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# Changing times in the middle of East and West: cultural dispositions three years later

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In the middle of East and West, Saudi Arabia is a society that has been the object of a socioeconomic plan to engineer a sustainable, knowledge-driven, and market-based economy since before the pandemic. The plan, which heavily relies on young college-educated women, requires a traditional collectivistic ethos to adjust to an individualistic one. The pandemic has temporarily interrupted the execution of the plan. The main aim of the present study is two-fold: (a) determine whether female college students' cultural dispositions and conceptual organization habits (similarity-driven versus function-driven ways of organizing information) have changed after the pandemic and (b) assess whether dispositions and habits contribute to academic attainment (as measured by GPA) differently before and after the pandemic. To this end, through a cross-sectional design, this retrospective study examines the cultural dispositions and conceptual organization habits of a sample of bilingual female college students 3 years apart before and after the pandemic. It finds no differences in conceptual organization habits as a function of time and no relationship between either cultural dispositions or conceptual organization habits and academic attainment. However, horizontal individualism is found to increase after the pandemic as well as to be negatively related to function-driven conceptual organization habits. Although these findings underlie the increasing individualism that accompanies socioeconomic development globally, they question common assumptions of a straightforward link between academic attainment and cultural differences.

## KEYWORDS

categorical perception, culture, change, youth, disposition

## 1. Introduction

Cultural dispositions have been associated with differences in the way objects and events in people's world are organized (Kitayama et al., 2003; Miyamoto et al., 2006). For instance, considerable evidence exists that the conceptual organization of Westerners and Easterners differ. Westerners, who are assumed to be individualistic, categorize the objects and events of their world based on similarities (e.g., bus and car). Meanwhile, Easterners, who are assumed to be collectivistic, categorize objects and events based on functional relationships (e.g., bus and driver; Chiu, 1972; Ji et al., 2000, 2004; Nisbett, 2003; Acar et al., 2011). In the middle of East and West, Saudi Arabia has been a society in transition since before the pandemic. Its economy is on the way to being reengineered to become sustainable, knowledge-driven, market-based, and gender-equitable. Its social fabric is expected to change accordingly. As a result of reengineering, which heavily relies on young college-educated women, its traditional

collectivistic ethos is asked to adjust to an incoming individualistic one. How is the adjustment realized? Before the COVID-19 pandemic, Pilotti et al. (2022c) asked whether Saudi female students were more like Westerners or Easterners with regard to various cultural disposition measures. They found that college students exhibited a diverse mix of proclivities (Li and Aksoy, 2007). Students rejected vertical individualism (VI; i.e., a view of oneself as an independent entity who recognizes and accepts the idea that inequalities exist among people). However, they endorsed horizontal individualism (HI; i.e., a view of oneself as an independent entity that believes that all people are equal). Students also endorsed horizontal collectivism (HC; i.e., a view of oneself as a member of a group who believes that all people are equal), and vertical collectivism (VC; i.e., a view of oneself as a member of a hierarchically organized group who recognizes and accepts inequalities within the group). Notwithstanding their self-reported mixture of cultural dispositions, students' conceptual organization was largely similarity-based, thereby replicating a preference found among Western students.

Then, the COVID-19 pandemic struck. The pandemic met the definition of a disruptive event due to its magnitude, and its being sudden, and unexpected. Such properties made it capable of drastically changing lives both individually and collectively (Mutch, 2014; Burchard, 2019). Not surprisingly, evidence exists that the pandemic has led to social isolation and altered social interactions so profoundly to be reflected in changes in brain functioning (Bzdok and Dunbar, 2022). Other relevant features of this disruptive event include the uncertainty experienced in everyday life and the helplessness generated by the sudden and unexpected loss of significant others (Panther et al., 2021), thereby increasing stress levels. In this regard, it is important to note that learning and memory under stress are less than optimal (Vogel and Schwabe, 2016). Although stress may enhance memory formation, leading to durable memories, stress markedly impairs memory retrieval, potentially lowering test performance. Stress may also hinder the updating of memory records in response to new information as well as induce a shift from a flexible form of learning to a rigid, habit-like behavior. Excessive worrying impairs executive functioning, slows the speed at which information processing is performed, and limits the amount of information concurrently available by depleting the cognitive resources of a person's working memory (da Silva Castanheira et al., 2021). Working memory allows one to maintain and manipulate information for several seconds for planning, decision-making, and task execution. As such, it is not surprising that changes in processing speed are often related to performance changes on tasks that rely on working memory (Beckwé et al., 2014; da Silva Castanheira et al., 2021). Deficiencies in the functioning of working memory may become worse over time and be associated with fatigue (Trezise and Reeve, 2016). One question that evidence of the pandemic having changed brain functioning (Bzdok and Dunbar, 2022) raises is whether the pattern uncovered by Pilotti et al. (2022c) would be different after the pandemic in a cross-section of students from the same population. Indeed, their task required students to briefly retain information in working memory to make a selection.

Potential information processing changes brought about by the pandemic are of interest due to the relevance of conceptual organization to students' learning. When presented with materials and activities to be learned, students extract information based on its perceived relevance, organize information into meaningful conceptual

units, and then rely on such units for recall and elaboration (Neisser, 1976). Conceptual units are coherent entities to the extent that they match students' background knowledge or naive theories about the world (Murphy and Medin, 1985). As such, conceptual units are informative and valuable to the users. The term learning styles was specifically coined to refer to stable individual habits in the conceptual organization and representation of the external environment (Riding, 2001).

The notion of learning styles is based on a theory of human information processing according to which thinking is defined by two qualitatively different types of cognitive strategies for information processing (Norenzayan et al., 2002; Kastanakis and Voyer, 2014): holistic and analytical. Among the main feature of the holistic computational mode is that it involves attention to the context or field where an object or event is situated, and is thereby concerned with the relationships that may exist among objects or events and their contexts. Instead, the main feature of the analytic mode is that objects and events in the environment are decoupled from their context, and are assigned to categories based on necessary and sufficient features. Across all cultures, people are likely to possess both of these cognitive strategies. However, cultural differences may exist in the relative accessibility and use of each strategy depending on the relative value that it holds within a given societal and educational environment. Accordingly, the analytic mode of thought has been reported to prevail among Western populations, whereas the holistic mode has been reported to prevail in East Asian populations (Masuda and Nisbett, 2001).

Not surprisingly, cultural dispositions, such as individualism and collectivism, have been reported to shape students' learning styles. For instance, in his seminal work, Chiu (1972) found that US children, as representatives of an individualistic culture, categorized objects in their world by their similarity. In contrast, Chinese children, as representatives of a collectivistic culture, preferred to categorize the same objects by their function. Thus, when asked to choose two items that go together in an array of three, such as a man, a woman, and a baby, US children chose "man" and "woman" because they are both adults, whereas Chinese children chose "woman" and "baby" because a mother takes care of her child. Similarly, Ji et al. (2004) asked Chinese and European American college students to select two words from an array of three presented in random order (monkey, panda, banana), and explain their selection. European Americans showed a clear preference for grouping items by their shared features or category memberships (e.g., monkey and panda are both animals). The Chinese students showed a preference for relationships, irrespective of whether they were tested in Chinese or English (e.g., monkeys eat bananas). Similar results were reported by Lacko et al. (2020) for map reading by Chinese/Taiwanese and Czech college students, who differed in their preferences for collectivism and individualism. Chinese/Taiwanese, who favored collectivism, categorized maps more holistically, whereas Czech participants, who preferred individualism, categorized them more analytically. Earlier, Masuda and Nisbett (2001) found that East Asian participants, compared to Westerners, devoted more attention to background information. They also found that East Asian participants exhibited relatively longer times for the detection of changes in focal targets and faster times for contextual changes (Masuda and Nisbett, 2006). Cohen (1969) calls the latter

“splitters,” who think that the characteristics of an object or event stand alone, and the former “lumpers,” who think that such characteristics are relevant only in relation to a whole (including the context in which an object or event is embedded). However, findings inconsistent with this dichotomy were reported by Alotaibi et al. (2017) who predicted cultural differences in how information is scanned in visual scenes between English participants (as representative of the analytical processing mode typical of an individualist culture) and Saudi Arabian participants (as representative of the holistic processing mode typical of a collectivist culture). They found both British and Saudi participants were faster at finding focal targets. Irrespective of the location of the target, the search times of Saudi Arabian participants were slower than those of British participants.

Yet, within-culture investigations have seldom been undertaken, even though in-group differences exist. For instance, Ji et al. (2004) found that Mainland Chinese exhibited a greater preference for relationships than Hong Kong Chinese. Peng et al. (2018) also found in-group differences in the extent to which information processing is more or less independent of contextual information. They examined regional-level differences in individualism/collectivism within the allegedly collectivistic Chinese culture. They found that southern Chinese participants, who were assumed to possess a collectivistic orientation, displayed a field-dependent style, whereby perception is highly influenced by the surrounding context. Instead, northern Chinese participants, who were assumed to be more individualistic, exhibited a field independent-style, whereby what matters is the object upon which attention is focused.

It has often been argued that to be effective instruction is to adjust to learning styles (Lemke-Westcott and Johnson, 2013). If learning in everyday contexts, which shape styles, both precedes and underlies conceptual knowledge in academic endeavors (Cohen, 1969; Graulich, 2015), conceptual organization habits arising from cultural dispositions can be expected to reflect differences in academic performance. Yet, mixed evidence exists as to whether differences in conceptual organization and the purported cultural dispositions that lie beneath translate into differences in academic performance. In principle, conceptual organization enhances performance in selected academic domains. For instance, Turan-Oluk and Ekmekci (2018) reported that instruction that changed students' conceptual organization was related to improved problem-solving skills and ensuing performance in chemistry. Pawl (2014) found that conceptual organization instruction promoted a problem-solving approach in physics by reducing students' equation-hunting approach. Differences in information processing, attributable to culturally defined conceptual organization habits, have been reported as well. Cohen (1969), for example, found function-based organization (also called field-dependent) in children to be associated with enhanced sensitivity to the effect of interfering stimuli (such as in the Stroop task; Kalanthroff et al., 2018), and to parts of objects (rather than the whole) and their context. He also reported flexible re-organization of objects, preference for social integration, and belief in learning as a social experience. However, Young and Ley (1997) found that such conceptual organization differences did not relate to admission rates in college. Instead, others reported function-based organization to be associated with lower grade point average (GPA; Cano, 1999), American College Test scores (ACT; Griffin and Franklin, 1996), or performance in mathematical word problems (Alamolhodaei, 2009).

## 2. The present study: structure, research questions, and hypotheses

Our study is a within-culture investigation that takes place in Saudi Arabia. Of course, in the middle of the East and West, Saudi Arabian youth may not fit the isomorphism reported between collectivism and function-driven organization observed in Easterners, and between individualism and similarity-driven organization observed in Westerners. Isomorphism may be particularly deficient in Saudi bilingual students who are exposed to two cultures through their use of both Arabic and English and their living in a society that is attempting to emulate a Western economic model of individualistic drives (Pilotti et al., 2022c). Indeed, in an earlier study, Pilotti et al. (2022c) found bilingual Saudi students to display a mixed cultural orientation with the endorsement of both collectivism and individualism. The impact of changes in one's sociocultural environment was also reported by Ji et al. (2004) who found Chinese participants from China to display a stronger preference for relationships than Chinese participants who temporarily resided in the United States.

In Saudi Arabia, the implementation of the economic plan labeled *Vision 2030* started before the pandemic. The plan promotes neoliberalism, which endorses entrepreneurial and competition-seeking practices under the umbrella of de-regularization of the marketplace (Le Ha and Barnawi, 2015). Both women and men are expected to contribute to the economy, thereby fostering a gender equity realignment along with the introduction of more English education to internationalize the country's education system. Young women have been the primary beneficiary of the changes envisioned by the plan. Women have now access to academic programs (e.g., engineering, law, etc.), have been given responsibilities, and are expected to perform tasks and enter professions previously the sole domain of men. Amid the promotion of neoliberal policies, which underscores individualism, religious and tribal customs, which predate such policies, continue to sustain collectivism (Awass, 2019).

Cultures are dynamic systems. They emerge from a particular context and may change as that context varies over time. Thus, as a disruptive event, the pandemic might have temporarily interrupted the movement toward this model advocated at the top, thereby questioning the current status of cultural dispositions and conceptual organization habits of Saudi students. To examine conceptual organization habits and related cultural dispositions before and after the pandemic, we relied on a cross-sectional sample of female students of a Saudi University that has adopted US curricula, English as the primary mode of communication, and student-centered pedagogy for instruction. Female students were selected as they represent the main target of the societal reengineering advocated from the top. The study asked the following questions, each accompanied by hypotheses based on the extant literature:

- a. Are conceptual organization habits and cultural dispositions different following a disruptive event such as the pandemic? On the one hand, stability may be predicted if cultural dispositions and conceptual organization habits are conceptualized as unbending habits that have developed over time through socialization practices (Graulich, 2015). On the other hand, change may be predicted if the pandemic has altered the way students conceptualize themselves, objects, and events within their society (Bzdok and Dunbar, 2022).

- b. Do female Saudi students' cultural dispositions relate to conceptual organization habits differently after this disruptive event? Before the pandemic, Pilotti et al. (2022c) found that Saudi participants not only displayed mixed cultural dispositions but also made choices mostly based on similarity (e.g., car and bus) instead of function (e.g., bus and driver), thereby emulating the Westerners' similarity-driven approach to perception. The extent to which the pandemic has altered the way students conceptualize themselves, objects, and events within their society will indicate whether the same pattern will be replicated.
- c. Do cultural dispositions contribute to academic attainment? Cultural differences are particularly relevant among students and educators if they contribute to academic performance. The extent to which cultural dispositions or conceptual organization habits specifically contribute to performance before and after the pandemic may be expected to be similar if students have been capable of quickly adjusting to a return to face-to-face classes (Pilotti et al., 2022b). The extent of the selected factors' contribution at each of these times is difficult to forecast for the simple reason that the results of the extant literature are unclear.

### 3. Method

#### 3.1. Participants

Convenience sampling was adopted to recruit 505 participants from a communication course of the general education curriculum of a Saudi university that has embraced US curricula and pedagogy. In this retrospective study, sampling occurred at two points in time 3 years apart: before the pandemic ( $n=267$ ) and after the pandemic ( $n=238$ ). Students were freshmen with a semester of completed courses. They were females of Saudi nationality whose age range was 18–32. The University classified them as Arabic-English bilingual speakers whose proficiency in the English language had been assessed at enrollment. Students lived in urban centers in the Eastern Province of Saudi Arabia. The participation rate was 96.42%.

#### 3.2. Materials and procedure

At the selected university, entirely face-to-face classes defined the semester preceding the pandemic and the semester ending it. Thus, toward the end of the fall semester preceding the pandemic and the fall semester following it, students were invited to participate in a study on how people organize their world. Following informed consent, students were presented with a sheet of paper on which 46 word-triplets (e.g., bus, car, driver) were displayed, each word of a triplet presented on a separate row. There were four lists of triplets, each with a different order in which the words were displayed in the triplets and in the way the triplets were listed. Randomization was used to create the stimulus lists and to assign students to the lists. The instruction of the sorting task required participants to think of the meaning of each of the words in a triplet. Then, they were to select two meanings in each triplet that would go best together. They were told that there was no right or wrong answer and were encouraged to make their choices quickly. A practice session was administered with four

triplets to ensure that students understood the instructions. The guidelines of Pilotti et al. (2022c) were followed to develop the stimulus material for the sorting task.

After participants completed the conceptual categorization task, they were asked to fill out the Culture Orientation scale of Triandis and Gelfand (1998). The scale consisted of 16 statements designed to measure four dispositions that could define the cultural orientation of an individual: HI, VI, HC, and VC. Participants were asked to indicate for each item of the scale the extent to which it applied to them. Answers were to be produced on a 9-point scale ranging from “never or definitely no” (−4) to “always or definitely yes” (+4) with 0 as the neutral point. Cronbach's alpha was 0.69.

All materials were in English. At the end of the session, which lasted approximately 15 min, debriefing was offered. Students' GPA for the semester during which the questionnaires were administered, educational level, nationality, and age were then collected from the Office of the Registrar. All identifying information was deleted immediately after the records were matched with students' completed questionnaires.

### 4. Results

#### 4.1. Do habits in conceptual organization, cultural dispositions, and academic performance vary as a function of time?

Table 1 illustrates the mean and standard deviation of participants' function-driven and similarity-driven choices, their academic performance (as measured by GPA), and their cultural disposition scores (as measured by four dimensions: VC, VI, HC, and HI) as a function of time (before and after the pandemic). For each participant, a preference score was computed (function-driven minus similarity-driven). Thus, a negative score illustrated a preference for similarity-driven choices.

To determine whether there were changes over time, all dependent variables were submitted to a Mann-Whitney *U* test, a non-parametric statistic, with time (before and after) as the independent variable. This analysis yielded no differences in organizational habits [ $U = 30260.00$ ,

TABLE 1 Mean (M) and standard deviation (SD) of participants' behavior and cultural dispositions as a function of time.

	Before M	SD	After M	SD
<b>Behavior</b>				
Function-driven choice	26.63%	16.50	28.38%	24.92
Similarity-driven choice	73.37%	16.50	71.62%	24.92
Preference	−46.74%		−43.24%	
GPA (0–4)	3.71	0.54	3.30	0.46
<b>Cultural dispositions (−4 – +4)</b>				
HI *	2.13	1.13	2.70	0.94
VI	0.78	1.63	1.06	1.45
HC	2.25	1.31	2.13	1.25
VC	2.33	1.38	2.49	1.25

Significant differences ( $p < 0.05$ ) between before and after the pandemic are marked with an asterisk.

ns]. Similarity-driven choices simply prevailed both before and after the pandemic. Among the four cultural disposition scores (VC, VI, HC, and HI), only HI increased after the pandemic [ $U = 41369.00$ ,  $p < 0.001$ ]. No significant change was detected in VI, HC, and VC [ $U \leq 34205.50$ , ns]. Similarly, there were no recorded changes in students' performance (GPA) as a function of time [ $U = 30403.59$ , ns].

## 4.2. Do self-reported cultural disposition or conceptual organization habits predict academic performance?

To determine whether there was a relationship between participants' individual differences and academic performance before and after the pandemic, a non-parametric test, Spearman correlation analysis (two-tailed test), was carried out. In this test, cultural dispositions (VC, VI, HC, and HI) or function-driven habits served as predictors, whereas academic performance served as the outcome variable (Table 2). Neither cultural dispositions nor conceptual organization habits contributed to academic performance as measured by the GPA obtained at the end of the semester during which the questionnaires were administered. In contrast, HI was inversely related to function-driven habits in conceptual organization after the pandemic. It is important to note though that the coefficient of determination was rather minor, indicating that HI accounted for approximately 2% of the variance in function-driven habits.

## 5. Discussion

The results of the present study can be summarized in four points: First, after the pandemic, HI increased. Santos et al. (2017) reported a global surge in individualism linked to socioeconomic development (including urbanization). Saudi Arabia's economic and social changes include widespread urbanization (Abou-Korin and Al-Shihri, 2015; Alqahtany and Aravindakshan, 2022) as one of the

outcomes of the drive to build a sustainable, knowledge-driven, and market-based economy to which both women and men are to contribute (Pilotti et al., 2022a). Thus, our finding of increased HI confirms a global trend in individualism. Yet, it suggests that the traditional Saudi culture, which mixes tribal networks and Islamic egalitarianism, may have fostered a predilection for the horizontal dimension in the participants of our study. Second, HI was found to be negatively correlated with a preference for function-driven choices, thereby underscoring the findings of earlier studies about the isomorphism between conceptual organization styles and cultural dispositions (Kitayama et al., 2003; Miyamoto et al., 2006). Third, there were no differences before and after the pandemic in conceptual organization habits, academic attainment, and the remaining cultural dispositions. These findings suggest that the changes brought about by the pandemic may not have altered habits and dispositions acquired through socialization processes. Concerning attainment, the lack of differences speaks of students' resilience in adjusting to a return to face-to-face classes, as reported in an earlier study (Pilotti et al., 2022b). Fourth, cultural dispositions and conceptual organization habits did not account for academic performance before or after the pandemic. One way to account for this finding is to recognize that GPA, which aggregates scores across several disciplines, may not be sufficiently sensitive to such variables. Sensitivity may be linked to particular class activities and related scores (e.g., teamwork as promoted by collectivism, and understanding of physics laws as promoted by a function-driven preference in students' conceptual organization). However, the complexity of academic demands makes assignments and tests reliant on a range of processes, thereby diluting the contribution of individual processes, such as those shaped by cultural dispositions and habits, to academic performance. As such, our finding questions the notion that culturally shaped dispositions and habits have straightforward relationships with academic attainment. As such, they are consistent with a warning expressed by Deng et al. (2022) who have argued that inventories that assess different, culturally-defined ways in which students process information may exhibit limited utility in guiding teaching and learning in educational settings.

The findings of the present study contribute to the extant literature on education by offering a window into the conceptual organization habits or cultural dispositions of an understudied student population. They suggest caution in assuming that such individual difference variables substantially bias information processing during learning (Rayner et al., 2009) to the point of visibly shaping academic attainment in college. Caution is particularly required when college students do not fall unambiguously into separate styles but rather exhibit a mixed makeup of dispositions. In a globalized world, mixed cultural mindsets, whereby one tendency coexists with a divergent other in a subdued form, are not an aberration but rather the inevitable byproducts of increased human contact. Such mindsets make understanding the viewpoint of people from other cultures easier. The reason is that their way of seeing and being is often the less preferred alternative in one's repertoire of choices (Rozin, 2003).

Among the limitations of our study, one may find its exclusive reliance on female college students who are urban dwellers. Although in a globalized world, the cultural makeup of an individual may be markedly mixed, especially among the educated youth, it may

TABLE 2 Spearman correlation analyses including cultural dispositions as predictors of academic performance.

	GPA	Preference
<b>Before</b>		
Function-driven preference	+0.09	
HI	+0.04	-0.03
VI	+0.04	+0.11
HC	-0.00	+0.05
VC	-0.04	-0.03
<b>After</b>		
Function-driven preference	-0.00	
HI *	-0.02	-0.13
VI	-0.06	-0.02
HC	+0.03	+0.02
VC	+0.02	-0.11

\* indicates a significant correlation ( $p < 0.05$ ).

be less so among the members of older generations. Another limitation of our study is its reliance on self-reports of cultural dispositions, which questions the extent to which participants' self-awareness of their dispositions or mere willingness to be transparent may have affected their reports. The impact of the language of assessment besides cultural differences may also have impacted the results of the current study (Ji et al., 2004). Of course, a longitudinal design is known to be more sensitive to changes in research participants than the cross-sectional design upon which we relied. Thus, future research will attempt to examine the link between cultural dispositions and academic attainment over time in the same participants. Human relations in Saudi Arabian society are being reshaped by the undergoing restructuring of its economic engine. Thus, even without an unpredictable and potentially catastrophic event, such as the pandemic, a longitudinal design reliant on a sizeable sample of young participants may be able to detect even minor fluctuations in the variables of interest.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Ethics statement

The research involving human participants was reviewed and approved by the Deanship of Research at Prince Mohammad bin Fahd University (PMU). It conformed to the guidelines for educational research of the Office for Human Research Protections of the US Department of Health and Human Services as well as those of the American Psychological Association's ethical standards. The

## References

- Abou-Korin, A. A., and Al-Shihri, F. S. (2015). Rapid urbanization and sustainability in Saudi Arabia: the case of Dammam metropolitan area. *J. Sustain. Dev.* 8, 52–65. doi: 10.5539/jsd.v8n9p52
- Acar, A., Taura, T., Yamamoto, E., and Yusof, N. F. M. (2011). Object vs. relation: understanding the link between culture and cognition with the help of WordNet. *Int. J. Asian Lang. Process.* 21, 199–208. Available at: <https://colips.org/journals/volume22/22.2.3-AdamAcar.pdf>
- Alamolhodaie, H. (2009). A working memory model applied to mathematical word-problem solving. *Asia Pac. Educ. Rev.* 10, 183–192. doi: 10.1007/s12564-009-9023-2
- Alotaibi, A., Underwood, G., and Smith, A. D. (2017). Cultural differences in attention: eye movement evidence from a comparative visual search task. *Conscious. Cogn.* 55, 254–265. doi: 10.1016/j.concog.2017.09.002
- Alqahtany, A., and Aravindakshan, S. (2022). Urbanization in Saudi Arabia and sustainability challenges of cities and heritage sites: heuristical insights. *J. Cult. Herit. Manag. Sustain. Dev.* 12, 408–425. doi: 10.1108/JCHMSD-07-2020-0108
- Awass, O. (2019). Contending with capitalism: fatwas and neoliberal ideology. *J. World-Syst. Res.* 25, 145–168. doi: 10.5195/jwsr.2019.843
- Beckwé, M., Deroost, N., Koster, E. H., De Lissnyder, E., and De Raedt, R. (2014). Worrying and rumination are both associated with reduced cognitive control. *Psychol. Res.* 78, 651–660. doi: 10.1007/s00426-013-0517-5
- Burchard, M. (2019). The need for philosophy in times of trauma. *Public Philos. J.* 2, 1–4. doi: 10.25335/PPJ.2.2-01
- Bzdok, D., and Dunbar, R. I. (2022). Social isolation and the brain in the pandemic era. *Nat. Hum. Behav.* 6, 1333–1343. doi: 10.1038/s41562-022-01453-0
- Cano, J. (1999). The relationship between learning style, academic major, and academic performance of college students. *J. Agric. Educ.* 40, 30–37. doi: 10.5032/jae.1999.01030
- Chiu, L. H. (1972). A cross-cultural comparison of cognitive styles in Chinese and American children. *Int. J. Psychol.* 7, 235–242. doi: 10.1080/00207597208246604
- Cohen, R. A. (1969). Conceptual styles, culture conflict, and nonverbal tests of intelligence. *Am. Anthropol.* 71, 828–856. doi: 10.1525/aa.1969.71.5.02a00040
- da Silva Castanheira, K., Sharp, M., and Otto, A. R. (2021). The impact of pandemic-related worry on cognitive functioning and risk-taking. *PLoS One* 16:e0260061. doi: 10.1371/journal.pone.0260061
- Deng, R., Benckendorff, P., and Gao, Y. (2022). Limited usefulness of learning style instruments in advancing teaching and learning. *Int. J. Manag. Educ.* 20:100686. doi: 10.1016/j.ijme.2022.100686
- Graulich, N. (2015). The tip of the iceberg in organic chemistry classes: how do students Deal with the invisible? *Chem. Educ. Res. Pract.* 16, 9–21. doi: 10.1039/C4RP00165F
- Griffin, R., and Franklin, G. (1996). Can college academic performance be predicted using a measure of cognitive style? *J. Educ. Technol. Syst.* 24, 375–379. doi: 10.2190/PMUM-N6LT-97N8-2Y
- Le Ha, P., and Barnawi, O. Z. (2015). Where English, neoliberalism, desire and internationalization are alive and kicking: higher education in Saudi Arabia today. *Lang. Educ.* 29, 545–565. doi: 10.1080/09500782.2015.1059436
- Ji, L. J., Peng, K., and Nisbett, R. E. (2000). Culture, control, and perception of relationships, in the environment. *J. Pers. Soc. Psychol.* 78, 943–955. doi: 10.1037/0022-3514.78.5.943
- Ji, L.-J., Zhang, Z., and Nisbett, R. E. (2004). Is it culture or is it language? Examination of language effects in cross-cultural research on categorization. *J. Pers. Soc. Psychol.* 87, 57–65. doi: 10.1037/0022-3514.87.1.57
- Kalanthroff, E., Davelaar, E. J., Henik, A., Goldfarb, L., and Usher, M. (2018). Task conflict and proactive control: a computational theory of the Stroop task. *Psychol. Rev.* 125, 59–82. doi: 10.1037/rev0000083

participants provided their written informed consent to participate in this study.

## Author contributions

MP, AW, KA, and HA equally contributed to the design of the study, to the collection, analysis, and interpretation of the data, as well as to the drafting and proofreading of the article. All authors contributed to the article and approved the submitted version.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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- Kastanakis, M. N., and Voyer, B. G. (2014). The effect of culture on perception and cognition: a conceptual framework. *J. Bus. Res.* 67, 425–433. doi: 10.1016/j.jbusres.2013.03.028
- Kitayama, S., Duffy, S., Kawamura, T., and Larsen, J. T. (2003). Perceiving an object and its context in different cultures: a cultural look at new look. *Psychol. Sci.* 14, 201–206. doi: 10.1111/1467-9280.02432
- Lacko, D., Šašinka, Č., Čeněk, J., Stachoň, Z., and Lu, W. L. (2020). Cross-cultural differences in cognitive style, individualism/collectivism and map reading between central European and east Asian university students. *Stud. Psychol.* 62, 23–43. doi: 10.31577/sp.2020.01.789
- Lemke-Westcott, T., and Johnson, B. (2013). When culture and learning styles matter: a Canadian university with middle-eastern students. *J. Res. Int. Educ.* 12, 66–84. doi: 10.1177/1475240913480105
- Li, F., and Aksoy, L. (2007). Dimensionality of individualism–collectivism and measurement equivalence of Triandis and Gelfand's scale. *J. Bus. Psychol.* 21, 313–329. doi: 10.1007/s10869-006-9031-8
- Masuda, T., and Nisbett, R. E. (2001). Attending holistically versus analytically: comparing the context sensitivity of Japanese and Americans. *J. Pers. Soc. Psychol.* 81, 922–934. doi: 10.1037/0022-3514.81.5.922
- Masuda, T., and Nisbett, R. (2006). Culture and change blindness. *Cogn. Sci.* 30, 381–399. doi: 10.1207/s15516709cog0000\_63
- Miyamoto, Y., Nisbett, R. E., and Masuda, T. (2006). Culture and the physical environment. Holistic versus analytic perceptual affordances. *Psychol. Sci.* 17, 113–119. doi: 10.1111/j.1467-9280.2006.01673.x
- Murphy, G. L., and Medin, D. L. (1985). The role of theories in conceptual coherence. *Psychol. Rev.* 92, 289–316. doi: 10.1037/0033-295X.92.3.289
- Mutch, C. (2014). The role of schools in disaster preparedness, response and recovery: what can we learn from the literature? *Pastor. Care Educ.* 32, 5–22. doi: 10.1080/02643944.2014.880123
- Neisser, U. (1976). *Cognition and reality: principles and implications for cognitive psychology*. San Francisco, CA: W. H. Freeman & Co.
- Nisbett, R. E. (2003). *The geography of thought: how Asians and westerners think differently, and why*. New York, NY: The Free Press.
- Norenzayan, A., Smith, E. E., Kim, B. J., and Nisbett, R. E. (2002). Cultural preferences for formal versus intuitive reasoning. *Cogn. Sci.* 26, 653–684. doi: 10.1207/s15516709cog2605\_4
- Panther, L., Allee-Herndon, K. A., Perrotta, K., and Cannon, S. (2021). I can tell you stories: teacher education during educational disruption. *Teach. Educ.* 56, 327–345. doi: 10.1080/08878730.2021.1918302
- Pawl, A. (2014). Is it disadvantageous to teach forces first in mechanics? *Am. Assoc. Phys. Teach.* 1119, 203–206. Available at: <https://www.compadre.org/PER/perc/2014/files/ForcesFirst1.pdf>
- Peng, S., Hu, P., and Guo, Z. (2018). Within-culture variation in field dependence/Independence: a region-level investigation across China. *Soc. Behav. Pers.* 46, 293–300. doi: 10.2224/sbp.6561
- Pilotti, M. A. E., El-Moussa, O. J., and Abdelsalam, H. M. (2022a). Measuring the impact of the pandemic on female and male students' learning in a society in transition: a must for sustainable education. *Sustainability* 14:3148. doi: 10.3390/su14063148
- Pilotti, M. A. E., Faisal, N. Y., Hassan, S. A., Cavazos, S. E., and Elmoussa, O. (2022b). Female students' responses to change. *Front. Educ.* 7:929998. doi: 10.3389/feduc.2022.929998
- Pilotti, M. A. E., Salameh, M. H., Abdulhadi, E. J. Y., and Al Ghazo, R. (2022c). Perceptual organization and attribution habits: a glimpse of the middle eastern bicultural mind. *J. Gen. Psychol.* 149, 169–195. doi: 10.1080/00221309.2020.1819767
- Rayner, K., Castelhana, M. S., and Yang, J. (2009). Eye movements when looking at unusual/weird scenes: are there cultural differences? *J. Exp. Psychol. Learn. Mem. Cogn.* 35, 254–259. doi: 10.1037/a0013508
- Riding, R. (2001). “The nature and effects of cognitive style” in *Perspectives on thinking, learning, and cognitive styles*. eds. R. J. Sternberg and L. F. Zhang (New York, NY: Lawrence Erlbaum Associates Publishers), 47–72.
- Rozin, P. (2003). Five potential principles for understanding cultural differences in relation to individual differences. *J. Res. Pers.* 37, 273–283. doi: 10.1016/S0092-6566(02)00566-4
- Santos, H. C., Varnum, M. E., and Grossmann, I. (2017). Global increases in individualism. *Psychol. Sci.* 28, 1228–1239. doi: 10.1177/09567976177006
- Treize, K., and Reeve, R. A. (2016). Worry and working memory influence each other iteratively over time. *Cognit. Emot.* 30, 353–368. doi: 10.1080/02699931.2014.1002755
- Triandis, H. C., and Gelfand, M. J. (1998). Converging measurement of horizontal and vertical individualism and collectivism. *J. Pers. Soc. Psychol.* 74, 118–128. doi: 10.1037/0022-3514.74.1.118
- Turan-Oluk, N., and Ekmekci, G. (2018). The effect of concept maps, as an individual learning tool, on the success of learning the concepts related to gravimetric analysis. *Chem. Educ. Res. Pract.* 19, 819–833. doi: 10.1039/C8RP00079D
- Vogel, S., and Schwabe, L. (2016). Learning and memory under stress: implications for the classroom. *Sci. Learn.* 1, 16011–16010. doi: 10.1038/npjscilearn.2016.11
- Young, D. B., and Ley, K. (1997). Cognitive style in developmental and regular admission college students. *Res. Teach. Dev. Educ.* 13, 45–54. Available at: <https://www.jstor.org/stable/42801963>