Lehigh University

Annual Progress Report: 2012 Formula Grant

Reporting Period

July 1, 2013 – July 30, 2014

Formula Grant Overview

Lehigh University received $75,533 in formula funds for the grant award period January 1, 2013 through June 30, 2015. Accomplishments for the reporting period are described below.

Research Project 1: Project Title and Purpose

Long-Term Consequences of Controlled Forgetting for Remote and Complex Memories – The purpose of the proposed research project is to define the scope and limitations of intentional forgetting, which will inform the mental health sector as to whether intentional forgetting could become a therapeutic tool helping patients to regain control over unwanted memories and intrusive thoughts that are characteristic of anxiety disorders. It has been shown that the intention to forget individual items in memory can impair their subsequent retrieval, but only short-term effects have been demonstrated. With the project, I seek to specify the conditions under which controlled forgetting can affect the retrieval of remote and complex memories in a long-lasting manner.

Anticipated Duration of Project

1/1/2013 – 6/30/2015

Project Overview

Instructing people to forget some recently encoded information, or asking them to suppress retrieval of this information, can cause memory impairments. However, it is currently not known whether this controlled forgetting extends from simple item lists to complex and autobiographical memories, and whether it has long-term consequences. This project seeks to fill this gap, and will thereby assess whether controlled forgetting could become a useful therapeutic tool helping patients who suffer from intrusive thoughts and memories to regain control over their mental processes. Five empirical studies involving human subjects are proposed that target the following aims. *Aim 1* concerns the optimal timing of controlled forgetting and the age of the targeted memory. Studies under Aim 1 will assess the long-term effects of controlled forgetting and whether controlled forgetting can impair the retrieval of remote memories. *Aim 2* concerns the role of memory complexity. Studies under Aim 2 will assess whether autobiographical memories and other complex episodic memories are subject to controlled forgetting, and which aspects of those memories can be affected. The studies will employ, but critically extend, two well-established research paradigms: list-method directed forgetting and retrieval suppression. In

the proposed studies, participants will be asked to learn some material (ranging from simple item lists to complex video segments) or to retrieve specific autobiographical memories. At later time points, participants will be instructed to forget or to suppress the retrieval of parts of the presented information, and to keep remembering or to practice retrieval of other parts. Memory performance for both the to-be-forgotten and the to-be-remembered material will be assessed with recall and recognition tests after various time delays. The studies will comprehensively assess under which conditions controlled forgetting impairs retrieval of individual items and complex episodic and autobiographical memories, both in the short and long term.

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Other Participating Researchers

None

Expected Research Outcomes and Benefits

The research project seeks to close a long-standing gap between basic memory research and clinical applications in the area of controlled forgetting. The usefulness of instructed forgetting/suppression for clinical applications cannot be assessed until we know (a) whether the forgetting effects persist in the long term, and (b) whether controlled forgetting can affect also more remote memories typically targeted in clinical practice. Specifically, controlled forgetting might become a therapeutic tool that helps patients control intrusive thoughts and memories. In order to be useful for the clinical practice, controlled forgetting must impair retrieval of autobiographical and complex memories. However, most studies use simple word or picture lists as study material, and have focused on short term effects. If it can be shown that controlled forgetting impairs the accessibility of complex memories in a long-lasting manner, this would be an important first step in developing efficient and cost-effective, but also self-empowering cognitive treatments for psychological disorders that are characterized by intrusive thoughts and memories such as anxiety and obsessive-compulsive disorders, and especially Posttraumatic Stress Disorder. The proposed studies systematically assess these open research questions and will provide important preliminary findings that will illustrate the feasibility of the research and will show under which conditions controlled forgetting has long-lasting consequences for both recent and remote, and critically, complex memories.

Summary of Research Completed

During the reporting period, additional subjects were recruited for Study 1C and data analyses for Studies 1A and 1C were finalized. Based on recent findings highlighting the pivotal role of

sleep for memory storage/consolidation, Study 1B (Aim 1) was modified to assess whether the long-term directed forgetting effects that were discovered in Study 1A are potentiated by sleep (in lieu of potentiated by repeated forget instructions as originally proposed). This study is important for understanding the mechanisms underlying long-term directed forgetting and therefore directly addresses Aim 1. A total of 162 participants were enrolled in this study. For Aim 2, the study material for Study 2B was piloted. A total of 12 participants were tested in this pilot study.

Aim 1: Does controlled forgetting cause long-lasting changes in the accessibility of memories, and can controlled forgetting affect remote memories?

Study 1A: Long-term-effects of directed forgetting

Results of the free recall test of this study were described in the prior annual report. The recognition test results were analyzed during this reporting period. In the recognition test, subjects were sequentially presented with items from List 1 (L1), List 2 (L2) and new items, and were asked to indicate the source of each item. It was hypothesized that immediate recognition performance should be unaffected by the forget cue, but that the costs (impaired memory for L1 in the forget group in comparison to the remember group) and the benefits (enhanced memory for L2 in the forget group in comparison to the remember group) of the forget cue should be demonstrated in the delayed recognition test. Figure 1 depicts recognition performances in the immediate (Fig. 1a) and delayed groups (Fig. 1b). As expected, performance was generally better in the immediate in comparison to the delayed groups. Crucially, no differences were found between the forget group and the remember group, neither in the immediate nor in the delayed recognition test. While this was hypothesized for the immediate condition, it was unexpected for the delayed condition. This dissociation shows that while the forget cue impairs the accessibility of items in memory; participants can still access these memory traces when strong retrieval cues are provided.

Study 1B: The role of sleep for long-term directed forgetting (DF)

Motivation. Recent studies show that sleep modulates the long-term storage of memories. Specifically, it has been shown that memories that are tagged as important during wakefulness are selectively strengthened during sleep, whereas memories that are unimportant or unwanted do not receive such a boost. In order to better understand the mechanisms underlying long-term DF, Study 1B assessed whether the long-term effects of DF that were discovered in Study 1A are sleep dependent. This directly addresses Aim 1.

Methods.

Design and Participants. Study 1B followed a 2 (instruction: forget, remember) x 2 (delay: 12hr-day vs. 12hr-night vs. 24hr-delay) x 2 (test: recall vs. recognition/source test) mixed factorial design, with test as the only within-subject factor. It was originally proposed to include 288 participants in Study 1B. This number was changed, because as in Studies 1A and 1C, the test variable was manipulated within instead of between subjects. This resulted in a target enrollment of 144 participants. During the reporting period, 162 participants between the ages of 18-35 were recruited through online advertisements from the Lehigh University campus, and from the departmental participant pool. The recruited number exceeded the target enrollment because several participants missed the second session of the experiment (N=11), or had to be excluded for other reasons (see results). Participants were randomly assigned to each of the 6 experimental groups. Participants received $15 or course credit for their participation.

Material. The study material consisted of 2 lists (L1, L2) of 15 concrete objects depicted as black-and-white line drawings. Across participants, each list served equally often as L1 or L2. During the recognition test, a third list of 15 concrete objects was used as new items.
Procedure. Learning took place either in the morning (12hr-day group), evening (12hr-night group) or at various times throughout the day (24hr group). Participants were told that they would be presented with separate lists of pictures and that after each list, they would be informed about whether to forget or to remember the just-presented information. Then L1 items were presented one at a time in a randomized order. After presentation of L1 items, participants were either cued to forget or to remember the list. Then, all participants were told that they were about to learn a second list and that this list was important to remember. Then L2 items were presented. Upon L2 presentation, all participants were given 30 two-digit subtraction/addition problems of which they were asked to solve as many as possible within 1 minute. Then all participants were released, but returned to the lab either 12 hours or 24 hours later for the final recall and recognition test. During the recall test, participants were asked to first write down all the L1 items they could remember. Afterwards, they were asked to recall L2 on a separate sheet of paper. Immediately after, participants were presented with L1, L2 and 15 new line drawings (L3) one at a time in a randomized order on the computer screen, with the task to decide for each item whether it was from L1, L2 or new. Participants in the 12-hr night and 24-hr delay group were additionally asked to fill in a sleep diary.

Results

Thirty-four participants were excluded from final analyses because they either did not follow or had difficulties understanding test instructions, recalled less than 3 items overall, recalled more than 2 items that were not part of either list, or showed recall performances that were more than 3 standard deviations above the mean of the specific delay condition.
Free Recall Performance. Figure 2 depicts recall performances in the 12hr- and 24hr-delay groups. The 24hr-delay group (Fig. 2a) replicated the results from Study 1A: The forget instruction resulted in long-term costs (diminished L1 recall). The long-term benefits (enhanced L2 recall) were marginally significant. A comparison between the 12hr-day (Fig. 2b) and the 12hr-night groups (Fig. 2c) shows (a) that memory generally benefited from sleep, and (b) that the costs and benefits of DF were potentiated by sleep. This is a novel finding, which demonstrates that sleep plays an essential role in the development of long-term DF effects. Since many psychological disorders such as Posttraumatic Stress Disorder (PTSD) are associated with sleep disturbances, this means that it might be especially challenging to modify the long-term accessibility of memories in these populations.
Recognition Performance. As in Study 1A, no differences in recognition performances were found between the forget and remember groups, in either of the delay groups. Together with the results of Study 1A, this provides strong evidence for the view that the attempt to forget impairs the retrievability or accessibility of information, while it does not "erase" memory traces altogether.

Study 1C: Controlled forgetting of remote memories

Results of the free recall part of this study were reported in the prior annual report. An additional 10 participants were recruited, of which 3 had to be excluded from analyses because of program error or because the participants recalled more than 2 items that were on neither list. This resulted in a final sample size of 24 in the forget and 23 in the remember condition. The addition of these participants did not change the pattern of free recall results that was reported in

the prior annual report. The recognition test results were analyzed during this reporting period. The procedure was identical to that described for Study 1A. The results are depicted in Figure 3. Since the forgetting instruction did not affect the free recall of L1 and L2, it is not surprising that it also did not affect recognition performance. A comparison of the recognition performances between Study 1A and Study 1C shows that source errors were reduced in Study 1C. This is due to the fact that the two lists were studied on different days, adding a temporal cue to the memory trace, which in turn makes the traces easier to distinguish.

Aim 2: Does controlled forgetting affect complex episodic-type memories?

Study 2A: not yet completed

Study 2B: Effects of retrieval suppression on new, complex memories

Motivation. Attempting to suppress the memory of individual target items (e.g., an individual word) can be understood as an all-or-none phenomenon in that people are either successful and the target does not come to mind, or they are not successful, and the target will come to mind, which will turn a suppression trial into a retrieval trial. In the case of event-type memories, retrieval suppression could be more gradual, e.g., people might be unable to suppress the initial parts of the remembered event, but might be successful at terminating retrieval at later time points in the event narrative. It is hypothesized that retrieval suppression effects should be more reliably observed with event-type memories than with the commonly used cue-target item pairs. During the reporting period, an episode of a TV show was pretested for use in Study 2B. The goal for this pilot study was to segment the video into three parts that are comparable in terms of number of idea units and complexity, and to develop test questions that assess memory for these parts.

Method and Results of the Pilot Study. A 20-minute episode of a TV show that contains intersecting story lines of four individual characters was chosen. The presence of individual story lines made it easy to segment the story. Three of the four story lines (characters) were chosen for memory assessment, because the complexity and number of idea units in these story lines appeared comparable. For each character, a set of 18 cued-recall questions was developed to assess the memory for each individual story line. Twelve participants were tested. First, they watched the TV episode, and after a short distractor task, answered a total of 54 cued recall questions, blocked by character. The order of blocks was counterbalanced across participants. The mean correct responses were above 50% for all characters (M_1=68%, M_2=59%, M_3=73%) which makes the episode and questions generally suitable for Study 1B. However, the mean correct recall rates differed between the three characters. A closer look at the individual questions and answers revealed that some of the questions (especially for character 2) were especially difficult to answer, while some other questions resulted in ceiling performances (especially for character 3). For Study 1B, I will therefore select 12 target questions of medium difficulty for each character, such that without retrieval suppression, cued recall performance can be expected to be comparable for the individual story lines.

Figures

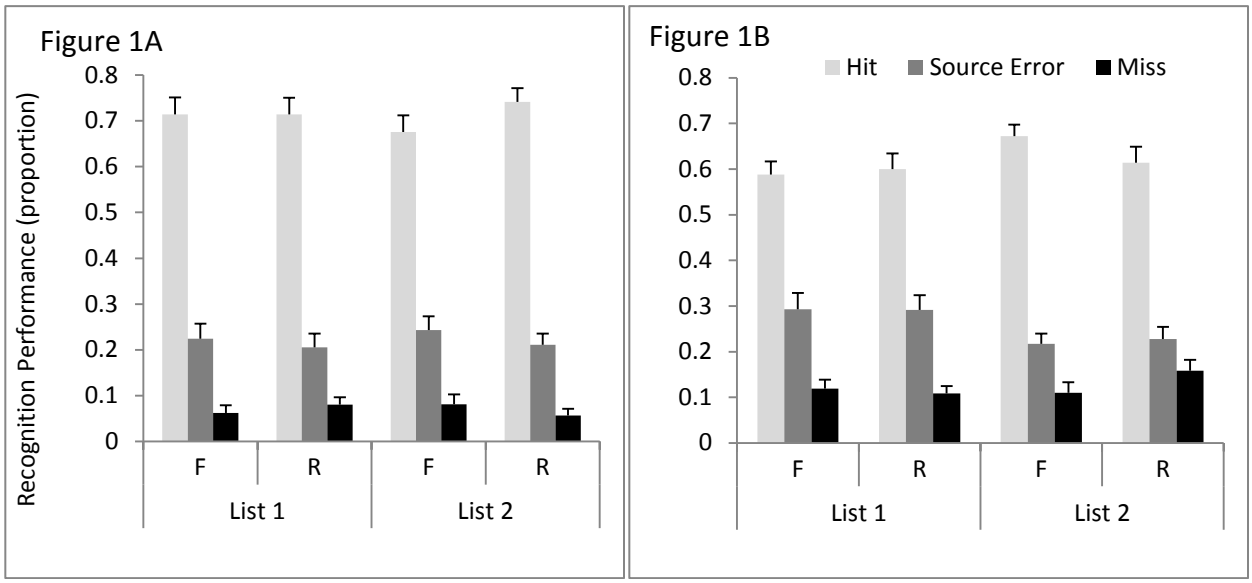

Figure 1: Proportion of items from List 1 and List 2 that were correctly identified, attributed to the incorrect list or missed in the immediate (Fig. 1a) and the delayed recognition task (Fig. 1b) in relation to the instruction (forget vs. remember). Error bars represent standard error of means.

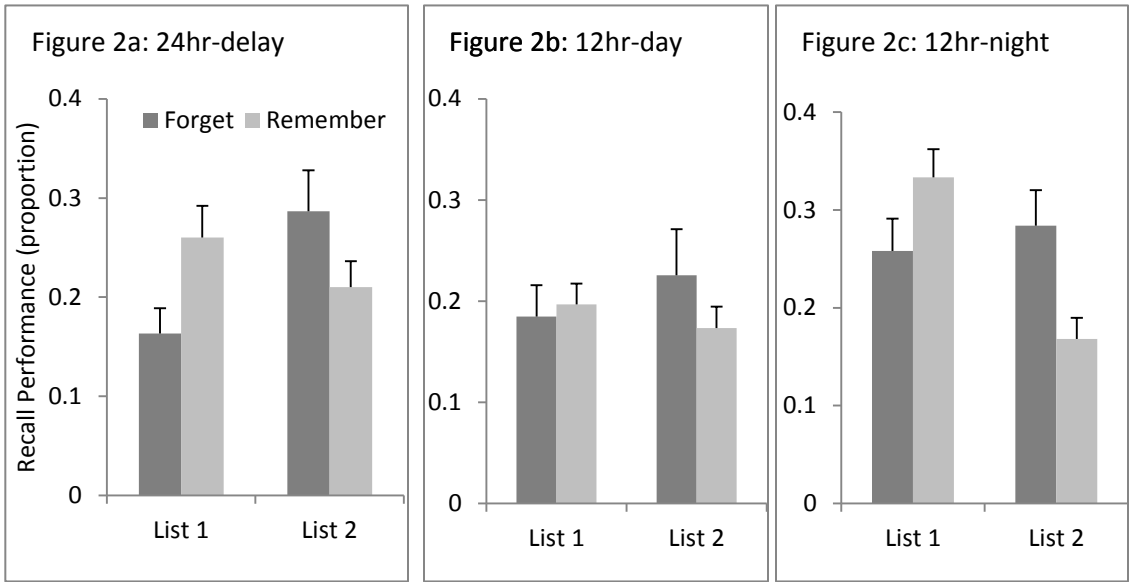

Figure 2: Proportion of items recalled in the 24hr-delay (Fig. 2a), 12-hr day (Fig. 2b), and 12hr-night groups (Fig. 2b) in relation to the instruction (forget vs. remember). Error bars represent standard error of means.

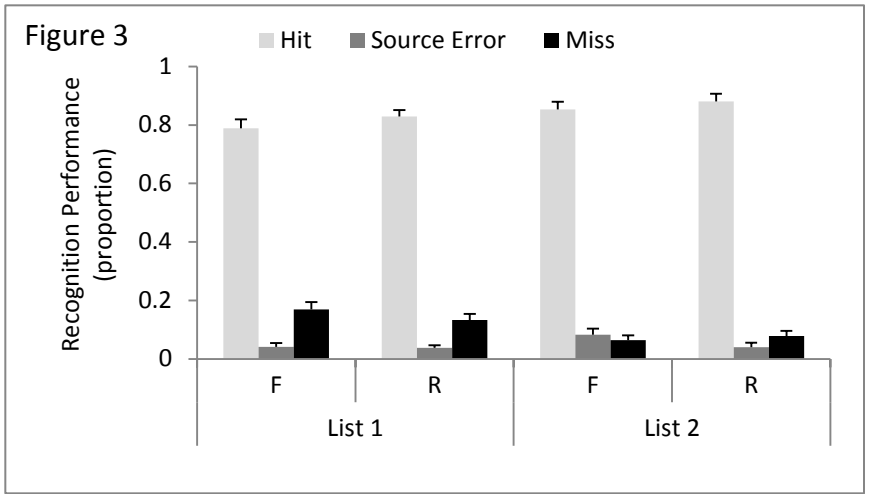

Figure 3: Proportions of items from List 1 and List 2 that were correctly identified, attributed to the incorrect list or missed in Study 1C in relation to the instruction (forget vs. remember). Error bars represent standard error of means.

Research Project 2: Project Title and Purpose

Mental Health Issues in the Bethlehem Community – Despite the high prevalence, psychological problems are overlooked and undertreated in adolescents from low-income and ethnically diverse populations (Thomas, Temple, Perez, & Rupp, 2011). School based mental health clinics (SBMHC) are one way to provide mental health services by increasing health care utilization for these hard to reach communities. Based within the Community Voices Clinic (CVC), an SBMHC, this research study will build knowledge about the issues that impact low-income children and families in Southside Bethlehem, in order to develop culturally sensitive prevention and treatment interventions. Focus groups with five stakeholders will provide multiple perspectives on mental health needs of this community.

Anticipated Duration of Project

1/1/2013 – 6/30/2015

Project Overview

Ethnic disparities among ethnic minority youth with regard to access to and quality of mental health care have been attributed to low income, underinsurance, lack of insurance, social stigma and limited access to culturally appropriate services. Because of their location and access, school based mental health clinics (SBMHC's) play a viable role in the provision of services thereby increasing family resiliency and in turn student achievement. Using a participatory action research methodology and conducting interviews through focus groups, we seek to gain knowledge from multiple perspectives on the key mental health needs of students and their families in Southside Bethlehem's Broughal Middle School. In doing so, we hope to identify culturally appropriate prevention and intervention that allows for greater access to mental health

services at the CVC, an SBMHC.

Aim 1: Building community partnership and buy-in for research on mental health care disparities. Engaging the community is important to the success of any community based research. In fact, participatory action research is based on the premise that partnering with relevant stakeholders is key to stronger research designs and more meaningful outcomes.
Aim 2: Understanding key mental health challenges faced by students in the Bethlehem community through multiple perspectives. An ecological framework highlights the mutual and reciprocal relationships between multiple cultural and systemic contexts and the students. Thus focus groups will be conducted with students, parents, teachers, counseling personnel, and community leaders. This approach has been widely used with school and ethnic minority populations as it allows participants to share ideas and opinions within a communal/collectivistic forum.
Aim 3: Understanding how to make mental health services culturally appropriate. Participatory intervention model explicitly examines the role of culture. Specifically, through this research, we seek to collaborate with the community by co-constructing culturally meaningful research protocols for investigation as well as culturally relevant prevention and intervention that would be appropriate for the community.

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Expected Research Outcomes and Benefits

The primary goal of this project is to obtain preliminary data to understand the key mental health related challenges faced by students and their families in the Broughal Middle School community and assess how effectively an SBMHC such as the family-focused CVC can viably support the school but also address public mental health concerns in a culturally appropriate manner. This overarching goal is based in four intended outcomes: (1) build a researcher-community partnership to better understand disparities in mental health; (2) use the data to not only inform remedial services but also develop more proactive universal preventive approaches so as to assess and refine services provided by the CVC; (3) use the data to define future research investigations on the mental health service delivery while identifying potential investigative partners; and (4) use the preliminary findings to help seed new research and be a steppingstone in applying to external funding (e.g., NIH/NIMH grant).

The clinic provides an important base for conducting research addressing mental health care

disparities. Given that the SBMHC is based within Broughal Middle School, conducting this research under the auspices of the clinic will further support the services offered in the school, build on the community trust, and increase engagement in mental health in general. Basing a research program that is situated in community concerns will increase reliability and help build groundwork for future investigations. This study's findings will (1) expand on the current treatment and preventive interventions needed to improve the health status and access to mental health services, (2) identify at-risk youth currently not exhibiting mental health difficulties, and (3) allows for better understanding of cultural issues that impact access to mental health care.

Summary of Research Completed

There have been two phases to this study. During this reporting period, data collected in phase 1 through the three focus groups was transcribed verbatim and checked for accuracies against the audio recordings. Transcripts were de-identified and coded for common themes that evolved from the data. These were then shared with the 13 interviewees from the focus groups to assess if the themes reflect the ideas and concepts discussed in the focus groups. Furthermore, feedback received on the interview protocol was used to develop a new interview protocol submitted for review to the 14 interviewees. Once approved, and consistent with community based participatory action research, we solicited those interviewees who have expressed interest in being part of the research team to assist us in identifying participants and conduct the focus groups. An advisory committee representative of the stakeholders was also appointed to solicit feedback on the research process.

During phase 2, the focus was on: Aim 2: Understanding key mental health challenges faced by students in the Bethlehem community through multiple perspectives. During this period, we conducted we conducted total of 11 focus groups: 3 student groups, 2 parent groups, 3 teacher groups, 2 mental health service provider groups, and one mental health funder group. Each focus group has lasted for 1-1.5 hours. Focus groups were audio-recorded, transcribed verbatim and coded for common themes. We are currently planning to conduct at least three more focus groups: one parent group and two community leader groups. Challenges have occurred due to scheduling difficulties. Based on the current data, we also presented our findings at the Society for Research in Child Development Special Topic Meeting: Strengthening connections among child, family research, policy, and practice, Alexandria, VA in April 2014.