

Online Supplement

Overview

This online supplement contains the following information:

- Exact survey items.
- Detail about the intervention procedures and content.
- Written samples from students in the intervention.
- Supplemental mediational analyses with baseline data from Samples 2 and 3.
- Table S1, which reports non-significant differences between experimental conditions at baseline.
- Tables S2 – S8, which report additional analyses to check for robustness of the results.
- Figure S1, a flowchart of participants and attrition in each sample.
- Figure S2 – S5, the effect of incremental theory intervention on continuous measure of depressive symptoms, sub-scale depressive symptoms, self-esteem, and negative self-views.
- Figure S6, maladaptive cognitions and emotions as mediators of the relation between entity theories and depressive symptoms.

Exact survey items

Implicit theories of personality. The four items used in previous research to assess adolescents' implicit theories of personality (Yeager et al., 2011) were: “Bullies and victims are types of people who really can’t be changed;” “There are two kinds of people: Bullies and their victims,” “You can’t change people who are jerks in schools,” “Some people are just jerks, and not much can be done to change them” (1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Mostly disagree*, 4 = *Mostly agree*, 5 = *Agree*, 6 = *Strongly agree*).

Depressive symptoms. The 10-item Children's Depression Inventory (Kovacs, 1992) is a commonly-used and well-validated measure of depression in children and adolescents. For each item, the CDI asks participant to choose one of three statements that best describes them in the past two weeks:

- I am sad once in a while (0); I am sad many times (1); I am sad all the time (2)
- Nothing will ever work out for me (2); I am not sure if things will work out for me (1); Things will work out for me O.K. (0)
- I do most things O.K. (0); I do many things wrong (1); I do everything wrong (2)
- I hate myself (2); I do not like myself (1); I like myself (0)
- I feel like crying every day (2); I feel like crying many days (1); I feel like crying once in a while (0)
- Things bother me all the time (2); Things bother me many times (1); Things bother me once in a while (0)
- I look O.K. (0); There are some bad things about my looks (1); I look ugly (2)
- I do not feel alone (0); I feel alone many times (1); I feel alone all the time (2)
- I have plenty of friends (0); I have some friends but wish that I had more (1); I do not have any friends (2)
- Nobody really loves me (2); I am not sure if anybody loves me (1); I am sure that somebody loves me (0)

For each item, the statements range in severity of depressive symptoms (0 = minimal; 1 = some; 2 = severe). As described in standard practices, responses to these items were summed to yield an overall score of depressive symptoms ranging from 0 to 20 (Kovacs, 1992).

Peer victimization. The following four items were used to assess adolescents' self-reported peer victimization within the past month. These items include how often they have been "kicked, pushed, or hit," "called names or had mean things said to you," "had rumors or lies spread about you," and "excluded or left out by other students." Items were on a 5-point scale (1 = *Never*, 2 = *Rarely*, 3 = *Sometimes*, 4 = *Often*, 5 = *All the time*). The items were averaged with higher values representing more victimization.

Detail on the Experimental Intervention

Here we repeat information that also appears in the supplement to Yeager et al. (2014). . The structure and content of the incremental theory of personality intervention was modeled on the six-session workshop tested and described by Yeager et al. (2013). In the third week of school, students were told that university researchers would be coming into their classroom to ask for their help in improving some messages to deliver to next year's high school freshmen. On the day of the intervention, researchers told students that because they were currently going through the transition to high school, they were in the best position to provide guidance to next year's students about what that is like. Researchers then told students about something called a "growth mindset" that they hoped to teach to next year's students and that they, the students, could help by first reading scientific information about the growth mindset and then writing a note explaining how someone could use the mindset. Next, researchers handed out envelopes containing a paper copy of either an experimental intervention or a control activity (in Sample 1) or students logged in to the computer and were assigned to materials (in Samples 2 and 3). Experimental and control exercises were formatted identically (similar clip art, font, and amount of text on a page) so that students would not suspect that another person was completing a different writing exercise. Both exercises discussed "the growth mindset" and the ability for

growth and change, again to minimize the possibility that students would suspect that they had completed different activities. Importantly, the teachers were kept blind to study hypotheses, message content and students' experimental conditions, and other teachers (whose grades were also part of the dependent variable) were not informed that students had participated in the experiment (and hence were also blind to condition and message content).

As noted in the manuscript, the experimental activity first presented scientific information in support of the idea that people have the potential to change. This involved reading a scientific article showing that people's behaviors are controlled by "thoughts and feelings in their brains," and that such pathways in the brain can be changed. To provide students with a reason to read the article, the intervention stated:

Below is an article reproduced from a popular magazine called *Psychology Today*, and it was published this year. It summarizes some scientific research on the "growth mindset."

We need your help picking out the most important points for students like you. Your assignment is to read the article and then summarize the three most important things that a student like you would need to know in order to use the growth mindset.

To build interest, the article began with a brief anecdote (based on what a teen who participated in our pilot studies said) about a person who ran into an old friend from high school, who talked how the growth mindset was helpful during freshman year. The teen in the anecdote said:

Not everybody is stuck on one personality; over time, people can change through practice and when their brain makes new connections.

Next, the article summarized what researchers say about the science underlying the "Growth Mindset." For instance, the article began as follows:

People's personalities live in their brains, and the brain can be changed.

I first read the research of Dr. Daniel Lawrence from Stanford University. I learned that people don't do things because of some label that people use to describe them. They do things because of the thoughts and feelings that they have—thoughts and feelings that live in the brain, and that can be changed.

When you have a thought or a feeling, the pathways of neurons in your brain send signals to other parts of your brain that lead you to do a behavior. By changing these pathways, you can actually change and improve how you behave after challenges and setbacks.

Everyone's brain is a "work in progress!"

The article then went on to summarize the findings of actual research studies that documented people's ability to change.

After participants read and summarized the content in this article, they were asked to help communicate these ideas to future students, after reading the comments that previous students had made about them. That is, first the document told participants that researchers had recently completed a survey on campus about the growth mindset, and they were asked to read three example quotes that upperclassmen had written. Each of these quotes involved a disclosure of a time the upperclassman felt excluded or left out, followed by statements that during that time they remembered that people can change—both they and the people who are doing bad things to them. For instance, one quote about the first month of high school (taken from an actual interview with a student when piloting the intervention) stated:

Some people in school began treating their friends, including me, in a way that showed we weren't as close or we were belittled or not important anymore. We are excluded and ignored. This morning I was walking by and all the person could do was act as if I

weren't there. Seeing them and they just look you in the face without a hi or smile used to make me feel invisible...

But I realized that it's probably not about me... Maybe they are acting different because they are going through some drama that's making them act this way. They could be insecure so they need to make themselves feel better by making me feel bad. People do things because of their thoughts and feelings, not because they have a trait that makes them good or bad. And thoughts and feelings change all the time.

Next, participants were asked to write their own version of such a narrative, drawing on the examples they had just read and on their own experiences in high school or middle school, to share with future ninth graders. As in the Yeager et al. (2013) intervention, the design of this final activity drew on a long line of research on persuasion, particularly the “saying-is-believing” or “self-persuasion” technique (Aronson, 1999). Using this method, even brief encounters with a novel message have resulted in long-term changes in important behaviors (e.g., Aronson, 1999; Aronson et al., 2002; Walton & Cohen, 2011). Note that excerpts from selected students' notes were in fact shared with future students, and so there was no deception.

The control group activity was parallel but focused on malleability in a non-relevant but important domain (athletic ability), to, as noted in the paper, eliminate the possibility that simple optimism about the potential for growth in any domain might account for our results. We did this in order to have a true placebo—something that could plausibly be seen as helpful. Analogous to the experimental intervention, this activity involved reading a scientific summary of evidence that athletic talent is malleable, followed by quotes from upperclassmen endorsing it, and then a self-persuasion exercise in which participants wrote mentoring notes to a future student echoing that sentiment. Hence, both conditions involved information that peers endorsed a growth

message and a prosocial activity of sharing that information to help others; in this way, the only difference between conditions was whether the intervention addressed the malleability of personality. Hence, our optimistic, positive control group provided a conservative test of our hypothesis.

Additional Unedited Written Samples from Treated Students

Sample excerpts from responses written by participants:

“After all that happened I got over really quickly. I knew that they would one day change but i didn't know when. I always thought to myself that maybe they were going through a hard time and they all just wanted to make themselves feel better. Or maybe thy were back-stabbed by there old friends and wanted to release their anger. I honestly don't know but i made new friends and they are so nice! Don't be afraid to make new friends, they can change your way of thinking.”

And

“People could change over time. Maybe they have a bad day or something. Everyone is grumpy or cranky in a while. For example, one time when I was talking to my friend, this one friend came up to us and said hi. I didn't really like her because she used to e mean to my best friend. But I guess people change with the people or influence around us. An advice would be that if they aren't going to talk to you and ignore you, find someone else to hang out with. You don't always have to be with the same person 24/7.”

And

“People can change, and it's only your first day of school. Some kids are shy, and don't know how to start a conversation.”

Supplementary Analyses

Understanding Psychological Process: A Cross-Sectional Mediation Analysis With

Sample 2 and 3's Baseline Data

As noted in the manuscript, some past correlational research has found a link between implicit theories of personality and maladaptive social cognitions and emotions (Erdley et al., 1997; Yeager et al., 2011; Yeager, Miu, Powers, & Dweck, 2013), and other research has shown a link between implicit theories and depression (Rudolph, 2010). Yet no study has documented the full mediational model between implicit theories and depressive symptoms through these maladaptive cognitions and emotions. As a supplementary analysis, we attempted to do this using the baseline data collected in Samples 2 and 3.

Measures.

Maladaptive cognitions and emotions. To more fully understand the potential mediating cognitions and emotions stemming from an entity theory and possibly increasing risk for depressive symptoms, we asked participants to report their interpretations of and reactions to a hypothetical conflict used in previous research on the hostile attributional bias (Yeager et al., 2013; also see Dodge, Coie, & Lynam, 2006, p.781). They read this scenario:

Imagine that you were walking in a crowded hallway at school and everybody was rushing to get to the next class so they wouldn't be late. While you were looking the other way, you and another student bumped into each other (pretty hard), so it hurt your shoulder and you dropped the books that you were carrying. The other student paused briefly, looked at you quickly, and then turned away and hurried to class.

Next, participants were asked, "If the story happened to you, how much would you think each of these things?" The three items were "Maybe I'm just not a likable person," "Maybe I'm a loser,"

(both fixed-trait attributions) and “I would feel shame” (a self-relevant emotion; Tangney et al., 2007). Each of these statements was rated (1 = *Not at all*, 7 = *An extreme amount*) and then averaged ($\alpha = .70$), such that higher values represented more maladaptive thoughts and emotions.

Results.

Direct effect. As expected, an ordinary linear regression predicting depressive symptoms produced a significant effect of an entity theory, unstandardized $b = .37$, $t(518) = 2.87$, $p = .004$, $\beta = .13$ (path c , see Figure S6). This result conceptually replicated previous findings that an entity theory was associated with greater depressive symptoms (Rudolph, 2010; also see Yeager et al., 2011).

Mediation. We next examined the underlying cognitions and emotions that might mediate the effect of implicit theories of personality on depressive symptoms. As expected, a linear regression showed that an entity theory predicted maladaptive cognitions and emotions following a peer conflict (e.g., feeling like you are a “loser” and feeling shame), $b = .13$, $t(518) = 3.52$, $p < .001$, $\beta = .15$ (path a). This conceptually replicates past research (Erdley et al., 1997; Yeager et al., 2011). Next, the maladaptive cognitions and emotions significantly predicted levels of depressive symptoms, $b = 1.39$, $t(518) = 9.58$, $p < .001$, $\beta = .39$ (path b), consistent with a long line of research showing that when one negatively attributes an event to fixed features of the self (e.g., being “not likable”), one is more vulnerable to depressed mood and helplessness (e.g., Abramson et al., 1978; also see Tangney et al., 2007).

Finally, controlling for maladaptive thoughts and emotions in an ordinary linear regression reduced the effect of entity theory on depressive symptoms, $b = .20$, $t(517) = 1.65$, $p = .099$, $\beta = .07$ (path c'). In a causal mediation analysis (using a method created by Hicks & Tingley, 2011), the indirect effect of an entity theory on depressive symptoms through the

maladaptive thoughts and emotions was significant, .171 (95% CI [.080, .283]). This is depicted in Figure S6.

Table S1. Effectiveness of Random Assignment: Non-Significant Pre-intervention Differences between Conditions

Pre-intervention variable	Control	Intervention	Test statistic	<i>p</i>
% Male	51%	49%	$\chi^2(1) = .92$	.337
% White	51%	49%	$\chi^2(1) = .64$	.424
Test scores	386.67	387.28	$t(596) = .10$	.917
Depressive symptoms (continuous)	2.75	2.54	$t(597) = .90$	.371
Victimization	1.66	1.67	$t(597) = .17$	.865
Entity Theories	2.72	2.83	$t(595) = 1.37$	.172
<i>N</i>	295	304		

Table S2. Effect of Intervention on Clinically-Significant Depressive Symptoms and Continuous Depressive Symptoms

	May Clinically-Significant Depressive Symptoms						May Continuous Depressive Symptoms					
	Model I			Model II			Model I			Model II		
	<i>OR</i>	<i>z</i>	<i>p</i>	<i>OR</i>	<i>z</i>	<i>p</i>	<i>b</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>t</i>	<i>p</i>
Condition	.56**	-2.81	.005	.50**	-2.67	.008	-.57	-1.83	.068	-.44	-1.77	.077
Baseline Subscale				1.68***	8.33	<.001				.75***	12.06	<.001
Sample 2	.72	-.96	.335	.77	-.55	.584	-1.00	-1.90	.058	-.30	-.59	.555
Sample 3	.77	-.91	.361	1.30	.64	.519	-.67	-1.43	.153	.00	.00	.997
Sex				1.24	.82	.414				.50	1.91	.057
Test Scores				1.00	-.49	.627				.00	.18	.855
Race				.61	-1.62	.106				.08	.26	.796
Baseline Entity Theories				1.16	1.07	.287				.14	1.08	.278
Baseline Victimization				1.08	.39	.694				.23	1.00	.317
Intercept	0.44**	-2.92	.004	.05*	-2.15	.031	4.11***	8.75	<.001	-.25	-.17	.863
$R^2 =$	.01			.33			.01			.40		
$N =$	599			591			599			591		

Note: For clinical cut-point: logistic regression; for continuous depressive symptoms: OLS regressions. *OR* = Odds ratio; *b* = unstandardized regression coefficient. *<.05; **<.01; ***<.001

Table S3. Effect of Intervention on May CDI:S Sub-Scales: Negative Mood and Anhedonia

	May Negative Mood						May Anhedonia					
	Model I			Model II			Model I			Model II		
	<i>b</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>t</i>	<i>p</i>
Condition	-.09*	-2.44	.015	-.08*	-2.44	.015	-.03	-.65	.517	-.04	-1.00	.317
Baseline Subscale				.60***	8.84	<.001				.43***	7.44	<.001
Sample 2	-.07	-1.02	.309	.02	.21	.831	-.03	-.58	.560	.00	-.04	.971
Sample 3	-.01	-.22	.824	.04	.71	.478	.05	.88	.379	.06	1.21	.228
Sex				.12***	3.56	<.001				.09*	2.44	.015
Test Scores				.00	.43	.666				.00	.11	.912
Race				.00	.07	.947				-.01	-.18	.854
Baseline Entity Theories				.01	.56	.573				.00	.25	.801
Baseline Victimization				.02	.64	.524				.09**	2.59	.010
Intercept	.38***	6.09	<.001	-.13	-.69	.490	.32***	6.12	<.001	-.12	-.64	.522
$R^2 =$	.01			.27			.01			.21		
$N =$	597			589			595			587		

Note: OLS regressions. *b* = unstandardized coefficient. *<.05; **<.01; ***<.001

Table S4. Effect of Intervention on May CDI:S Sub-Scales: Ineffectiveness and Negative Self-Esteem

	May Ineffectiveness						May Negative Self-Esteem					
	Model I			Model II			Model I			Model II		
	<i>b</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>t</i>	<i>p</i>
Condition	-.09*	-2.32	.021	-.08*	-2.01	.044	-.05	-1.45	.148	-.04	-1.43	.154
Baseline Subscale				.36***	5.39	<.001				.68***	12.19	<.001
Sample 2	-.12	-1.72	.086	-.03	-.35	.725	-.17*	-2.56	.011	-.10	-1.69	.092
Sample 3	-.06	-.93	.353	.02	.24	.809	-.16*	-2.64	.009	-.07	-1.22	.221
Sex				.05	1.43	.153				.03	1.00	.315
Test Scores				.00	.13	.898				.00	-.07	.941
Race				.04	1.03	.303				.01	.17	.862
Baseline Entity Theories				.03	1.75	.080				.02	1.61	.108
Baseline Victimization				.07*	2.08	.038				.04	1.63	.104
Intercept	.33***	4.85	<.001	-.13	-.73	.466	.50***	8.37	<.001	.05	.33	.743
$R^2 =$	.01			.13			.02			.38		
$N =$	592			584			596			588		

Note: OLS regressions. *b* = unstandardized coefficient. *<.05; **<.01; ***<.001

Table S5. Effect of Intervention on May Self-Esteem and Negative Self-Views, With and Without Covariates

	May Self-Esteem (Self-report)						May Negative Self-Views (LIWC Categorization)					
	Model I			Model II			Model I			Model II		
	<i>b</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>t</i>	<i>p</i>
Condition	.18*	1.67	.096	.24*	2.51	.012	-.96**	-2.69	.007	-.90**	-2.60	.009
Baseline outcome				.54***	9.03	<.001				.09	1.68	.094
Baseline depressive symptoms										.16	1.91	.056
Sample 2	-.33	1.85	.065	-.02	-.08	.935						
Sample 3	.19	1.15	.252	-.02	-.13	.894	.97**	2.84	.005	.75	1.88	.060
Sex				-.01	-.09	.924				.50	1.46	.146
Test Scores				.00*	1.94	.053				.00	-.23	.817
Race				-.04	-.38	.707				.57	1.44	.151
Baseline Entity Theories				-.08	-1.56	.119				-.25	-1.44	.151
Baseline Victimization				-.05	-.64	.525				.09	.23	.817
Intercept	5.50***	34.18	<.001	2.01***	3.59	<.001	1.17	3.30	<.001	.62	.49	.625
$R^2 =$	.03			.22			.02			.06		
$N =$	602			587			522			514		

Note: OLS regressions. *b* = unstandardized coefficient. Negative self-views only available for Samples 2 and 3. Baseline self-esteem only available in Samples 2 and 3; for Sample 1, baseline values were imputed to avoid list-wise deletion. *<.05; **<.01; ***<.001

Table S6. Non-Significant Interactions between Incremental Theory of Personality Intervention and Covariates (Results From Separate Logistic Regression Models Predicting Levels of Dichotomized Depressive Symptoms)

Moderator	<i>OR</i>	<i>z</i>	<i>p</i>
Sample 2 (vs. 1 and 3)	1.46	.54	.592
Sample 3 (vs. 1 and 2)	2.09	1.19	.232
Sex (1 = Female, 0 = Male)	.54	-1.46	.143
Test Scores	1.00	.86	.389
Race/ Ethnicity	1.07	.15	.883
Baseline Victimization	.77	-.99	.320

Note: Each row represents the coefficient from a different Moderator × Condition interaction in separate regression models including a main effect for condition, the moderator, and the interaction between the two. Condition: 1 = Random assignment to incremental theory of personality intervention; 0 = Random assignment to control condition. *OR* = odds ratio. *.<.05; **.<.01; ***.<.001

Table S7. Effect of Incremental Theory of Personality Intervention on Clinically Significant Depressive Symptoms for Samples 2 and 3 Only and Dichotomizing at 7 Reported Symptoms

	Samples 2 and 3 Only			Cutoff at 7 out of 20		
	<i>OR</i>	<i>z</i>	<i>p</i>	<i>OR</i>	<i>z</i>	<i>p</i>
Condition	.53*	-2.28	.023	.57*	-2.12	.034
Baseline Depressive symptoms	1.67***	7.52	<.001	1.52***	8.28	<.001
Sample 2	-	-	-	.96	-.08	.938
Sample 3	1.80	1.10	.271	1.75	1.23	.218
Sex	1.45	1.33	.184	1.38	1.20	.229
Test Scores	1.00	-.46	.645	1.00	-.50	.614
Race	.58	-1.54	.123	.86	-.52	.603
Baseline Entity Theories	1.22	1.27	.204	1.13	.88	.378
Baseline Victimization	.95	-.23	.815	1.04	.17	.864
Intercept	.01***	-3.65	<.001	.03*	-2.30	.021
$R^2 =$	.32			.26		
$N =$	514			591		

Note: Logistic regressions predicting the probability of reporting clinically significant levels of depressive symptoms on the CDI short form. *Samples 2 and 3 Only:* A cut-point of 6 out of 20 points on the CDI short form was used, but with only Samples 2 and 3. *Cutoff at 7:* A score of 7 out of 20 on the CDI short form is used as a cut-point for clinically significant levels of depressive symptoms; all three samples. *OR* = odds ratio. Condition: 1 = Random assignment to incremental theory of personality intervention; 0 = Random assignment to control condition. *<.05; **<.01; ***<.001

Table S8. Effect of Incremental Theory of Personality Intervention on Clinically Significant Depressive Symptoms 9 Months Later for Participants who Did Not Meet Clinical Level of Depressive Symptoms at Baseline

	1				2		
	<i>OR</i>		<i>z</i>	<i>p</i>	<i>OR</i>	<i>z</i>	<i>p</i>
Condition	.55 *		-1.96	.050	.54 *	-1.99	.047
Baseline Depressive symptoms	332.42 ***		6.37	<.001	1.75 ***	5.71	<.001
Sample 2					.60	-.79	.429
Sample 3					1.62	.90	.367
Sex					1.16	.46	.645
Test Scores					1.00	-.84	.402
Race	.76		-.87	.383	.59	-1.49	.137
Baseline Victimization					1.33	1.77	.076
Baseline Entity Theories					.95	-.22	.827
Intercept	.00 ***		-7.49	<.001	.05 *	-2.19	.029
$R^2 =$	.14				.16		
$N =$	497				495		

Note: Logistic regressions predicting the probability of reporting clinically significant levels of depressive symptoms 9 months later on the CDI short form for participants who did not meet clinical levels of depressive symptoms at baseline. *OR* = odds ratio. Condition: 1 = Random assignment to incremental theory of personality intervention; 0 = Random assignment to control condition. *<.05; **<.01; ***<.001

Figure S1. Flowchart of Participants and Attrition in Each Sample.

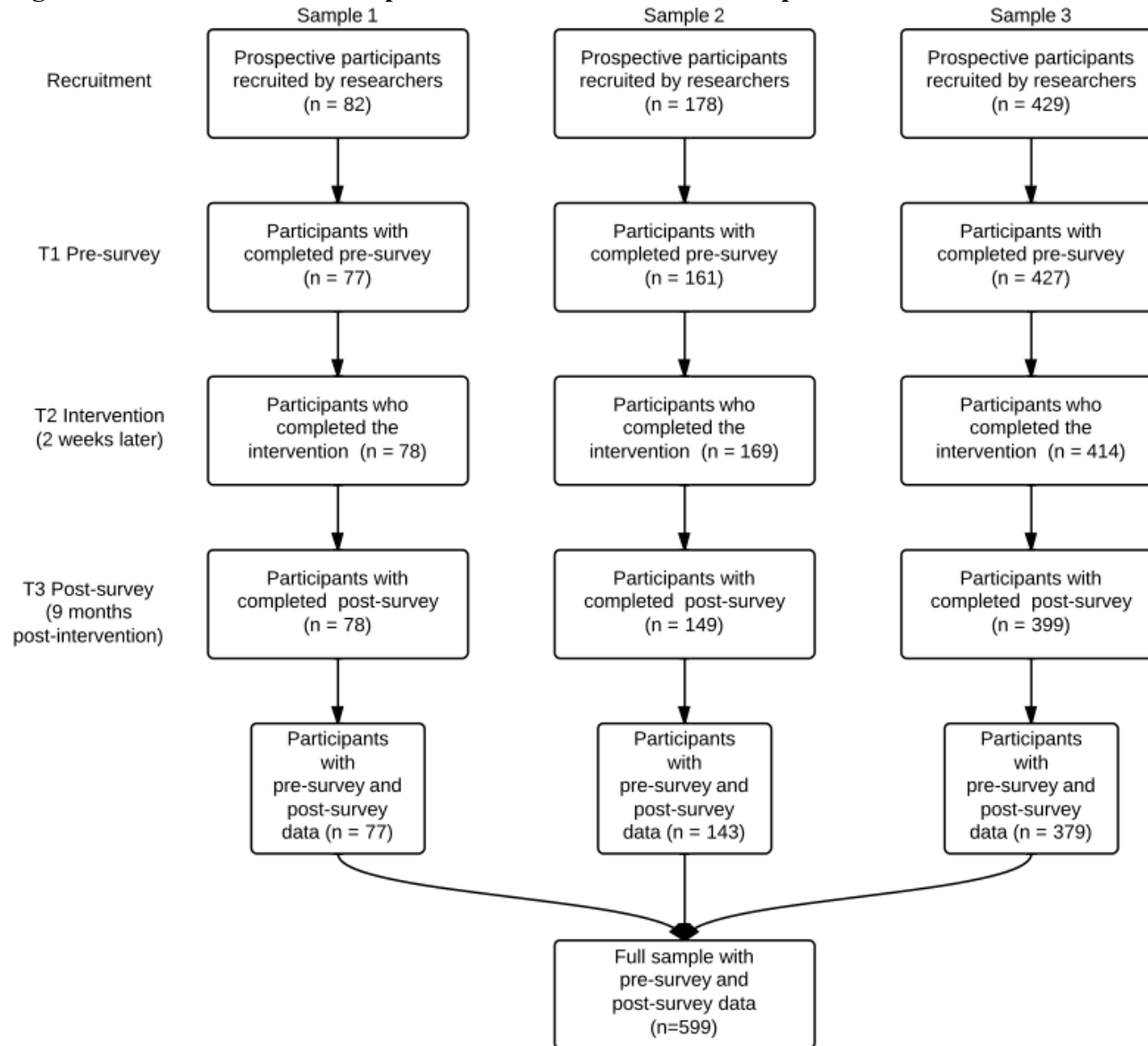
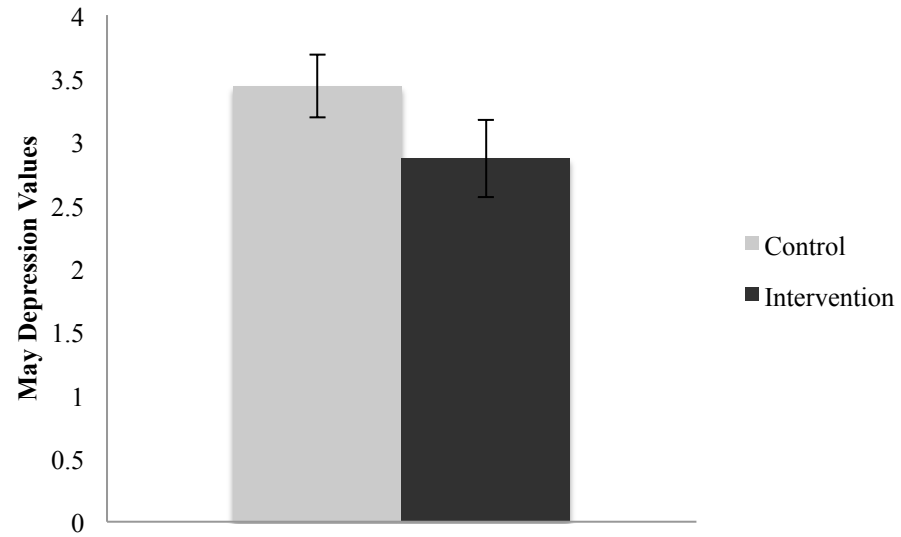
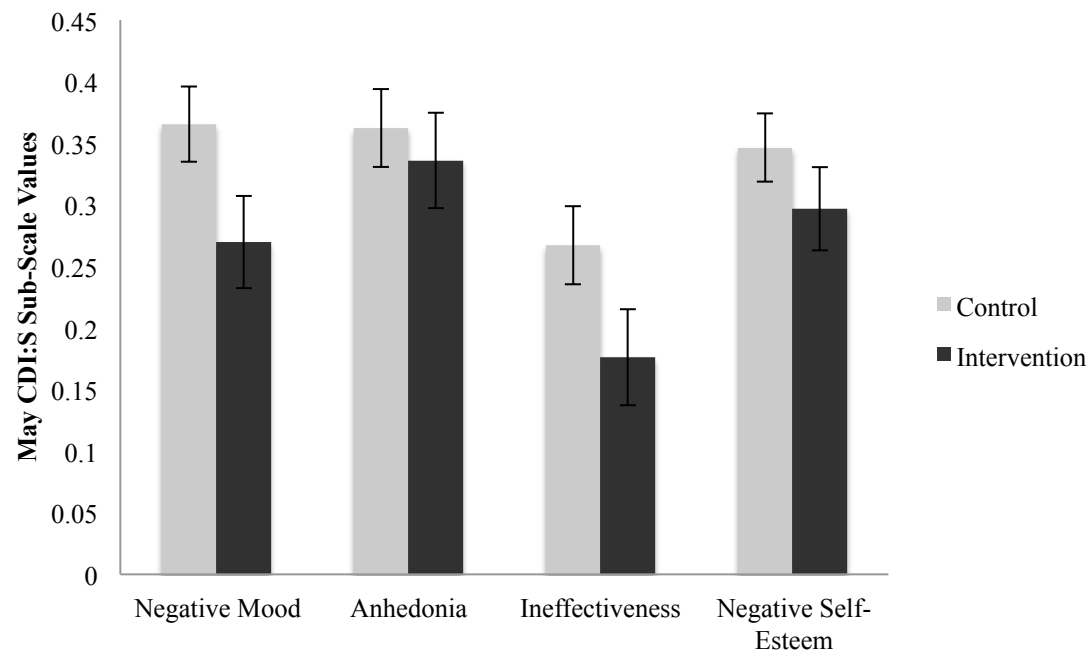


Figure S2. May Values of the Continuous Metric of Depressive Symptoms, by Condition.



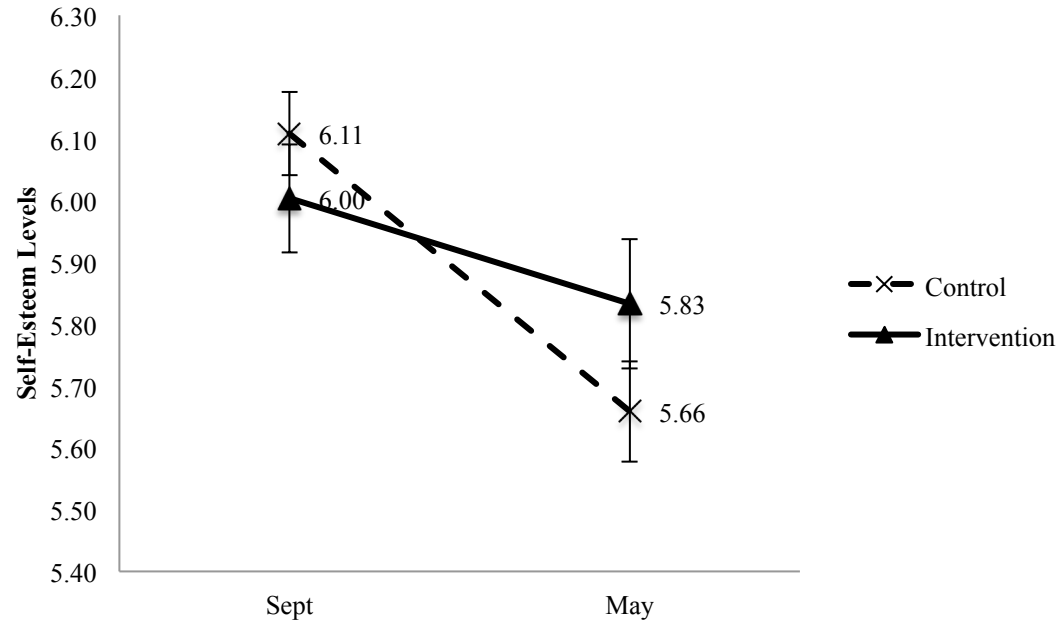
Note: Continuous measure of depressive symptoms, ranging from 0 to 20, with higher scores representing more symptoms.

Figure S3. May Values of Sub-Scales of Children’s Depression Inventory, Short Form, by Condition.



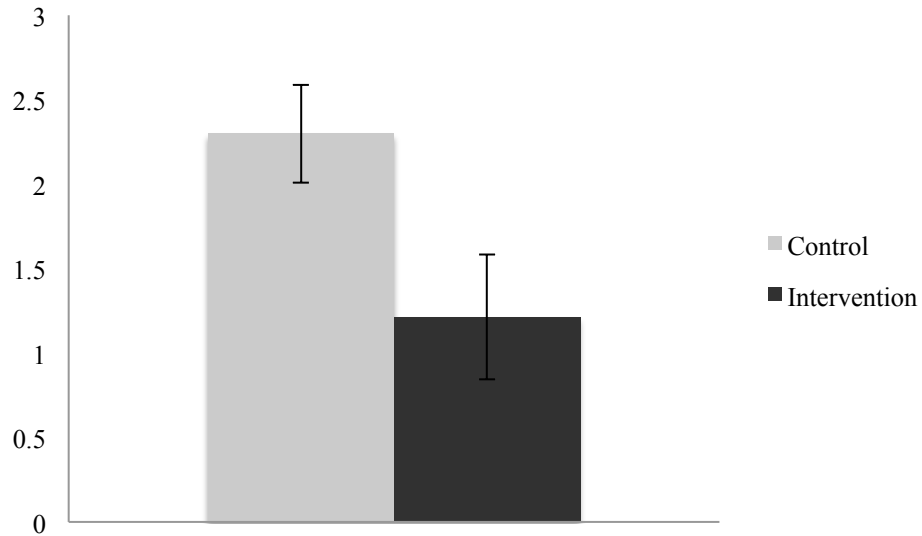
Note: Range: 0 – 2; 0 = no symptom 2 = highest level of the symptom.

Figure S4. The Incremental Theory of Personality Intervention Slows the Loss of Self-Esteem Over Freshman Year



Note: Range of 1 to 7, with higher scores representing greater self-esteem.

Figure S5. May Negative Self-Views, as Assessed by LIWC Categorization of Self-Descriptions, by Condition.



Note: Higher scores represent more negative self-views. This consists of participants in samples 2 and 3 because self-views were only assessed in these two samples.

Figure S6. Correlational Effect of a Measured Entity Theory of Personality on Depressive Symptoms, Mediated by Maladaptive Cognitions and Emotions. Supplementary analysis of Samples 2 and 3's baseline data. Direct and indirect effects of an entity (fixed) theory of personality on the depressive symptom scores on the CDI, mediated by maladaptive cognitions and emotions (e.g., shame, self-blame) about a hypothetical bullying incident. b = unstandardized coefficient. All paths were estimated with OLS.

