

Supplemental Material for:

A Brief Intervention to Motivate Empathy among Middle School Students

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1. Supplementary Tables

Table S1. School differences in grades enrolled, sample size, percentage of students who are socioeconomically disadvantaged, percentage of students who are suspended, and percentage of students who failed to meet statewide standards on assessments of math and literacy. Data were obtained from cde.ca.gov DataQuest and School Accountability Report Cards (SARC reports), 2016-2017 academic year. With the exception of sample size, data are mean centered to protect school identity. Schools are presented in order by percent of socioeconomically disadvantaged students, from 1 (greatest percent of socioeconomically disadvantaged) to 4 (smallest percent of socioeconomically disadvantaged).

	<i>School 1</i>	<i>School 2</i>	<i>School 3</i>	<i>School 4</i>
Grades	6 – 8	6 - 8	6 – 8	5 - 8
n	131	202	290	234
Percent Socioeconomically Disadvantaged	18.00%	9.30%	4.30%	-31.60%
Suspension Percentage	0.73%	0.73%	0.43%	-1.88%
CAASP English/Language Arts Level 1 (Standard Not Met)	17.97%	2.62%	-3.16%	-17.43%
CAASP Math Level 1 (Standard Not Met)	16.72%	4.40%	-0.56%	-20.56%

Table S2. School differences in empathic motives, beliefs about malleability of empathy, beliefs about social normativity of empathy, physical aggression, relational aggression, stress, loneliness, self-reported prosocial behavior, and IRI subscale scores. These data are school-wide averages, collapsed across all three experimental conditions. Means are printed outside of the parentheses, standard deviations are printed inside the parentheses.

Outcome Measure	School 1	School 2	School 3	School 4
Empathic Motives	37.22 (8.27)	38.07 (9.5)	39.22 (8.88)	39.70 (8.49)
Normativity Beliefs	25.32 (4.89)	26.47 (5.47)	28.16 (5.83)	29.44 (5.69)
Malleability Beliefs	26.93 (4.3)	27.91 (5.67)	29.94 (7.03)	29.40 (5.76)
Physical Aggression	3.71 (1.9)	3.31 (1.69)	3.27 (1.61)	2.65 (1.28)
Relational Aggression	9.57 (4.32)	8.51 (3.37)	8.48 (3.26)	7.47 (2.56)
Stress	19.43 (4.66)	20.48 (5.71)	19.00 (6.75)	17.85 (6.36)
Loneliness	34.63 (10.13)	34.09 (10.53)	32.55 (11.09)	31.70 (10.19)
Self-Reported Prosociality	13.62 (3.55)	14.12 (3.26)	14.74 (3.15)	14.56 (2.72)
Empathic Concern	8.67 (3.57)	9.59 (3.67)	9.52 (3.39)	10.34 (3.22)
Perspective Taking	8.25 (3.57)	8.81 (3.52)	8.81 (3.4)	9.54 (2.85)
Personal Distress	6.62 (3.43)	7.02 (3.42)	6.27 (3.45)	6.64 (3.28)
Peer-Reported Prosocial Behavior	9.11 (6.84)	9.94 (8.18)	10.50 (7.88)	10.35 (7.29)

Table S3. Condition by school differences in empathic motives, beliefs about malleability of empathy, beliefs about social normativity of empathy, physical aggression, relational aggression, stress, loneliness, self-reported prosocial behavior, number of prosocial nominations received from peers, and IRI subscale scores. Means are printed outside of the parentheses, standard deviations are printed inside the parentheses.

School	Outcome Measure	Social Norms	Malleable Mindset	Control
School 1	Empathic Motives	37.98 (8.72)	37.15 (7.97)	36.58 (8.22)
	Normativity Beliefs	24.95 (5.53)	25.49 (4.89)	25.53 (4.27)
	Malleability Beliefs	26.49 (4.3)	26.72 (4.14)	27.62 (4.49)
	Physical Aggression	3.77 (1.95)	3.81 (1.9)	3.57 (1.87)
	Relational Aggression	10.37 (4.34)	9.88 (4.55)	8.54 (3.97)
	Stress	19.95 (4.15)	19.47 (4.76)	18.87 (5.08)
	Loneliness	33.14 (7.96)	34.77 (10.5)	35.83 (11.49)
	Self-Reported Prosociality	13.88 (3.68)	13.48 (3.49)	13.50 (3.56)
	Empathic Concern	8.32 (3.78)	9.34 (3.48)	8.35 (3.43)
	Perspective Taking	7.73 (3.59)	8.83 (3.6)	8.18 (3.51)
	Personal Distress	6.37 (3.38)	7.24 (3.52)	6.25 (3.39)
	Peer-Reported Prosocial Behavior	8.70 (5.68)	9.98 (7.86)	8.72 (6.9)
School 2	Empathic Motives	39.41 (9.36)	38.10 (10.2)	36.58 (8.86)
	Normativity Beliefs	27.84 (5.31)	26.27 (5.51)	25.24 (5.35)
	Malleability Beliefs	27.59 (4.89)	27.94 (5.97)	28.22 (6.23)
	Physical Aggression	3.23 (1.56)	3.35 (1.91)	3.36 (1.64)
	Relational Aggression	8.89 (3.51)	8.48 (3.86)	8.15 (2.67)
	Stress	20.99 (5.94)	20.42 (5.13)	20.02 (5.98)
	Loneliness	35.09 (10.84)	32.34 (10.31)	34.62 (10.37)
	Self-Reported Prosociality	13.52 (3.08)	14.35 (3.53)	14.53 (3.13)
	Empathic Concern	9.08 (3.68)	9.97 (3.99)	9.81 (3.36)
	Perspective Taking	8.47 (3.5)	9.43 (4.03)	8.63 (3)
	Personal Distress	7.00 (3.34)	7.38 (3.77)	6.70 (3.19)
	Peer-Reported Prosocial Behavior	9.58 (5.99)	10.70 (9.28)	9.61 (9.15)
School 3	Empathic Motives	41.97 (8.12)	38.16 (8.92)	37.66 (9.02)
	Normativity Beliefs	29.35 (6.37)	27.40 (5.8)	27.69 (5.17)
	Malleability Beliefs	29.63 (6.68)	30.10 (7.21)	30.08 (7.25)
	Physical Aggression	3.19 (1.5)	3.39 (1.92)	3.22 (1.38)
	Relational Aggression	8.43 (2.95)	8.33 (3.38)	8.66 (3.44)
	Stress	18.06 (6.27)	18.40 (7.3)	20.41 (6.5)
	Loneliness	31.11 (10.25)	33.84 (11.88)	32.68 (11.04)
	Self-Reported Prosociality	14.48 (2.9)	14.51 (3.55)	15.19 (2.96)
	Empathic Concern	9.29 (3.61)	9.29 (3.78)	9.95 (2.75)
	Perspective Taking	8.61 (3.42)	8.38 (3.81)	9.41 (2.89)

School 4	Personal Distress	5.92 (3.46)	6.34 (3.89)	6.52 (2.98)
	Peer-Reported Prosocial Behavior	11.32 (8.44)	9.40 (6.97)	10.75 (8.1)
	Empathic Motives	40.95 (8.65)	40.49 (8.06)	37.57 (8.44)
	Normativity Beliefs	30.48 (5.88)	29.38 (5.39)	28.46 (5.71)
	Malleability Beliefs	28.01 (5.47)	30.08 (5.71)	30.10 (5.91)
	Physical Aggression	2.60 (1.32)	2.86 (1.42)	2.49 (1.07)
	Relational Aggression	7.39 (2.21)	7.68 (3.09)	7.32 (2.3)
	Stress	17.61 (6.08)	19.19 (6.88)	16.60 (5.81)
	Loneliness	32.56 (10.67)	33.22 (10.72)	29.15 (8.62)
	Self-Reported Prosociality	14.70 (2.88)	14.40 (2.63)	14.59 (2.65)
	Empathic Concern	10.49 (3.08)	10.14 (3.16)	10.38 (3.46)
	Perspective Taking	9.75 (2.94)	9.42 (2.63)	9.44 (2.99)
	Personal Distress	6.14 (3.13)	7.21 (3.4)	6.59 (3.27)
	Peer-Reported Prosocial Behavior	10.11 (6.06)	9.50 (6.42)	11.47 (9.07)

Table S4. Racial demographics by school, ordered alphabetically.

Race	School 1	School 2	School 3	School 4
American Indian	3	0	3	1
Black or African American	3	8	10	1
East Asian	7	2	7	24
Hispanic or Latino/a	49	72	62	22
Middle Eastern	0	1	7	6
Mixed (More than one of the above)	20	48	58	46
Other	15	16	25	17
Pacific Islander	4	6	4	1
South Asian	2	4	13	14
White or Caucasian	11	15	51	75
Did not report	17	30	50	27

Please note that participants' race is not included in either dataset, as there were multiple instances where only one participant at a school identified with a certain racial group, and we wanted to protect all participants' identities.

Table S5. Age breakdowns by school.

Age	School 1	School 2	School 3	School 4
11	0	3	1	1
12	105	141	204	182
13	9	28	33	21
Did not report	17	30	52	30

Please note that participants' age is not included in either dataset, as there were two instances where there was only one participant at a school of a particular age, and we wanted to protect all participants' identities.

Table S6. Sample size in each condition by school.

School	Condition			Total
	Social Norms	Malleable Mindset	Control	
1	43	42	46	131
2	72	63	67	202
3	94	94	102	290
4	80	78	76	234
Total	289	277	291	857

2. Intervention and follow up dates

Although the research team tried to ensure consistency across schools in timing and administration of the intervention, sessions were scheduled based on each schools' preferences and availability. All of the intervention sessions were administered over a two-week period, but the spacing between the third intervention session and the follow up sessions differed across schools. Because the differences in administration timing were not systematic, the present work cannot offer information about optimal timing for the delivery of such an intervention. This is an important avenue of inquiry for future work.

Pilot School

Follow up: 52 days after session 3

School 1

Follow up: 27 days after session 3

School 2

Follow up: 27 days after session 3

School 3

Follow up: 44 days after session 3

School 4

Follow up: 19 days after session 3

3. Video transcripts and stills

Session 1 Video 1 (Social Norms and Malleable Mindset Conditions)

Empathy is the ability to share and understand other people's thoughts and feelings. And importantly, empathy is really different from sympathy. Sympathy is when you feel bad for somebody else, if you encounter someone who is upset about something you might feel or think something like "oh, I feel so bad for this person". Sympathy is feeling for somebody – maybe pitying them. Empathy is different, more like feeling with somebody. If someone is feeling sad about something, it's empathy that makes us feel sad too. So if something bad happened to somebody you care about and they were upset about it, you might not just feel sympathy for them. Instead you might feel empathy for them, meaning you would feel sad too.

Empathy often makes us want to help people. And when we help people, it makes them feel better especially during difficult times. When we share their thoughts and feelings, we're closer to them, and it makes us feel better too. That means that empathy helps us build strong relationships with friends and family.

So what does it mean to be empathic? Well, as we've already discussed, it means things like feeling upset when somebody that we are close with or somebody we encounter is upset. But it also means feeling good when somebody we interact with is feeling good. Or even feeling excited or joyful when something good happens to someone else. At your age, your brain is growing at a rapid rate and you're learning new things in school, facing new challenges, and lucky for you, your brain is growing really quickly to catch up. One part of the brain that grows a lot at your age is the prefrontal cortex. This is really important because the prefrontal cortex helps us empathize. We'll talk more about this in the next video. And given how much it is developing at your age it's no surprise that now more than ever, you are "empathy experts," able to empathize with friends really well.

So to recap, in this video we've talked about how empathy is the ability to share and understand other people's thoughts and feelings. And we've also talked about how your brain, now that you're in seventh grade, is growing faster than ever, particularly this one region right here, the prefrontal cortex, which is one of the regions of the brain that supports empathy.

Session 1 Video 2 (Social Norms and Malleable Mindset Conditions)

So to recap, in our last video we talked about empathy, specifically how empathy is the ability to understand and share other people's thoughts and feelings. Empathy is feeling with other people, like when you feel bad because somebody else does, or feel good because someone else is excited. We also talked about some of the changes that happen in your brain at your age. Specifically, in the prefrontal cortex, a region that supports empathy. In this video, we're going to think about where empathy came from, why humans developed empathy, and why it's a good thing. But first, how do feelings work? Whenever we feel an emotion, maybe we feel upset or happy or excited about something, our bodies and our brains communicate with each other and

our brains send messages to places like our hearts. You've probably seen this in action, like when you are upset about something and your heart starts to beat faster.

When we empathize with somebody, you can sort of think of the prefrontal cortex as a set of eyes, that lets us see how somebody else probably feels, and figure out what's going on inside of their brains and how their brains are talking to their bodies. After you figure out what someone else feels, you might experience a change in how your own brains talk to your own body, and that's why you'd have an emotional reaction.

Like we mentioned last time, empathy is a good thing because it lets us help people in need, which makes them feel good. Empathizing also makes us feel good. So it's beneficial to both people involved. Empathy also helps people work together and though humans show the most empathy of all species on the planet, other species like chimpanzees show it too. Chimpanzees have a bigger prefrontal cortex than other animals, and because of that can empathize with one another. Empathy lets them help each other and work together to do things that they couldn't do on their own. Empathy helps people work together, too, and lets us accomplish things that we couldn't do on our own, like playing an orchestra song or scoring a goal in football. But our prefrontal cortex is also much bigger than that of other animals. That means that we can empathize in richer, more sophisticated and interesting ways. We don't just share simple emotions like fear and joy, but also share other people's frustration, hope, and other emotions.

As we talked about in the last video, sharing and understanding other people's emotions make us feel more connected with them and make them feel more connected with us. But in addition to making the relationships we already have better, empathy also helps us form new relationships. When we meet someone new, sharing their feelings helps connect us and helps us, and to make friends with them. So to recap everything we've covered so far, we know that empathy is a way to see into other people to know what they're thinking and feeling. That it helps people and even other species work together and succeed. And finally, that empathy is really important for keeping our relationships strong and also for making new relationships, such as friendship.

Session 1 Video 1 (Control Condition)

So what exactly is intelligence? For most of us, intelligence and how our brains work seems like a mystery. When people think about their own intelligence and the intelligence of people around them, many people believe that a person is born either smart, average, or dumb – and they stay that way for life. These people think about intelligence as a fixed trait, like eye color. Such people think ‘you’re either smart or you’re not, and that’s life’. But science tells us that intelligence works more like a muscle. It can be developed with practice – the same way a weightlifter can get bigger and stronger by practicing lifting more weights over time. In other words, science says that our intelligence can grow. At your age, your brain is growing at a rapid rate and you’re learning new things in school, facing new challenges, and lucky for you, your brain is growing really quickly to catch up. One region in particular is growing especially quickly at your age, and this is the prefrontal cortex. This is really important because the prefrontal cortex is the region of the brain that supports our intelligence. And given how much it is developing at your age it’s no surprise that now more than ever, you are able to learn new things at school. So to recap, in this video we have discussed how our brain is best thought of like a muscle. We’ve talked about how we can grow our intelligence with effort and practice. And we’ve also talked about how your brain, now that you’re in seventh grade, is growing faster than ever, particularly this one region right here, the prefrontal cortex, which is one of the regions that helps your intelligence grow.

Session 1 Video 2 (Control Condition)

So to recap, in our last video we talked about intelligence, specifically how our intelligence, as well as our brain, works like a muscle. We talked about how we can grow our intelligence with effort, practice, and by taking on new challenges, the same way a weightlifter can build muscles by practicing lifting heavier weights. Finally we talked about some of the changes that happen in your brain at your age. Specifically, in the prefrontal cortex, a region that supports intelligence. In this video, we're gonna dive in further to thinking about how the brain works, how it develops, and how it allows our intelligence to grow. Scientists used to believe that the brain did not change much after childhood. They believed that by the time we become adults, the brain is "hardwired" and "fixed". But scientists have recently learned that this is not true. We now know that the brain can change and be "re-wired" throughout our lives. In other words, our brains are like plastic. Scientists who study the brain call this process of change "neuroplasticity". How does neuroplasticity work? Try to think of the brain like a traffic grid. Some of the roads in this grid we use everyday. These roads reflect our habits, the things we think about, and the things we know how to do. Every time we think a certain way, or practice a certain task, we strengthen this road, making it easier for our brain to travel along this road. When we challenge ourselves to learn a new skill, our brain creates a new road. And as we continue practicing this new skill, it becomes easier for our brain to travel this new road too. This process of forming new roads, or connections in our brain, is called neuroplasticity. Lucky for us, we all have the ability to learn and change because of this quality of our brains. When you've learned a new skill, such as how to ride a bike or play a musical instrument, you've experienced neuroplasticity in action. So by focusing our effort and attention on learning other new skills, over time, we can 're-wire' our brains. So to recap everything we've covered so far, we know that our brains change not just in childhood, but throughout life. This process of change that occurs whenever we take on new skills, and engage in new ways of thinking, is called neuroplasticity. And this means that our brains will continue to change, and grow as we take on new challenges and learn new skills in the future, both inside and outside of school.

Session 2 Video 1 (Social Norms Condition)

So last time we talked about empathy, our ability to understand and share what other people feel. We talked about how empathizing with people, for example if they feel bad, might make them feel better, make us feel better too, and bring us closer together. Because of this, empathy helps us keep our friendships strong and also to make new friends, and work together to do things we couldn't do on our own like playing sports or making music.

We also spent some time talking about your brain and how it develops a lot in seventh grade. Particularly this one area of your brain right here, the prefrontal cortex, which is an area of the brain that helps us empathize. And at the very end of our session we mentioned how empathy, like some other qualities, becomes more common in seventh grade. Today were gonna tell you more about that idea.

If you try to empathize with a friend when they're upset – to share and understand their feelings – you're activating that region of your brain, that area called the prefrontal cortex. As we've discussed, your brain grows a lot during 7th grade, and one of the areas that has the biggest growth spurt is the prefrontal cortex. . Inside of the cortex of the brain there are billions of tiny nerve cells called neurons, and there's lots of them. Neurons have branches that connect them to other cells, and when these brain cells connect, they allow us to do everything we do, like riding a bike, or talking to other people, or solving problems, and even empathizing.

These brain changes explain a lot of the social changes that you may have noticed happening with you and your classmates. Since you've been in middle school, you've probably continued to meet new people, to make new friends, and to interact with other students you haven't talked to before. Just like you, all of your peers in seventh grade are also experiencing changes in their brains. And because of this, they, just like you, are better able to understand and share other people's feelings better and do so more easily than ever before. This means that people's attitudes towards empathy also change in seventh grade changing. Specifically seventh graders tend to like empathy more, meaning that they want to be empathic. They also value empathy in others, meaning that they like it when other people are empathic and want to be friends with empathic people. Finally, they expect empathy from others, meaning that in seventh grade, most people are empathic.

And now more than ever you and your seventh grade peers are better able to share and understand each other's emotions. You may notice that empathy is more common in your social interactions now that you're better able to empathize and your peers are too. When we empathize with people it feels good for them and it feels good for us. People like to interact with others who they believe are empathic, who try to understand and share their emotions, and seventh graders usually know that when interacting with friends at school, with teachers, with peers, with family, it's important to be empathic. (edit long pause) So to summarize, in seventh grade people usually like empathy more, meaning that they want to show empathy to others, and that they like to be empathic. They also value empathy in others more, meaning that they like to be treated with empathy, they like others to try to empathize with them, and they like to be friends with empathic people, and that they expect empathy from others, meaning that in seventh grade most people are empathic, and that your classmates will expect you to be empathic too.

Session 2 Video 1 (Malleable Mindset Condition)

So last time we talked about empathy, our ability to understand and share what other people think and feel. We talked about how empathizing with people, for example if they feel bad, might make them feel better, make us feel better too, and bring us closer together. Because of this, empathy helps us keep our friendships strong and also to make new friends, and work together to do things we couldn't do on our own like playing sports or making music.

We also spent some time talking about your brain and how it develops a lot in seventh grade. Particularly this one area of your brain right here, the prefrontal cortex, which is an area of the brain that helps us empathize. And at the very end of our last meeting we talked about how empathy can change over time, meaning that people can actually grow the levels of empathy they have. Today we're going to talk more about that last point.

Every time we empathize with someone, we're practicing our empathy. And like other things you practice, say a musical instrument or a sport, you can get better at it. If you try to empathize with a friend when they're upset – to share and understand their feelings, you're activating that region of your brain, that area called the prefrontal cortex, right here. The key to growing this region of your brain and to growing empathy is to practice and try to empathize in new situations, with new people, even when it feels hard. It might be easy to empathize with your friend because you've known each other for so long. But the big changes happen when you try to empathize with new people. When you try to empathize with new people, maybe someone you haven't talked to before, maybe someone who seems different from you, your brain works harder to try to empathize with them. When you do this your prefrontal cortex changes. Inside of the cortex of the brain there are billions of tiny nerve cells called neurons, and there's lots of them. Neurons have branches that connect them to other cells, and when these brain cells connect, they allow us to do everything we do, like riding a bike, or talking to other people, or solving problems, and even empathizing. When you empathize even when it's not easy, for example, with new people or people who are different from you, these tiny connections in the prefrontal cortex multiply and get stronger. The more you challenge your mind to empathize, the more your prefrontal cortex cells grow, kind of like your muscles do when you exercise. After you practice empathy enough, people you used to have a hard time empathizing with before become easier to empathize and connect with. It becomes easier to understand and share their feelings. And the result is a stronger, more empathic prefrontal cortex.

Remember when we empathize with people our prefrontal cortex is like a pair of eyes. They help us read others and let us see what they're doing, thinking, and feeling. When we empathize with them, we get an understanding of what's going on inside of them. Sometimes it's hard to understand new people at first, especially when we don't know them well. But the more we practice empathy, the easier it becomes.

So what does this mean for our ability to empathize? It means that, if they want to – people can shape how much empathy they feel for others by developing their prefrontal cortex. And when it's hard for you to empathize with someone, say because they're different from you, remember that empathy can be changed. If you think harder about why they feel what they do, that will help you understand and share their feelings. This is because parts of your brain that help you empathize are getting stronger. Empathy isn't hard like a rock that never changes, it's more like a muscle that can grow. If you don't feel empathy at first, it doesn't mean you can't feel empathy at all.

Session 2 Video 1 (Control Condition)

So last time we talked about intelligence. We talked about your brain and how it develops a lot in seventh grade. Particularly this one area of your brain right here, the prefrontal cortex, which is an area of the brain that supports our intelligence. We talked about neuroplasticity - the process of forming new connections in the brain. We also mentioned how intelligence, like some other qualities, can be developed over time as a result of neuroplasticity. In short, we showed that people can actually change their intelligence. Today we're gonna tell you about how intelligence grows, how you can help your brain develop its intelligence regions through practice and by challenging yourself in school.

So every time we attempt to learn a new skill or take on a new problem, we're growing our intelligence. When you try to learn more difficult subjects at school, be it math, science, or English, you're activating that region of your brain, that area called the prefrontal cortex, right here. The key to growing this region of your brain and to growing intelligence is to try to learn new skills, approach new material, adopt new ways of thinking, frequently, and even when it feels hard. It might be easy to do math problems we have mastered in the past. But the big changes happen when you try new, more challenging ones. When you approach new challenges in school, maybe ones you've never tried before, or maybe ones you have struggled with in the past; your brain works harder too during these challenges. Inside of the cortex of the brain there are billions of tiny nerve cells called neurons, and there's lots of them. Neurons have branches that connect them to other cells in complicated networks, communication between these brain cells is what allows us to do everything, like riding a bike, or talking to other people, or doing math. When you challenge yourself at school, these tiny connections in the prefrontal cortex actually multiply and get stronger. The more you challenge your mind, the more your prefrontal cortex cells grow. Then, problems you had a hard time with before become easier to conquer. It becomes easier and more natural to understand difficult concepts. And the result is a stronger, smarter prefrontal cortex. Though it might be hard for us to understand ideas that challenge us, the more we practice thinking about them, the easier it becomes. An important part of this process can be finding a strategy that best fits the problem at hand. When we encounter new problems, we can think about strategies that we've used in the past to learn new skills and overcome challenges, and apply them here. It takes practice to develop our ability to adjust our strategy for solving problems, but it is important to do so when the strategy we are using is not working as well as we would like it to. By taking on new challenges and thinking how to best approach these challenges, it will become easier for us to challenge our mind in the future. By doing so, we can learn new skills more quickly and with less effort. And why does it become faster and easier? It's because we've developed more connections in our prefrontal cortex. So what does this mean for our intelligence? It means that, if they want to – people can shape their intelligence by developing their prefrontal cortex. No one's intelligence hard like a rock, and every time you struggle in school, remember that intelligence can be changed. You can increase your connections in the prefrontal cortex by working hard to understand things that feel challenging, and knowing this is a crucial step for the development and growth of your young mind.

4. Writing Prompts

Session 1

Social Norms and Malleable Mindset

To recap some of the key points from the two videos you just watched:

1. Empathy is the ability to share and understand other people's thoughts and feelings
2. Empathy happens in the prefrontal cortex, a region of the human brain that develops rapidly during 7th grade
3. Empathy helps us build our connections to other people, strengthen our relationships and make new friends

Now we want to know about some of your experiences with empathy at your school. We're going to ask you to tell us about what empathy means to you and why you value it.

To give you a better sense of what we want you to write about, we'll show you some examples. We asked Stanford students what empathy means to them and why they value it. On the next few screens, you can read some of their responses.

(Stanford students' responses presented)

(Prompt 1) Now that you've seen these examples, it's your turn. In the box below, please describe why you value empathy.

(Prompt 2) We are also curious about your experience of empathy in 7th grade. In the paragraph box below, please describe a time when you've used empathy this year.

Control

To recap some of the key points from the two videos you just watched:

1. Our brain is like a muscle; we can grow our intelligence with effort and practice
2. Intelligence happens in the prefrontal cortex, a region of the human brain that develops rapidly during 7th grade
3. Our brain grows through neuroplasticity, the ability for the brain to form new connections and strengthen old ones.

Now we want to know about some of your experiences with growing your brain. We're going to ask you to tell us about a time you built connections in your brain by practicing something that was hard for you.

Think about something you know how to do really well. Maybe it's riding a bike, maybe it's playing an instrument, or anything that you're good at doing. Now think back in your life to the time when you first tried to do this thing.

Try to reflect on how difficult it was for you to do it then, and how easy it is for you to do it now.

Now think about what you learned in the videos you just watched, namely about how the brain can grow new connections that let us learn how to do new things.

(Prompt 1) In the box below, please tell us about something you're really good at doing now but didn't always know how to do. Tell us how you became good at it, how you practiced and how you improved.

(Prompt 2) Now recall what you learned in the video about neuroplasticity, your brain's ability to form new connections and strengthen old ones. How did neuroplasticity help you learn how to do the thing you're now good at doing?

Session 2

Social Norms

Because we're going to ask you to write about empathy in your grade, we will now show you some of the things your peers wrote about empathy in the last session. On the next three screens, we'll show you three of your peers' responses to our questions from last week. These responses will not have the writer's name and will be randomly selected. Pay attention to their beliefs about empathy, as we'll ask you to report back on their views in just a few minutes.

(Peers' responses presented)

Now we're going to ask you to summarize and reflect on your peers' views on empathy. Take a moment to think about what your peers said that lets you know they value empathy.

Based on the responses you just read from your peers, describe how people in your grade feel about empathy.

Malleable Mindset

As you may have noticed, some of these students wrote about "empathic challenges" when asked to describe their experience with empathy. An "empathic challenge" is a time in which empathizing feels challenging or difficult. As we mentioned in the video, it can sometimes be harder to empathize with people you've never met before or with people who are different from you.

However, these empathic challenges are opportunities for us to grow our empathy because, when we try really hard to empathize, we increase the amount of neural connections in the brain that allow us to empathize.

Even when empathy feels hard, you can still do it. And if you empathize when it's challenging, you get better at empathizing across all challenging times, like when you're meeting someone new, when you don't understand a person, or even when you're in a conflict with someone.

Now we're going to ask you about a recent empathic challenge you were able to overcome with effort. We want you to take a few moments and reflect on 7th grade so far. Since you've come back to school, you've met new people, you have changed, and your peers have changed. You've likely already encountered an empathic challenge, or a time when it was difficult to empathize with a peer. We want you to tell us about a time since the school year started where you were able to overcome an empathic challenge.

In the box below, describe an "empathic challenge" you were able to overcome with effort. Think about a time when you had difficulty empathizing, but were able to overcome the challenge by trying extra hard to empathize.

Control

As you may have noticed, some of these students wrote about "academic challenges" when asked to describe their experience with intelligence. These challenges are when something in school feels difficult to understand. As we mentioned in the video, it can sometimes be harder to understand new ideas or difficult concepts in school.

However, these challenges are opportunities for us to grow our intelligence because, when we try really hard to understand hard ideas, we increase the amount of neural connections in the brain that allow us to think and solve problems.

Even when something feels hard, you can still do it. And if you try to understand the problems that feel really hard, you get better at understanding challenges across different areas, like in different subjects like math or science.

Now we're going to ask you about a recent school challenge you were able to overcome with effort. We want you to take a few moments and reflect on 7th grade so far. Since you've come back to school, you've taken new classes, you learned new ideas, and you've encountered new challenges in school. We want you to tell us about a time since the school year started where you were able to grow your brain by working hard to overcome a challenge from one of your classes.

In the box below, describe a school challenge you were able to overcome with effort. Think about a time when you had difficulty understanding something, but were able to overcome the challenge by trying extra hard.

Session 3

Social Norms

Last time, we had you write about your school in particular; we asked you to tell us why people at your school value empathy.

We told you to pay attention to your experience being empathic and observing empathy around you. Now we want to hear about what you observed.

First, we want to hear what you noticed about your classmates' empathy.

(Prompt 1) In the box below, tell us what you noticed since our last session. Describe some recent times when YOUR CLASSMATES showed empathy to people from school.

Now we want to hear about your own experience with empathy at school.

(Prompt 2) In the box below, tell us what you noticed since our last session. Describe some recent times when YOU showed empathy to people from school.

Last time, we showed you some of your classmates' opinions on empathy. We asked you to read your classmates' answers and then tell us what people in your grade think about empathy.

We're now going to show you some of your classmates' answers from last session, about what people in your grade think about empathy. Pay attention to their responses, because we're going to ask you to write about them in a few minutes.

(Peers' responses presented)

Now we want you to imagine that you're talking to a 7th grader from a different school or a student from a different grade who's a little younger than you. Reflect back on your classmates' views on empathy and on what you know about how the brain changes in 7th grade.

(Prompt 3) Now imagine this person wants to know about empathy in your grade. What would you tell this person? How do you and the people in your grade feel about empathy?

Malleable Mindset

At the end of the last session, we asked you to try increasing your empathy.

We're now going to ask you about how it felt to try to grow your empathy.

(Prompt 1) Think back on your week and describe a time when you tried to empathize when it felt challenging. What tricks did you use to try to understand their thoughts and feelings? How were you able to "up" your empathy for this person?

(Prompt 2) How did you feel after empathizing with this person? What did you learn about your ability to empathize?

Now we want you to think about some empathic challenges that you might expect to arise during 7th grade. These could include empathizing with new people, people who are different from you, and things like that.

Take a moment to think about some empathic challenges you can imagine facing (or are already facing) in 7th grade. When you've thought of at least three, press the button below to continue.

What is an empathic challenge you can imagine facing this year (or are currently facing)? Tell us about it in detail in the box below.

How will you overcome this empathic challenge? Describe the strategies you'll use to grow your empathy during this challenge. Be specific!

Control

At the end of the last session, we asked you to try increasing your intelligence.

We're now going to ask you about how it felt to try to grow your intelligence. Think back on your week and remember a time when you tried to do a problem or understand a concept that felt challenging.

(Prompt 1) In the box below, tell us what you tried since our last session. Describe a recent time when you were able to overcome a challenge at school. What tricks did you use? How were you able to "up" your intelligence in this situation?

(Prompt 2) How did you feel after you were able to understand something that used to feel challenging? What did you learn about your ability to grow your intelligence?

Now we want you to think about some other school challenges that you could expect to arise during 7th grade. These could include things like trying harder problems in class, learning a new language, and things like that.

We also want you to think about how you can overcome these challenges by trying harder to understand, which will help you grow your intelligence.

On the next few screens, we're going to have you list three school-related challenges that you could face in 7th grade, and then think about ways that you could overcome them.

Take a moment to think about some new challenges you can imagine facing (or are already facing) in 7th grade. When you've thought of at least three, press the button below to continue.

What is a challenge you can imagine facing (or are currently facing) in class this year? Tell us about it in detail in the box below.

How will you overcome this challenge? Describe what you will do if you experience this challenge, and the strategies you'll use to grow your intelligence. Be specific!

5. Social Normativity and Malleability of Empathy Questionnaires
1 – 7 scale, Strongly Disagree to Strongly Agree

Social Normativity of Empathy

1. People generally don't want to be empathic and usually try to avoid empathy. *(reverse coded)*
2. On the whole, people value empathy.
3. Empathy isn't really socially desirable. *(reverse coded)*
4. For the most part, people want to be empathic and experience empathy for others.
5. People don't generally value empathy. *(reverse coded)*
6. Empathy is socially desirable, and people like when others show empathy.

Malleability of Empathy
(From Schumann et al., 2014)
1 – 7 scale, Strongly Disagree to Strongly Agree

1. A person's level of empathy is something very basic about them, and it can't be changed much. *(reverse coded)*
2. People can always change how much empathy they generally feel for others.
3. People can't really change how much empathy they tend to feel for others. Some people are very empathic and some aren't and they can't change that much. *(reverse coded)*
4. No matter who somebody is, they can always change how empathic a person they are.
5. Whether a person is empathic or not is deeply ingrained in their personality. It cannot be changed very much. *(reverse coded)*
6. Anybody can change how empathic a person they are.

**6. Empathic Motives Questionnaire (from Schumann et al., 2014)
and engagement questions**

1 – 9 scale, Strongly Disagree to Strongly Agree

1. It is a good thing to feel empathy for others.*
2. People who feel empathy for others are kinder than people who don't feel empathy for others.*
3. Feeling empathy for others is not a good thing.
4. Feeling empathy for others can be scary.
5. I am willing to take on personal distress to feel empathy for others.*
6. I strive to feel empathy for others.*
7. I often benefit from feeling empathy for others.*
8. I suffer from feeling empathy for others.
9. I want to be an empathic person.*

*denotes items included in composite score as per Schumann et al. 2014

Self-engagement:

How carefully did you read the material in this program today?

- (1) not at all carefully
- (2) slightly carefully
- (3) somewhat carefully
- (4) very carefully
- (5) extremely carefully

Peer-engagement:

How many students were working carefully and quietly on this program today?

- (1) fewer than half of the students
- (2) about half of the students
- (3) more than half of the students
- (4) almost all students, just a few exceptions
- (5) all students.

7. Supplemental indirect effects comparing mindset to control

Indirect effects were modeled using the lavaan package for structural equation modeling in R (Rosseel, 2012). To examine indirect effects of the mindset intervention, we fit a mediation model comparing participants assigned to the mindset condition to those in the control condition. We examined whether group assignment (malleable = 1, control = 0) affected downstream outcomes related to empathy. There was no significant indirect effect of condition on peer-observed prosocial behavior ($ab = 0.15, p = .12$). There was no significant indirect effect of condition on loneliness ($ab = -0.27, p = .11$). There was no significant indirect effect of condition on physical aggression ($ab = -0.05, p = .08$). Finally, there was no significant indirect effect of condition on physical aggression ($ab = -0.07, p = .11$).

8. Additional follow up measures

Perceived stress scale (Cohen et al., 1983). This 10-item scale measured feelings of stress. Participants rated their agreement with each statement (e.g., How often have you felt that you were unable to control the important things in your life?) using a 5-point scale from 0 (never) to 4 (very often). Items were coded such that higher scores indicated more stress.

Asher-Wheeler loneliness scale (Asher et al., 1985). This 16-item scale measured feelings of loneliness at school (e.g., “I have nobody to talk to in my classes”). Students rated the items on a scale from 1 (always true) to 5 (not true at all). Items were coded such that higher scores indicated more loneliness.

Children’s Social Behavior Scale – Self Report (Crick & Grotpeter, 1995). This measure assessed social behavior at school, and included a prosocial behavior subscale (4 items; e.g., “Some kids say or do nice things for other kids. How often do you do this?”), a relational aggression subscale (5 items; e.g., “Some kids tell lies about a classmate so that the other kids won’t like the classmate anymore. How often do you do this?”) and a physical aggression subscale (2 items; e.g., “Some kids push and shove other kids at school. How often do you do this?”). The response scale ranged from 1 (never) to 5 (all the time).

Brief Interpersonal Reactivity Index/B-IRI (Ingoglia et al., 2016). This abbreviated version of the Interpersonal Reactivity Index/IRI (Davis, 1983) measured trait empathy, and included three four-item subscales: an empathic concern subscale (e.g., “I often have tender, concerned feeling for people less fortunate than me”), a perspective taking subscale (e.g., “I try to look at everybody’s side of a disagreement before I make a decision”), and a personal distress subscale, (e.g., “In emergency situations, I feel apprehensive and ill-at-ease”). Participants

indicated the extent to which each item described them on a 5-point Likert scale ranging from 0 (does not describe me at all) to 4 (describes me very well).

9. Partial and missing data

Participants were reminded throughout the experiment that their involvement was completely voluntary, that they could stop at any time without consequence, and that they could decline to answer any questions. As such, some participants have partial data, and items that appeared later in the survey have more data missing. Below, we provide information on which measures are missing data, with measures are ordered by their order of appearance in the survey.

Measures collected at the end of third intervention session:

- **Empathic motives.** 5 participants were missing data on this measure (3 control, 1 social norms, 1 malleable mindset).

Measures collected at follow up:

- **Relational aggression.** 7 participants were missing data on this measure (1 control, 2 social norms, 4 malleable mindset).
- **Self-reported prosocial behavior.** 5 participants were missing data on this measure (2 control, 1 social norms, 2 malleable mindset).
- **Physical aggression.** 3 participants were missing data on this measure (1 control, 1 social norms, 1 malleable mindset).
- **Empathic concern.** 26 participants were missing data on this measure (13 control, 2 social norms, 11 malleable mindset).
- **Personal distress.** 28 participants were missing data on this measure (13 control, 6 social norms, 9 malleable mindset).

- **Perspective taking.** 20 participants were missing data on this measure (12 control, 2 social norms, 6 malleable mindset).
- **Loneliness.** 44 participants were missing data on this measure (19 control, 15 social norms, 10 malleable mindset).
- **Stress.** 66 participants were missing data on this measure (25 control, 21 social norms, 20 malleable mindset).
- **Malleability beliefs.** 90 participants were missing data on this measure (31 control, 27 social norms, 32 malleable mindset).
- **Norms beliefs.** 108 participants were missing data on this measure (36 control, 34 social norms, 38 malleable mindset).

10. Supplemental direct effects of interventions on self- and peer-report measures

We examined differences across intervention groups on downstream measures of constructs known to be related to empathy. We assessed participants' engagement in prosocial behavior via self- and peer-report at follow up, as well as participants' aggressive behavior via self-report. Across the three intervention conditions, participants did not differ on measures of peer-reported prosocial behavior $F(2, 854) = .37, p = .69, \eta^2 = .001$, self-reported prosocial behavior, $F(2, 849) = 1.30, p = .27, \eta^2 = .003$, physical aggression, $F(2, 851) = 1.11, p = .33, \eta^2 = .003$, or relational aggression, $F(2, 847) = .91, p = .40, \eta^2 = .002$.

We also examined differences across groups in participants' self-reported trait empathy at follow up (empathic concern, perspective taking, and personal distress subscales of the IRI) and wellbeing (stress and loneliness). Participants across the three intervention conditions did not differ on measures of empathic concern, $F(2, 828) = .82, p = .44, \eta^2 = .002$, perspective taking, $F(2, 834) = .57, p = .57, \eta^2 = .001$, stress, $F(2, 788) = .15, p = .86, \eta^2 = .0004$, or loneliness, $F(2, 810) = .44, p = .64, \eta^2 = .001$. Participants in the three intervention conditions did differ in self-reported personal distress, however this difference did not meet statistical significance, $F(2, 826) = 2.49, p = .084, \eta^2 = .006$.

11. Supplemental analyses of engagement in aggression by school

We also found differences in the mean levels of empathy-related behavior across the 4 schools, indicating that the descriptive norms surrounding empathy likely differed across schools, see **Figures S1A and S1B**. There were also differences across the four schools in participants' mean levels of self-reported physical aggression, $F(3, 850) = 14.00, p < .001, \eta^2 = .047$, such that participants at School 1 reported higher mean levels of physical aggression than participants at the other three schools. The same pattern of results emerged for engagement in relational aggression, $F(3, 846) = 11.75, p < .001, \eta^2 = .040$, see **Figure S1**, such that participants at School 1 reported higher mean levels of relational aggression than participants at the other three schools.

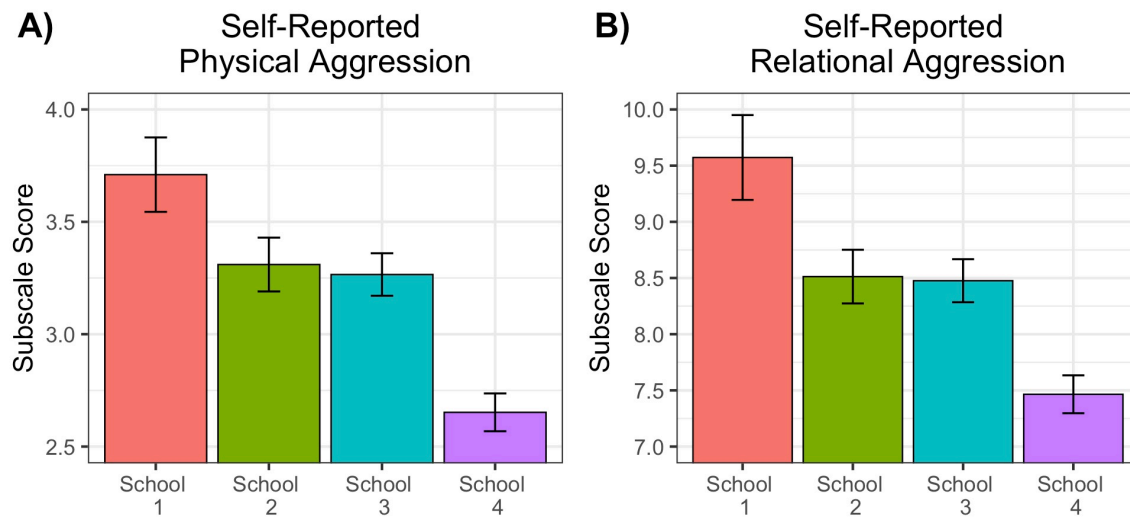


Figure S1. School-based differences in aggression and empathy beliefs. Mean scores for (A) self-reported physical aggression and (B) self-reported relational aggression are displayed on the y-axis for each of the four schools. Error bars reflect +/- 1 standard error.

12. Supplemental pairwise comparisons

Physical aggression by school

Participants at School 1 reported higher mean levels of physical aggression than those at School 2, $t(255.83) = 1.96, p = .051$, 95% CI [-0.003, .80], $d = .23$, School 3, $t(218.07) = 2.33, p = .021$, 95% CI [.07, .82], $d = .26$, and School 4, $t(198.41) = 5.69, p < .001$, 95% CI [.69, 1.42], $d = .69$. School 4 participants reported lower mean levels of physical aggression than those at Schools 2, $t(367.26) = -4.49, p < .001$, 95% CI [-0.95, -0.37], $d = -0.44$, and 3, $t(520.98) = -4.85, p < .001$, 95% CI [-0.86, -0.36], $d = -0.42$.

Relational aggression by school

Participants at School 1 reported engaging in more relational aggression at follow up than participants at School 2, $t(230.52) = 2.37, p = .018$, 95% CI [.18, 1.94], $d = .28$, School 3, $t(199.47) = 2.59, p = .010$, 95% CI [.26, 1.93], $d = .30$, and School 4, $t(182.81) = 5.10, p < .001$, 95% CI [1.29, 2.92], $d = .64$. Participants at School 4 reported less engagement in relational aggression than students at School 2, $t(365.88) = -3.58, p < .001$, 95% CI [-7.47, -8.51], $d = -0.354$, and School 3, $t(517.94) = -3.96, p < .001$, 95% CI [-7.47, -8.48], $d = -0.34$.

13. Supplemental indirect effects analysis comparing norms to malleable and control

Using the lavaan package for structural equation modeling in R (Rosseel, 2012), we fit a mediation model comparing participants assigned to the social norms condition to those in the malleable mindset and control condition. We examined whether group assignment (social norms = 1, malleable = 0, control = 0) affected peer-reported prosocial behavior indirectly through participants' self-reported motivation to empathize with others. We observed a significant indirect relationship between receiving the social norms intervention (as compared to the control intervention) and peer-reported prosocial behavior via motivation to empathize (bootstrapped indirect effect from 10,000 samples $ab = 0.25$, 95% CI [0.08, 0.47], $se = 0.10$, $p = 0.015$).

14. Supplemental analyses including pilot school

We observed an overall effect of intervention condition on participants beliefs about the social normativity of empathy, $F(2, 817) = 4.94, p < .008, \eta^2 = .012$. Participants in the social norms condition endorsed stronger beliefs about the social normativity and desirability of empathy compared to those in the control condition, $t(542.20) = 3.01, p = .003, 95\% \text{ CI } [.51, 2.42], d = .25$, and those in the malleable mindset condition, $t(534.25) = 2.09, p = .037, 95\% \text{ CI } [.07, 2.06], d = .18$. Participants in the malleable mindset condition and control condition did not differ in their beliefs about the social normativity of empathy, $t(529.63) = .87, p = .39, 95\% \text{ CI } [-.51, 1.32], d = .07$.

Next, we examined participants' beliefs about the malleability of empathy during the first follow up session. There was a relationship between intervention condition and participants' beliefs about the malleability of empathy, but this difference did not meet statistical significance $F(2, 837) = 2.47, p = .085, \eta^2 = .006$.

There were no significant overall differences by group on measures of self-reported physical aggression, $F(2, 940) = 1.84, p = 0.16, \eta^2 = .004$, self-reported relational aggression, $F(2, 936) = 0.90, p = .41, \eta^2 = .002$, stress, $F(2, 860) = 0.05, p = .95, \eta^2 = .0001$, or loneliness, $F(2, 886) = 0.37, p = .69, \eta^2 < .001$.

At the pilot school, participants completed a 21-item version of the Interpersonal Reactivity Index, instead of the brief scale (B-IRI) administered to the other schools. Items that were not part of the abbreviated IRI were excluded from analyses in order to obtain consistency in scores across schools. One item on the B-IRI was originally expressed as a reverse item in the IRI (EC-18). For participants at School 2, this item was reverse scored before it was added to

their composite empathic concern score. No condition-based differences were observed in empathic concern, $F(2, 910) = 0.96, p = .38, \eta^2 = .002$, perspective taking, $F(2, 916) = 0.98, p = .37, \eta^2 = .002$, personal distress, $F(2, 905) = 1.92, p = .15, \eta^2 = .004$, or peer-reported prosocial behavior $F(2, 943) = 0.58, p = .56, \eta^2 = .001$. There was a relationship between group assignment and self-reported prosocial behavior, $F(2, 938) = 2.59, p = .075, \eta^2 = .006$, but this difference was not statistically significant.

At the end of each intervention session, students rated their own engagement with the intervention as well as their peers' engagement. There were no overall differences by condition in students self-reported engagement, $F(2, 940) = .51, p = .60, \eta^2 = .001$, or in students' perceptions of peer engagement, $F(2, 921) = .08, p = .93, \eta^2 < .001$. However, we did find an effect of school on both self-reported engagement, $F(4, 938) = 14.26, p < .001, \eta^2 = .057$, and perceptions of peer engagement $F(4, 919) = 51.9, p < .001, \eta^2 = .184$.

Participants at School 1 reported being less engaged themselves than participants at School 2, $t(328.00) = -3.57, p < .001, 95\% \text{ CI } [-.50, -.14], d = -.40$, School 3, $t(418.00) = -7.79, p < .001, 95\% \text{ CI } [-.75, -.45], d = -.82$, School 4, $t(362.00) = -4.15, p < .001, 95\% \text{ CI } [-.53, -.19], d = -.45$, and the pilot school, $t(217.00) = -3.46, p < .001, 95\% \text{ CI } [-.56, -.15], d = -.48$. Participants at School 3 reported greater levels of engagement than participants at School 2, $t(488.00) = 3.97, p < .001, 95\% \text{ CI } [.14, .41], d = .37$, School 4, $t(522.00) = 3.60, p < .001, 95\% \text{ CI } [.11, .36], d = .32$, and the pilot school, $t(377.00) = 2.84, p = .005, 95\% \text{ CI } [.07, .41], d = .34$. There were no differences in self-reported engagement between the pilot school and School 2, $t(287.00) = .33, p = .74, 95\% \text{ CI } [-.16, .23], d = .04$, the pilot school and School 4, $t(321.00) = -.04, p = .97, 95\% \text{ CI } [-.19, .19], d = -.01$, and School 2 and School 4 $t(432.00) = -.48, p = .63, 95\% \text{ CI } [-.19, .12], d = -.05$.

We observed similar patterns by school for perceptions of peer engagement. Participants at School 1 reported that fewer of their peers were engaged with the intervention material than did participants at School 2 $t(320) = -9.68, p < .001, 95\% \text{ CI } [-1.18, -.78], d = -1.10$, School 3, $t(415) = -13.26, p < .001, 95\% \text{ CI } [-1.31, -.97], d = -1.41$, School 4, $t(348) = -10.08, p < .001, 95\% \text{ CI } [-1.16, -.78], d = -1.12$, at the pilot school, $t(214) = -6.27, p < .001, 95\% \text{ CI } [-1.03, -.54], d = -.87$. Participants at School 3 reported greater levels of peer engagement than participants at School 2, $t(483) = 2.46, p = .014, 95\% \text{ CI } [.03, .29], d = .23$, School 4, $t(511) = 2.65, p = .008, 95\% \text{ CI } [.04, .29], d = .24$, and at the pilot school, $t(377) = 4.41, p < .001, 95\% \text{ CI } [.20, .51], d = .53$. Unlike self-reported peer engagement, we found that participants' perceptions of peer engagement at the pilot school were lower than participants at School 2, $t(282) = -2.09, p = .037, 95\% \text{ CI } [-.38, -.01], d = -.27$ and School 4, $t(310) = -2.10, p = .036, 95\% \text{ CI } [-.37, -.01], d = -.26$. There were no significant differences in perceptions of peer engagement between School 2 and School 4 $t(416.00) = .07, p = .94, 95\% \text{ CI } [-.14, .15], d = .01$.

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15. Correlation matrices for key variables

Entire Sample

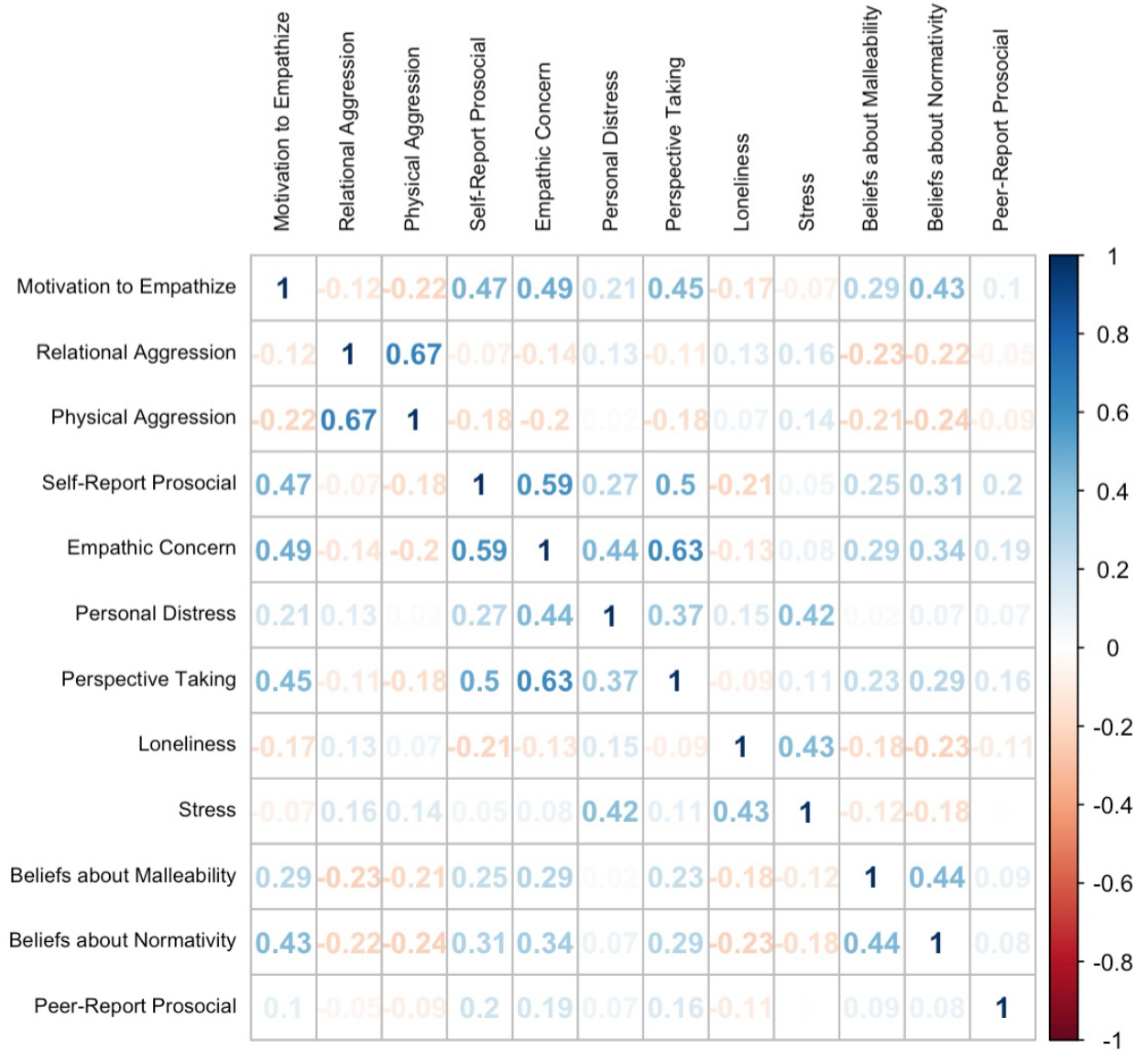


Figure S2. Full sample. Correlation matrix for key variables within the entire sample.

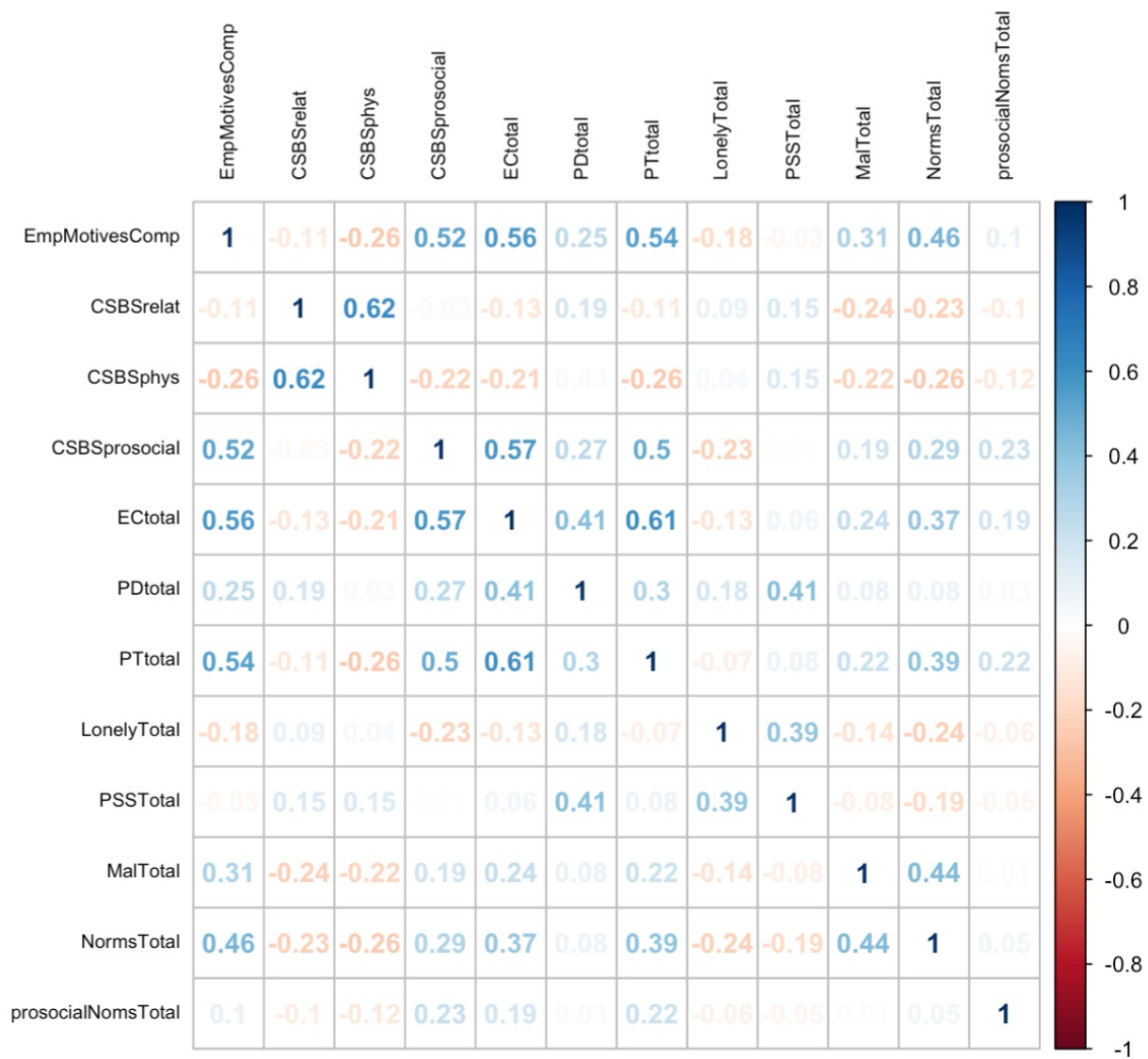


Figure S3. Norms. Correlation matrix for key variables within the social norms condition.

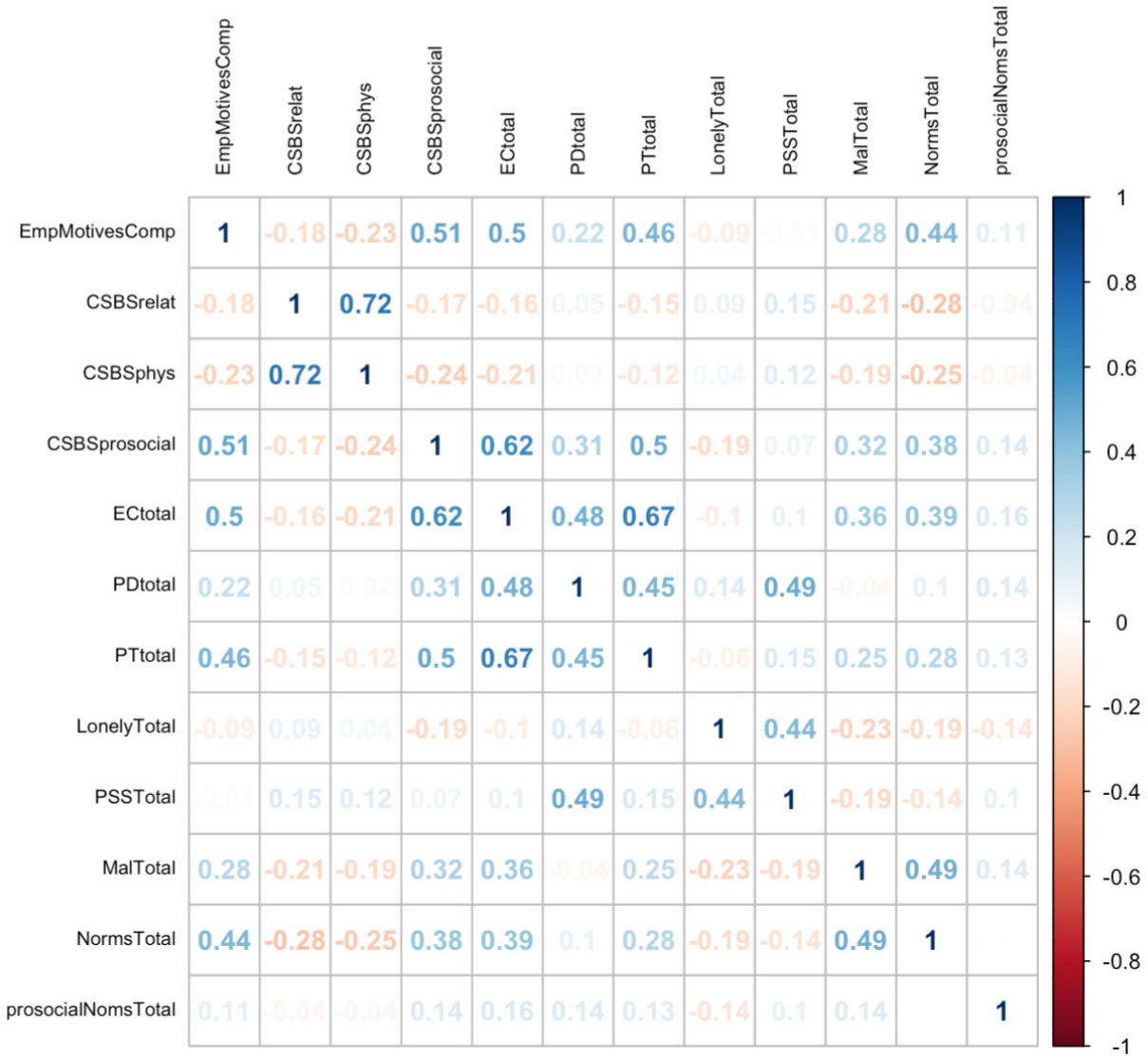


Figure S4. Mindset. Correlation matrix for key variables within the mindset condition.

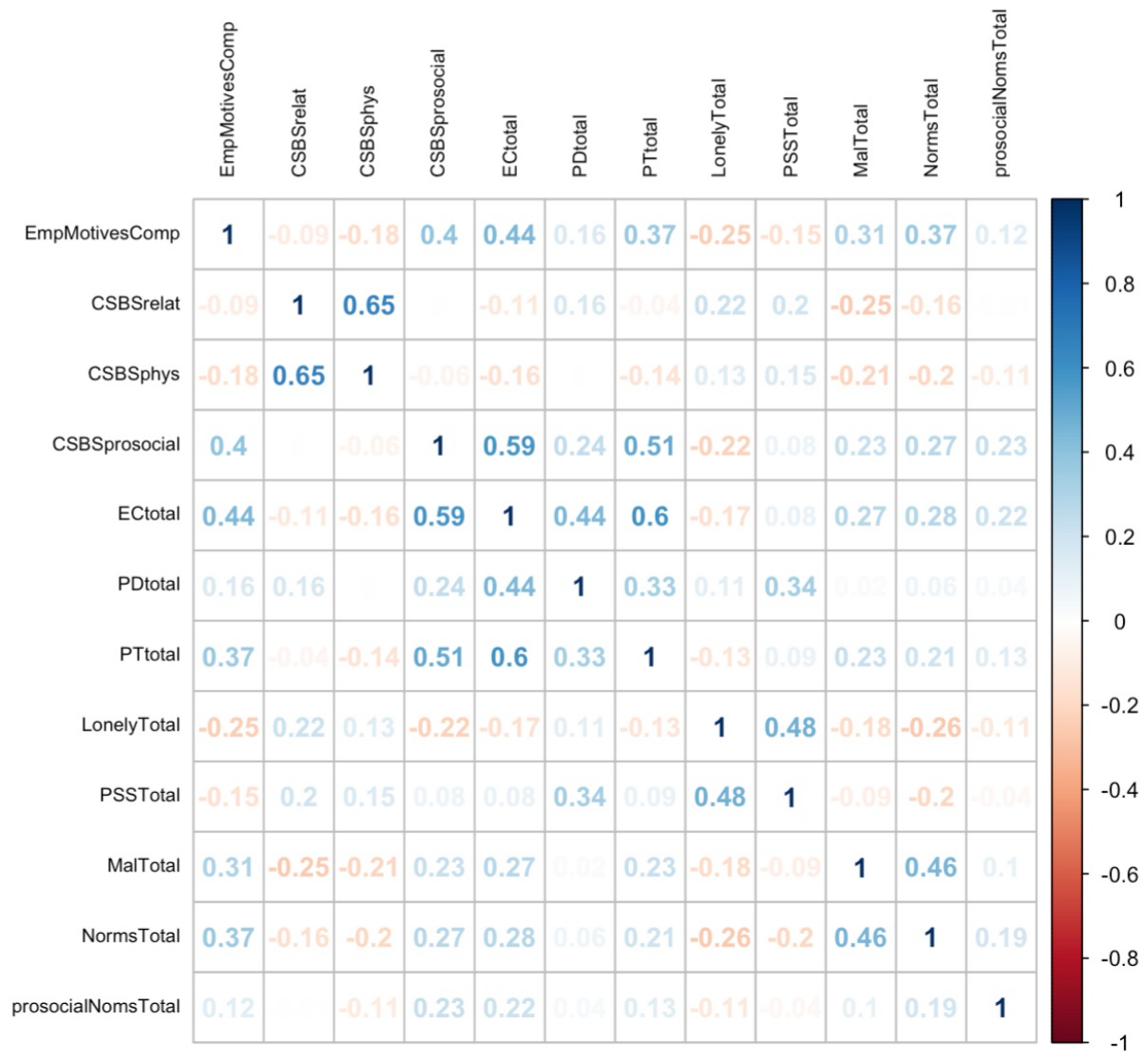


Figure S5. Control. Correlation matrix for key variables within the mindset condition.