

# Growth mindsets are less endorsed and less associated with academic performance in non-WEIRD cultures

Received: 3 December 2025

Accepted: 13 February 2026

Cite this article as: Wang, Y., Tang, X., Wu, S. *et al.* Growth mindsets are less endorsed and less associated with academic performance in non-WEIRD cultures. *npj Sci. Learn.* (2026). <https://doi.org/10.1038/s41539-026-00406-w>

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**Growth Mindsets Are Less Endorsed and Less Associated with Academic  
Performance in Non-WEIRD Cultures**

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**Abstract**

We test whether growth mindsets are less relevant in non-WEIRD cultures using nationally representative data from PISA 2018 (48 countries,  $N = 409,287$ ). Students from non-WEIRD countries reported lower growth mindsets ( $r = -.47$ ). Multilevel models revealed that the mindset-achievement associations were weaker in non-WEIRD cultures for reading and science, and marginal for math. Our findings suggest that culture-specific factors should be considered when applying the growth mindset framework.

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## **Growth Mindsets Are Less Endorsed and Less Associated with Academic Performance in Non-WEIRD Cultures**

“Most people are not ‘WEIRD (Western, Educated, Industrialized, Rich, and Democratic)’” (1). Despite being proposed over a decade ago, many fields still rely heavily on samples from WEIRD societies and continue to overgeneralize findings to all humans (2). In education and psychology, decades of research have sought to cultivate learning by studying and altering students’ beliefs about learning, with particular attention to the growth mindset of intelligence (3). A growth mindset refers to the belief that intelligence is malleable, and fostering a growth mindset is associated with stronger motivation to learn and more positive academic outcomes. Although research on growth mindsets has primarily focused on US-centred WEIRD cultures, large-scale interventions have been implemented to enhance students’ learning motivation and academic performance in many other societies worldwide, and such a mindset revolution is believed to be ‘reshaping education’ (4,5).

Despite the prevalence of the growth mindset framework, recent controversies have emerged due to the mixed effects of intelligence mindsets on student performance. While much of the literature has demonstrated positive effects of growth mindsets on academic outcomes (6,7), a growing body of studies have reported null or even negative associations between growth mindset beliefs and achievement (8, 9, 10, 11). Here, we note that a sizable number of these null findings come from cultures distant from WEIRD societies. For example, both large-scale and individual studies found that Chinese individuals were less likely to endorse a growth mindset than peers in WEIRD cultures (9). Similarly, a widely cited study tested multiple samples of

Chinese children and found that neither experimentally induced nor self-endorsed growth mindsets predicted responses to failure, academic persistence, school grades, or changes in grades over time (10). A recent meta-analysis further revealed that the association between growth mindsets and academic achievement is nearly zero in Chinese samples (11). Moreover, mindset interventions in many other non-WEIRD cultures, such as Argentina, and South Africa, showed increases in mindset belief endorsement but null effects on academic performance (12, 13). Given this, culture is likely a key mechanism behind the heterogeneity of growth mindset results. Examining growth mindsets from a cultural perspective thus enables a clearer understanding of the universal and culture-specific factors that support academic motivation and outcomes.

Here, we test the proposal that the growth mindset belief is culturally ingrained in WEIRD countries, particularly those centred around the US. Our investigation tested two specific hypotheses. First, we tested whether non-WEIRD cultures are less likely to hold a growth mindset. Growth mindset ratings were retrieved from the 2018 Programme for International Student Assessment (PISA), averaged within each country (14). Cultural WEIRDness for each country was operationalized using the *Cultural and Psychological Distance* index from the US, as defined and developed by Michael Muthukrishna, Joseph Henrich, and colleagues (2020) (15). As a proxy of cultural WEIRDness, Cultural and Psychological Distance represents how culturally and psychologically similar a country is to the US. Cultural and Psychological Distance was calculated using a population biology method (i.e., fixation index measure,  $F_{ST}$ ) applied to the World Values Survey responses, which reflect individuals' *core values, beliefs, and behaviours* (15, 16, 17, 18). The index ranges from 0.026 to 0.234, with higher

values indicating greater cultural distance from the US and, therefore, lower WEIRDness. For example, Indonesia is a relatively non-WEIRD country, with a Cultural and Psychological Distance of 0.178 from the US, whereas Great Britain is relatively WEIRD, with a distance of 0.046. Our analysis included a total of 48 countries,  $N = 409,287$  participants in PISA 2018 (See Table S1 for specific sample sizes by country).

Fig. 1 depicts the relation between cultural WEIRDness and growth mindset ratings by country. As predicted, cultural WEIRDness was significantly associated with growth mindset endorsement,  $r(46) = -.47, p < .001$  (note that the US was included with a cultural and psychological distance of zero). This finding indicates that students from non-WEIRD countries were less likely to endorse a growth mindset.

We next tested the hypothesis that, in non-WEIRD cultures, a growth mindset is less associated with academic performance. Using multilevel mixed-effects modelling, we predicted students' reading, science, and math scores in PISA 2018 with growth mindset, cultural and psychological distance index, and their interaction terms as predictors. Model A is a covariate-free model (specific results see Table 1). We focus on Model B, which controlled for demographics including participant gender, age, social class, country-level GDP per capita and population density. Across all three analyses, significant main effects were found that a growth mindset was associated with higher performance in reading ( $b = 18.94, \beta = .21, se = 2.58, p < .001$ ), science ( $b = 15.82, \beta = .20, se = 2.55, p < .001$ ), and math ( $b = 12.62, \beta = .16, se = 2.09, p < .001$ , Table 1). Cultural and psychological distance does not statistically significantly predict PISA scores in reading ( $b = -236.67, \beta = -.15, se = 227.06, p = .297$ ), science ( $b = -126.98, \beta = -.09, se = 235.55, p = .590$ ), and math ( $b = -129.24, \beta = -.08, se = 272.65, p = .635$ ).

Importantly, we found that PISA science and reading scores were significantly predicted by the interaction between growth mindset and cultural and psychological distance (reading:  $b = -64.95$ ,  $\beta = -.32$ ,  $se = 21.65$ ,  $p = .003$ ; science:  $b = -45.82$ ,  $\beta = -.24$ ,  $se = 21.47$ ,  $p = .033$ ). PISA math score was marginally predicted by this interaction ( $b = -31.81$ ,  $\beta = -.18$ ,  $se = 17.27$ ,  $p = .066$ ). These results indicate that in more WEIRD countries, a growth mindset was more strongly associated with academic performance in reading, science, and, marginally, math.

Our results showed that the growth mindsets of intelligence are less accepted by students from non-WEIRD societies. This is best illustrated by comparing Singapore with other East and Southeast Asian countries. Despite their geographic proximity and many cultural similarities among themselves, these countries differ markedly in both their WEIRDness and their growth mindset endorsements. Singapore, as a WEIRD country, ranked among the highest in growth mindset ratings, whereas non-WEIRD countries, including Indonesia, Thailand, and the Philippines, ranked among the lowest. While individuals of Chinese heritage make up the majority of the Singapore population, Singapore has a higher WEIRDness than China, and it is ranked higher in growth mindset ratings. These results highlight the need for culture-specific approaches to understanding how individuals think of intelligence and its malleability, and the nature of how individuals in certain cultures endorse a relatively fixed mindset of intelligence.

Students from non-WEIRD societies also tend to benefit less from endorsing a growth mindset. While believing in a growth mindset is generally associated with higher academic performance, our findings show that in non-WEIRD cultures, this association is significantly weaker, especially in reading ( $b = -64.95$ ,  $\beta = -.32$ ,  $se = 21.65$ ,  $p = .003$ )

and science ( $b = -45.82$ ,  $\beta = -.24$ ,  $se = 21.47$ ,  $p = .033$ ). This aligned with past findings in Chinese students, who were found to show a ‘fixed mindset, high performer’ pattern (9,11). Our results provide a unified account of considering cultural variations in the growth mindset framework. In particular, the growth mindset of intelligence is not a universal belief system that uniformly characterizes individuals’ motivation to learn and predicts academic achievement.

## Methods

*Participants.* This study examined data from the 2018 Programme for International Student Assessment (PISA), an international large-scale assessment that measured the academic performance of 15- to 16-year-olds in reading, science, and math using representative samples across 79 countries and regions worldwide. The current study included data from 48 countries/regions ( $N = 409,287$ ) in the multilevel mixed-effects models for science and math, and 47 countries/regions in the analysis for reading.

*Core Measures.* Growth mindset was measured with a single item, “Your intelligence is something about you that you can’t change very much”, drawn from Carol Dweck’s original Implicit Theories of Intelligence Scale (3). Academic performance was measured using scores on the PISA 2018 assessments in reading, science, and math. Cultural WEIRDness was indexed using the Cultural and Psychological Distance (from the US) (15). For each country, the cultural WEIRDness index represents how culturally and psychologically similar a country is in comparison to the US. This index was calculated by applying a population biology method to the World Values Survey responses, which reflect individuals’ *core values, beliefs, and behaviours* (15, 16, 17).

This index ranges from 0.026 (most culturally similar to the US) to 0.234 (most culturally distant from the US). Individual-level covariates included gender, age, and social class from PISA 2018. Country-level covariates included GDP per capita and population density and were extracted from the 2017 World Bank data (17).

*Data Analysis.* Fig. 1 correlation was calculated using averaged mindset ratings and cultural and psychological distance values by country (14,15). To examine the association between students' growth mindset and performances (reading, science, and math) while accounting for PISA's complex sampling design, we fitted a three-level multilevel model with sampling weights in *Mplus*, treating students as nested within schools, which were nested within countries. Missing data were handled using multiple imputation, and parameter estimates were combined following Rubin's rules (Model B in Table 1). At the within-individual level, we modelled students' achievement scores as a function of their own mindset beliefs, allowing this slope ( $sL1$ ) to vary randomly across schools. Individual-level covariates were included in this level of analysis. At the between-school level, we examined whether schools with more positive average growth mindset beliefs also showed higher average achievement, and we allowed the randomly varying student-level slopes to be estimated at the school level. At the between-country level, national mean growth mindset and cultural and psychological distance from the US, along with country-level covariates, predicted cross-national variation in performance. Cultural and psychological distance was entered as a moderator of the random slope  $sL1$ , testing whether the strength of the mindset–achievement association varied by cultural and psychological distance from the US. The model was estimated using the `TYPE = THREELLEVEL RANDOM` specification, with country and school as

clustering identifiers and student sampling weights applied at the individual level. We also fit a basic three-level random-slopes model with no covariates (Model A, Table 1). A more detailed analysis protocol, statistical analysis scripts in *Mplus*, and the dataset used for the analysis are available on OSF

([https://osf.io/2hf46/overview?view\\_only=aa9713175a6d40a1a05c1cc5aeb07ec0](https://osf.io/2hf46/overview?view_only=aa9713175a6d40a1a05c1cc5aeb07ec0)).

*Data Availability.* PISA data are available at

<https://www.oecd.org/en/data/datasets/pisa-2018-database.html>. Cultural and psychological distance data are available in the original paper (15). Country-level covariate data are available at <https://data.worldbank.org>.

**Data availability:** PISA data are available at

<https://www.oecd.org/en/data/datasets/pisa-2018-database.html>. Cultural and psychological distance data are available in the original paper (15). Country-level covariate data are available at <https://data.worldbank.org>.

**Code availability:** Statistical analysis scripts in *Mplus* and the dataset used for the analysis are available on OSF

([https://osf.io/2hf46/overview?view\\_only=aa9713175a6d40a1a05c1cc5aeb07ec0](https://osf.io/2hf46/overview?view_only=aa9713175a6d40a1a05c1cc5aeb07ec0))

**Acknowledgments:** The current research is supported by the Strategic Hiring Scheme awarded to X.S., funded by the Hong Kong Polytechnic University.

**Author contributions:**

Conceptualization: YW, XS

Methodology: YW, XT, SW, XS

Investigation: YW, XT, SW, XS

Visualization: YW, XS

Project administration: YW, XS

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Writing – original draft: YW, XS

Writing – review & editing: YW, XT, SW, XS

**Competing interests:** The authors (YW, XT, SW, and XS) declare no competing interests.

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**Fig. 1. Growth Mindset Endorsement and Cultural WEIRDness (i.e., Cultural and Psychological Distance from the US).**

*Note.* Cultural and Psychological Distance, as defined and calculated by Muthukrishna et al. (2020) (15), quantifies cross-national differences in cultural values based on the World Values Survey data. A higher value indicates greater cultural and psychological distance from the US, reflecting lower levels of WEIRDness. Cultural and Psychological Distance was significantly negatively correlated with growth mindset endorsement,  $r(46) = -.47, p < .001$ , showing that students from non-WEIRD cultures (i.e., those more distant from the US) were less likely to endorse a growth mindset of intelligence.

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**Table 1** Multilevel mixed-effects model results: Growth mindset x Cultural and psychological distance on PISA math, reading and science performance

Variable	Math				Reading				Science			
	<i>b</i>	$\beta$	<i>SE</i>	<i>p</i>	<i>b</i>	$\beta$	<i>SE</i>	<i>p</i>	<i>b</i>	$\beta$	<i>SE</i>	<i>p</i>
<b>Model A, without covariates</b>												
Growth mindset	13.01	.17	2.27	<.001	20.44	.23	2.80	<.001	17.88	.23	2.89	<.001
Cultural distance	-306.59	-.18	225.04	.173	-425.70	-.25	187.84	.023	-375.18	-.23	193.50	.053
Growth mindset x Cultural distance	-30.61	-.16	13.38	.028	-73.30	-.30	23.64	.002	-62.31	-.31	24.97	.013
<b>Model B, with covariates</b>												
<i>Country-level covariates</i>												
GDP per capita	35.23	.45	17.60	.045	25.68	.34	14.11	.069	25.68	.35	14.43	.075
Population density	10.59	.33	3.39	.002	7.20	.23	3.45	.037	8.10	.27	3.22	.012
<i>Individual-level covariates</i>												
Age	6.28	.02	1.16	<.001	6.56	.02	0.96	<.001	5.55	.02	1.12	<.001
Gender	9.85	.07	1.19	<.001	-20.62	-.13	1.25	<.001	3.66	.02	1.19	.002
Social class	15.35	.23	1.69	<.001	13.96	.20	1.30	<.001	14.73	.22	1.51	<.001
<i>Core variables of interest</i>												
Growth mindset	12.62	.16	2.09	<.001	18.94	.21	2.58	<.001	15.82	.20	2.55	<.001
Cultural distance	-129.24	-.08	272.65	.635	-236.67	-.11	227.06	.297	-126.98	-.09	235.55	.590
Growth mindset x Cultural distance	-31.81	-.18	17.27	.066	-64.95	-.32	21.65	.003	-45.82	-.24	21.47	.033

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## Cultural and Psychological Distance from US and Growth Mindset

