THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF PSYCHOLOGY

NON-CONTINGENT AFFECTIVE OUTCOMES INFLUENCE FEELINGS OF CONTROL

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A thesis
submitted in partial fulfillment
of the requirements
for a baccalaureate degree
in Psychology
with honors in Psychology

Reviewed and approved* by the following:

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Thesis Supervisor

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ABSTRACT

Although a body of evidence suggests that the sense of agency, or feelings of control (FoC) over actions and their outcomes, is a central component of intentional action, little is known about how emotionality influences agency. Furthermore, this connection has not been fully explored using an explicit account of agency judgements. In a series of experiments, we asked participants to complete variations of a simple aiming task, in which words appeared in place of clicked targets. The affective content of the words was not contingent on participants' performance. We then asked participants to judge their sense of agency. We found that FoC varied consistently across levels of affect, with the highest FoC for conditions with positive outcome words (e.g., 'puppy') and the lowest FoC for conditions with negative outcome words (e.g., 'killer'). These results suggest affective outcomes can influence the sense of agency, even though the outcomes are not related to performance.

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ACKNOWLEDGEMENTS

First, I would like to thank Dr. Richard Carlson for his three years of continuous support during every stage of this project. Dr. Carlson provided resources, lab space, expert advice and guidance from the conceptualization phase to the final draft. Additionally, I would like to thank Cory Potts, a graduate student in the Cognitive Skills Acquisition Lab, for his expertise, insight and comments throughout the process.

Lastly, many thanks to all the undergraduate research assistants who contributed to data collection, assisted in data coding, and provided comments during lab meetings that contributed to this project.

Chapter 1

Introduction

A growing body of evidence suggests that agency, or the feeling of control (FoC) over actions and their outcomes, is influenced by wide variety of factors. Some factors known to influence feelings of control include task performance (Metcalfe and Greene, 2007), temporal characteristics of actions and outcomes (Vuorre & Metcalfe, 2016), and response conflict (Sidarus & Haggard, 2016). However, a factor that has received scant attention in relation to agency is affective valence. The lack of research on the relationship between affect and feelings of control is surprising, given that affect has been shown to be an important signal for the adjustment of control (Dreisbach & Fischer, 2015; Driesbach & Goschke, 2004).

Some provisional support for a relationship between affect and FoC is provided in work by Yoshie & Haggard (2013). The authors reported connections between affectively valenced cues and intentional binding (IB), suggesting that negative outcomes weaken FoC over time. The concept of IB refers to actions and events being "bound" together in time in the subjective view of the experiencing agent (Moore & Obhi, 2012). Christenson and colleagues (2016) attribute the link between FoC and IB and this finding to the broader phenomenon of self-serving bias, asserting that people attribute negative outcomes to some "other" while identifying with positive actions (Bandura 1991). While not considered a holistic measure of agency, IB may be linked to explicit reports of FoC (Moore & Obhi, 2012). However, ambiguity remains about whether IB is, in fact, a valid measure of agency (David et al., 2008). Thus, it is unclear whether explicit reports of feelings of control would be affected by the emotional content of action-outcomes.

Indeed, it follows that there would be a connection between FoC and affect when one considers the typical goal of actions. Typically, the goal of intentional action is to bring about some effect on the environment (Blakemore, Wolpert & Frith, 2002). Said another way, actions are performed to successfully complete goals. Furthermore, contemporary ideomotor theory postulates that a reciprocal relationship exists between the internal representation of actions and actions themselves (Shin et al., 2010). If one allows that successful goal completion is associated with positive affect due to superior task performance, then it would make sense for positive affect to be connected to stronger FoC. One would then expect that this positive affect would match the internal representation of goal completion intended by the action initiator. Moreover, one might expect negative affect, which is presumably associated with unsuccessful task completion, to conflict with this internal representation, and would therefore be associated with weaker FoC.

As briefly mentioned above, a connection between feelings of control and affect seems probable when one considers the role of affect in the adjustment of control-related resources. Previous models of cognitive control support the connection between affect and the recruitment of control-related resources. Broadly, this research suggests that positive affect signals that current levels of control are sufficient for successful task completion (Kuhl & Kazén, 1997). Thus, one might expect an association between positive affect and stronger FoC due to the relation to successful performance. Negative affect, on the other hand, signals the need for an adjustment to the level of control (Driesbach & Goschke, 2004). Gratton and colleagues demonstrated that participants responded to incongruent trials faster than congruent trials (Gratton, Coles and Donchin, 1992). According to this model, the presence of competition among responses, or task dysfluency, results in negative affect, which signals the need for

additional control. Later research showed that positive affect as a primer, mood state, or outcome could reduce or even eliminate the Gratton effect (van Steenbergen et al.; 2009,2010, 2011). This suggests that affectively valenced signals can play various roles in maintaining and shifting goal-directed action, depending on context.

To more directly address the relationship between affect and explicit reports of FoC, we asked participants to complete an aiming task in which clicked targets were replaced by affectively valenced words. In some conditions, when participants clicked targets, they saw a negative word (e.g. ‘murder’), and in others, they saw a positive word (e.g. ‘love’). As previously discussed, performance is an important cue to agency (Metcalfe & Greene 2007). Therefore, the task was designed such that the affective valence of outcomes did not depend on task performance.

In a set of experiments, we found consistent effects of affect on FoC. Moreover, in Experiment 2, we found that an additional factor, namely aiming difficulty, influenced FoC, though the effect was independent from the effect of affect. These findings suggest that although the affective outcomes had no connection to task performance, participants showed considerable sensitivity to the affective valence of these outcomes. To our knowledge, this is the first demonstration of the effect of affective valence on explicit reports of control.

Chapter 2

Experiment 1

In Experiment 1a, participants completed an aiming task in which clicked targets were replaced by positive or negative words, depending on the block. At the end of each block, participants reported how much in control they felt by clicking along a slider bar, where the left side was “very little” control and the right side was “very much”. In Experiment 1b, a second group of participants completed an identical task, with two exceptions. First, blocks containing neutral words were presented in addition to positive and negative blocks. Second, instead of counterbalancing blocks, the order of blocks was randomized. Because of the similarity between the two experiments, the methods and results for Experiments 1a and b will be discussed together.

Participants

A total of 43 Pennsylvania State University undergraduate students participated in this experiment. Subjects were students in an introductory psychology class and received a small amount of course credit in exchange for participating in this study.

Design and Procedures

The subjects were broken into two counterbalanced groups: one completed positively valenced blocks first, and another completed negatively valenced blocks first. Participants were asked to perform a simple computer aiming task constructed using E-Prime software. In this task, a red circle appeared at the center of a screen. Clicking within the red circle's perimeter caused it to turn green, and a second blue target circle appeared. If participants clicking within the blue target circle, it briefly turned green (500ms) and then disappeared. The task is diagrammed in Figure 1. If they missed the circle initially, they were able to continue clicking until they successfully clicked within the circle's perimeter. Thus, failure in the aiming task was not possible. When the green target circle disappeared, a word appeared in its location. The word was displayed for one second before the next trial began.

The word that appeared on the screen either had a positive valence or a negative one. Words were taken from the ANEW dataset (Bradley and Lang 1999). These words were rated on a scale from 1 to 9 for affective valence, with 1 representing extremely negative valence and 9 representing extremely positive valence. A rating of 2.5 or below was considered negative,

and a 7.5 or higher rating was considered positive. Neutral words had an affective valence between 3.5 and 5.5.

After completing each block of six trials, subjects were asked to judge how in control they felt by answering the question: “how much in control did you feel during this task?” They answered by clicking along a slider bar, with one end labeled “very little” and the other labeled “very much”. After answering the question, the next set of trials began. Participants completed a total of four blocks in Experiment 1a (positive and negative affect, with 2 blocks per affect) and six blocks in Experiment 1b (positive, negative and neutral affect, with 2 blocks per affect). In Experiment 1a, the blocks were counterbalanced such that the transitions between positive and negative blocks were balanced between groups. Preliminary analyses suggested no effect of transition between affect in Experiment 1a. Therefore, in Experiment 1b, order was randomized.

Results

We predicted a relation between affect and FoC such that positive affect would be associated with stronger FoC, and negative affect would be associated with lower FoC. A repeated-measures ANOVA using the proportion of distance participants clicked from the left side of the slider bar, for which the label was “little control,” confirmed this prediction. In Experiment 1a there was a significant main effect of affect, F (1, 41) =9.43, p<.004, with stronger FoC for blocks with positive-outcome words (M=.712), and weaker FoC for blocks with negative-outcome words (M=.623). The results are shown in Figure 2. These results replicated in Experiment 1b, F (1, 48) =3.42, p<.04, as shown in Figure 3. The lowest ratings of control were

reported in the negative condition (M=.816) the highest were reported in the positive condition (M=.843), and the neutral condition fell in between (M=.858)

Discussion

Although previous studies have provided provisional support for a relationship between agency and affect, to our knowledge the effect of affective outcomes on explicit reports of control has remained untested. Therefore, Experiment 1a and 1b, we tested the association between explicit reports of control and affectively valence outcomes. Our results confirmed our predictions. A small, but reliable effect emerged across both experiments, suggesting that punctuating tasks with non-contingent affective stimuli in the form of positive or negative words can produce reliable influences on FoC. These results are surprising, given that these outcomes had no connection to task performance; participants could continue clicking until they successfully completed the task, therefore it was not possible to fail. Regardless, participants showed remarkable sensitivity to the affective content of action-outcomes.

We suggest that this relation is due to associations between successful actions and positively valenced outcomes, and unsuccessful actions and negatively valenced outcomes. As proposed in previous research on cognitive control, positive affect is a signal that the level of control is adequate to maintain performance and requires no adjustment. Negative outcomes and thus negative affect, on the other hand, signal a disruption to performance, and thus the recruitment of additional control-related resources. Thus, it makes sense for positively valenced outcomes to indicate that participants are in control, as no adjustments need to be made, and for negatively valenced outcomes to indicate that participants are not in control, and thus

need to adjust their control for successful performance. Interestingly, whereas previous research on cognitive control has suggested that the negative affect resulting from response conflict or disfluency signals the recruitment of additional control, here we find that an externally presented negative cue, unrelated to task performance, influenced FoC. This result raises interesting questions about the causal relation between affect and control.

Chapter 3

Experiment 2

In Experiment 2, we had two broad goals. The first was to replicate the effect observed in the first two experiments. The second was to test the effect of affect when a second factor that we have found to consistently influence agency, aiming difficulty, was introduced to the paradigm (Potts & Carlson, in prep). To manipulate aiming difficulty, target size was either large or small in each block.

Design and Procedures

A total of 42 participants completed Experiment 2 for a small amount of course credit. The procedure for Experiment 2 was identical to Experiments 1a and 1b, with one exception. In some blocks, the targets were small (10 pixels), and therefore more difficult to click. In other blocks, the targets were large (50 pixels) and therefore easier to click. Participants completed a total of 12 blocks of trials (positive, negative and neutral affect; large and small target size), with six trials in each block, for a total of 72 trials. The order of the blocks was randomized. At the end of each block, participants reported how much in control they felt.

Results

The effect of affect on FoC replicated in Experiment 2, F (1, 42) =4.129, p<.02. Collapsing across target size, the strongest FoC were reported for positive affect (M=.801) followed by neutral (M=.792), and negative affect (M=.752). Additionally, a significant main effect of target size emerged, F (1, 42) =11.288, p<.002, with stronger FoC for large targets (M=.813) and weaker FoC for smaller targets (M=.750). However, there was no interaction between these two factors. The data is shown in Figure 4.

Discussion

In Experiment 2, we introduced a second factor known to affect agency, namely aiming difficulty, to test for potential interactions with affect. Although both affect and aiming difficulty influenced agency, the two factors did not interact. This suggests independent contributions of movement-related factors and affective outcomes to FoC. This result makes sense because the outcomes were not meaningfully tied to the movements. Therefore, participants may not have considered a causal relation between movement difficultly and affective outcomes as more difficult aiming conditions were paired with both positively and negatively valenced words. It is possible, however, that there was variation among participants in the extent to which they considered movement-related and outcome-related components of the task. In future experiments, one could ask participants what they were intending to do to test the relative contributions of movement-related and outcome-related components, depending on the level at which participants represented the task.

Chapter 4

General Discussion

The results of three experiments suggested a clear and consistent effect of affect on feelings of control. Positive affect was reliably associated with stronger FoC, and negative affect was related to weaker FoC. These results suggest that non-contingent affective stimuli can reliably influence FoC. Experiment 1b additionally suggested that a neutral outcome would fall reliably between positive and negatively valenced stimuli, suggesting a consistent pattern of influence that was confirmed in the third experiment. Moreover, in Experiment 2 we found an effect of aiming difficulty on feelings of control, though this effect was independent of affect. Having established a connection between affectively valenced outcomes and feelings of control, we have two additional points of discussion.

Our first point addresses the connection between FoC and affective valence. A limitation of this study is that we were not aware of the extent to which participants thought about the goal of the task in terms of the action (i.e., clicking on targets) or in terms of the outcome (i.e., producing affectively valenced words)." Participants who thought about the task in terms of aiming would probably be less affected by the affective outcomes. Conversely, participants who thought about the goal of the task as producing affective words would probably be less affected by the aiming components. In future replications of this experiment, asking participants to report what they believed their goal was during the task would address the possibility that, although participants were told that the words were not connected to the aiming task, participants may have thought of the affective words as feedback on their aiming performance. Additionally, stating the agency question another way may produce different results. For example, if participants were asked instead how much control they used in a given block, one might expect

reports that would more closely follow the amount of control that would be predicted by models of cognitive control.

The second point relates to the potential applications of this paradigm that could inform ongoing research within clinical psychology. Individual differences in the metacognition of agency have been linked to broader theoretical explanations of the mental representation of self and other, which goes by many different names (e.g., social cognition, mentalizing, reflective function) throughout the psychological literature (Miele et al., 2011; Zalla et al., 2015). Deficits in this broad area of related constructs have been linked to a wide range of psychological disorders (Chung, Barch & Strube, 2014; Fonagy and Target, 2000; Uekermann et al., 2008). Applying this task and others like it could potentially provide valuable diagnostic information, as individual differences could shed light on the extent to which affective information is disrupting the experience of agency for different people. For instance, since depressed and anxious individuals are known to fixate on negative aspects of their own lives, one might expect an exaggerated pattern of responses, fixated on negative outcomes more heavily than positive ones, despite non-contingency. Similarly, in patients with borderline personality disorder (BPD), which is characterized by rapid vacillation between emotional states, one might expect to see a disorganized pattern of responses reflecting this theoretical tenet of BPD (Carpenter & Trull, 2013). An empirical investigation modeling the relationship between characteristics of BPD and trends in responses may also help researchers pinpoint differences in attribution or attention paid to emotional stimuli in real time. Though further research is needed to solidify these conclusions, applying this paradigm, and others like it, to clinical populations could shed light on the potentially problematic cognitive patterns that are characteristic of these disorders.

Feelings of control in intentional action play a key role in our understanding of both cognitive and experiential control-related processes. We argue that the role of affect on the cognitive level further suggests that FoC processes are vulnerable to the influence of affective valence. Taken together, our findings provide the first evidence for an explicit account of this relationship, and these results warrant further exploration and validation.

Appendix A

Figures

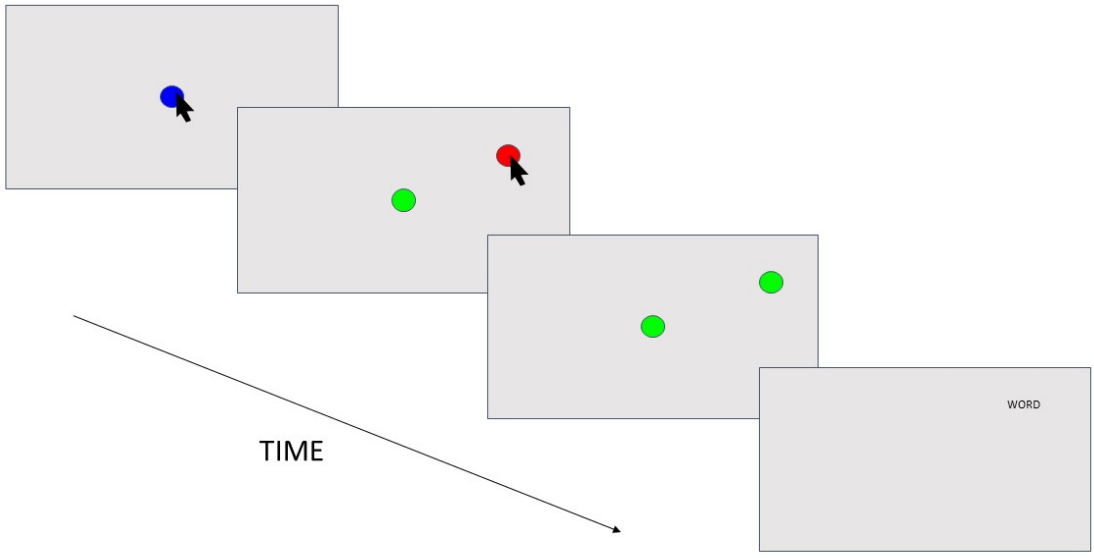

Figure 1. Computer display of task

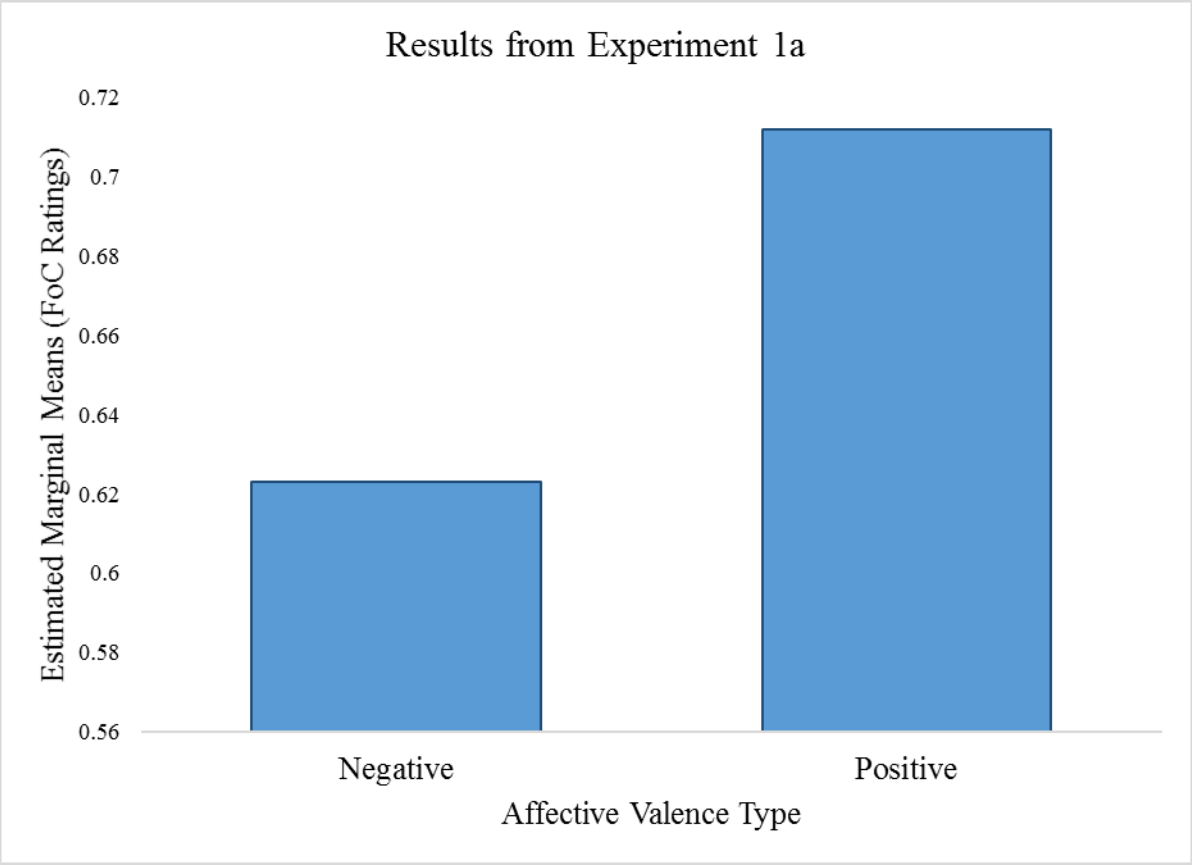

Figure 2. results from Experiment 1a

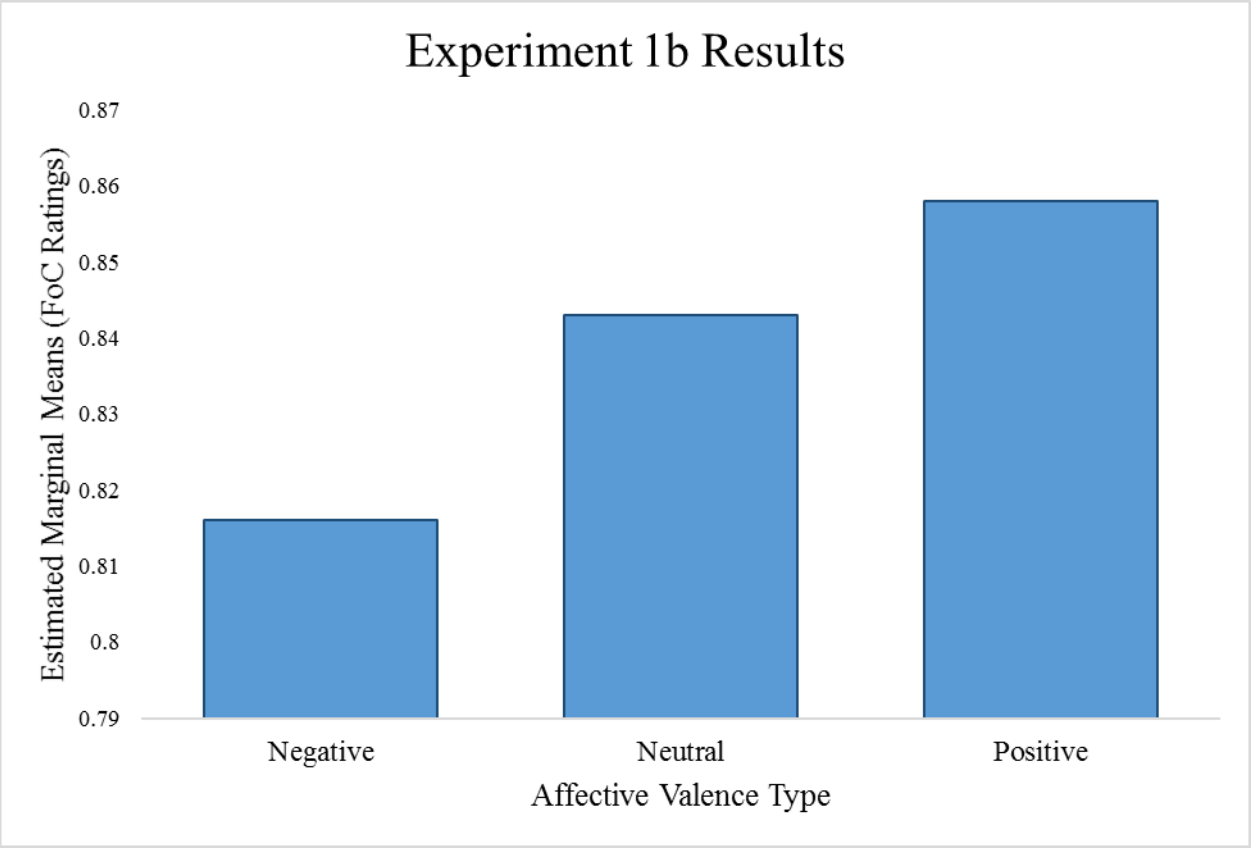

Figure 3. Results from Experiment 1b

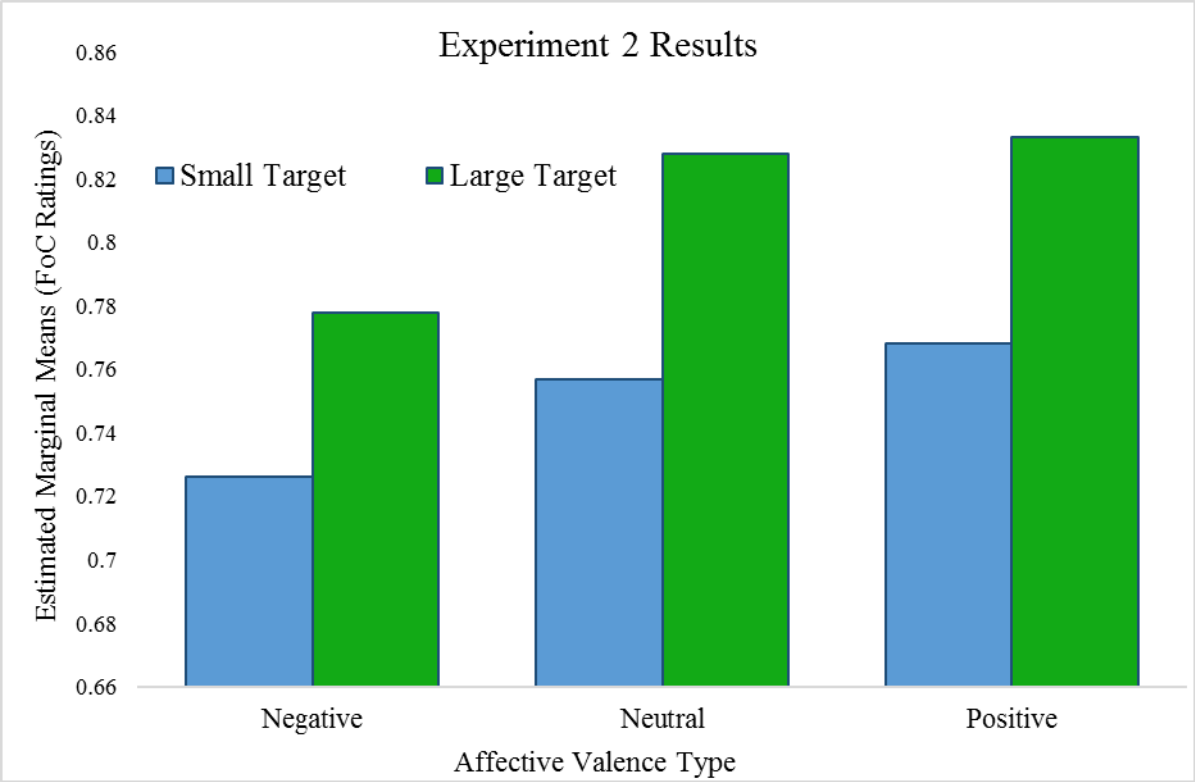

Figure 4. Results from Experiment 2

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ACADEMIC VITA

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Education

The Pennsylvania State University Spring 2019
Psychology, B.A., & Enhanced Minor in Italian, Paterno Fellow and Schreyer Scholar

Honors Thesis
Transient emotional states and feelings of control.
Advised by Dr. Richard Carlson

Università Mediterranea di Reggio Calabria *via Penn State Study Abroad* Summer 2017
Instructed by Prof. Vincenzo Gatto | Reggio Calabria, Italy
Intensive summer courses designed to promote fluency in Reggio Calabria, Italy. Taught solely in Italian by a senior Penn State faculty member native to Calabria, with guest lectures from university faculty across a variety of domains.

Academic Scholarships, Honors and Awards

Janet Shaner Memorial Fund Scholarship ($1000)	2015
Chester County Italian Society Scholarship ($1000)	2015
Wegmans Scholarship Fund ($1500 /year)	2016-Present
Paterno Fellowship (Approx. $8000/semester)	2015-Present
Dean's List	2015-Present
Penn State Liberal Arts Enrichment Funding: Global Experience Award ($1500)	Summer 2017
Penn State Liberal Arts Enrichment Funding: Research Award ($1500)	Summer 2018
Pennsylvania State University Student Marshal for Psychology	Spring 2019
Charles N. Cofer Memorial Award in Psychology	Spring 2019

Research Experience

The Cognitive Laboratory of Dr. Richard Alan Carlson
Supervised by Richard Carlson, Ph.D. | University Park, PA
Research Assistant (2016-Present) & Laboratory Manager (2017-Present)

Projects are focused on negative affect and working memory, the intentional void, and agency studies. Research assistantship entails subject running, data collection and coding. Lab management responsibilities include creating and executing study protocols**,** RA training and performance evaluation, data analysis, preparations for conference presentations and papers for publication. Specific studies outlined below.

The Intentional Void Project

Coordinate subject running and data coding for a study on the cognitive characteristics of forgetting and retrieval of intentions.

Agency Studies

Coordinate subject running, data coding, and data analysis to assist graduate student in dissertation preparation. Research explored explicit accounts and manipulations of cognitive control and action identification.

Affect and Agency Studies (Honor's Thesis)

Responsible for all aspects of the project, including conceptualization, data collection, analysis, and poster presentation. Project formed basis for honors thesis proposal.

Laboratory of Personality, Psychopathology & Psychotherapy Research

Supervised by Kenneth N. Levy, Ph.D. | University Park, PA
Research Assistant (2017-Present) & Laboratory Coordinator (2017-Present)

Lab focuses on Axis II disorders, specifically borderline personality disorder. Minor themes include self-harm and attachment in the context of personality disorders. Assist in manuscript preparation, data collection, RA training, and the maintenance and execution of study protocols. Specific coordination duties outlined below.

Data Informatics

Oversee training of undergraduate RAs in SPSS statistical software and maintain protocols for data management/training procedures.

IRB Coordinator

Coordinate research proposals for presentation to the International Review Board (IRB), as well as managing maintenance, modification and recertification of IRB protocols for over twenty projects.

TD/OX Study: Telomere Degradation, Oxytocin and BPD

Responsible for cataloging all biological materials and communicating with faculty across departments and universities regarding methods for DNA extraction, telomere assay, and strategies for DNA analysis.

MMA: ARI Mentalizing Meta-Analysis

Coordinated article coding for an Army Research Institute-funded meta-analysis designed to evaluate the current cross-disciplinary state of mentalization research.

Clinical Assessment: Summer Coordinator and Scheduler

Responsible for recruitment and scheduling of participants, consenting, post-

interview payment protocols, and support for RAs completing clinical assessment training. Also charged with management of participant database, including information from semi-structured interviews and self-report measures.

Follow-Up Study: Summer Coordinator

Manage participant data in an ongoing study designed to examine the long-term efficacy of several types of treatment in a multi-treatment RCT for borderline personality disorder.

Clinical Experience

Clinical Interviewer 2017-Present

Laboratory of Personality, Psychopathology & Psychotherapy Research
Supervised by Lia K. Rosenstein, M.S., Benjamin N. Johnson, M.S. & Kenneth N. Levy, Ph.D.

Received 40+ hours of training in the administration, coding, and transcription of structured and semi-structured clinical interviews to provide diagnoses to determine presence of BPD and other comorbid disorders for research protocols.

60+ hours of experience conducting clinical interviews, as well as consenting and running participants from the clinic and subject pool according to a variety of research study protocols within the lab. Also experienced in recording interview data and presenting cases at weekly meetings.

Presentations

Posters

Paolizzi, S.G., Potts, C.A., and Carlson, R.A. (2018, April) *Fleeting emotional states and feelings of control.* Poster presented at the Psi Chi Undergraduate Research Conference, State College, PA.

Paolizzi, S.G., Potts, C.A., and Carlson, R.A. (Expected 2018, November) *Non-contingent affective outcomes influence feelings of control.* Poster to be presented at the 2018 Psychonomic Society Annual Meeting, New Orleans, LA.

Skills and Certifications

Computer Skills
SPSS
Microsoft Office
Google Drive
SONA systems
EPrime (*Basic)*
Zotero
Otranscribe
Qualtrics
ExpressScribe (*Transcription)*
Titanium
R *(Basic)*

Clinical Skills
SCID-IV/5*:* The Structured Clinical Interview for DSM-IV/5
SASII: Linehan's Suicide Attempt Self-Injury Interview Standard Short Version
IPDE: The International Personality Disorder Examination
AAI: Main's Adult Attachment Interview (Including Transcription)
RMET: The Reading the Mind in the Eyes Test

Languages
English- *Native*
Italian- *Conversational*

Organization/Committee Membership

Ad Hoc Member, Liberal Arts Academic Integrity Committee (LAAIC) Summer 2018
Committee Chair: Dr. Andrew Peck

Committee composed of undergraduates, graduate students, and faculty meets on a semi-regular basis to review cases of suspected academic misconduct within the College of the Liberal Arts. Determinations are made regarding intentional academic dishonesty and appropriate penalties are recommended to the Office of Student Affairs.

THON Chair/Captain, Penn State Womens Ice Hockey Club 2015-Present
Coached by Patrick Fung (2015-2017) and Jeremy Bean (2017-Present)

Club maintains Division 1 membership in the American Collegiate Hockey Association (ACHA). Traveling club competes against both NCAA and ACHA competition in the top division of collegiate club athletics.

THON Chair accomplishments include raising over $10,000 for the Penn State Dance Marathon, a student philanthropy organization that raises money for pediatric cancer treatment and support of the families. Chair is also charged with maintaining a strong relationship with the organization's Four Diamonds family as Isabelle, their daughter, undergoes treatment.

Relevant Coursework

Abnormal and Clinical Psychology
Introductory Abnormal Psychology
Principles of Change in Psychotherapy

Developmental Psychology
+Introductory Developmental Psychology
+Psychology of Cognitive Development

Research Methods and Statistics
Research Methods in Psychology
Statistical Concepts and Reasoning*
Elementary Statistics
Applied Statistics in Science
Finite Mathematics
Foundations of Econometrics

+Adolescent Psychology
Juvenile Delinquency

Industrial and Organizational Psychology
Introductory Industrial/Organizational Psychology
+Work Attitudes and Motivation

Biology and Neuropsychology
Introductory Neuropsychology
Biological Anthropology

General Psychology
Psychology as a Science & Profession
Introductory Psychology*

**Credited through Advanced Placement Exam* *+Honors Coursework*

Work Experience

Wegmans Food Markets, Part-Time Customer Service 2014-Present
Store 048 (Malvern, PA), and Store 098 (State College, PA)
Various Supervisors: References available upon request

Work approximately 500 hours per year across many departments. Play various roles primarily within the bakery and deli from production to customer service.

References

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