4-20-2023

Psychological influences on problem-solving following lab-induced learned helplessness

Aqdas Khan
Western Michigan University

Psychological Influences on Problem-Solving Following Lab-Induced Learned Helplessness

Aqdas Khan

Western Michigan University

Honor's Thesis

Dr. Scott T. Gaynor

Abstract

The purpose of the present study was to examine psychological influences on problem-solving following lab-induced learned helplessness. There are several related psychological constructs in the literature that appear relevant. These have been typically examined in isolation in various sub-fields within psychology. Determining which is most influential, and their unique and overlapping contributions, could provide important conceptual clarity and point to ways to streamline and guide targets of psychological intervention. The constructs of interest were: need for cognition, psychological flexibility, grit, learned helplessness (LH) attributional style, cognitive fusion, and the Big 5 personality trait of neuroticism. A within-subjects correlational research group design was used wherein all participants completed psychological inventories on key constructs and then engaged in two unexpectedly challenging problem-solving tasks. On the first task, participants received response-independent feedback that 60% of their answers were incorrect. The second task involved solving challenging compound remote associates (CRAT) problems where participants were expected to fail on the majority of items. The primary research questions were which variables predict task performance (persistence, changes in reaction time, rates of not responding) and reactivity to the tasks (changes to mood and thinking following the tasks). Psychological flexibility was found to predict a lack in persistence on the LH task. No variables significantly predicted reaction times on the CRAT. An LH attributional style was the strongest predictor of higher cognitive fusion (i.e., more negative thinking following the tasks meanwhile extroversion predicted a higher positive mood the best). Negative mood was best predicted by conscientiousness following the CRAT and by an LH attributional style following the LH task respectively.

Psychological influences on problem-solving following lab-induced learned helplessness

Everyone will face challenging problems at some point in their life, often unexpectedly. When presented with challenging problems, individual differences in psychological characteristics influence the emotional, cognitive, and behavioral responses that occur. Certain traits help individuals persevere and stay motivated to face future problems. Some traits can also lead to dysfunction in thoughts, actions, and feelings preventing individuals from responding productively, if at all, in the present and/or future. The nature of the challenging tasks can also influence responses, such as whether one has control over the outcomes of the task or not. Moreover, the quality of life is impacted by these reactions. A wide variety of candidate characteristics have been described in the literature.

Grit is the ability to persevere in the face of setbacks and resist discouragement. Grit has been associated with high achievement in a variety of domains, most notably in academics (Duckworth et al., 2007). Psychological flexibility is the ability to remain open, aware, and engaged in committed action towards one's values in the face of negative emotions, thoughts, and memories (Hayes et al., 2006). Need for cognition is the tendency to enjoy thinking hard and engaging in effortful cognitive activities (Cacioppo & Petty, 1982). Grit, psychological flexibility, and need for cognition all may be reasonably predicted to increase persistence in problem-solving and promote resilience to the negative impacts of experiencing unexpected challenges.

Learned helplessness occurs when individuals have no control over negative outcomes such that they stop behaving (Maier & Seligman, 2016). A learned helplessness attributional style is a tendency to conclude/believe that one is unable to solve problems one is facing (Quinless & Nelson, 1988). Cognitive fusion is the tendency to get caught up in and struggle to

let go of negative self-thoughts (Hayes et al., 2006; Gillanders et al., 2014). The Big 5 personality traits include: openness to experience, conscientiousness, extroversion, agreeableness, and neuroticism. The latter, neuroticism, is the tendency to experience mood shifts and a proclivity toward negative affect. A learned helplessness attributional style, cognitive fusion, and neuroticism all would be predicted to decrease persistence in problem-solving and increase reactivity to experiencing challenges.

The constructs described above have overlapping characteristics, but also unique aspects. The constructs also emerge from different theoretical perspectives and subdisciplines in psychology. Grit and learned helplessness come out of the positive psychology tradition, psychological flexibility and cognitive fusion from contextual behavioral science, need for cognition from cognitive psychology, and neuroticism from personality psychology. Thus, it is interesting to consider how these variables overlap and which best predict how individuals respond to facing challenging problem-solving situations. Past research has looked at the effects of these variables in isolation on problem-solving and resilience. This study aimed to look at the effects of all these variables simultaneously in order to best understand their influences on emotions, cognition, and behavior in the face of challenges.

One type of challenging situation is when people experience a lack of control. That is, there is no relationship between their behavior and the outcomes they experience. Hooper and McHugh (2013) used an unsolvable task wherein participants were told they needed to figure out the right answers by trial and error as they made repeated choices (40 trials) between two complex stimuli that differed from each other across four dimensions: color, shape, size, and the letter used. In reality, participants were told they were correct or incorrect randomly 50% of the time. Another type of challenging situation is when problems seem as though they should be

solvable, but the solution is elusive. Compound remote associates tasks are one example. In a compound remote associates task, participants are given three words (cottage/swiss/cake) and asked to figure out one new word (cheese) that connects the three. Some associates are more remote than others. Normative data (Bowden & Jung-Beeman, 2003) allow for selection of remote associates problems of varied difficulties, including ones that are unlikely to be solved quickly or at all (e.g., over/plant/horse: power).

The current study collected data on participants' grit, need for cognition, psychological flexibility, learned helplessness attributional style, cognitive fusion, and neuroticism, and then exposed them to the unsolvable task and the compound remote associates task, measuring their emotional, cognitive, and behavioral reactions. A within-subjects group design was used. Of interest was which constructs best predicted reactions to these challenging problem-solving tasks. The time taken on the tasks, including the change in time spent towards the start versus the end of the task, number of correct answers on the compound remote associates task, and their SCFQ and PANAS-10 scores after these tasks were the dependent variables of interest.

Methods

Participants

Twenty adults (i.e., 8 cis-men, 10 cis-women, 1 non-binary/third gender, 1 other) participated in this study. The age range was 18-26 (Mean=21.05, Median=21.50, SD=2.282). The ethnoracial and class standing distribution is shown in Table 1. The cumulative GPA of the sample ranged from 1.45-4.00 (Mean=3.39, Median=3.60, SD=0.67), showing an academically successful sample.

Table 1

Ethnoracial and Class Standing Distribution of the Participants.

	n (N=20)	Percent
Race/Ethnicity		
White or Euro-American	12	60
Black or African American	1	5
Hispanic or Latinx, including Mexican American, Central American, and others	4	20
Asian or Asian-American, including Chinese, Japanese, and others	2	10
Other	1	5
Year in College		
Freshman	6	30
Sophomore	1	5
Junior	5	25
Senior	5	25
Super Senior	3	15

The only exclusionary criteria were being under the age of 18. Participants were recruited via posted flyers and class announcements to consider participating in a study of non-verbal and verbal problem-solving. Extra credit for eligible classes was offered for participating and completing the study. Participants were not told the purpose of the study until after they completed the study.

Setting

The study took place in two small research rooms, both with a table and chair at a Midwestern University.

Instruments

Anonymity Code Sheet, used to assign a code to the indvidual response sets of participants, shown in figure 1 below.

Figure 1

Here is an example code for John Smith, son of Jennifer Smith, who was born Dec 10th, graduated from Kalamazoo Central High School, and identifies as a male.

Question	Code
1) Last letter of your first name?	N
2) First letter of your mother's first name?	J
3) First letter of the month you were born?	D
4) First letter of the last high school you attended?	K
5) "M" if male; "F" if female; "N" Non-binary/neither	M
6) The number of letters in your first name (enter 0 if greater than 9)?	4
FINAL CODE =	**NJDKM4**

The Cognitive Fusion Questionnaire (CFQ), a seven item measure of the difficulty letting go of negative thoughts. The mean normative score in a students and community sample of 1040 participants in past research was 22.28 (SD=8.30) with Cronbach's α being 0.90, showing strong internal consistency (CFQ; Gillanders et al., 2014).

The Need for Cognition Scale (NCS-6), a six item measure of the tendency to enjoy thinking hard. The mean normative score for the 6 items used in an adult American sample of 821 individuals with a mean age of 32.12 years in past research was 3.69 (SD=1.12) with Cronbach's α being 0.94, showing really strong internal consistency (Lins de Holanda Coelho et al., 2018).

The LHS - Learned Helplessness Scale, a 20 item measure of proneness to making learned helplessness attributions. The mean normative score in a college sample of 229 participants mainly aged 15-25 in past research was 39.12 (SD=6.32) with Cronbach's α being 0.79, showing fair internal consistency (Quinless & Nelson, 1988)

The Short Grit Scale, an eight item measure of tendency to persistence in face of challenges. The mean normative score in an adult sample aged 25–34 with 300 participants (79%

female) in past research was 3.2 (SD=0.7) with Cronbach's α being 0.82, showing good internal consistency (Duckworth & Quinn, 2009).

The Ten Item Personality Inventory, a 10 items measure of the Big 5 personality characteristics: extroversion, agreeableness, conscientiousness, emotional stability, and openness. The mean normative scores in an undergraduate college sample of 1813 participants in past research were as follows: extroversion=4.44 (SD=1.45), agreeableness=5.23 (SD=1.11), conscientiousness=5.40 (SD=1.32), emotional stability=4.83 (SD=1.42), openness =5.38 (SD=1.07). The Cronbach alphas were .68, .40, .50, .73, and .45 for the extroversion, agreeableness, conscientiousness, emotional stability, and openness scales respectively. The low internal consistency stems from the relatively low inter-item correlations in conjunction with the fact that the TIPI scales have only two items (Gosling et al., 2003).

The PSY-FLEX, a six item measure of psychological flexibility. The mean normative score in an adult community sample of 346 participants with mean age 31.42 in past research was 20.4 (SD=4.3) with Raykov's coefficient being 0.90, showing good internal consistency (PF, Gloster et al., 2021).

The State Cognitive Fusion Questionnaire (SCFQ), the same seven items as the original CFQ reworded to capture respondents present moment experience rather than general tendencies toward cognitive fusion. The mean normative score for the SCFQ in a sample of 308 individuals aged 18-74 (mean age= 20.05) in past research was 24.93 (SD=11.38) with the Cronbach's α being 0.95, showing excellent internal consistency (Bolderston et al., 2019).

The State Positive and Negative Affect Scale (PANAS-10), a list of 10 words that describe different feelings and participants indicate to what extent they feel that way at the moment. The mean normative score for the PANAS positive affect in a sample of 660

individuals comprising mainly of college undergraduates in past research was 29.7 (SD=7.9) with the Cronbach's α being 0.89, showing good internal consistency. The mean normative score for the PANAS negative affect for the same sample was 14.8 (SD=5.4), with the Cronbach's α being 0.85, showing good internal consistency (PANAS-10; Watson et al., 1988).

Procedure

All participants went through the same conditions in the exact same sequence. Participation was designed to occur in one approximately 60-minute visit. It took about 10 minutes to go over the informed consent document, 20 minutes to complete study surveys, and the remaining time was spent doing the problem-solving tasks and the short (<5 minute) debriefing at the end. Completion times varied to some extent (~15 minutes) based on individual differences on the problem-solving tasks or the number of questions asked during debriefing.

Participants were read the informed consent document upon arrival. If they consented to participating, they were asked to sign a paper copy of the informed consent document and then sit in front of a laptop computer placed on the flat workspace in the research room. The remainder of the experimental procedures were guided by instructions from the computer programmed via the experimental platform Testable (https://www.testable.org/). The link provided here (https://tstbl.co/495-946) provides access to the experimental procedures used in this study.

The first activity was to fill out the anonymity code sheet to establish a code for each participant so their responses to the various measures were linked without the use of personally identifying information.

Next, participants completed a demographic questionnaire (to ascertain their age, gender identity, ethno-racial identity, year in college, and college GPA) to allow to appropriately

characterize the sample followed by completion of six brief self-report surveys assessing psychological characteristics. The surveys used were the CFQ, NCS-6, LHS, Short Grit Scale, Ten Item Personality Inventory, and PSY-FLEX

Learned Helplessness Task:

Following completion of the surveys, participants were introduced to the non-verbal (response independent) problem-solving task. The instructions, taken from Hooper and McHugh (2013), were as follows:

> "In this experiment, you will be looking at a series of computer-presented images. Each image will involve two stimulus patterns on it. One to the left and another to the right. The stimulus patterns are composed of four different dimensions (shape, letter, size of letter, and color of letter), with two values associated with each dimension (square/circle, A/T, big/small, black/red). For each presentation, I have chosen one of the eight values as being correct. For each image, I want you to choose which side contains this value. To do this, you must click on one of the buttons presented underneath the image (left or right). If your choice is incorrect, the word "Incorrect" will appear on the screen. If your choice is correct, the word "Correct" will appear on the screen. Your task is to learn the predetermined value by your response, according to whether or not you chose the correct or incorrect response. The current experiment is adapted from a standard intelligence test. Most people learn to respond appropriately to the task with relative ease. Click "Next" to continue."

Completion of the non-verbal problem-solving task involved responding to a series of 40 computer-presented images. Each image involved two stimulus patterns, one to the left and another to the right. The stimulus patterns were composed of four different dimensions (shape,

letter, size of letter, and color of letter), with two values associated with each dimension (square or circle, the letter A or T, the size of the letter [big or small], and the color of the letter [black or red]). Participants were told that, for each presentation, one stimulus (left or right) is correct based on its combination of dimensions. Participants would choose the left or right stimulus. To do this, they were asked to click one of the buttons underneath the image (left or right). They were told their task is to determine, based on trial and error, which relations between dimensions determine correct choices, such that over time they will come to make correct choices. After each choice, the word “Incorrect" or "Correct" would appear on the screen as putative feedback. In reality, however, the feedback was response-independent (i.e., not contingent on their selection and set to appear as "Incorrect" in 60% of the trials).

After completion of the non-verbal (response independent) problem-solving task, the computer presented the participant with two brief surveys assessing their current emotional state: the SCFQ and PANAS-10.

Compound Remote Associates Task (CRAT):

After completion of the State CFQ and PANAS-10, participants progressed to the verbal problem-solving (Compound Remote Associates) task. The instructions were as follows:

> “On the screen, you will see a list of three words. Your task is to identify a solution word that will link all the others together. For example, if the three words on the screen were dew/comb/bee the solution word would be “honey” and you would type “honey” into the open space below the three words and then press the "Enter" key. Make sure your answer is typed in all lowercase. If you are unable to identify a solution word, you can type “DK” for Don’t Know into the space and then press the "Enter" key.”

Participants were presented with 20 compound remote associate problems. The 20 problems were divided into five blocks of four problems each. Block assignment, and the order of items within each block, was determined at random. Each block of four problems had one problem that normative data suggested greater than 60% of participants solved in 30 seconds, one problem 41-60% solved in 30 seconds, one that 21-40% solved, and one that 0-20% solved in 30 seconds.

After completion of the verbal (compound remote associates) problem-solving task, the computer presented the participant with the two brief surveys assessing their current emotional state: the State CFQ and PANAS-10.

Debriefing:

After finishing the two surveys, the participants viewed a debriefing statement explaining the deception used in the study. The key information provided to participants was the following:

> "In this study we are interested in better understanding the psychological variables that predict responses to, and persistence when, confronted with unpredictably challenging tasks. To gather these data, we needed to deceive you about some aspects of the study. Namely, we told you that the tasks were relatively easy when, in fact, the problem-solving tasks were designed such that you would fail. In the first task – the non-verbal problem-solving task -- your responses did not even matter. The feedback was predetermined and had nothing to do with your input. In the second task – the verbal problem-solving task -- the items were selected due to their known difficulty level. We predicted that most of them would be unsolved. As such, please know that the tasks used in this study say nothing about your intelligence, creativity, capabilities, or aptitude in solving practical problems."

Mood-Enhancing Video:

After reading the debriefing statement the participants were directed to click a link for a final study related activity. The link was to a positive mood induction in the form of a one-minute funny animal video set to upbeat music (https://tstbl.co/383-756). Pairing evocative visual images with upbeat music has been found to be among the most effective procedures for enhancing positive affect (Zhang et al., 2014). After watching the video, participants were directed to inform the experimenter they were finished.

Data Collection and Data Analysis

All data were collected by Testable for individual participants organized into an Excel spreadsheet containing the individual responses for that participant. From the individual participant data (the raw data) the composite scores were calculated for each measure and combined into an Excel sheet containing the summed scores for all participants. This Excel sheet was imported into IBM SPSS Statistics software which was used to conduct all analyses. Pearson's product moment correlation coefficients were the first tests conducted to examine relationships between constructs, and, most importantly, bivariate relationships between the six target constructs and behavior during the problem-solving tasks and thoughts and feelings after the tasks. All significant bivariate relations were then tested in multiple linear regression models to examine the relative contribution of each of the predictors.

Results and Discussion

Learned Helplessness (LH) Task

The reaction times were used as a measure of persistence. The total time spent doing the task and the time spent engaging in each block of 10 pairs of stimuli were observed. The change in time from engaging with the first block to the fourth and last block were calculated. A positive

change meant a drop in time from the beginning to the end of the task, implying that the participant "gave up".

Table 2

Preference Formation and Reaction Times in LH Task

	Left Button Selections (%)	**Time Difference (Block 1 versus 4) (in ms)**
N=20		
Mean	53.25	2078.9300
Median	51.25	1534.3500
Standard Deviation	8.16	1624.1358

Table 2 shows that the mean and median percentage of the number of times the left button was pressed during the nonverbal task was 53.25 and 51.25 respectively. This shows that participants did not form a choice for the left or right stimuli presented and clicked on both roughly equally. The average amount of time spent trying to solve the last ten pairs of stimuli dropped on an average of 2.1 seconds versus the first ten pairs, possibly implying the participants "gave up" on the task. Both these datasets imply the nonverbal task was successful in inducing learned helplessness in participants.

Table 3

Pearson's Correlations Between Reaction Times in LH Task and Psychological Variables

	Total Time (in ms)	**Time difference (Block 1 versus 4) (in ms)**	
		Mean	**Median**
Trait Cognitive Fusion	-.080	-.226	-.272
Need for Cognition	.151	.231	.014
LH attributions	.289	.151	.210
Grit	.062	-.351	.018

Extroversion	-.331	-.253	.005
Agreeableness	-.386	-.579**	-.208
Conscientiousness	.122	-.222	.047
Emotional Stability	.087	.014	.057
Openness	-.509*	-.333	-.298
Psy Flex	.267	.615**	.590**

Note. LH= Learned Helplessness; Psy Flex= Psychological Flexibility; * significant at $p < 0.05$; ** significant at $p < 0.01$.

As shown in Table 3, the only significant predictors for the behavioral reactions on the nonverbal learned helplessness task were agreeableness, openness, and psychological flexibility. Agreeableness had a negative correlation (-.579) with the mean time difference between the first and last ten pairs of stimuli (i.e., as agreeableness went up, the participants persisted longer on the task and did not give up towards the end). This finding was not replicated for the median time difference implying that there might be some extreme scores in the dataset. Openness to experience was negatively correlated (-.509) with the total time spent on the task. Psychological flexibility was positively correlated with the mean and median time difference (.615 and .590 respectively) between the first and last ten pairs of stimuli (i.e., as psychological flexibility went up, the participants gave up on the task faster). The last two findings were incompatible with the initial prediction that these two variables would imply greater persistence. Instead, both openness and psychological flexibility correlated with giving up faster on the task.

Table 4

Pearson's Correlations Between SCFQ and PANAS-10 Scores Following LH Task and Psychological Variables

	SCFQ	**Positive Affect (P)**	**Negative Affect (N)**	**Affect (P-N)**

Trait Cognitive Fusion	.354	-.259	.497*	-.459*
Need for Cognition	-.209	.432	-.212	.469*
LH attributions	.734**	-.687**	.481*	-.815**
Grit	-.164	.309	-.297	.406
Extroversion	-.505*	.671**	-.089	.613**
Agreeableness	-.326	-.123	-.340	.059
Conscientiousness	-.284	.136	-.465*	.339
Emotional Stability	-.427	.308	-.591**	.545*
Openness	-.415	.473*	-.226	.511*
Psy Flex	.573**	-.550*	.196	-.562**

Note. SCFQ= State Cognitive Fusion Questionnaire; PANAS= Positive and Negative Affect Scale; LH= Learned Helplessness; Psy Flex= Psychological Flexibility; * significant at $p < 0.05$; ** significant at $p < 0.01$.

Table 4 shows that SCFQ scores were significantly correlated positively with LH attributions (.734) and psychological flexibility (.573) and negatively with extroversion (-.505). The positive correlation between psychological flexibility and SCFQ is an interesting finding because higher flexibility generally implies lower fusion between thoughts and beliefs. Positive affect was significantly correlated positively with extroversion (.671) and openness to experience (.473) and negatively with LH attributions (-.687) and psychological flexibility (-.550). All these correlations match the initial predictions except for psychological flexibility. Higher flexibility in thinking is usually associated with better moods. Negative affect was significantly correlated positively with trait cognitive fusion (.497) and LH attributions (.481) and negatively with conscientiousness (-.465) and emotional stability (-.591). The following multiple linear regressions were run for these three dependent variables using all the independent variables they significantly correlated with:

SCFQ-

Table 5

ANOVA Table for Multiple Linear Regression on SCFQ for LH Task

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1234.593	3	411.531	6.505	.004[b]
Residual	1012.207	16	63.263		
Total	2246.800	19			

Note. df= degrees of freedom; Sig.= significance.

Table 6

Coefficients for Multiple Linear Regression on SCFQ for LH Task

	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
(Constant)	-10.634	15.177		-.701	.494
LH attributions	.833	.358	.617	2.327	.033
Extroversion	-.303	.671	-.095	-.451	.658
Psy Flex	.274	.781	.085	.350	.731

Note. Sig.= significance; LH= Learned Helplessness; Psy Flex= Psychological Flexibility.

The results of the regression indicated the three predictors explained 54.9% of the variance (R^2=.549, F(3,16)=6.505, p<.01). It was found that LH attributions significantly predicted SCFQ scores (β=.617, p<.05).

Positive Affect-

Table 7

ANOVA Table for Multiple Linear Regression on Positive Affect for LH Task

	Sum of Squares	df	Mean Square	F	Sig.
Regression	894.467	4	223.617	5.227	.008[b]
Residual	641.733	15	42.782		
Total	1536.200	19			

Note. df= degrees of freedom; Sig.= significance.

Table 8

Coefficients for Multiple Linear Regression on Positive Affect for LH Task

	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
(Constant)	42.692	18.376		2.323	.035
LH attributions	-.476	.314	-.426	-1.516	.150
Extroversion	1.100	.572	.417	1.925	.073
Openness	-.289	.889	-.074	-.325	.750
Psy Flex	-.217	.645	-.081	-.336	.742

Note. Sig.= significance; LH= Learned Helplessness; Psy Flex= Psychological Flexibility.

The results of the regression indicated the four predictors explained 58.2% of the variance (R^2=.582, F(4,15)=5.227, p<.01). None of the predictors were individually found to significantly predict positive affect but the closest was extroversion (β=.417, p=.073).

Negative Affect-

Table 9

ANOVA Table for Multiple Linear Regression on Negative Affect for LH Task

	Sum of Squares	df	Mean Square	F	Sig.
Regression	161.343	4	40.336	1.851	.172[b]
Residual	326.857	15	21.790		
Total	488.200	19			

Note. df= degrees of freedom; Sig.= significance.

Table 10

Coefficients for Multiple Linear Regression on Negative Affect for LH Task

	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
(Constant)	-4.024	13.115		-.307	.763
LH attributions	.547	.224	.869	2.441	.028
Extroversion	.412	.408	.277	1.010	.328
Openness	.086	.635	.039	.136	.893
Psy Flex	-.413	.460	-.275	-.898	.383

Note. Sig.= significance; LH= Learned Helplessness; Psy Flex= Psychological Flexibility.

The results of the regression indicated the model was not significant ($F(4,15)=1.851$, p=n.s.). Individually, LH attributions significantly predicted negative affect ($\beta=.869$, $p<0.05$).

Compound Remote Associates Task (CRAT)

The average number of correct responses on this task was 2.65 (Median=2.00, SD=2.907) out of 20. This shows that the CRAT was difficult to solve for the participants. The time spent trying to solve the sets of words answered incorrectly was used as a measure of persistence. The total time spent on all sets of words answered incorrectly had a mean of 30.61s and a median of 26.77s (SD=20.71).

Table 11

Pearson's Correlations Between Reaction Times in CRAT and Psychological Variables

	Total Time spent on incorrect responses (in ms)	
	Mean	**Median**
Trait Cognitive Fusion	.128	.142
Need for Cognition	-.026	-.054
LH attributions	-.311	-.292
Grit	-.291	-.272
Extroversion	-.089	-.086
Agreeableness	.289	.295
Conscientiousness	-.091	-.104
Emotional Stability	-.065	-.082
Openness	.380	.410
Psy Flex	-.108	-.118

Note. CRAT= Compound Remote Associates Task; LH= Learned Helplessness; Psy Flex= Psychological Flexibility; * significant at $p < 0.05$; ** significant at $p < 0.01$.

As shown in Table 11, none of the psychological variables significantly predicted the reaction times on the CRAT.

Table 12

Pearson's Correlations Between SCFQ and PANAS-10 Scores Following CRAT and Psychological Variables

	SCFQ	**Positive Affect (P)**	**Negative Affect (N)**	**Affect (P-N)**
Trait Cognitive Fusion	.215	-.147	.404	-.347
Need for Cognition	-.239	.544*	-.057	.453*
LH attributions	.562**	-.764**	.229	-.722**
Grit	-.055	.186	-.374	.359
Extroversion	-.385	.671**	-.138	.598**
Agreeableness	-.271	-.029	-.286	.143
Conscientiousness	-.365	.073	-.626**	.417
Emotional Stability	-.290	.320	-.359	.454*
Openness	-.252	.586**	.031	.436
Psy Flex	.500*	-.610**	.168	-.568**

Note. SCFQ= State Cognitive Fusion Questionnaire; PANAS= Positive and Negative Affect Scale; CRAT= Compound Remote Associates Task; LH= Learned Helplessness; Psy Flex= Psychological Flexibility; * significant at $p < 0.05$; ** significant at $p < 0.01$.

Table 12 shows that SCFQ scores were significantly correlated positively with LH attributions (.562) and psychological flexibility (.500). These replicate the findings from the previous task. Positive affect was significantly correlated positively with need for cognition (.544), extroversion (.671) and openness to experience (.586) and negatively with LH attributions (-.764) and psychological flexibility (-.610). All these correlations again replicate findings from the previous task with need for cognition being the only new predictor for positive affect. The only significant predictor for negative affect following CRAT was conscientiousness, $r = -.626$, $p<.01$. The following multiple linear regressions were run for SCFQ scores and positive affect using all the independent variables they significantly correlated with:

SCFQ-

Table 13

ANOVA Table for Multiple Linear Regression on SCFQ for CRAT

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Regression	885.679	2	442.840	4.284	.031[b]
Residual	1757.121	17	103.360		
Total	2642.800	19			

Note. df= degrees of freedom; Sig.= significance.

Table 14

Coefficients for Multiple Linear Regression on SCFQ for CRAT

	Unstandardized Coefficients		**Standardized Coefficients Beta**	**t**	**Sig.**
	B	Std. Error			
(Constant)	-13.363	11.976		-1.116	.280
LH attributions	.613	.416	.419	1.473	.159
Psy Flex	.699	.994	.200	.703	.492

Note. Sig.= significance; LH= Learned Helplessness; Psy Flex= Psychological Flexibility.

The results of the regression indicated the two predictors explained 33.5% of the variance (R^2=.335, F(2,17)=4.284, p<.05). Neither predictor was found individually significant, but LH attributions were the closest (β=.419, p=.159).

Positive Affect-

Table 15

ANOVA Table for Multiple Linear Regression on Positive Affect for CRAT

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**

Regression	718.288	4	179.572	8.052	.001[b]
Residual	334.512	15	22.301		
Total	1052.800	19			

Note. df= degrees of freedom; Sig.= significance.

Table 16

Coefficients for Multiple Linear Regression on Positive Affect for CRAT

	Unstandardized Coefficients		**Standardized Coefficients Beta**	**t**	**Sig.**
	B	Std. Error			
(Constant)	26.767	15.132		1.769	.097
LH attributions	-.262	.286	-.284	-.917	.374
Extroversion	.766	.402	.351	1.906	.076
Psy Flex	-.405	.501	-.183	-.809	.431
Need for cognition	.321	.304	.218	1.056	.308

Note. Sig.= significance; LH= Learned Helplessness; Psy Flex= Psychological Flexibility.

The results of the regression indicated the four predictors explained 68.2% of the variance (R^2=.682, F(4,15)=8.052, p<.01). None of the predictors were individually found to significantly predict positive affect but the closest was extroversion (β=.351, p=.076).

Implications

These results are crucial for future research on new treatments for mood disorders, lack of motivation, learned helplessness, and highly fused thinking. Extroversion, conscientiousness, psychological flexibility, and an LH attributional style are all alterable using appropriate interventions. The current study suggests that higher levels of extroversion and conscientiousness and lower levels of LH predicted a more positive affect in people. Lower LH also predicted greater persistence during challenging tasks. If these findings can be replicated, new treatments with an emphasis on these traits can be tested for effectiveness. This study also challenged the effectiveness of psychological flexibility for persisting during negative experiences. More

research needs to be done to make a claim about the correlation between lack of persistence and psychological flexibility, since past literature claims otherwise.

Limitations and Future Directions

Some limitations of this study were the size and the nature of the sample used. The number of participants was very small, possibly limiting the generalizability of the results since some idiographic commonalities might be present in the participant pool. The lack of any significant correlations for reaction times on the CRAT could also be due to the small sample size. All participants were roughly the same age and in college as an undergraduate, possibly limiting the external validity of the study. Another limitation was possible response bias for all the psychological constructs since they were measured using self-reported surveys. Using reaction times on the two tasks as a measure of persistence could be a possible threat to construct validity. Possible alternative explanations besides lack of persistence for participants having shorter reaction times could be boredom, a belief that the tasks are being solved quickly and correctly, etc. A more extensive study with a larger, more diverse sample needs to be conducted to find significant predictors of persistence following LH. If the findings from this study are replicated, the next step would be performing experimental research trying to show causation between these traits and emotional, cognitive, and behavioral reactions. Training to increase extroversion and reduce an LH attributional style could be a possible direction for treatment plans for mood disorders if causation is found. More research needs to be done on psychological flexibility in the context of learned helplessness and persistence to understand the findings from this study.

Conclusion

The current study suggests that the strongest predictor of lack in persistence during a learned helplessness task is psychological flexibility. The significant correlation of $r=.615$ and $p<0.01$ serves as promising evidence. Further research needs to be done to evaluate if more psychological flexibility, which has been linked with positive affect in the past (Hayes et al., 2006), is positively correlated to a lack in responding to challenges. No significant predictors of persistence were found for the CRAT. An LH attributional style was the strongest predictor of higher state cognitive fusion and negative affect following the difficult tasks, implying that reducing LH thinking patterns might reduce negative thinking following difficult situations. Conscientiousness was also a strong predictor of negative affect, with $r = -.626$ and $p<.01$. This implies that being more conscientious might make people more resistant against a negative mood. Extroversion was the best predictor for positive mood following both tasks. This finding suggests the importance of being outgoing and enthusiastic in the context of staying positive following difficult tasks.

References

Bolderston, H., Gillanders, D. T., Turner, G., Taylor, H. C., Ní Mhaoileoin, D., & Coleman, A. (2019). The initial validation of a state version of the Cognitive Fusion Questionnaire. *Journal of Contextual Behavioral Science*, *12*, 207–215. https://doi.org/10.1016/j.jcbs.2018.04.002

Bowden, E. M., & Jung-Beeman, M. (2003). Normative data for 144 compound remote associate problems. *Behavior Research Methods, Instruments & Computers*, *35*(4), 634–639. https://doi.org/10.3758/BF03195543

Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology*, *42*(1), 116–131. https://doi.org/10.1037/0022-3514.42.1.116

Duckworth, A.L., Peterson, C., Matthews, M.D., & Kelly, D.R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, *9*, 1087-1101. http://www.sas.upenn.edu/~duckwort/images/Grit%20JPSP.pdf

Duckworth, A.L, & Quinn, P.D. (2009). Development and validation of the Short Grit Scale (GritS). *Journal of Personality Assessment*, *91*, 166-174. http://www.sas.upenn.edu/~duckwort/images/Duckworth%20and%20Quinn.pdf

Gillanders, D. T., Bolderston, H., Bond, F. W., Dempster, M., Flaxman, P. E., Campbell, L., Kerr, S., Tansey, L., Noel, P., Ferenbach, C., Masley, S., Roach, L., Lloyd, J., May, L., Clarke, S., & Remington, B. (2014). The Development and Initial Validation of the Cognitive Fusion Questionnaire. *Behavior Therapy*, *45*(1), 83–101. https://doi.org/10.1016/j.beth.2013.09.001

Gloster, A. T., Block, V. J., Klotsche, J., Villanueva, J., Rinner, M. T. B., Benoy, C., Walter, M., Karekla, M., & Bader, K. (2021). Psy-Flex: A contextually sensitive measure of

psychological flexibility. *Journal of Contextual Behavioral Science*, *22*, 13–23. https://doi.org/10.1016/j.jcbs.2021.09.001

Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, *37*(6), 504–528.

Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and Commitment Therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, *44*(1), 1–25. https://doi.org/10.1016/j.brat.2005.06.006

Hooper, N., & McHugh, L. (2013). Cognitive defusion versus thought distraction in the mitigation of learned helplessness. *The Psychological Record*, *63*(1), 209–218. https://doi.org/10.11133/j.tpr.2013.63.1.016

Lins de Holanda Coelho, G., H. P. Hanel, P., & J. Wolf, L. (2018). The Very Efficient Assessment of Need for Cognition: Developing a Six-Item Version. *Assessment*, *27*(8), 107319111879320. https://doi.org/10.1177/1073191118793208

Maier, S. F., & Seligman, M. E. P. (2016). Learned helplessness at fifty: Insights from neuroscience. *Psychological Review*, *123*(4), 349–367. https://doi.org/10.1037/rev0000033

Quinless, F. W., & Mcdermott Nelson, M. A. (1988). Development of a measure of learned helplessness. *Nursing Research*. https://doi.org/10.1097/00006199-198801000-00003

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070.

Zhang, X., Yu, H. W., & Barrett, L. F. (2014). How does this make you feel? A comparison of four affect induction procedures. *Frontiers in Psychology, 5*. https://doi.org/10.3389/fpsyg.2014.00689