official website. The researcher explained that the focus of the task was to have the fastest reaction time compared to their competitor in each of the 5 reaction time trials. During the activity, when the light turned green on the stoplight, participants needed to tap the red button on the right-hand side of the screen as quickly as possible. After they had tapped the screen, they waited until the researcher gave them each verbal feedback on their performance, comparing them to their competitor, before tapping the screen to start the next trial. A sticky note was used to cover the section with the results. Participants were not aware that the positive or negative comparison was pre-determined and not based on their actual performance.

After participants completed the ORTT, the researcher pulled up the UMACL for them to complete a second time. Following this, participants were thanked for their time and the deception of performance was revealed to mitigate any negative mood affects it may have caused. This concluded the study session.

Statistical Analysis

Using the data collected through the UMACL and RSES surveys along with the ORTT a paired samples t-test, independent samples t-test, a one-way ANOVA, and a Fisher's Exact test were performed. The RSES measured the level of the participant's self-esteem. Based on participants' scores on the RSES, they were separated into three categories: high (score >25), normal (score 15-25), and low (score <15) self-esteem. The paired samples t-tests were used to determine differences between the average score for the pre-UMACL survey compared to the average score of the post-UMACL survey for those in the positive or negative social comparison groups respectively. A repeated measures ANOVA was used to measure the average difference of the pre- and post-UMACL survey of the positive versus negative social comparison groups. An independent samples t-test was used to measure how the average time of the ORTT differed based on participants' social comparison group. A one-way ANOVA was used to measure the average pre-UMACL and post-UMACL scores based on self-esteem category along with how both the average pre- and post-UMACL scores differed based on self-esteem category. A one-way ANOVA was also used to determine how the average time of the ORTT differed based on self-esteem category. Finally, a Fisher's Exact test was used to measure the change in mood within each self-esteem level.

Results

Sixty-four participants (n=14 males, 50 females) were recruited for this study. All participants met the inclusion criteria. Based on the RSES, 8 participants fell into the low self-esteem category, 48 in the normal self-esteem category, and 8 in the high self-esteem category. In this study, we set the p-value indicating statistical significance to p=0.05.

Mood

In the positive social comparison group, the average pre-UMACL score was 73.25 and average post-UMACL score was 75.50 (see table 1). The average UMACL score within the positive social comparison group increased by an average of 2.25 ($p<0.012$) from the pre- to post-UMACL (see table 2). Similarly, the negative social comparison group's average pre-UMACL score was 73.22 while the average post-UMACL score was 75.97 (see table 1). The scores within the negative social comparison group increased by 2.75 ($p<0.009$) between the pre- and post-UMACL (see table 2). The p-value of both the positive and negative social comparison groups indicated that both groups reached statistical significance. Due to the p-value being 0.7041 (see table 3) for the average difference in pre- and post-UMACL scores of the social comparison groups, there was not sufficient evidence to state that the average difference of UMACL scores differed depending on social comparison group.

Table 1: Descriptive Statistics for UMACL Scores Within Positive and Negative Social Comparison Groups

Feedback Group	Survey Group	Sample Size	Mean	Standard Deviation	Min	Q1	Median	Q3	Max
Positive	Pre	32	73.25	4.70	64	70	73.00	76.5	83
	Post	32	75.50	5.50	64	72.5	75.5	78.5	88
	Dif.	32	2.25	4.79	-6	-1.5	2	5.50	15
Negative	Pre	32	73.22	6.73	54	70	73.5	77.5	85
	Post	32	75.97	6.69	59	73	75.5	79	92
	Dif	32	2.75	5.66	-8	0	2	6	20

Table 2: The Effects of Social Comparison on Pre- and Post-UMACL Scores

Research Question	Group	DF	T-Value	P-Value	Mean Difference	Mean Lower-Level Confidence Interval	Mean Upper-Level Confidence Interval	Cohen's D
1	Positive	31	2.66	0.012	2.25	0.525	3.975	0.470
2	Negative	31	2.75	0.009	2.75	0.708	4.792	0.486

Table 3: The Effects of Social Comparison Group on Average Difference of Pre- and Post-UMACL Scores

Effect	Result	P-Value
UMACL	F(1,62)=14.55	0.0003
UMACL*Feedback	F(1,62)=0.15	0.7041

The average score of the pre-UMACL survey for the high, normal, and low self-esteem groups were respectively 76.63, 72.73, 72.88 (p= 0.190) (see table 4 and 5).The average score of the post-UMACL survey for the high, normal, and low self-esteem groups were respectively 76.13, 75.67, and 75.75 (p= 0.988) (see table 4 and 5).The average difference in the scores of the pre-UMACL survey compared to the post-UMACL survey for the high, normal, and low self-esteem group were respectively 0.05, -2.94, and 2.87. Based on these results, there was not enough sufficient evidence to indicate statistical significance (p= 0.166) (see table 5). The positive change within self-esteem groups was 3 out of 8 for the high self-esteem level, 33 out of

48 for the normal self-esteem level, and 7 out of 8 for the high self-esteem level (p= 0.1660) (see table 6). While this was not statistically significant, it was trending toward significance.

Table 4: The Effects of Self-Esteem Level on Pre- and Post-UMACL Scores

Survey Group	RSES Level (n)	Checking for Normality	Mean	Standard Deviation	Min	Q1	Median	Q3	Max
Pre	H(8)	0.652	76.63	4.90	68	74	77	80	83
	N(48)	0.445	72.73	6.11	54	69	72.5	77	85
	L(8)	0.102	72.88	2.95	70	70	72.5	75.5	77
Post	H(8)	0.609	76.13	4.85	70	73	75	79	85
	N(48)	0.899	75.67	6.73	59	72	76	79	92
	L(8)	0.048	75.75	2.19	74	74	75	77	80

Table 5: Effects of Self-Esteem Level on UMACL Score

Time	Chi-Square	DF	P-Value
Pre	3.3181	2	0.1903
Post	0.0270	2	0.9878
Difference	3.5909	2	0.1660

Table 6: The Change in UMACL Scores According to Self-Esteem Level

RSES Fisher's Exact Test

	Negative Change	No change	Positive Change	Total
H	5	0	3	8
N	11	4	33	48
L	1	0	7	8
P-Value				0.1651

Reaction Time

The average reaction time for the positive and negative social comparison groups were 0.4788 and 0.5090, respectively (see table 7). The mean difference for the average reaction time between social comparison groups was 0.030 (p=0.244) (see table 8). The t-test revealed that we are 95% confident that the reaction time changed by between -0.021 and 0.081seconds. There was not sufficient evidence to suggest that the type of social comparison received affected the reaction time of participants.

Table 7: Descriptive Statistics on the Effects of Social Comparison Group on Reaction Time Performance

Group	Mean	Mean Lower-Level Confidence Interval	Mean Upper-Level Confidence Interval
Negative	0.5090	0.4696	0.5484
Positive	0.4788	0.4444	0.5133

Table 8: The Effects of Social Comparison Group on Reaction Time Performance

Group	DF	T-Value	P-Value	Mean	Mean Lower-Level Confidence Interval	Mean Upper-Level Confidence Interval	Cohen's D
RT Average	62	1.18	0.2440	0.0302	-0.021	0.081	0.294

The average reaction time of the self-esteem levels were 0.51 for high self-esteem, 0.49 for normal self-esteem, and 0.52 for low self-esteem (see table 9). The p-value for the effects of self-esteem level on the average reaction time was 0.671 (see table 10). There was not sufficient evidence that the reaction time of participants differed based on their self-esteem level.

Table 9: Descriptive Statistics on the Effects of Self-Esteem Level on Reaction Time

Descriptive Statistics for Reaction Time								
RSES (L/N/H)	N	Mean	Std Dev	Minimum	Lower Quartile	Median	Upper Quartile	Maximum
H	8	0.51	0.09	0.39	0.42	0.52	0.58	0.62
N	48	0.49	0.10	0.35	0.41	0.46	0.56	0.74
L	8	0.52	0.14	0.39	0.43	0.49	0.54	0.85

Table 10: The Effects of Self-Esteem Level on Average Reaction Time

Effect	Results	P-Value

RSES	F(2, 61) = 0.40	0.671

Discussion

The primary aim of this study was to assess how both positive and negative social comparison affect an individuals' immediate mood and performance on a simple reaction time test. Results demonstrated that there was a significant increase in mood following the reaction time testing during which positive and negative social comparisons were made. There were no other significant findings found in relation to mood or reaction time performance. The secondary aim of this study was to assess if self-esteem category influenced mood or performance outcomes. In this study there was not enough evidence to suggest a significant difference between the three self-esteem groups. However, there was a trend toward significance in pre-UMACL to post-UMACL changes and with more equivalent samples among our self-esteem categories, this may have reached statistical significance.

Mood

In this study, we measured mood before and after performing the ORTT during which the participants received social comparison feedback which was predetermined. As far as the participants were aware during the study, the feedback was reflective of their performance. By providing feedback and telling the participants that they were performing better than their peer counterpart, they had a positive social comparison. Likewise, the opposite was done for the negative social comparison. While there was not significant evidence for the average difference of the UMACL scores based on their social comparison group, there was significant evidence showing both the positive and negative social comparison groups increased in scores from pre- to post-UMACL, which was unexpected. We expected the negative social comparison group to have a decrease in mood due to the nature of the feedback. Research shows that positive

feedback should increase the mood of individuals along with downward comparison. In a previous study, it was found that when an individual lost in an activity, they reported lower levels of joy and higher levels when they won. However, if another participant lost more than them, they reported higher levels of joy (Dvash et al., 2010). According to Diel et al. (2021) the type of comparison also influences the participants' emotions. Those that experienced more downward comparison reported greater levels of happiness while those that received upward comparison reported lower levels of happiness (Diel et al., 2021). Studies concluded that those who received the positive mood condition reported a more positive mood at the end of the study compared to those in the neutral and negative mood conditions (Brown & Mankowski, 1993). The current study did not display this same effect. This is potentially due to the low stake's activity completed and majority of the participants were able to complete the study with a friend as their partner, making the activity more fun than stressful and competitive.

Another possible explanation is the view of feedback as constructive. A previous study compared the effects of positive social comparison to praise without social comparison. The participants reported that they felt the praise was more positive without the social comparison than with the social comparison (Gaines et al., 2005). While the praise was more positive without the social comparison, the positive social comparison was better than no praise at all. The praise the participants felt enhanced their overall performance satisfaction (Gaines et al., 2005). Regardless of if they received praise or positive social comparison, it was agreed that social comparison was still better than nothing at all. Participants in our negative social comparison group may have viewed the comparison as feedback giving an indicator to their current performance but allowing for an opportunity for improvement in future trials of the ORTT.

Previous research studies found correlations between pre- and post- mood and positive and negative performance. Mood has been found to affect performance and likewise, performance has been found to affect mood. While the type of mood has been proven to affect performance, this is also believed to be dependent on the individual and their personality. Every individual feels moods and emotions differently leading those moods and emotions to affect their lives and performance differently. Being a pessimist versus an optimist is one way personality can affect one's moods (Norem & Illingworth, 2004). It has been purported that those who are more pessimistic feel more negative moods compared to those who are more optimistic. However, the way moods affect performance in a pessimist differs from that of an optimist. A pessimistic individual feeling a negative mood is going to perform better than when they are feeling a positive mood. Alternatively, an optimistic individual feeling a negative mood is going to perform worse than when they are experiencing a positive mood (Norem and Illingworth, 2004). The performance due to the mood of these individuals occurs because of their naturally occurring mood. The more naturally occurring mood in these individuals led to a greater performance compared to the alternative mood. If a pessimist was in a positive mood, it was seen as a disruption to their naturally occurring mood which led to a decrease in their performance, just as a negative mood was a disruption to an optimist's naturally occurring mood. However, when both an optimist and pessimist were experiencing a negative mood, they performed similarly (Norem and Illingworth, 2004). This indicates that optimists tend to have better performance than pessimists because optimists have similar performances even with a disruption to their naturally occurring mood. This means that while a participant in our study may have had a lower UMACL score and thus a higher reaction time, it may have been reflective of their best performance if they were a pessimist.

Additionally, the type of sport an athlete participates in affects the moods they experience. Those who participate in individual sports reported higher stress levels and lower levels of vigor (Brandt et al., 2017). This is believed to be because the athletes are playing for themselves, and the outcome is solely dependent on their performance. Since it only affects themselves and not others though, the amount of vigor is lower. The outcome of the competitions affected the amount of tension and vigor. Athletes that lost reported higher levels of tension, fatigue, confusion, and anger (Brandt et al., 2017). In our study participants competed as individuals which would lead us to expect similar results as to what has been found with individual sport athletes. However, our data did not indicate the same effect. The participants in our research study reported higher mood scores after the ORTT compared to before, but during the ORTT, the researchers noted that participants receiving the negative feedback would get visibly frustrated and more competitive. This is thought to be because the feedback affected the participant's mood in the moment but did not have a lasting effect on mood in the short-term.

While the results of this study demonstrated an increase in mood with both positive and negative social comparisons, the effects on mood may have been different with a higher stakes activity. Mood potentially increased due to the ORTT being a low stakes activity. A previous study found that low stake activities were associated with having fun (Kowalski and Christensen, 2019). Since the low stakes activity was seen as fun, the level of competition and vigor were low because the participants did not see any consequences for losing. One study reported a direct quote from participants describing what low stake tasks meant to them, "I think, just competing with your friends can be fun. Even if you don't do the best or win, knowing that you tried your best and you did it with your friends is the most important" (Kowalski and Christensen, 2019). This was often discussed with participants finishing the ORTT due to participants pairing with

their friends during the study. Verbal feedback from participants often included them describing their enjoyment while participating, especially when competing against a friend. Low stakes tasks are an option to provide opportunities for practice, mistakes and allow for feedback on their learning without mistakes affecting their future (Roediger and Karpicke, 2006). Therefore, the ORTT would fall into the category of low stakes, encouraging participants to try their best, but not having any repercussions for poor performance. It is believed that the ORTT being a low stakes activity is the reason the mood of the participants, in both positive and negative feedback groups, increased rather than acting inversely.

This study also measured mood based on self-esteem level. There was not enough evidence to find statistical significance that self-esteem categories affect pre-, post-, and average difference UMACL scores. While this was not statistically significant, it was trending toward significance. It is believed that we may have found a significant difference if the study had more equivalent numbers of participants in each self-esteem category. As it was, our study had very few participants in both the low and high self-esteem categories, with the majority falling into the normal category. The trends associated with this study seem to indicate that individuals with low self-esteem experienced the largest amount of change in their mood with those in the high self-esteem group experiencing the smallest amount of change in their mood. This study concluded that individuals with low self-esteem tended to have greater reactions to feedback than those with high self-esteem. This is consistent with the literature, where a study found that individuals with low self-esteem reported moods with more variation compared to those with high self-esteem (Brown and Mankowski, 1993). This is believed to be because those with low self-esteem begin with a lower mood leaving them with more room to increase their mood compared to those with high self-esteem who start with a higher mood.

Additionally, it is believed that those with low self-esteem need more reassurance for their self-enhancement (Ilies et al., 2007) and experience lower moods compared to those who have high self-esteem (Setliff and Marmurek, 2002). One study measured the associated feelings in individuals with high and low self-efficacy after positive and negative feedback. It was found that those with low self-efficacy experienced greater levels of sadness with negative feedback compared to those with high self-efficacy (Motro et al., 2021). The negative feedback is more detrimental to those with low self-esteem because those individuals lack the self confidence in their own abilities, and they try to fill that void using feedback from others. Since the negative feedback is more detrimental to those with low self-esteem, it causes a greater variation in their mood. Those with high self-esteem feel secure in themselves which allows them to not be as affected by negative feedback. They may see the feedback as a means to improve rather than a reflection of themself personally. Since they view the feedback differently, those with high self-esteem do not allow their mood to be as greatly impacted by the feedback.

Performance

In our study, social comparison feedback type received by participants was not found to impact performance directly. Participants' reaction time scores changed in a positive direction regardless of social comparison group association. This may indicate that regardless of the social comparison received, participants were inclined to try harder on their next trial of the ORTT. One study assessing performance following praise found that while praise can make an individual feel good about their performance, it can also add additional pressure to the individual to continue performing at that level (Delin and Baumeister, 1994). This may be why there was not a difference between the two social comparison groups, as they both felt either pressured to continue performing well or felt pressure to perform better. In another study, they compared

personal social comparison to non-personal social comparison. The feedback received in this study was either personal to the participant's personal performance or non-personal feedback on performance. This meant that participants were either receiving feedback on their own performance, or on a standard performance that was predetermined (Valt et al., 2020). The results from this study showed no difference in the participants' accuracy and response to the task. In the current research, all feedback was personal, and predetermined. Although it was predetermined, the participants still received personalized feedback, regardless of if it was accurate of their performance. The results concluded that there was no difference to how the participants performed based on the positive or negative comparison feedback given.

In the current research study, participants were being compared to a peer. Although they were receiving an outside comparison, participants often make their own comparisons while performing due to the social comparison they are being told. Although the results from this study revealed no statistical significance in difference in reaction time by social comparison group or self-esteem category, this may have been due to a multitude of factors, including that participants received feedback from a peer rather than a superior, participation was typically done with a friend rather than a stranger, and the performance test was a low stakes task rather than a high stakes one.

Receiving feedback from a peer may differ from that of a superior due to how participants may view and interpret the feedback, as well as the level of organization of the information. Generally, superiors are viewed as more experienced and respected individuals who can provide constructive correction. Often their feedback is viewed as more clear, beneficial, personalized, and holding more weight. Additionally, the organizational structure within systems defines a hierarchy from which channels of communication are established and performance is

evaluated. Therefore, in society we more often find we receive more important feedback from superiors rather than peers. One study found that instead of passively waiting to see how comparison affects participants, organizational leaders can manage comparisons towards a more constructive interpretation and overall higher performance due to their leadership roles (Waltre et al., 2023). It also found that any time there are actions taken that expect to have social comparison, leadership or authority figures can be used to shape the social comparison towards a more positive direction (Waltre et al., 2023). This implies that if the current study would have used a superior or authority figure rather than a peer to provide the comparison, the effects of performance may have been affected differently.

As noted earlier, a previous study found that low stake activities were associated with having fun (Kowalski and Christensen, 2019). Since low stakes activities are seen as fun, the level of competition is much lower because participants will not be directly impacted or have consequences for their performance. Low stakes tasks are an option to provide opportunities for practice, mistakes and allow for feedback on their learning without mistakes affecting their future (Roediger and Karpicke, 2006). The ORTT was a low stakes task as it allowed the opportunity for participants to learn from their mistakes and try again since there were 5 trials. Also, participation was done in pairs, commonly consisting of friends signing up together. Since doing the task with a friend rather than a stranger, this made the experience more relaxed. Most individuals view competition within friendships as fun and friendly competition, rather than vigorous (Kowalski and Christensen, 2019). This was confirmed by the verbal feedback participants proffered during participation, in which they stated they were enjoying the experience and it was fun. By participating with friends, this allowed most of the participants in

this study to have a sense of comfort while participating and allowed for a more friendly environment, taking away from the true competitiveness of the reaction time task.

While this study did not demonstrate performance differences based on self-esteem grouping, other studies have demonstrated that the level of self-esteem can affect how an individual views their performance during a task. One study measured how the level of self-esteem correlates with doubts and concerns related to one's actions. Individuals with a high level of self-esteem exhibited lower concern over mistakes and lower levels of doubt, while those with low self-esteem exhibited the alternative of high concern over mistakes and higher levels of doubt (Koivula et al., 2002). This indicates that those with low self-esteem take longer to think about their decisions and may not be able to make quick decisions. With more equal samples among our self-esteem categories, this study may have demonstrated a difference in reaction time performance based on self-esteem level within our participants. In theory those with low self-esteem would be expected to have slower reaction times due to self-doubt, whereas those with higher self-esteem would be more likely to demonstrate faster reaction times in alignment with positive patterns of perfectionism (Koivula et al., 2002). This implies that those with high self-esteem expect high performance from themselves while using healthy techniques.

Likewise, a study compared relative self-ratings to absolute self-ratings of participants based on their work performance. The relative self-ratings were significantly lower than the absolute self-ratings (Carver et al., 2021). The relative self-rating typically included the participant reflecting on their performance and then comparing themselves to a reference group. A relative rating uses a comparison to a reference group, and an absolute rating process utilizes verbal cues without referencing others' performance. This indicates that those in a lower self-esteem category receiving verbal comparisons should be affected the most in their performance.

Another study found that participants that needed the most motivational support are most likely to be negatively impacted by competition, which may impact their low competence due to placing behind their peers (Kowalski and Christensen 2019). The study found that those who have a higher self-esteem are less impacted by verbal comparison. Those with low self-esteem are likely more affected when given verbal comparisons in their performance. Those in low self-esteem categories are also more negatively impacted by competition, more greatly affecting their self-esteem. Therefore, we would expect those with lower self-esteem to be most impacted by the social comparison and feedback they receive. With greater numbers of participants in each self-esteem category perhaps these trends could be confirmed in future studies.

Limitations

Multiple limitations were noted during this study. The completion of a low stakes task led to the environment of the study being less competitive. Due to the low stakes task, the feedback did not leave lasting consequences on the participants' mood. With the feedback being given by peers rather than a superior, it may not have been as impactful. Another limitation found was the low numbers in the high and low self-esteem groups. It is believed if the groups were more even, some results related to self-esteem may have reached statistical significance. Related to the ORTT, one limitation was that the screen would occasionally move on some participants while they tried to tap the screen as quickly as possible. Lastly, the button for the ORTT was on the right-hand side making it more difficult for those who are left-handed.

Future Research

There are multiple different studies that can be completed based on the foundational findings of this study. Performing a high stakes task, having a superior provide feedback, and having even numbers of participants in each self-esteem level would be adjustments that can be

made for future research. Additionally, adding a control group that does not receive any social comparison would provide information on how one's mood and performance naturally varies. This study can also be performed looking at differences within genders or if competing against those of the same or opposite gender leads to different effects. Lastly, future research could see if examining an athletic population which are naturally competitive would produce different results compared to the general population which was assessed in this study.

Conclusions

To our knowledge, this was the first study of its kind to examine how both positive and negative social comparison affects individuals' immediate mood and performance on a simple reaction time test as well as self-esteem levels effect on mood or performance. In this study we found that regardless of the social comparison type that was given to participants, they both increased their mood after completing the ORTT. However, there was no relationship found between social comparison and performance. A trend in positive variation of mood within self-esteem categories was noted. Those who had lower self-esteem demonstrated a wider variety of moods and were more easily impacted by social comparison in a positive direction. Those in the normal self-esteem category were also impacted more by social comparison in a positive direction, however those in the high self-esteem category were rarely impacted positively by social comparison. Our study revealed that there is a direct relationship between receiving social comparison feedback and an increase in mood. This means that when providing a social comparison in the field, individuals will often have an increase in their mood after receiving the feedback. Therefore, it is better to provide a social comparison than nothing at all due to the increased mood state. Previous research shows that workers who are in a better mood tend to be more productive leading to an improved overall performance (Bellet et al., 2024; Salas-Vallina et

al., 2020; Zarim et al., 2016) and overall life satisfaction increased productivity (Bellet et al., 2024). To gain more insight into the nature and effects of social comparisons, future research should include performance on high stakes tasks, feedback given by a superior, and further evaluation of the self-esteem levels.

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