Proceedings of The National Conference
On Undergraduate Research (NCUR) 2015
Eastern Washington University, Cheney, WA
April 16-18, 2015

Comparison Threat: Social Comparison and Working Memory Capacity

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Abstract

The threat of comparison to intellectual superiors evokes a stress response, which, evidence suggests, depletes working memory capacity [11]. Expectation of social comparison has been shown to increase physiological and perceived stress in individuals, especially in upward comparisons [7 & 10]. Upward comparison is comparing oneself to someone the individual deems superior to themselves. In the present study, upward comparison, but not downward comparison, diminished working memory capacity, relative to a no-comparison group. The role of sex of subject as a moderating variable was examined.

Keywords: memory, comparison, threat

1. Introduction

Virtually all high-order cognitive processes require working memory. Working memory is a short-term memory system responsible for the active maintenance and the processing of a limited amount of relevant information, while inhibiting irrelevant thoughts and distracting environmental stimuli [2]. This system is theorized to be the location of executive processes, which mediate many other cognitive processes [1]. Working memory capacity (WMC) has been positively correlated with reading comprehension, verbal SAT scores, and reasoning ability [9, 4, & 8]. Thus, any threat depleting WMC is a threat to many other processes as well.

Evidence indicates many external threats to individual WMC exist, with one primary perpetrator being stress [11]. According to Schmader, Johns, and Forbes' integrated process model of stereotype threat, physiological stress responses hinder working memory capacity in two ways: intrusive negative thoughts/feelings and direct physiological impairment of prefrontal processing [11]. Even mildly stressful events can lead to intrusive and repetitive thoughts regarding the preceding stressor [6]. Intrusive thoughts and worries hinder WMC by commandeering resources typically allocated for task execution [2]. The stressor presently studied is social comparison and its effects on WMC.

Social comparison in general has been shown to significantly increase physiological arousal, and upward comparisons positively influence perceived stress as well as decreasing positive affect in individuals, all of which, evidence indicates, would inhibit WMC [7, 10, 5, & 12]. Upward comparison is comparing oneself to someone the individual deems superior to themselves. Downward comparison is just the opposite, and is comparing oneself to someone the individual deems inferior to themselves. Also, downward comparison appears to have little to no effect on perceived stress in individuals. We make social comparisons daily and are acutely aware of them in high-stakes scenarios such as interviews and proficiency exams (SAT, GRE, etc.). Social comparison as a threat to WMC would provide further insight into the fragility and susceptibility of cognitive performance. The present study tests the effects of introducing an upward or downward intellectual social comparison on WMC in college students.

I hypothesize that, in the present study, an upward social comparison will significantly decrease WMC while a downward social comparison will show no significant difference compared to the control.

2. Method

2.1 Participants

The subjects were 29 undergraduate students (18 male, 11 female) enrolled in various psychology courses and received class credit for participation. Subjects were randomly assigned into their comparison groups: upward (n=10, 30% female), downward (n=9, 44% female), control (n=10, 40% female). Participants were recruited for General Psychology classes, comprised mostly of lower division students.

2.2 Materials and procedures

A reading span task was chosen to measure WMC, because it captures the active nature of working memory. Microsoft PowerPoint was used to administer the reading span task and the sentences used were modified versions of the list provided by Conway et al., plus an additional twenty-two sentences [3]. This task requires participants to read multiple series of sentences aloud, each ranging from (2-6) sentences of (10-12) words each. Sentences were presented one at a time on individual PowerPoint slides. There were three sets of each sentence series length with a total of sixty sentences per task. A blank screen followed each series of sentences that cued the participant to recall the last, one syllable word from each sentence of the series in the order that they appeared. Subjects started at a two sentence series and were presented increasingly larger series lengths until they failed all three sets at a particular series level. Their reading span was the largest sentence set (2-6) at which they successfully recalled two out of three sets of sentences. A half point was awarded for successful recall of one out of three sets at a given sentence number. As this was a repeated measures design, subjects took two similar reading span tasks. Reading span task (A) and reading span task (B) had completely different sentences and half of the students in each group took task (A) then (B), and the other half took (B) then (A) to counterbalance for content. A practice round of two sentences and recall preceded the official test.

Participants were randomly assigned into one of three groups: control, upward comparison, and downward comparison. All subjects across all groups took a baseline reading span test, and were told to try their best. Following the first test, participants were asked to step outside for two minutes while the other task was being prepared. After the two minute break, individuals in the control group returned, were told simply to try their best again, and completed the other similar reading span task. When the upward comparison group returned from the two minute break, they were told that their second score was to be compared to scores of Ph.D. graduates immediately before commencing the second similar reading span task. The downward comparison group was told that their second scores were to be compared to scores of high school students just prior to commencing the other similar reading span task. This downward group served to control for a general comparison affect. Participants were sent a debriefing email following completion of all trials to avoid contamination.

All participants signed an Informed Consent form prior to data collection and the University of Minnesota Institutional Review Board approved all procedures.

3. Results

As gender could be a factor in susceptibility to social comparison, Table 1 shows a 3-way ANOVA that analyzed the effects of gender and comparison group and their interaction with task number (Trial).

Table 1. Tests of within-subjects contrasts: Trial, Group (comparison group), and sex

Source	df	F	Sig.	Partial Eta Squared
Trial	1	11.72	.002	.34
Trial * Group	2	7.21	.004	.39
Trial * Sex	1	0.24	.630	.01
Trial * Group * Sex	2	0.17	.845	.02
Error	23			

Seen in Table 1, a main effect of Trial (first vs. second) was found: $F(1,23) = 11.72$, $P < .002$, $\eta^2 = .34$. More interestingly, data showed a significant Trial-by-Group interaction with a very large effect size indicating a strong impact of the Trial-by-Group interaction: $F(2, 23) = 7.21$, $P < .004$, $\eta^2 = .39$. Sex did not appear to have an effect on Trial: $F(1,23) = .238$, $P < .63$, $\eta^2 = .01$, nor a three-way interaction with Trial and Group: $F(2,23) = .17$, $P < .845$, $\eta^2 = .02$.

Scores from the control group increase across Trials: T1 (M=2.964; SE=0.281) – T2 (M=3.583; SE=0.250). The downward comparison group scores also increased across Trials: T1 (M=3.125; SE=0.273) – T2 (M=3.412, SE=0.243). Unlike those two groups, the upward comparison group scores actually decreased across Trials: T1 (M=3.125; SE=0.262) – T2 (M=3.021; SE=0.234).

A Levene's Test for homogeneity of variance failed to find significant difference among the six groups (3 treatments by 2 sexes) for either the first trial ($F_{5,23}=1.53$, p=0.22) or the second trial ($F_{5,23}=1.75$, p=0.16). A t-test for related samples failed to find a significant difference in variance from the first to the second trial for any of the three treatment groups (Control, $t_8=1.10$; Upward, $t_8=0.50$; Downward, $t_7=0.42$).

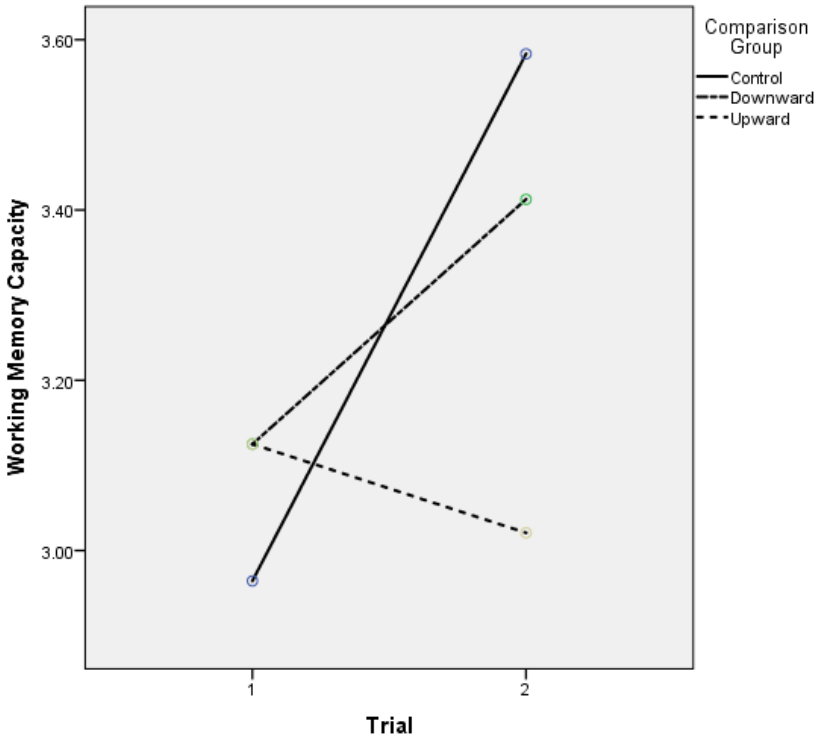

Figure 1. Mean changes for each comparison group across the two trials.

4. Discussion

The present study examined the impact of various types of social comparison on WMC in undergraduate students. Specifically, intellectual social comparison was used, as college students are acutely aware of intellect within academic performance. Results above (Figure 1), showed the control and downward comparison groups both experienced a practice/familiarity effect across trials, while the upward comparison group's performance suffered across trials, thus reflecting a hindrance of working memory performance overall. Since the upward comparison group's performance actually deteriorated over time, the upward social comparison overwhelmed the observed practice/familiarity effect shown in the other two groups. Given that the control and downward comparison groups showed improvement across trials, the impairment in working memory in the upward comparison group may actually be greater than what is reflected in the data, with a practice effect masking some of the impairment due to upward comparison. Given the

physiological reports in the literature, the threat of an upward comparison might possibly result in physiological arousal and increased perceived stress. This, in turn, might disrupt ongoing working memory, perhaps by acting as a distractor (intrusive thoughts) and/or reducing positive mood. Though to solidify these speculations, a repeat study should be conducted, and following the second reading span task, a perceived stress, intrusive thought, and mood change survey should be administered to the participants in each group. Ideally, physiological measures could be taken and correlated with both the performance in the memory task, and with this additional survey information.

The data found in the present study may not be generalizable beyond the undergraduate student population, especially in using the specific intellectual social comparison (Ph.D. graduates and high school students), but it would be simple to test in the general population as well, using prestigious and modest occupations as the comparison treatment.

As mentioned earlier, we experience social comparisons daily and are acutely aware of them in high-stakes scenarios such as interviews and proficiency exams. These scenarios are pivotal to the success of many individuals; so further research needs to be conducted to learn of ways to negate the effects of social comparison. Also, more research could be done to find what other high-order cognitive processes are affected by social comparison.

5. References

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