Using Brief Experimental Analysis to Increase GRE Vocabulary Knowledge
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Abstract
College students planning to apply for graduate school often prepare to take the Graduate Record Examination (GRE). The advanced vocabulary questions on the GRE verbal are often a high priority for students studying for the GRE (Loken, et al., 2004). We plan to explore whether Brief Experimental Analysis (BEA) procedures can be applied to select an effective intervention for university students preparing for the GRE. Once an effective intervention is identified through BEA, an extended analysis using a cumulative acquisition single-case experimental design, will be conducted. In this design, the most effective and second most effective intervention will be implemented on alternating days to see which results in a higher number of correct defined words across time. Data will be analyzed using visual analysis procedures. We hypothesize that BEA can be used to select an effective intervention and that applying that intervention over time will result in greater gains in vocabulary compared to the second most effective intervention.

Method
The GRE is the most common entrance examination for a diverse array of graduate schools. Approximately 800,000 college students take the GRE each year (Educational Testing Services, 2013). Performance on the GRE has a large impact on the ability to obtain an advanced degree. The GRE is composed of three sections: Verbal Reasoning, Quantitative Reasoning, and Analytical Writing (Educational Testing Services, 2013). Thus, language skills are fundamental for overall success on the GRE. Despite this, there is a lack of research on effective study strategies. An analysis of study behaviors indicated that students emphasized the vocabulary-based questions within the verbal section while studying (Loken, Riddellnays, Crespi, Millet, & Cushing, 2004). Research indicates that for school-aged children Brief Experimental Analysis (BEA) can be used to select effective academic interventions, especially in oral reading fluency (Burns & Wagner, 2008). BEA is a way to “test drive” different interventions, delivered in succession, to select a promising intervention for each participant. That promising intervention can be implemented, and its effects measured, over time. We selected three interventions commonly used to teach word definitions: interspersal, incremental rehearsal, and traditional flashcard drill. Although traditional flashcard drill procedures have been used for vocabulary instruction (e.g., MacQuarrie, Tucker, Burns, & Hartman, 2002), research suggests that interspersal procedures yield better results than traditional flashcard drill procedures for definitional knowledge and retention of knowledge over time (Peterson-Brown & Burns, 2011). In our study, we aimed to extend BEA beyond its conventional use to select an effective vocabulary intervention for college students. We then measured the effectiveness of this intervention across time in an extended analysis.

Participants
2 (1 male, 1 female) undergraduates preparing to take the GRE participated in the study. Helga was a freshman psychology major, and Leonard was a junior psychology major. Participants were offered extra credit for their time.

Interventions
Traditional Flashcard Drill: 6 unknown vocabulary words are presented to participants, who must then orally state and define the word. Once the participant has attempted to define each word, the procedure is repeated for 8 more trials.

Interspersal: 6 unknown words and 2 known words are presented to the participant in the following order: K1-U1-U2-K2-U3-U4-K3-U5-U6 (K= known word, U= unknown word) in a drill format. Once the participant has attempted to define each word, the unknowns are shuffled and the trial is repeated for 8 more trials.

Incremental Rehearsal: 6 unknown words and 9 known words are presented such that unknown words are interspersed between known words in a ratio that increases by one known word as each unknown word is introduced: (U1-K1-U1-K2-U1-K3-U1-K4-U1, and so on). After the participant has attempted to define each word, the procedure is repeated for 5 more trials.

Procedure
Participants completed a 336-word pre-test to determine known and unknown vocabulary words. Words included in the test were selected from commercially available GRE test preparation materials and were identified by the publishers as commonly occurring words on the GRE (e.g., Kaplan, Princeton Review). This test required participants to select the correct definition for a given word from an array of five options. The test was administered online. There was no time limit for completing the test and participants could take breaks throughout if they chose to do so. For each participant, a pool of unknown and known words was randomly identified. These words were then randomly assigned to conditions for the BEA and extended analysis such that 6 unknown words were assigned to each condition. A different number of known words was assigned based on the condition as described above. The BEAs were conducted in quiet rooms on campus and took place across two sessions, each lasting approximately 20-30 minutes. During the first session, the three interventions were delivered in a predetermined random order. After each intervention was delivered, a five-minute break was taken. After the delay, each unknown word was presented orally in turn and the participant was asked to state the definition of that word. The experimenter tracked the number of words defined correctly and this served as an outcome measure for the BEA. Approximately 24 hours after the BEA session was completed, the participant was either contacted via phone, or during the next session, and again asked to define the 6 words targeted in each of the BEA sessions. The experimenter tracked the number of words defined correctly and this served as the delayed recall outcome measure. For Helga, the top two interventions were selected to be used in the extended analysis based on the total number of words recalled in the immediate and delayed recall test (i.e., IR, and interspersal respectively). For Leonard, because all conditions resulted in 100% accuracy in recall, the two interventions deemed easiest to implement by the researcher were selected for the extended analysis (i.e., traditional flashcard drill and interspersal).

Outcomes
Participants retook the pretest to assess their gains in vocabulary knowledge by comparing their post-intervention scores to their pre-intervention scores.

Discussion
If we assume data collection continues on the trend we are seeing with Helga’s results thus far, our results may accord with other findings—that BEA can be used to select an effective intervention. However, our results could add to the literature by providing evidence that BEA’s effectiveness for selecting effective interventions can be extended to higher education, which has never been done. Potential limitations to our study include selection bias—only students who were highly motivated to increase their advanced vocabulary knowledge may have volunteered to participate. Additionally, we cannot be sure that participants did not study vocabulary words outside of the sessions, although we discouraged them from doing so. Another possible limitation is our small sample size. In single-case designs, small sample size is always considered a possible limitation. Implications for our study include possibly incorporating BEA into the study practices of higher-education students to maximize the use of similar study strategies for individual students, thus making the most of their time spent studying. For the GRE specifically, our results could indicate that BEA can be used to increase vocabulary knowledge for all students preparing to take the GRE, not just students who struggle with vocabulary. Future research could investigate similar questions on other GRE sections.

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References

Introduction
The GRE is the most common entrance examination for a diverse array of graduate schools. Approximately 800,000 college students take the GRE each year (Educational Testing Services, 2013). Performance on the GRE has a large impact on the ability to obtain an advanced degree. The GRE is composed of three sections: Verbal Reasoning, Quantitative Reasoning, and Analytical Writing (Educational Testing Services, 2013). Thus, language skills are fundamental for overall success on the GRE. Despite this, there is a lack of research on effective study strategies. An analysis of study behaviors indicated that students emphasized the vocabulary-based questions within the verbal section while studying (Loken, Riddelnsays, Crespi, Millet, & Cushing, 2004). Research indicates that for school-aged children Brief Experimental Analysis (BEA) can be used to select effective academic interventions, especially in oral reading fluency (Burns & Wagner, 2008). BEA is a way to “test drive” different interventions, delivered in succession, to select a promising intervention for each participant. That promising intervention can be implemented, and its effects measured, over time. We selected three interventions commonly used to teach word definitions: interspersal, incremental rehearsal, and traditional flashcard drill. Although traditional flashcard drill procedures have been used for vocabulary instruction (e.g., MacQuarrie, Tucker, Burns, & Hartman, 2002), research suggests that interspersal procedures yield better results than traditional flashcard drill procedures for definitional knowledge and retention of knowledge over time (Peterson-Brown & Burns, 2011). In our study, we aimed to extend BEA beyond its conventional use to select an effective vocabulary intervention for college students. We then measured the effectiveness of this intervention across time in an extended analysis.

Results
If we assume data collection continues on the trend we are seeing with Helga’s results thus far, our results may accord with other findings—that BEA can be used to select an effective intervention. However, our results could add to the literature by providing evidence that BEA’s effectiveness for selecting effective interventions can be extended to higher education, which has never been done. Potential limitations to our study include selection bias—only students who were highly motivated to increase their advanced vocabulary knowledge may have volunteered to participate. Additionally, we cannot be sure that participants did not study vocabulary words outside of the sessions, although we discouraged them from doing so. Another possible limitation is our small sample size. In single-case designs, small sample size is always considered a possible limitation. Implications for our study include possibly incorporating BEA into the study practices of higher-education students to maximize the use of similar study strategies for individual students, thus making the most of their time spent studying. For the GRE specifically, our results could indicate that BEA can be used to increase vocabulary knowledge for all students preparing to take the GRE, not just students who struggle with vocabulary. Future research could investigate similar questions on other GRE sections.