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Cooperative and competitive school climate: their impact on sense of belonging across cultures

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The role of sense of belonging within an educational context has been well-documented. Previous studies on belongingness using OECD-PISA data showed that the degree to which students feel a sense of belongingness to their school varies across countries. The current study extends the prior findings by analyzing the relationship between the sense of belonging and perceived competitiveness and cooperation in schools using the 2018 PISA cycle, including data from 76 countries. Perceived cooperation across all countries and aggregated on the country level was significantly and positively correlated with belongingness. Belongingness regressed on perceived competitiveness and perceived cooperativity results in both variables being significant predictors in the expected directions. Together, the two climate variables explained 18.8% of the variance on belongingness between countries. Thus, there is robust cross-cultural evidence that sense of belongingness is negatively affected by a competitive and positively by a cooperative classroom climate.

KEYWORDS

school belonging, intercultural comparison, learning climate, competitive & collaborative learning, trend analyses

Introduction

The motivation to form and maintain social relationships appears to be universal for humans. [Baumeister and Leary \(1995\)](#) conceptualized it as a fundamental motivation in the sense that goal-oriented behaviors are carried out to satisfy a need to create and maintain close social relations. Accordingly, successfully establishing meaningful social connections has positive effects on mental health and development ([Ryan and Deci, 2000](#); [Moeller et al., 2020](#); [Watts and Thrasher, 2023](#)).

For adolescents, the school setting plays an important role in cultivating feelings of belongingness, which has implications for healthy development and successful learning ([Eccles and Roeser, 2011](#); [Gosnell, 2020](#); [Kathuria and Pandya, 2020](#)). School belongingness, often understood as the feelings of connectedness that students feel towards the school community, is positively associated with self-efficacy and learning motivation which, in turn, are associated with better academic performance ([Midgley et al., 1989](#); [Goodenow, 1993](#); [Datu and Valdez, 2019](#)). [Xie et al. \(2022\)](#) monitored the change in motivation of high schoolers across the span of 2 years, and found that the feeling of belongingness, along with prior academic achievement, has a positive impact on student learning motivation.

Having positive attitudes towards peer groups and perceiving the learning environment as caring are factors that relate to the degree to which students feel connected with their school environment ([Battistich et al., 1997](#); [Ryzin et al., 2007](#)). Belongingness is also discussed as a

protective factor against developmental risk, such as substance abuse, delinquency, and depression (Anderman, 2002; Napoli et al., 2003; Baskin et al., 2010; Arslan, 2021). Sense of belongingness in an academic setting has also been shown to have implications for students' decisions to enter health professions and STEM fields, where lower levels of belongingness are attributed with lower levels of interest and engagement in these fields (Tellhed et al., 2016; Vivekananda-Schmidt and Sandars, 2018).

Belongingness across cultures

According to previous research, culture plays an important role in shaping school belongingness (Kumar and Maehr, 2010; Crul, 2018). Sense of belongingness has been reported to be lower for immigrants and racial minority groups compared to groups from the majority culture (Battistich and Hom, 1997; Johnson et al., 2007; Lardier et al., 2019).

Additionally, there is evidence that sense of belongingness varies across countries (Glass and Westmont, 2014; Seo, 2019). Cortina et al. (2017) investigated sense of belongingness cross-nationally reanalyzing data from the 2003 cycle of the Programme for International Student Assessment (PISA) commissioned by the Organization for Economic Co-operation and Development (OECD). The authors documented systematic differences in average sense of belongingness in 15-year-old students across nations and explained them in part through Hofstede's cultural dimension theory (Hofstede et al., 2010). They examined the cultural dimensions of power distance and individualism/collectivism and explored how the macro level cultural differences between East Asian and Western countries in these dimensions manifested in meso-level differences in school climate.

Individualism–collectivism is the dimension that encompasses fundamentally different ways in which individuals interact with – and position themselves within – their social context (Markus and Kitayama, 1991). This cultural factor suggests that countries with higher levels of collectivism, i.e., countries where group harmony and social unity are emphasized values, would show higher trends in overall sense of belongingness compared to countries with higher levels of individualism, where individual uniqueness is emphasized and valued to a greater extent. Cortina et al. (2017) argued that the dimension of power distance as it relates to the power dynamic between subordinates and superiors, is the predominant factor in shaping the nature of social relations within the school context. They maintained that the discrepancies in overall belongingness between East Asian and Western countries is due to the higher overall power distance and low individualism in East Asia compared to Western Europe and North America. High-power distance as a cultural factor can be observed in the more teacher-centered instructional style prevalent in East Asian cultures, while Western cultures emphasize student-centered aspects of learning (Hofstede et al., 2010). Heavy emphasis on achievement monitoring through testing also appears to be a more salient feature in East Asian cultures, which, in turn, reinforces a climate of competition between students in the form of pressure to outperform others in standardized assessments.

Cortina et al. (2017) found in fact that the average belongingness across countries followed the predicted trend: East Asian countries scored significantly lower in terms of average belongingness compared

to Western countries. In accordance with their predictions, Hofstede's power distance scores explained a significant portion of the variance in belongingness observed between the countries. Additionally, the preference for cooperation as opposed to competition in the learning environment was associated with higher levels of school belongingness at the individual level across countries. Note, however, that preference for competition/cooperation was not a direct measure of actual perceived school climate, which the authors noted as a significant limitation of their study.

Competition versus cooperation as elements of the school climate

The incorporation of competitive learning styles or pedagogical practices that encourage a competitive learning environment has been a controversial topic in the educational discourse for decades (see, e.g., Maehr and Midgley, 1996). The effects of a competitive learning environment have been well-documented in multiple domains. Some studies showed that higher achievement levels were associated with competitive learning styles if the competition was perceived as constructive (Fülöp, 2000, 2004; Williams and Sheridan, 2010). Other researchers argued that alternative motivational factors, in particular mastery orientation, are more beneficial than competition and emphasized the negative repercussions of competition as a source of motivation (Ames and Ames, 1984). For college students Bergin (1995) showed that performance on a cognitive learning task was higher in students who were motivated by mastery goals as opposed to competitive motivation, i.e., performance goals. In Lam et al.'s (2001) study, competitive motivation was associated with higher achievement on easier tasks, but often reduced students' willingness to attempt tasks that were more challenging. Some researchers maintained that competition can be harmful when students feel that success in the learning process comes at the expense of the success of other students, in which case the learning of all parties are hindered (Johnson and Johnson, 1989, 1994; Slavin, 2000).

Additionally, Posselt and Lipson (2016) demonstrated that overemphasis of competition in the learning environment has a particularly negative impact on the psychological well-being of students from underrepresented minority groups. According to Canning et al. (2019), perceived classroom competition fosters imposter syndrome in first-generation college students accompanied by a lack of identification within their academic field which, in turn, reduced their engagement in STEM courses that are perceived as highly competitive.

On the other hand, there is a large converging body of research demonstrating the benefits of a cooperative school climate. Cooperative learning styles have been observed to contribute to higher levels of self-efficacy, learning engagement, and deep learning processes (Slavin, 2014; Keramati and Gillies, 2021). The benefits of cooperative learning methods have been demonstrated consistently across different cultures as well (Tran et al., 2019; Keramati and Gillies, 2021). Lätsch (2017) reported from a study on German secondary school students that perceived helpfulness, which was related to feelings of cooperativity between peers, had a mediating effect on the relationship between prosocial behavior and perceived stress. In addition, perceived competition exacerbated the effect of peer conflict on perceived stress. Other studies have shown that cooperative

learning styles, which encouraged group coherence and positive social relations with peers, were associated with increased sense of belongingness and less instances of bullying (Osterman, 2000; Ryzin and Roseth, 2019; Ryzin et al., 2020).

Given that competitive and cooperative learning environments have important implications on the academic and psychological development of students, we argue that student perception of levels of competition and cooperation in their learning environment are critical explanatory constructs to understand cultural differences in sense of belonging in international comparative studies. Thus, examining how sense of belongingness is related to perceived climate in terms of competition and cooperation in the learning environment may provide important contributions towards our understanding of the international differences in the learning context of students from a psychological perspective. Stable cultural differences require a process of reproduction through the generations and stable institutional setting like schools play a key role as socialization agents (Wentzel, 2015).

Present study

Cortina et al. (2017) found supporting evidence for a negative association between preference for competition and sense of belongingness in Western countries, but found an opposite effect for East Asian countries, where preference for competition had a positive association with belonging. As noted by the authors, the PISA 2003 student questionnaire did not contain a scale that directly measured the perceived levels of competition in the school, and instead used as a proxy a scale that asked about preferred style of learning in mathematics with competitive or cooperative styles as options. But a preference is clearly distinct from the perception of the actual climate.

The most recent cycle of the PISA student questionnaire data (OECD, 2018) included scales that directly measure the perceived levels of competition and cooperation in the school environment and is not constrained to the context of one specific class or school subject. Instead, these scales inquire about the student's feelings about their overall school environment, which provides a much more accurate measure for the constructs of perceived competition and cooperation in the learning context. One purpose of the current study is therefore to investigate the hypothesized school climate effect on sense of belonging using more accurate and valid measures. Additionally, a limitation of the previous study was that PISA data from a single cycle. Therefore, to monitor any changes in overall belongingness that may have occurred over the past 15 years, the present study will start with comparing global belongingness trends between the two time points. The 2018 PISA cycle also has twice the number of participating countries that have data on sense of belongingness compared to the 2003 PISA cycle, and thus we were able to test our hypotheses using a more globally encompassing data set. The present study thus has the following aims:

1. Replicating the prior analysis with respect to international differences regarding the average sense of school belonging in the population of 15-year-old students,
2. Directly assess the hypothesis that perceived competitive climate has a universal negative effect on sense of belonging, and

3. Test whether the international differences discovered in 1) are reduced or disappear entirely when the climate perception (cooperative/competitive) are controlled (mediation hypothesis).

Methods

Participants

The present study analyzed the data from the 2018 cycle of the PISA study, which sampled from 79 countries (82 sampled regions), including data from 609,673 students in 20,842 schools. The PISA study collected achievement test data and questionnaire responses of 15-year-old students in accordance with specific guidelines, and the data were weighted accordingly to be representative of the national population for each country to allow for cross-national comparisons (OECD, 2018). The average age of the participants was $M = 15.79$, $SD = 0.291$, 50.2% were male.

Sampled regions with no valid response data to the belongingness, perceived competition, or perceived cooperation scales were excluded from the analysis, bringing the total number of countries included in the analysis to 74.

Measures

PISA includes a student questionnaire on different aspects of their academic lives, including motivational and affective measures. Several scales from the PISA 2018 student survey were used as the outcome and predictor variables of this study, detailed below. Reliabilities were calculated for each of the scales used in this study separately for each country.

Belongingness scale

School belongingness as an outcome variable was measured using six statements that students rated their agreement on a Likert scale ranging from 1 (strongly agree) to 4 (strongly disagree) (e.g., "My school is a place where... I feel like I belong" OECD, 2004, 2018).

The belongingness scale has an overall Cronbach's alpha of 0.80, which indicates a high level of reliability. Cronbach's alpha values for the belongingness scale for all countries separately exceed 0.64, indicating moderate levels of reliability. The countries with the lowest reliabilities are Morocco, France, Jordan, Kosovo, and Vietnam. Excluding these countries, Cronbach's alpha values for the belongingness scale for all other countries exceed 0.70, indicating satisfactory to high levels of reliability.

Perceived competitiveness scale

Perception of the competitiveness of the learning environment was measured using a four-item scale with the item stem: "Think about your school: how true are the following statements" followed by four statements, e.g., "Students seem to value competition" (OECD, 2018). Students rated their response to each item on a Likert scale of 1 (not at all true) to 4 (extremely true). Cronbach's alpha values for the perceived competitiveness scale for all

countries exceed 0.73, indicating satisfactory to high levels of reliability.

Perceived cooperativity scale

Perceived cooperative climate was measured similarly to perceived competitive climate using the following four statements, e.g., “It seems that students are cooperating with each other” (OECD, 2018). Students responded to each statement using the same response scale of 1 to 4 as for the perceived competitiveness scale. Cronbach’s alpha values for the perceived cooperativity scale for all countries exceed 0.82, indicating high levels of reliability.

Data analysis

The analysis methods used to address the hypotheses of the present study are detailed below. Belongingness scores, as well as perceived competitiveness scores and perceived cooperativity scores were calculated for each country in order to perform analyses at the country level. Correlation and regression analysis of the outcome variable of belongingness and the predictor variables of perceived competitive and cooperative climate were carried out using SPSS, version 29.

Descriptive statistics

To calculate the belongingness score for each student, items 2 and 5 of the belongingness scale were recoded, and responses to all items were then averaged, giving a total belongingness score between 1 and 4, with 1 indicating the lowest level and 4 indicating the highest level of belonging. Belongingness scores were then aggregated on the country level and mean and standard deviation values for belongingness were calculated. Student data for this and all the following scales were weighted according to the PISA recommendations to approximate a random sample for 15-year-olds for each country.

The responses on the perceived competitive and cooperate climate scales were calculated similarly by averaging the item responses, generating a score for each student between 1 and 4, with 1 indicating a low level and 4 indicating a high level of perceived competition or cooperation, respectively. Both climate scales were also aggregated to the country level with mean and standard deviation values calculated for each country.

Analyses

Of the 76 countries that were included in the 2018 cycle of PISA data, 38 also participated in the 2003 PISA cycle. These countries that were present for both cycles of PISA data were ranked based on their belongingness score, and a rank correlation between the two datasets was calculated to assess the relative stability of belongingness levels across countries. Correlational analysis between belongingness and perceived climate were carried out initially for each country separately. The mean correlations of belongingness and each of the perceived climate variables, as well as between the two perceived climate variables across all countries were calculated by converting the raw correlation coefficients for each country into Fisher’s z-scores to account for the range limit of the correlation coefficient, thus avoiding a slightly skewed distribution of the means towards 0.

The Fisher z-scores were then averaged and converted back to a correlation coefficient. Note that on the country level, each nation is equally weighted. Belongingness was regressed on perceived cooperative and competitive climate on the national level in a structural equation model. In a final step, a multilevel structural equation model (using Mplus 8) was used to confirm the aggregated regression analysis to take into consideration the hierarchical data structure in PISA where schools are sampled first and then students within school. The student data were aggregated to the school level (level 1) and country was treated as level 2. Critical coefficients are the regression coefficients on level 2.

Descriptive statistics

Mean scores for belongingness, perceived competitiveness, and perceived cooperativity across all countries in the PISA data are listed in Table 1 and presented visually in Figure 1. Overall, the average belongingness scores range was $2.77 < M < 3.30$.

Correlation analyses

Average belongingness by country from the PISA 2003 cycle had a moderate correlation with the average belongingness scores from the PISA 2018 cycle, $r(36) = 0.49$, $p < 0.001$. However, excluding four countries that had the largest discrepancies between the two cycles, Japan, Korea, Lithuania, and Sweden, strengthens the correlation substantially, $r(32) = 0.67$, $p < 0.001$, indicating that the change in the belongingness scores of these four countries accounted for most of the instability in the overall relative belongingness scores of these countries over time.

Overall, significant correlations between belongingness and perceived competitiveness were weak and present in both directions ($-0.12 < r < 0.23$, $p < 0.001$) with a mean correlation of 0.05 (calculated using Fisher’s z-transformation). By contrast, the correlations between belongingness and perceived cooperativity were stronger and significantly positive for all countries ($0.11 < r < 0.40$, $p < 0.001$). The mean (Fisher’s z) correlation was $r = 0.25$. The correlations between perceived competitive climate and cooperative climate were all significant except for two countries, and positively correlated except for one country ($-0.05 < r < 0.46$, $p < 0.001$). The average (Fisher transformed) correlation was $r = 0.22$. When aggregated on the country level, the correlation between perceived competition and perceived cooperation was significant and positive, $r(74) = 0.40$, $p < 0.001$. The specific calculated correlation coefficients and p values for each country can be found in Table 2.

Regression analysis

In the regression models, belongingness was regressed on perceived cooperativity and perceived competitiveness and both variables were shown to be significant predictors of overall belongingness aggregated in most countries. In more than three fourth of the countries, competitive climate is a negative, cooperation a positive predictor (Table 3).

TABLE 1 Mean belongingness and perceived competitive and cooperative climates.

Descriptive statistics									
Country	Sense of belongingness			Perceived competitiveness			Perceived cooperativity		
	N	M	SD	N	M	SD	N	M	SD
Albania	6,100	3.26	0.52	6,049	2.92	0.67	6,044	3.13	0.66
Baku (Azerbaijan)	4,827	2.91	0.60	3,962	2.70	0.76	3,757	2.73	0.78
Argentina	10,188	3.02	0.58	8,222	2.24	0.67	7,837	2.32	0.71
Australia	11,911	2.91	0.58	10,865	2.78	0.68	10,553	2.69	0.66
Austria	6,297	3.22	0.66	5,479	2.47	0.67	5,240	2.92	0.74
Belgium	7,578	3.06	0.52	7,362	2.35	0.70	7,086	2.62	0.67
Bosnia and Herzegovina	5,850	3.03	0.56	5,534	2.68	0.71	5,522	2.70	0.76
Brazil	8,298	2.93	0.58	6,859	2.56	0.75	6,352	2.40	0.75
Brunei Darussalam	6,211	2.78	0.49	5,084	2.75	0.64	4,612	2.65	0.66
Bulgaria	4,272	2.85	0.57	3,837	2.50	0.75	3,756	2.42	0.78
Belarus	5,661	2.97	0.53	5,496	2.29	0.64	5,469	2.57	0.71
Chile	6,470	3.01	0.60	5,285	2.50	0.73	4,943	2.58	0.74
B-S-J-Z (China)	11,973	2.95	0.55	11,972	2.57	0.69	11,948	2.85	0.73
Chinese Taipei	7,134	3.01	0.54	7,087	2.72	0.76	7,071	2.85	0.74
Colombia	6,523	2.97	0.55	5,519	2.55	0.62	5,221	2.58	0.71
Costa Rica	6,435	3.06	0.61	6,340	2.49	0.72	6,336	2.54	0.76
Croatia	6,266	3.08	0.55	5,651	2.30	0.76	5,476	2.65	0.74
Czech Republic	6,435	2.89	0.52	6,345	2.18	0.65	6,135	2.52	0.68
Denmark	6,438	3.14	0.56	6,260	2.38	0.65	5,944	2.86	0.63
Dominican Republic	2,973	2.89	0.60	1,730	2.58	0.76	1,476	2.62	0.80
Estonia	5,087	2.96	0.54	4,851	2.32	0.62	4,808	2.58	0.67
Finland	5,255	3.03	0.59	5,112	2.55	0.61	4,964	2.71	0.63
France	5,635	2.94	0.50	4,915	2.42	0.79	4,586	2.40	0.72
Georgia	4,670	2.95	0.55	4,474	2.43	0.74	4,398	2.83	0.80
Germany	3,912	3.19	0.58	2,601	2.26	0.67	2,206	2.70	0.73
Greece	6,046	3.07	0.55	5,670	2.51	0.69	5,513	2.67	0.72
Hong Kong	5,699	2.82	0.50	5,614	2.81	0.71	5,595	2.70	0.66
Hungary	4,888	3.09	0.58	4,399	2.36	0.71	4,262	2.58	0.71
Iceland	2,964	3.04	0.69	2,499	2.57	0.72	2,355	2.87	0.71
Indonesia	11,766	3.03	0.48	11,691	2.55	0.66	11,694	2.91	0.63
Ireland	5,357	2.96	0.54	4,741	2.69	0.70	4,417	2.56	0.65
Italy	10,594	3.07	0.54	9,060	2.35	0.69	8,678	2.48	0.69
Japan	5,988	3.04	0.54	5,967	2.21	0.73	5,897	2.73	0.76
Jordan	8,565	2.97	0.55	8,170	2.75	0.74	8,041	2.72	0.80
Kazakhstan	18,121	2.91	0.56	16,314	2.52	0.77	15,798	2.85	0.72
Korea	6,605	3.18	0.54	6,596	2.84	0.82	6,592	2.78	0.75
Kosovo	4,634	3.07	0.48	4,485	2.70	0.69	4,473	3.01	0.71
Latvia	4,962	2.88	0.56	4,647	2.46	0.64	4,585	2.51	0.65
Lithuania	6,354	2.90	0.65	5,692	2.58	0.71	5,563	2.81	0.76
Luxembourg	4,819	3.06	0.58	4,650	2.42	0.69	4,505	2.62	0.73

(Continued)

TABLE 1 (Continued)

Descriptive statistics									
Country	Sense of belongingness			Perceived competitiveness			Perceived cooperativity		
	N	M	SD	N	M	SD	N	M	SD
Macao	3,764	2.79	0.51	3,755	2.62	0.67	3,757	2.72	0.65
Malaysia	6,019	2.97	0.48	5,881	2.77	0.60	5,806	3.06	0.65
Malta	3,073	2.90	0.57	2,857	2.81	0.69	2,760	2.62	0.69
Mexico	5,512	3.03	0.60	4,234	2.49	0.64	3,817	2.65	0.71
Moldova	5,193	3.03	0.52	4,983	2.56	0.58	4,922	2.77	0.63
Montenegro	6,074	2.97	0.56	5,693	2.69	0.74	5,631	2.74	0.77
Morocco	4,424	2.88	0.53	2,946	2.66	0.67	2,570	2.56	0.75
Netherlands	3,745	3.17	0.49	3,665	2.20	0.59	3,594	2.75	0.61
New Zealand	5,845	2.92	0.56	5,214	2.79	0.66	4,961	2.66	0.65
Norway	5,372	3.19	0.61	5,285	2.82	0.62	5,231	3.07	0.62
Panama	3,485	2.94	0.59	2,112	2.55	0.75	1,808	2.59	0.76
Peru	4,218	2.99	0.53	2,548	2.63	0.58	2,050	2.70	0.66
Philippines	6,977	2.94	0.51	6,550	2.67	0.65	6,303	2.80	0.68
Poland	5,452	2.88	0.57	5,145	2.67	0.63	5,010	2.66	0.68
Portugal	5,454	3.12	0.52	5,049	2.66	0.69	4,834	2.62	0.66
Qatar	11,933	2.93	0.56	11,868	2.64	0.73	11,645	2.67	0.78
Romania	4,904	3.02	0.56	4,613	2.59	0.65	4,471	2.74	0.67
Russian Federation	6,935	2.78	0.55	6,557	2.44	0.69	6,473	2.62	0.71
Moscow Region (RUS)	1,871	2.77	0.53	1,764	2.40	0.71	1,744	2.57	0.74
Tatarstan (RUS)	5,369	2.80	0.52	5,229	2.44	0.69	5,170	2.63	0.72
Saudi Arabia	5,661	3.06	0.57	5,454	2.64	0.75	5,362	2.59	0.83
Serbia	5,571	3.05	0.59	5,002	2.48	0.76	4,879	2.60	0.77
Singapore	6,589	2.95	0.56	6,486	2.99	0.65	6,401	2.82	0.67
Slovak Republic	5,412	2.87	0.55	4,959	2.44	0.66	4,829	2.52	0.71
Slovenia	5,914	2.98	0.54	5,234	2.37	0.69	4,924	2.63	0.70
Spain	32,967	3.30	0.58	27,861	2.47	0.72	26,694	2.61	0.72
Sweden	4,974	3.03	0.64	4,895	2.61	0.72	4,725	2.62	0.70
Switzerland	5,002	3.17	0.57	3,806	2.41	0.69	3,444	2.75	0.73
Thailand	8,493	2.85	0.46	8,381	2.62	0.65	8,348	2.80	0.66
Turkey	6,778	2.94	0.62	6,701	2.75	0.79	6,648	2.65	0.85
Ukraine	5,801	2.93	0.53	5,256	2.34	0.68	5,018	2.73	0.74
United Arab Emirates	17,636	2.97	0.57	17,444	2.65	0.74	17,204	2.79	0.81
United Kingdom	12,654	2.91	0.56	12,364	2.77	0.66	11,950	2.58	0.65
United States	4,613	2.89	0.60	4,598	2.81	0.70	4,558	2.56	0.68
Uruguay	3,978	3.03	0.58	3,151	2.34	0.77	2,826	2.50	0.74
Vietnam	5,343	2.81	0.41	5,337	2.32	0.65	5,300	2.66	0.60

Integrated into a multilevel SEM model, 18.8% of the variance between countries is explained with aggregated perceived competition and cooperation as predictors (Table 4). The significance of the residual indicates that the average school climate variables do not explain all of the variance between countries in their average sense of belonging.

Discussion

The current study investigated the relationship between student sense of belonging and perceived competitiveness and cooperativeness in the context of explaining intercultural differences in sense of school belonging.

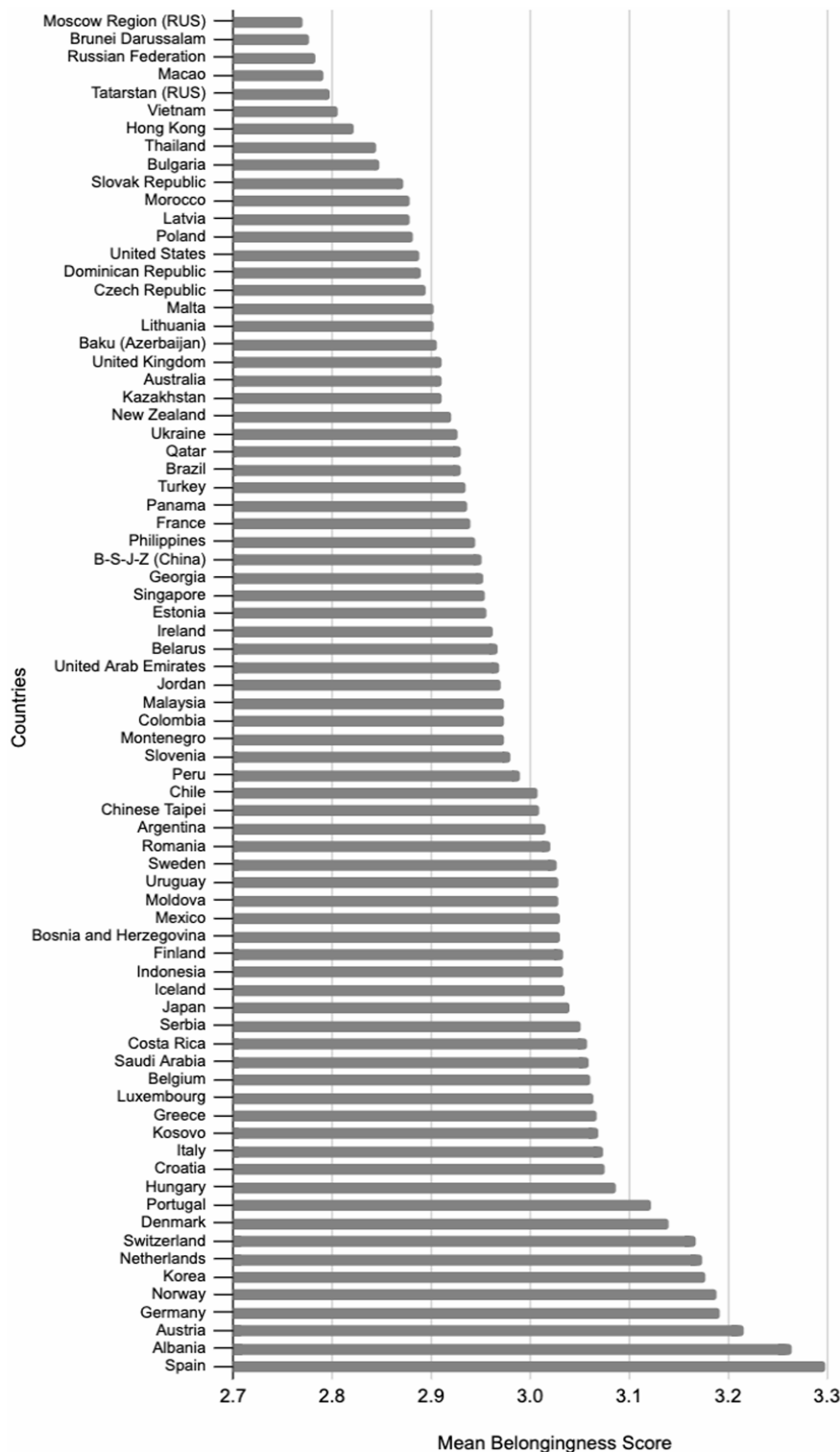


FIGURE 1 Average sense of belonging by country (scale truncated).

The first aim was to examine the relative stability of sense of belongingness over time for countries that were present during both 2003 and 2018 cycles of PISA data. The second aim was to test the hypothesis that higher perceived competitiveness in the learning environment corresponded with lower reported levels of

belongingness across all countries. The third aim was to assess whether the variance in belongingness between countries was explained at a significant level by perceived competitive and cooperative climate.

We found a moderate positive correlation between the relative belongingness scores of countries in both the 2003 and 2018 cycles of

TABLE 2 Correlations between belongingness and perceived climates.

Correlations									
Country	Sense of belongingness and perceived competitiveness			Sense of belongingness and perceived cooperativity			Perceived competitiveness and perceived cooperativity		
	<i>r</i>	<i>p</i>	<i>N</i>	<i>r</i>	<i>p</i>	<i>N</i>	<i>r</i>	<i>p</i>	<i>N</i>
Albania	0.179**	<0.001	5,984	0.330**	<0.001	5,971	0.406**	<0.001	5,967
Baku (Azerbaijan)	0.092**	<0.001	3,767	0.143**	<0.001	3,519	0.412**	<0.001	3,446
Argentina	-0.007	0.543	8,017	0.219**	<0.001	7,566	0.181**	<0.001	7,535
Australia	0.018	0.061	10,799	0.270**	<0.001	10,492	0.187**	<0.001	10,472
Austria	0.024	0.082	5,431	0.221**	<0.001	5,183	0.187**	<0.001	5,112
Belgium	-0.063**	<0.001	7,302	0.220**	<0.001	7,030	0.147**	<0.001	7,002
Bosnia and Herzegovina	0.116**	<0.001	5,402	0.231**	<0.001	5,367	0.344**	<0.001	5,314
Brazil	0.034**	0.005	6,703	0.165**	<0.001	6,214	0.170**	<0.001	6,195
Brunei Darussalam	0.088**	<0.001	5,045	0.197**	<0.001	4,580	0.365**	<0.001	4,560
Bulgaria	-0.007	0.689	3,720	0.181**	<0.001	3,623	0.225**	<0.001	3,594
Belarus	0.034*	0.011	5,463	0.200**	<0.001	5,426	0.241**	<0.001	5,388
Chile	0.020	0.148	5,254	0.261**	<0.001	4,902	0.193**	<0.001	4,881
B-S-J-Z (China)	-0.044**	<0.001	11,967	0.403**	<0.001	11,942	0.143**	<0.001	11,946
Chinese Taipei	0.064**	<0.001	7,082	0.287**	<0.001	7,066	0.229**	<0.001	7,058
Colombia	0.050**	<0.001	5,471	0.196**	<0.001	5,150	0.314**	<0.001	5,132
Costa Rica	0.055**	<0.001	6,287	0.222**	<0.001	6,273	0.221**	<0.001	6,251
Croatia	-0.066**	<0.001	5,612	0.271**	<0.001	5,427	0.009	0.518	5,368
Czech Republic	-0.117**	<0.001	6,279	0.255**	<0.001	6,069	-0.011	0.392	6,076
Denmark	-0.033**	0.009	6,219	0.322**	<0.001	5,895	0.096**	<0.001	5,877
Dominican Republic	0.057*	0.02	1,660	0.111**	<0.001	1,407	0.401**	<0.001	1,418
Estonia	-0.029*	0.042	4,829	0.274**	<0.001	4,789	0.127**	<0.001	4,762
Finland	0.011	0.434	5,081	0.309**	<0.001	4,934	0.192**	<0.001	4,927
France	-0.027	0.061	4,838	0.206**	<0.001	4,512	0.090**	<0.001	4,489
Georgia	-0.031*	0.042	4,356	0.254**	<0.001	4,244	0.099**	<0.001	4,201
Germany	-0.019	0.334	2,565	0.250**	<0.001	2,175	0.111**	<0.001	2,143
Greece	-0.019	0.161	5,615	0.239**	<0.001	5,456	0.041**	0.002	5,433
Hong Kong	-0.021	0.11	5,608	0.331**	<0.001	5,590	0.141**	<0.001	5,587
Hungary	-0.004	0.775	4,372	0.306**	<0.001	4,228	0.110**	<0.001	4,207
Iceland	0.014	0.483	2,475	0.197**	<0.001	2,328	0.198**	<0.001	2,325
Indonesia	0.067**	<0.001	11,636	0.283**	<0.001	11,615	0.260**	<0.001	11,617
Ireland	-0.043**	0.003	4,726	0.271**	<0.001	4,407	0.124**	<0.001	4,398
Italy	-0.034**	0.001	8,995	0.260**	<0.001	8,596	0.110**	<0.001	8,503
Japan	0.062**	<0.001	5,952	0.346**	<0.001	5,878	0.272**	<0.001	5,875
Jordan	0.234**	<0.001	8,056	0.276**	<0.001	7,919	0.458**	<0.001	7,910
Kazakhstan	0.019*	0.018	16,167	0.221**	<0.001	15,616	0.260**	<0.001	15,547
Korea	0.020	0.098	6,592	0.282**	<0.001	6,585	-0.051**	<0.001	6,586
Kosovo	0.193**	<0.001	4,403	0.338**	<0.001	4,366	0.376**	<0.001	4,341
Latvia	0.003	0.821	4,623	0.211**	<0.001	4,553	0.180**	<0.001	4,522

(Continued)

TABLE 2 (Continued)

Correlations									
Country	Sense of belongingness and perceived competitiveness			Sense of belongingness and perceived cooperativity			Perceived competitiveness and perceived cooperativity		
	<i>r</i>	<i>p</i>	<i>N</i>	<i>r</i>	<i>p</i>	<i>N</i>	<i>r</i>	<i>p</i>	<i>N</i>
Lithuania	0.001	0.935	5,648	0.199**	<0.001	5,515	0.193**	<0.001	5,486
Luxembourg	-0.011	0.441	4,609	0.304**	<0.001	4,461	0.175**	<0.001	4,415
Macao	-0.012	0.465	3,753	0.303**	<0.001	3,752	0.097**	<0.001	3,751
Malaysia	0.221**	<0.001	5,878	0.344**	<0.001	5,804	0.350**	<0.001	5,794
Malta	0.039*	0.039	2,827	0.278**	<0.001	2,730	0.193**	<0.001	2,725
Mexico	0.055**	<0.001	4,216	0.203**	<0.001	3,799	0.260**	<0.001	3,799
Moldova	0.103**	<0.001	4,953	0.345**	<0.001	4,878	0.222**	<0.001	4,851
Montenegro	0.091**	<0.001	5,568	0.233**	<0.001	5,490	0.289**	<0.001	5,429
Morocco	0.170**	<0.001	2,830	0.181**	<0.001	2,430	0.369**	<0.001	2,406
Netherlands	-0.008	0.643	3,657	0.286**	<0.001	3,581	0.125**	<0.001	3,571
New Zealand	0.016	0.256	5,197	0.261**	<0.001	4,936	0.137**	<0.001	4,935
Norway	0.030*	0.028	5,247	0.282**	<0.001	5,187	0.214**	<0.001	5,152
Panama	0.038	0.085	2025	0.165**	<0.001	1713	0.306**	<0.001	1718
Peru	0.017	0.404	2,529	0.184**	<0.001	2036	0.254**	<0.001	2038
Philippines	0.107**	<0.001	6,519	0.281**	<0.001	6,272	0.378**	<0.001	6,269
Poland	0.061**	<0.001	5,118	0.239**	<0.001	4,989	0.237**	<0.001	4,973
Portugal	-0.012	0.413	5,024	0.246**	<0.001	4,811	0.114**	<0.001	4,805
Qatar	0.117**	<0.001	11,721	0.296**	<0.001	11,417	0.372**	<0.001	11,412
Romania	0.087**	<0.001	4,574	0.324**	<0.001	4,429	0.258**	<0.001	4,439
Russian Federation	0.033**	0.007	6,458	0.235**	<0.001	6,371	0.281**	<0.001	6,340
Moscow Region (RUS)	0.029	0.235	1738	0.235**	<0.001	1722	0.336**	<0.001	1708
Tatarstan (RUS)	0.035*	0.013	5,139	0.207**	<0.001	5,088	0.277**	<0.001	5,092
Saudi Arabia	0.208**	<0.001	5,209	0.318**	<0.001	5,113	0.420**	<0.001	5,275
Serbia	0.038**	0.008	4,868	0.225**	<0.001	4,730	0.242**	<0.001	4,697
Singapore	0.038**	0.002	6,477	0.291**	<0.001	6,387	0.179**	<0.001	6,387
Slovak Republic	0.064**	<0.001	4,900	0.237**	<0.001	4,759	0.282**	<0.001	4,736
Slovenia	-0.032*	0.023	5,214	0.248**	<0.001	4,897	0.159**	<0.001	4,886
Spain	-0.031**	<0.001	27,715	0.211**	<0.001	26,512	0.094**	<0.001	26,333
Sweden	-0.059**	<0.001	4,840	0.203**	<0.001	4,676	0.075**	<0.001	4,683
Switzerland	0.003	0.844	3,770	0.288**	<0.001	3,417	0.191**	<0.001	3,384
Thailand	0.039**	<0.001	8,359	0.301**	<0.001	8,325	0.228**	<0.001	8,313
Turkey	0.093**	<0.001	6,668	0.170**	<0.001	6,610	0.257**	<0.001	6,602
Ukraine	0.021	0.133	5,233	0.266**	<0.001	4,994	0.131**	<0.001	4,967
United Arab Emirates	0.183**	<0.001	17,231	0.334**	<0.001	17,018	0.398**	<0.001	17,053
United Kingdom	0.034**	<0.001	12,224	0.288**	<0.001	11,812	0.186**	<0.001	11,801
United States	0.009	0.537	4,577	0.278**	<0.001	4,529	0.127**	<0.001	4,527
Uruguay	-0.047**	0.009	3,044	0.208**	<0.001	2,742	0.163**	<0.001	2,733
Vietnam	-0.075**	<0.001	5,308	0.274**	<0.001	5,272	0.045**	<0.001	5,279

*Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed).

TABLE 3 Regression by country.

Regression model by country					
Country	Standardized coefficients				Adjusted R square
	Perceived competition		Perceived cooperation		
	β	p	β	p	
Albania	0.051	<0.001	0.308	<0.001	0.110
United Arab Emirates	0.059	<0.001	0.311	<0.001	0.115
Argentina	-0.049	<0.001	0.226	<0.001	0.049
Australia	-0.037	<0.001	0.280	<0.001	0.076
Austria	-0.016	0.265	0.222	<0.001	0.048
Belgium	-0.096	<0.001	0.231	<0.001	0.056
Bulgaria	-0.051	0.003	0.190	<0.001	0.034
Bosnia and Herzegovina	0.038	0.009	0.220	<0.001	0.055
Belarus	-0.019	0.171	0.206	<0.001	0.040
Brazil	0.009	0.497	0.164	<0.001	0.027
Brunei Darussalam	0.019	0.218	0.193	<0.001	0.040
Switzerland	-0.051	0.002	0.296	<0.001	0.084
Chile	-0.028	0.049	0.267	<0.001	0.069
Colombia	-0.004	0.791	0.197	<0.001	0.038
Costa Rica	0.006	0.632	0.221	<0.001	0.049
Czech Republic	-0.115	<0.001	0.255	<0.001	0.078
Germany	-0.042	0.045	0.262	<0.001	0.067
Denmark	-0.067	<0.001	0.326	<0.001	0.107
Dominican Republic	0.019	0.515	0.103	<0.001	0.011
Spain	-0.052	<0.001	0.216	<0.001	0.047
Estonia	-0.068	<0.001	0.285	<0.001	0.080
Finland	-0.050	<0.001	0.319	<0.001	0.098
France	-0.042	0.004	0.211	<0.001	0.044
United Kingdom	-0.025	0.005	0.295	<0.001	0.085
Georgia	-0.053	<0.001	0.258	<0.001	0.066
Greece	-0.026	0.054	0.240	<0.001	0.057
Hong Kong	-0.068	<0.001	0.341	<0.001	0.114
Croatia	-0.071	<0.001	0.272	<0.001	0.079
Hungary	-0.037	0.013	0.313	<0.001	0.096
Indonesia	-0.005	0.555	0.285	<0.001	0.080
Ireland	-0.076	<0.001	0.280	<0.001	0.079
Iceland	-0.023	0.274	0.200	<0.001	0.038
Italy	-0.062	<0.001	0.268	<0.001	0.072
Jordan	0.138	<0.001	0.214	<0.001	0.091
Japan	-0.034	0.008	0.355	<0.001	0.120
Kazakhstan	-0.039	<0.001	0.229	<0.001	0.049
Korea	0.036	0.003	0.284	<0.001	0.081
Kosovo	0.080	<0.001	0.307	<0.001	0.118
Lithuania	-0.039	0.004	0.204	<0.001	0.040
Luxembourg	-0.058	<0.001	0.313	<0.001	0.094

(Continued)

TABLE 3 (Continued)

Regression model by country					
Country	Standardized coefficients				Adjusted R square
	Perceived competition		Perceived cooperation		
	β	p	β	p	
Latvia	-0.037	0.012	0.220	<0.001	0.046
Macao	-0.042	0.008	0.307	<0.001	0.093
Morocco	0.112	<0.001	0.144	<0.001	0.044
Moldova	0.028	0.040	0.337	<0.001	0.118
Mexico	0.014	0.407	0.201	<0.001	0.041
Malta	-0.013	0.496	0.280	<0.001	0.076
Montenegro	0.032	0.021	0.228	<0.001	0.057
Malaysia	0.115	<0.001	0.303	<0.001	0.129
Netherlands	-0.043	0.007	0.292	<0.001	0.083
Norway	-0.026	0.056	0.288	<0.001	0.080
New Zealand	-0.025	0.067	0.265	<0.001	0.069
Panama	-0.015	0.562	0.168	<0.001	0.026
Peru	-0.045	0.048	0.197	<0.001	0.035
Philippines	0.000	0.980	0.281	<0.001	0.079
Poland	0.001	0.962	0.241	<0.001	0.058
Portugal	-0.039	0.006	0.250	<0.001	0.061
Qatar	0.009	0.352	0.293	<0.001	0.088
Baku (Azerbaijan)	0.046	0.014	0.125	<0.001	0.022
B-S-J-Z (China)	-0.104	<0.001	0.418	<0.001	0.173
Moscow Region (RUS)	-0.059	0.019	0.257	<0.001	0.058
Tatarstan (RUS)	-0.024	0.100	0.213	<0.001	0.043
Romania	0.003	0.829	0.322	<0.001	0.104
Russian Federation	-0.031	0.017	0.242	<0.001	0.055
Saudi Arabia	0.087	<0.001	0.280	<0.001	0.106
Singapore	-0.013	0.282	0.292	<0.001	0.084
Serbia	-0.016	0.270	0.230	<0.001	0.051
Slovak Republic	0.001	0.941	0.237	<0.001	0.056
Slovenia	-0.065	<0.001	0.260	<0.001	0.066
Sweden	-0.081	<0.001	0.209	<0.001	0.047
Chinese Taipei	-0.001	0.905	0.287	<0.001	0.082
Thailand	-0.032	0.003	0.308	<0.001	0.091
Turkey	0.054	<0.001	0.157	<0.001	0.032
Ukraine	-0.017	0.207	0.269	<0.001	0.071
Uruguay	-0.084	<0.001	0.223	<0.001	0.050
United States	-0.033	0.023	0.285	<0.001	0.079
Vietnam	-0.090	<0.001	0.278	<0.001	0.083

PISA data. However, after excluding four countries that had the largest discrepancies between the datasets, Japan, Korea, Lithuania, and Sweden, there was a strong positive correspondence between the overall relative belongingness scores. This result indicates that the

discrepancies in these countries accounted for most of the instability of the relative belongingness scores overall. A possible explanation could be that changes were made to the translation of the items between the two datasets over time that caused a significant change in

TABLE 4 Level 2 regression coefficients in a two-level SEM model (df = 68).

	Standardized β	p
Perceived competition	-0.294	<0.001
Perceived cooperation	0.447	<0.001
R^2	0.188	<0.001
Residual	0.812	<0.001

potential interpretation of the response items. Even more impactful would be a change in the wording of the Likert response scale anchors (e.g., from “fully agree” to “very much agree”) because it keeps the factorial structure of the scales intact but makes mean comparison over time problematic (Sun et al., 2019). Further examination of the response items in the language administered for each country for both datasets would be required to fully assess this possibility. The alternative explanation would be that the increase in belongingness was caused by a substantial shift in the national pedagogy which seem rather unlikely.

Although no strong significant direct correlation was found between belongingness and perceived competitive climate overall across countries, a significant positive correlation was found between belongingness and perceived cooperative climate for all countries, confirming what prior research found in country-specific analyses (Lätsch, 2017; Tran et al., 2019; Ryzin et al., 2020; Keramati and Gillies, 2021). When belongingness was regressed on both climate perception variables, perceived competition becomes a significant negative predictor in all but 5 countries, which follows our theoretical predictions and supports the notion in prior research that a competitive learning climate can have detrimental effect on the psychosocial wellbeing in schools (Slavin, 2000; Posselt and Lipson, 2016). Our results suggest that although perceived competition does not directly correlate with belongingness, there is a possible interaction effect that perceived cooperation has on perceived competition: Competition can be beneficial for promoting a sense of belongingness, but only when it is perceived to be a friendly and not threatening competition, i.e., when the dominant sense is that of a cooperative and supportive climate. In this case competition has a more playful, not threatening character. Another possible explanation could be that perceived cooperation may act as a protective factor against the negative effects of perceived competition on belongingness. Further research is needed to address the exact relationship between the perceived climate variables.

The residual variance in belongingness across countries remains significant after controlling for the two key predictor variables, suggesting that other variables also contribute to the differences between countries in terms of average school belongingness. One likely factor that generally contributes to additional (random) variance is translation imprecision of survey items. This is particularly likely in international studies like the Trends in International Mathematics and Science Study (TIMSS) and PISA when items are translated into over 50 different languages. Even in cases where there are no translation imprecisions in terms of item meaning, the semantic of item anchors of Likert scales may vary enough to cause artificial mean differences across languages (translation of terms like “some,” “very” and “totally” will differ in

valence). Therefore, we maintain that the amount of variance explained by perceived climate variables is a lower-bound estimate of its actual importance to explain intercultural differences in the sense of school belongingness.

Limitations

One potential limitation of this study could be the variation in sample sizes between countries which can affect the power of the significance test. However, for all countries the absolute sample size can be considered saturated in the sense that even small true correlations with limited theoretical relevance would become significant in all subsamples.

The obtained rank correlation between the 2003 PISA data cycle and the 2018 PISA data cycle of 0.49 indicates that there is a degree of instability among the belongingness scores over time. At face value, this result could potentially indicate an overall global shift in student sense of belongingness. However, a more plausible explanation is that the discrepancies can be attributed to changes that were made to the scales used to measure belongingness across time in each country, including but not limited to changes in translation of the scale items and response scales. This needs further exploration, for example by analyzing data from all PISA cycles between 2003 and 2018.

Another limitation is that the measurements obtained from the scales in the PISA survey are dependent on self-rated reports from students. Thus, the results may be subject to the limitations in validity and reliability that come with self-reported measurements in general as the validity of the data depends on the levels of self-reflecting, honesty, and self-awareness of the students.

Future directions

Overall, the findings of this study show that in addition to the mediation effect of perceived climate for international difference in levels of belonging, there is a potential interaction effect between perceived competition and perceived cooperation that may influence sense of belongingness in most, if not all countries. Future studies should further investigate and characterize the moderating effects of perceived cooperative climate on the effect of perceived competitive climate on belongingness and should assess whether cultural differences influence the degree to which this effect occurs, as well as examine the differences between PISA datasets distributed in countries with high levels of discrepancies between to address the issue of the instability in belongingness observed in a few countries. Additionally, future research should characterize the relationship between the constructs of perceived competitive climate and perceived cooperative climate to contribute to a more thorough understanding of the complex ways in which student perceptions of climate interact with the social context within an educational setting.

Data availability statement

Publicly available datasets were analyzed in this study. This data can be found here: <https://www.oecd.org/pisa/data/2018database/>.

Ethics statement

The studies involving humans were approved by Health Sciences and Behavioral Sciences Institutional Review Board (IRB-HSBS) at the University of Michigan. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

SO wrote the introduction, and did the descriptive analysis. KC wrote the method and results. The discussion was written together. All authors contributed to the article and approved the submitted version.

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