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The Effects of Feedback on Student Performance While Performing Multiple Tasks Simultaneously

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ABSTRACT

Research shows that feedback or knowledge of results can increase performance on multiple activities. In order for feedback to be successful, it should follow closely in time to the behavior. The current study is a between-group design where the experimental group received visual feedback in the form of a point total about their accuracy in performing a computer task and the control group was not presented with the point totals. While the experimental group did have higher average point totals, the results were not statistically significant. Gender served as the second independent variable and there was not a significant difference between the average total points for men and women. There was not a significant interaction between the two variables.

THE EFFECTS OF FEEDBACK ON STUDENT PERFORMANCE WHILE PERFORMING MULTIPLE TASKS SIMULTANEOUSLY

Knowledge of results (KR) is “feedback containing the level of performance obtained” (“Feedback,” 2000, p.172). Several studies have investigated the effect of knowledge of results on the performance of different tasks. Information about how knowledge of results can influence performance is beneficial for the fields of education and behavior modification. Some educational facilities are currently putting this scientific information into practice. Pokorny and Pickford (2010) researched student perceptions of feedback on academic performance and found that lengthy written feedback is not affective in response to a final paper or project. Students reported that an instructor’s feedback is most beneficial when followed closely behind the assignment.

Several populations have been used to study the effects of knowledge of results or feedback. Individuals with either physical or mental handicaps are often the subjects of feedback studies, one study by Hemayattalab and Rostami (2010) examined the effects of knowledge of results in dart throwing abilities of children with cerebral palsy. They used an ANOVA to test their results and found that those in the feedback condition were able to learn new motor tasks. In a study conducted by Carroll (1973), normal male participants ages 18 to 29 completed different perceptual-motor tasks with and without performance feedback. The
group receiving immediate feedback on their performance became faster at completing the
task as the trials progressed. Motor tasks were most commonly used in studies but Szalma,
Hancock, Dember and Warm (2006) conducted a study were undergraduates viewed a
chemical process on a computer screen and were then asked if that process led to a reaction.
This study separated the types of feedback provided, one group was only given feedback 
when they were correct and another group was only given feedback when they responded
when a response was not necessary. Szalma et al. discovered the perceptual sensitivity scores
(accuracy rates) increased with feedback of either type.

While most studies found that knowledge of results or feedback lead to improved
performance, Tiu (2006) found that the distribution of scores for those receiving feedback
matched the distribution for those who did not receive feedback when the task was
remembering obscure facts. A similar study conducted by Smith and Kimball (2010)
examined the effects of feedback by using the test retest method of trivial facts. They found
that if the participant answered correctly the first time, delayed feedback functioned to
preserve the initially correct response. However, the Smith and Kimball (2010) study also
showed that delayed feedback is not beneficial in correcting errors from the first testing session.

The current study attempts to investigate the effects of feedback on performance using a
multitasking computer program, SynWin (Activity Research Center, 2001). During the first
experimental section, the participant was presented with two tasks to complete; a letter
recognition task and an addition problem. The second experimental section added two more
tasks, a gas gauge to reset, and a tonal discrimination task. Based on their performance of the
tasks, participants in the experimental condition received feedback in the form of a point
total in the center of their screen, and the control group did not.

Based on existing literature, the hypothesis for the current study is participants who
receive continuous feedback will have higher accuracy rates in the form of average point
totals than those who receive no feedback. Also, the point totals should decrease in the
second experimental section because there are more tasks to complete. The manipulated
independent variable for this study is whether or not the participants receive feedback about
their performance. In addition, gender serves as quasi-independent variable, but the
researchers do not think it will have a significant effect on the data. Average accuracy rates
measured by point totals serve as the dependent variable. Point totals were compiled based
on correct and incorrect responses to the tasks; incorrect responses resulted in loss of points,
making it possible to have a negative score.

METHOD

Participants

A total of 32 undergraduates from South Dakota State University participated: 10 men
and 22 women. The participants were randomly assigned to either the control (5 men, 13
women) or experimental (5 men, 9 women) condition depending on which session time they
were scheduled. Participants were recruited from undergraduate psychology classes. Some
students received compensation from their course instructors for their participation in this
study. Upon completion of the study, each participant’s name was entered into a raffle
drawing with the chance to win a coupon or gift card to Cubby’s Sports Bar and Grill, SDSU Dairy Bar, and Brookings Cinema 5. Students with a current diagnosis of any form of psychiatric or behavioral disorder, students under the influence of alcohol, illegal substances, any antidepressant or anti-anxiety drug or cold medicine, students with a history of epilepsy or seizures, students taking any medication for Attention Deficit Disorder, and students under the age of eighteen did not have their results included in the final data analysis. The Institutional Review Board approved the current study.

Materials

Computers were used to show the participants the SynWin (Activity Research Center, 2001) program containing the experiment. The program recorded responses to all the tasks in addition to the total points for both conditions. The demographic information sheet served as an implied consent form that the participants completed and returned.

Procedures

Both groups performed the same tasks under the same environmental conditions; the only difference was the experimental group was provided with visual feedback in the form of a score in the middle of their screen. This score provided the participants with continuous visual feedback about their accuracy in completing the tasks.

The information sheet was read aloud and the participants were told that their consent was implied by their completion and submission of their demographic information sheet. A short demographic information sheet containing questions about the participant’s age, major, and gender, was then completed and sealed in individual manila envelopes. The participants were given three minutes to practice and become familiar with the SynWin program and the tasks to be completed. In the upper left corner was a letter recognition task, and the upper right corner had the math problem, as seen in Figure 1. Immediately following the practice, the participants began the 15-minute experimental session with only the two tasks. The second part of the experiment followed the same pattern as the first part, but included two additional tasks. The lower left corner had a gauge that needed to be reset and the lower right corner had an alert circle to be clicked when the participant heard a high tone from a background of low tones. During the tasks, the experimental group received visual feedback in the form of point totals. Once all participants finished the second 15-minute experimental part, they were debriefed as to the hypothesis of the study.

RESULTS

The average total points are presented in figures 2 and 3 for each of the independent variables. Figure 2 examines the average point totals between the no feedback and feedback conditions. The experimental group has a higher total point average than the control group, but there is large variation between the two groups (M=3059.79, SD=1220.91; M=2050, SD=1515.548435 respectively). A two-way between ANOVA using experimental condition and gender as the two variables, shows there is no significant main effect of experimental condition on average point totals [F(1,28)=1.877, p=.182].
Figure 3 displays the effects of gender. The average total points for men and women are close, but men have slightly higher average total points than women do (M=2709.6, SD=1685.71; M=2392.77, SD=1383.41 respectively). In addition to the similar average total points, there is a large amount of variability within both groups. The results of a two-way between ANOVA did not find a significant main effect of gender on average point totals [F(1,28)=.119, p=.732]. Table 1 also displays that there is not a significant interaction between experimental condition and gender [F(1,28)=1.794, p=1.91].

**DISCUSSION**

In the current study, those receiving feedback had higher average point totals than did those in the control group who did not receive visual feedback. There were no main effects of either independent variable nor an interaction between the two, as determined by a two-way between ANOVA, which could be due to the large variability within the measure of behavior. A literature review indicated that gender did not influence the effects of feedback and the current study did not find a significant difference between the average total points of men and women.

Chiviacowsky, Wulf, Walley, and Borges (2009) examined the effects of feedback during a motor task completed by older adults. The task involved tossing beanbags onto a target, which had different points to be earned for getting the bag in a specific area of the target. One group received feedback about their highest scoring trials and the other group received feedback on their lowest scoring trials. Results from that study showed that as the trials progressed, the group who received “good” feedback became more accurate with their tosses. Their findings were not statistically significant. The current study was similar in that there was not a significant effect. A possible explanation for the lack of significant effects in either study could be the high degree of variability within the behaviors.

Another possible explanation for the lack of significance in the current study could be that the computer task is not as affected by feedback as are gross-motor tasks. The majority of the research in the area of feedback involves gross-motor tasks, but Rantz, Dickinson, Sinclair, and Van Houten (2009) conducted a study to determine whether or not feedback lead to greater accuracy in completing a pre-flight checklist during flight simulation training. Rantz et al. (2009) found that graphic and verbal feedback lead to more list items correctly completed. The Rantz et al. (2009) study demonstrates that feedback can be beneficial for non-motor tasks.

Neth, Khemlani, and Gray (2008) investigated the effects of local verses global feedback on a multitasking computer program called Tardast. In their study, global feedback was given continuously in the form of a satisfactory scale, and the global feedback condition was given as a summary of level of performance at the end of the task. Neth, Khemlani, and Gray (2008) found both conditions improved as the trials progresses but that those who received local feedback had significantly higher satisfactory scores than those who received global feedback. Knowing that others have found that feedback has an effect on multitasking behavior, there is another possible explanation for the lack of significant findings in the current study. It is possible that the feedback in this particular study was insufficient in
producing the desired outcomes. Although only the experimental group was provided with the continuous score about their accuracy rates in responding, both groups received audio feedback for some correct and incorrect responses. For a correct, or point-earning response on the letter recognition task and the addition problem, participants heard a coin clink sound. When they responded incorrectly on either of those two tasks they heard an aversive tone. The research design did not draw attention to these sounds, but it is possible that the participants in the control group interpreted the audio feedback and adjusted their responding accordingly.

In further research, examining visual feedback alone might yield a greater difference between the experimental and control conditions, and it could decrease the variability within the measure. An increase in sample size for other feedback studies might be beneficial in approaching statistically significant results. A different dependent variable such as average reaction times in a study similar to the current one might be more effective at picking up differences between groups if these differences are present. Continued research on the effects of feedback on computer related tasks or learning tasks is needed in order to determine if feedback can be useful for improving accuracy in areas that are non-motor related.

Table 1: Results of a Two-Way ANOVA Between examining Gender and Condition

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
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<td>232760</td>
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<td>0.732</td>
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<tr>
<td>Condition</td>
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<td>3658387</td>
<td>1.877</td>
<td>0.182</td>
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<tr>
<td>Gender * Condition</td>
<td>3496592.24</td>
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<td>3496592</td>
<td>1.794</td>
<td>0.191</td>
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<tr>
<td>Within</td>
<td>54578044.79</td>
<td>28</td>
<td>1949216</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 1. A screen shot of the SynWin program for the experimental condition is shown.

Figure 2. The average total points for the experimental and control conditions. Error bars represent the standard deviation.
Figure 3. The average total points for men and women. Error bars represent the standard deviation.

REFERENCES


SynWin (Version 1.2.28) [Computer Software.] Chula Vista, California: Activity Research Services.


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