

# Self-assertive interdependence in Arab culture

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**Arabs represent a major cultural group, yet one that is relatively neglected in cultural psychology. We hypothesized that Arab culture is characterized by a unique form of interdependence that is self-assertive. Arab cultural identity emerged historically in regions with harsh ecological and climatic environments, in which it was necessary to protect the survival of tribal groups. Individuals in Arabian cultures were honour-bound to be respectable and trustworthy group members. Supporting this hypothesis, study 1 found that Arabs were interdependent and holistic (like East Asians), but also self-assertive (like Westerners). This psychological profile was observed equally for both Muslim and Christian Arabs, thus ruling out Islamic religion as an alternative explanation for our findings. Studies 2 and 3 showed that the self-assertive tendency of Arabs is in service of interdependence, whereas that of Westerners is in service of independence. Our work contributes to the current effort by cultural psychologists to go beyond the prevailing East versus West, interdependence versus independence paradigm. It also speaks to the emerging socioecological perspective in cultural research.**

Arabs represent a pan-ethnic cultural group of 400 million people currently, spanning territories from Western Asia to North Africa. As is the case with other major cultural groups, Arabs have made numerous contributions to arts and science throughout history. Today, the Arab world continues to play a significant role in global business and politics<sup>1–3</sup>.

Despite their historical and cultural significance, Arabs have been relatively neglected in social and cultural psychological research. Aside from ethnographies<sup>4–6</sup>, few empirical studies on Arab culture exist<sup>7,8</sup>, and those that do are typically generalizations from single countries<sup>7,9</sup> or explicit self-reports<sup>10–12</sup> that cultural psychologists now recognize as having serious methodological problems<sup>13–17</sup>. At present, then, little is known about what cultural profiles Arabs may exhibit and how they compare with more commonly studied profiles of predominantly independent Westerners (that is, North Americans and Western Europeans) and predominantly interdependent East Asians (that is, Japanese, Chinese and Koreans). In particular, it is currently unknown how Arabs respond on non-reflective or non-deliberative (or ‘implicit’ as opposed to ‘explicit’) psychological measures, which are often more direct indicators of affect, cognition and behaviour across different cultures than self-report measures<sup>14</sup>. Thus, we hope to go beyond the predominant East–West paradigm for cross-cultural research in psychology and neighbouring fields by examining the Arab cultural group using implicit (and previously validated) measures of cultural dimensions<sup>18</sup>.

Integrating existing historical and anthropological sources with an emerging socioecological perspective in cultural research<sup>19–23</sup>,

we predicted that Arabs would show a psychological profile that is distinct from that of either East Asians or Westerners. In particular, we expected Arabs to show a self-assertive form of interdependence—a form of interdependence not yet tested in the current literature. This form of interdependence involves a strong commitment to in-groups; at the same time, this commitment also recruits strong self-assertion for the sake of sustaining and protecting in-group identity and welfare. This profile is in stark contrast with a self-effacing form of interdependence that is more common among East Asians, in which self-assertion is seen as a hindrance to in-group harmony<sup>24</sup>. Rather, the predicted self-assertive interdependence of Arabs was expected to be similar to a form of independence that is common among Westerners. However, whereas self-assertion is in service of independence for Westerners<sup>14,24</sup>, we hypothesized that it is in service of interdependence for Arabs.

The modern Arab world covers a vast geographic area, comprising 22 countries in Western Asia and North Africa, with regions that are highly heterogeneous and geographically variable. Nevertheless, these regions are culturally united by both the use of Arabic language and a sense of shared history<sup>1–3</sup>. We assume that certain critical seeds of Arab culture can be traced back to common, ancient sources, similar to recent empirical demonstrations that certain cultural tendencies observed in Western Europe and East Asia can also be linked to distal historical and ecological circumstances<sup>19–23</sup>. Specifically, following some historians and anthropologists<sup>3,25,26</sup>, we suggest that one important source of Arab culture lies in kin-based, partially nomadic tribal groups called the Bedouins. The Bedouins originated from the Arabian Peninsula and the Southern Levant deserts, with the first recording of modern Arabic written script around the fourth-century AD. Although the majority of Arabs lived in big cities, which were major cultural centres, and farmlands from the Early Middle Ages onwards, Bedouins continued to be seen as an inspiration for traditional Arab culture despite later influences, such as Islam from the seventh century AD<sup>3,26</sup>.

Life was deprivation in the Arabian Desert in pre-Islamic times—the socioecological environment in which Arab cultural identity originally emerged. Resources including water and farmland were scarce and unpredictable, and populations were dispersed across the vast deserts. While cross-regional trade for various portable goods (for example, incenses and precious woods) was a necessity, there often existed no central governing authority that could ensure the security of personal property or regular commerce. We propose that as a result of this unique constellation of socioecological factors, kin-based tribes in the Arabian Desert necessarily became highly cohesive functional units<sup>26,27</sup> with individuals from each tribe highly interdependent with one another to insure their survival. Indeed, Arab culture has traditionally placed a high premium on kinship cohesion

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and solidarity—‘asabiyya’ in Arabic, which means ‘kinship spirit’ and is derived from the verb ‘asab’ meaning ‘to tie together’<sup>23,26–30</sup>.

However, life in the desert in pre-Islamic times was not just one of deprivation; it was also dangerous. In particular, raids by other competing tribes represented a common threat, and consistent with the aetiology and socioeconomic conditions of other honour cultures<sup>31</sup>, much of this property was portable, able to be stolen and thus necessary to be vigilantly protected. As such, individual honour displays could be an effective deterrent of potential attacks on the in-group<sup>31</sup>. For this reason, we submit that the ability and motivation for the assertion of one’s individual prowess in service of in-group protection formed a powerful basis for dignity and pride in Arab communities. Ultimately, this proactive and often pre-emptive self-assertion probably enhanced the tribe’s social standing<sup>25</sup>. Thus, Arab culture has historically valued a strong sense of honour towards one’s in-group and cultivated a deep commitment to it. Indeed, a series of ethnographies have documented a strong honour ethic that is thriving to this day in several rural Arab regions<sup>5,6</sup>. More recent empirical work also shows that modern-day Arabs hold positive attitudes towards honour<sup>32–35</sup>.

The combination of interdependence with one’s group and self-assertive tendencies to defend it served well to ensure survival in the socioecological niche of traditional Bedouin culture<sup>3,4,26,28</sup>. More importantly for our purposes, this shared history of the region has coloured the contemporary psychology of many Arab cultures. For example, several twentieth-century anthropologists observing rural Arab societies in the Levant and North Africa have argued that Arab cultural ethos is constituted by both a strong commitment to the kin group and a readiness to assert the kin group’s social standing vis-à-vis other groups<sup>4,30,36–38</sup>.

By defining Arab culture as characterized by a self-assertive form of interdependence, we can readily situate Arab culture in the landscape of the current comparative research in cultural psychology<sup>24,39–41</sup>. This literature has largely focused on comparisons between Westerners and East Asians<sup>24,42</sup>. Cultural psychologists have typically found that, compared with Westerners, East Asians are more interdependent in social orientation<sup>14,24</sup> by, for example, associating happiness with social harmony<sup>43,44</sup>. Interdependence is also linked to more holistic cognition because individuals committed to relational goals have to allocate attention broadly to various contextual or relational cues<sup>14,41</sup>. To the extent that Arabs are highly interdependent, Arabs may be expected to be similar to East Asians in the measures of interdependence (for example, the close association between happiness and social harmony) and holistic cognition (for example, holistic locus of attention and attenuated dispositional bias).

Critically, in the current cultural psychology literature, it is widely assumed that independent orientations are inherently linked to enhancement and assertion of the individual self<sup>45</sup> as independent selves are thought to express their own unique attributes. Typically, at least for East Asian interdependence, self-assertion is seen as a hindrance to in-group harmony<sup>24</sup>. Thus, the absence of self-assertion (or greater self-effacement) is considered a constitutive element of interdependence<sup>46</sup>. However, in this respect, we anticipated a major departure of Arab culture from East Asian culture. Unlike East Asians, individuals in Arab culture were expected to derive a strong sense of self as a means for in-group protection, and as a consequence, they regard individual self-assertion not as a hindrance, but rather as a valuable trait that is in service of in-group solidarity and welfare<sup>26,37</sup>. Hence, for Arabs, a strong interdependent tendency (both social interdependence and holistic cognition) was expected to co-exist with a high degree of self-assertion (study 1a,b). In this way, one major contribution of the current research is to show that self-assertive orientations are inherently linked and, in fact, can causally result from experimentally activating a sense of interdependence for Arabs (studies 2 and 3). Whereas self-assertion has been consistently assumed to be in service of independence for

human groups<sup>14,24</sup>, the current research demonstrates that it can be in service of interdependence.

In study 1a, we tested the hypothesis that, like East Asians (but unlike Westerners), Arabs are highly interdependent and holistic. Critically, we also hypothesized that the high level of interdependence co-exists with strong self-assertion in Arabs, similar to Westerners. To test these predictions, we used previously validated measures of implicit interdependence and independence<sup>14,47</sup>. We used implicit measures because they do not incur the usual problems exhibited by self-report scales, such as lacking predictive validity in cross-cultural comparisons<sup>13,14</sup>, being subject to self-presentation biases<sup>15–17</sup>, and measuring individual beliefs and values rather than cultural norms (cultural norms are better predictors of behaviour)<sup>48,49</sup>. Because they measure automatic habits and routines in thinking and feeling<sup>14</sup>, implicit measures capture behaviour better than explicit beliefs about the self. In particular, cross-cultural variation in implicit psychological tendencies of independence and interdependence is more systematic and reliable than cross-cultural variation in self-reports<sup>14,50</sup>. As a result, implicit measures often better capture cultural differences than explicit measures<sup>14</sup>.

As one measure of affective interdependence, we tested correlates of happiness. Previous work shows that East Asians associate happiness with social harmony (that is, interdependence), whereas Westerners associate happiness with personal achievement (that is, independence)<sup>43</sup>. We predicted that, like East Asians, Arabs would also associate happiness with social harmony rather than with personal achievement. We also included two implicit indicators of holistic cognition; namely, the framed-line test (FLT; where the judgement of the length of a line is influenced by the changing frame size, suggesting context dependence) and dispositional bias in attribution (where the judgement of personality is uninfluenced by information about situational context, suggesting context independence). Both of these indicators of holistic cognition have been shown to closely relate to interdependent self-construal in a wealth of previous research<sup>23,41,50–53</sup>. Accordingly, compared with Westerners, East Asians show more of the frame effect in the FLT<sup>14,54</sup> and less dispositional bias<sup>14,55</sup>. We predicted that Arabs would show similar levels of holistic cognition to East Asians on both measures.

We also included two different tests to implicitly measure self-assertion. First, we used reported experience of socially disengaged emotions (that is, pride, self-esteem, frustration and anger) that have self-assertive qualities<sup>14</sup> relative to reported experience of socially engaged emotions (that is, friendly feelings, shame, closeness to others and guilt) that have few self-assertive qualities<sup>14</sup>. Second, we measured symbolic self-inflation, as reflected in the relative size of circles designating the self versus others in a social network. The size of a circle increases with the importance attached to the person depicted in that circle<sup>14,56</sup>. Previous work has shown that Westerners both report the experience of the socially disengaging emotions more<sup>14</sup> and show a greater degree of symbolic self-inflation, thus indicating self-assertion<sup>14</sup>. Thus, we also predicted that Arabs would be as assertive as Westerners in these measures of self-assertion.

We hypothesized that the proposed cultural psychological character of Arab people (both interdependent and self-assertive) is derived from the unique cultural heritage of this group. To address this hypothesis, we included two different Arab groups; namely, Saudi Arabians ( $n = 128$ ) and Lebanese ( $n = 47$ ). The Lebanese sample included both Muslims and non-Muslims, which enabled us to address the potential confounding role of religion. As a critical cultural group comparison, we also included Ashkenazi Jews ( $n = 86$ ), who inhabit the Middle East today, but also largely share the same European cultural heritage as Western Europeans. In addition, we used comparable data from a previous investigation<sup>14</sup> to compare the psychological profile of Arabs with those of Westerners (European Americans,  $n = 94$ ; British,  $n = 95$ ; and Germans,  $n = 128$ ) and East Asians (Japanese,  $n = 122$ ).

Mean scores in all tasks for each of the groups included in the analysis can be found in Table 1. As in previous work<sup>14,50</sup>, within-group correlations among the tasks were negligible, and statistically no different from zero in nearly all cases. According to Kitayama et al.<sup>14</sup>, features of independent versus interdependent social orientation are coherent at the level of culture. However, each individual has access to these features selectively to yield a unique, idiosyncratic profile of social orientation. This access will depend on each individual and, thus, may practically be nearly completely random across individuals<sup>50</sup>, thereby resulting in near-zero within-group correlations among the tasks tested.

Analysis of covariance (ANCOVA) controlling for gender and age performed on the measure of interdependence (the social (versus personal) correlate of happiness) yielded a significant main effect of culture ( $F_{6,549} = 4.26$ ,  $P < 0.001$ ,  $\eta^2_p = 0.04$ ).  $\eta^2_p$  is a measure of effect size for use in ANCOVA. Kitayama et al.<sup>14</sup> had shown that Japanese were most interdependent and Americans least so, with the two European groups (British and German) falling between them. As predicted, both Saudis and Lebanese were as interdependent as Japanese, whereas Ashkenazi Jews were no different from Americans. Table 1 indicates all pairwise mean comparisons.

The same ANCOVA performed on the FLT measure of holistic (versus analytic) cognition also showed a significant main effect of culture ( $F_{6,633} = 8.78$ ,  $P < 0.001$ ,  $\eta^2_p = 0.08$ ). Kitayama et al.<sup>14</sup> had shown that Japanese were most holistic and Americans least so, with the two European groups falling between them. As predicted, both Saudis and Lebanese were as holistic as Japanese, whereas Ashkenazi Jews were no different from Americans (see Table 1). The same analysis performed on the dispositional attribution measure of holistic cognition showed a significant main effect of culture ( $F_{6,637} = 9.17$ ,  $P < 0.001$ ,  $\eta^2_p = 0.08$ ). Kitayama et al.<sup>14</sup> had shown that Japanese were significantly less dispositional (that is, more holistic) than the remaining three Western groups. As predicted, both Saudis and Lebanese were no different from Japanese, whereas Ashkenazi Jews were no different from Americans (see Table 1).

We then analysed the two implicit measures of self-assertion. First, the measure of socially disengaged/assertive (versus engaged/non-assertive) emotions showed a significant main effect of culture ( $F_{6,570} = 18.80$ ,  $P < 0.001$ ,  $\eta^2_p = 0.17$ ). Kitayama et al.<sup>14</sup> had shown that disengaged/assertive emotions were more pronounced in Americans and least so in Japanese, with the two European groups falling between them. As predicted, the two Arab groups (Saudis and Lebanese) were no different from Americans and higher than Japanese. Ashkenazi Jews were no different from Americans either (see Table 1).

Second, the measure of symbolic self-inflation also showed a significant main effect of culture ( $F_{6,629} = 5.28$ ,  $P < 0.001$ ,  $\eta^2_p = 0.05$ ).

Kitayama et al.<sup>14</sup> had shown that symbolic self-inflation was most prominent in Americans and least so in Japanese, with the two European groups falling between them. As predicted, the two Arab groups were no different from Americans and neither was the Ashkenazi Jew group (see Table 1).

Study 1a showed a unique psychological profile of Arabs. Arabs were as interdependent and holistic as Japanese, and significantly more so than Westerners. At the same time, they were as self-assertive as Westerners, and significantly more so than Japanese. This pattern is in support of our hypothesis that Arab culture encourages a form of interdependence that is self-assertive. This conclusion is reinforced by the similarity between two otherwise rather different Arab groups (Saudis and Lebanese). Moreover, our finding that the Ashkenazi Jew group was no different from the Western groups underscores our assumption that the tasks used here tap cultural heritage.

Importantly, the Lebanese sample in study 1a included both Muslims and non-Muslims (mostly Christians), which enabled us to explore the potential confounding role of Islamic religion in producing self-assertive interdependence. Our theorizing was predicated on the influence of the Bedouin ethos (rather than Islamic religion) on modern-day Arab culture, and we wanted to test this possibility empirically. Among the Lebanese participants, 24 were Muslims. The remaining 23 were non-Muslims, 22 of whom were Christians. Muslims were no different from non-Muslims on any implicit psychological tendency (correlates of happiness:  $F_{1,43} = 0.22$ ,  $P = 0.64$ ,  $\eta^2_p = 0.01$ , 95% confidence interval (CI) =  $-0.35$  to  $0.56$ ; holistic versus analytic attention:  $F_{1,43} = 0.32$ ,  $P = 0.58$ ,  $\eta^2_p = 0.01$ , 95% CI =  $-2.57$  to  $4.55$ ; dispositional bias:  $F_{1,43} = 0.26$ ,  $P = 0.61$ ,  $\eta^2_p = 0.01$ , 95% CI =  $-0.92$  to  $0.55$ ; disengaged versus engaged emotions:  $F_{1,38} = 2.00$ ,  $P = 0.17$ ,  $\eta^2_p = 0.05$ , 95% CI =  $-0.81$  to  $0.14$ ; symbolic self-inflation:  $F_{1,42} = 1.23$ ,  $P = 0.27$ ,  $\eta^2_p = 0.03$ , 95% CI =  $-1.78$  to  $6.14$ ). However, caution is due because our sample was small and the analysis post-hoc.

In study 1b, we decided to repeat the same procedure with a larger sample in Lebanon ( $n = 127$ ). This country exhibits great religious diversity; a significant portion of the population are Christian Arab (around 40%), and Christianity has been continuously present for centuries (dating back to before the spread of Islam), thereby significantly shaping the local culture<sup>57</sup>.

The means for the two Muslim and non-Muslim Lebanese groups are shown in Table 2. As can be seen, in no case were the two groups different from one another. For comparison, Table 2 also reports the corresponding means from the Lebanese group from study 1a. As can be seen, the pattern of the means was no different in study 1b. In addition, consistent with previous evidence<sup>14,50</sup> and replicating

**Table 1 | Means and s.d. values for the indices of interdependence, holistic cognition and self-assertion for East Asians (Japanese), Arabs (Saudis and Lebanese) and Westerners (Ashkenazi Jews, Germans, British and European Americans) in study 1a**

	Japanese	Saudis (study 1a)	Lebanese (study 1a)	Ashkenazi Jews (study 1a)	Germans	British	European Americans
<b>Interdependence</b>							
Correlates of happiness	-0.44 <sup>a</sup> (0.94)	-0.26 <sup>a</sup> (0.74)	-0.21 <sup>ab</sup> (0.75)	-0.02 <sup>bc</sup> (0.85)	-0.14 <sup>ab</sup> (0.91)	0 <sup>bc</sup> (0.77)	0.16 <sup>c</sup> (0.69)
<b>Holistic cognition</b>							
Holistic (versus analytic) attention	-7.15 <sup>a</sup> (6.42)	-8.96 <sup>a</sup> (11.71)	-6.72 <sup>a</sup> (5.94)	-3.81 <sup>b</sup> (6.08)	-4.19 <sup>b</sup> (6.56)	-5.25 <sup>ab</sup> (7.72)	-1.62 <sup>b</sup> (9.59)
Dispositional bias	0.45 <sup>a</sup> (1.06)	0.66 <sup>a</sup> (1.36)	0.39 <sup>a</sup> (1.17)	1.13 <sup>b</sup> (0.93)	1.10 <sup>b</sup> (0.96)	1.25 <sup>b</sup> (0.91)	1.19 <sup>b</sup> (1.01)
<b>Self-assertion</b>							
Disengaged (versus engaged) emotions	-0.47 <sup>a</sup> (0.68)	0.64 <sup>c</sup> (0.84)	0.56 <sup>c</sup> (0.73)	0.56 <sup>c</sup> (0.58)	0.16 <sup>b</sup> (0.69)	0.23 <sup>b</sup> (0.67)	0.53 <sup>c</sup> (0.66)
Symbolic self-inflation	0.41 <sup>a</sup> (8.81)	4.40 <sup>b</sup> (10.78)	5.25 <sup>b</sup> (6.37)	4.51 <sup>b</sup> (7.46)	4.83 <sup>b</sup> (9.07)	3.00 <sup>b</sup> (7.41)	6.22 <sup>b</sup> (9.18)

Raw data from ref. <sup>14</sup> were used for the Japanese, German, British and European American indices. Means in the same row with different superscripts differ at  $P < 0.05$ . s.d. values are shown in parentheses.

**Table 2 | Means and s.d. values for the indices of interdependence, holistic cognition and self-assertion for Lebanese Muslims and non-Muslims in study 1a,b**

	Lebanese Muslims (study 1b)	Lebanese non-Muslims (study 1b)	Lebanese (study 1a)
<b>Interdependence</b>			
Correlates of happiness	-0.29 <sup>a</sup> (0.64)	-0.27 <sup>a</sup> (0.64)	-0.21 <sup>a</sup> (0.75)
<b>Holistic cognition</b>			
Holistic (versus analytical) attention	-7.03 <sup>a</sup> (8.80)	-7.25 <sup>a</sup> (7.93)	-6.72 <sup>a</sup> (5.94)
Dispositional bias	0.73 <sup>a</sup> (0.98)	0.55 <sup>a</sup> (0.97)	0.39 <sup>a</sup> (1.17)
<b>Self-assertion</b>			
Disengaged (versus engaged) emotions	0.75 <sup>a</sup> (0.84)	0.72 <sup>a</sup> (0.58)	0.56 <sup>a</sup> (0.73)
Symbolic self-inflation	4.95 <sup>a</sup> (9.29)	4.50 <sup>a</sup> (12.45)	5.25 <sup>a</sup> (6.37)

Means in the same row with different superscripts differ at  $P < 0.05$ . s.d. values are shown in parentheses.

study 1a, within-group correlations among the tasks were negligible for the most part.

Although Arabs were as self-assertive as Westerners in study 1a,b, this may conceal an important difference between both cultural groups. Previous research has consistently shown that self-assertion for Westerners is a way to express the personal self and, thus, self-assertion in the West is conceptualized as an outcome of the self's independence. However, as discussed above, self-assertion for Arabs is likely to serve the social function of enhancing the cohesion and welfare of the in-group. We thus expected Arabs to exhibit self-assertion when their interdependence with their extended kinship group was primed. This would demonstrate that self-assertion for Arabs originates from interdependence.

In study 2, we conducted an experiment to test this hypothesis. We recruited 118 Moroccan undergraduates. Participants were randomly assigned to list either similarities with family and friends<sup>58</sup> ( $n=61$ ) or differences from family and friends ( $n=57$ ). We first submitted the measure of social (versus personal) correlates to an ANCOVA controlling for gender and age. There was a significant main effect of our experimental manipulation, such that participants in the similarities condition reported stronger social (versus personal) correlates of happiness than participants in the differences condition ( $F_{1,114}=5.20$ ,  $P=0.024$ ,  $\eta^2_p=0.04$ , 95% CI=0.048 to 0.68; see Table 3). This result demonstrates the success of our priming manipulation.

The same test performed on the index of socially disengaged/assertive (versus engaged/non-assertive) emotions indicated a significant main effect of our experimental manipulation. As predicted, disengaged/assertive (versus engaged/non-assertive) emotions were greater in the similarities condition than in the differences condition ( $F_{1,114}=7.16$ ,  $P=0.009$ ,  $\eta^2_p=0.06$ , 95% CI=-0.62 to -0.09; see Table 3). Overall, study 2 shows that Arabs become more self-assertive when primed with interdependence by similarity with kinship-group members.

Whereas study 2 focused on the effect of interdependence on self-assertive tendency by testing emotional experience, study 3 investigated an alternative index of self-assertion; that is, inflated self-representations. We expected that priming Arabs ( $n=74$ ) with their similarities to (versus differences from) kinship-group others would increase their symbolic self-inflation, and that this effect would be reversed for Americans ( $n=60$ ).

**Table 3 | Means and s.d. values for the indices of interdependence and self-assertion in study 2**

	Differences from group	Similarities with group
<b>Interdependence</b>		
Correlates of happiness	-0.01 <sup>a</sup> (0.84)	-0.42 <sup>b</sup> (0.86)
<b>Self-assertion</b>		
Disengaged (versus engaged) emotions	0.61 <sup>a</sup> (0.72)	0.96 <sup>b</sup> (0.68)

Means in the same row with different superscripts differ at  $P < 0.05$ . s.d. values are shown in parentheses.

A culture  $\times$  priming ANCOVA controlling for gender showed a significant interaction between the two factors ( $F_{1,129}=8.17$ ,  $P=0.005$ ,  $\eta^2_p=0.06$ , 95% CI=-9.79 to -1.78). As predicted, the relative self-size was significantly larger for Moroccans in the similarity priming condition than in the difference priming condition ( $F_{1,129}=4.17$ ,  $P=0.043$ ,  $\eta^2_p=0.03$ , 95% CI=0.04 to 2.72). In stark contrast, the relative self-size was significantly larger for Americans in the difference priming condition than in the similarity priming condition ( $F_{1,129}=4.04$ ,  $P=0.047$ ,  $\eta^2_p=0.03$ , 95% CI=0.02 to 3.00; see Table 4). There was no gender effect.

The results of our studies can be discussed in light of different theoretical implications and assumptions. First, the present work provides evidence that Arabs show a distinct psychological profile of self-assertive interdependence. This profile is unique compared with both Westerners (that is, European Americans and Western Europeans, as well as Ashkenazi Jews) and East Asians (that is, Japanese). On the one hand, unlike Westerners, Arabs are interdependent and holistic, just as strongly as Japanese. However, unlike Japanese, Arabs are also self-assertive, just as strongly as Westerners (study 1a,b). The apparent similarity between Arabs and Westerners on self-assertion conceals an important difference. Whereas for Westerners self-assertion is based on independence, for Arabs it is based on interdependence (studies 2 and 3). This psychological profile was observed equally for both Muslim and Christian Arabs, thus ruling out Islamic religion as an alternative explanation.

The Arab profile demonstrated in our studies is consistent with the notion of 'asabiyya' in Arab social theory, which means 'kinship spirit' (defined specifically vis-à-vis other groups and derived from the verb 'asab', meaning to tie together)<sup>26</sup>. Thus, in Arab identity, strong in-group orientation and commitment is defined in explicit contrast with outgroups. Assertion and achievement of the self (for example, expressions of self-esteem and pride regarding one's kin group) are viewed as instrumental for the group and thus valued and seen as honourable. This view of self-assertion in service of in-group welfare and protection is very different from an East Asian view of the assertion of the individual self as hindrance against in-group harmony<sup>24</sup>. In East Asia, as in other collectivistic societies including Arab culture, kinship ties are strong and seen as ubiquitous in social life, at least traditionally. However, in East Asia, this commitment is typically realized by conformity to in-group norms, and thus suppression of the personal self. Just as important, the Arab view of self-assertion as fundamentally prosocial is also different from the Western view of it as expression of personal self for the sake of realization of the independence of the self. The data reported here in studies 2 and 3 demonstrate this compelling cultural difference, hidden in plain sight within the apparent similarity.

One important strength of our work lies in the implicit measures we use to assess interdependence, holistic cognition and self-assertion. These measures are free from various artefacts linked to self-report scales (for example, response bias, acquiescence and demand characteristics). Moreover, they are closer to habits,

**Table 4 | Means and s.d. values for the index of self-assertion in study 3**

	USA		Morocco	
	Differences from group	Similarities to group	Differences from group	Similarities to group
<b>Self-assertion</b>				
Symbolic self-inflation	4.22 <sup>a</sup> (6.47)	1.11 <sup>b</sup> (8.00)	1.31 <sup>b</sup> (5.32)	4.07 <sup>a</sup> (4.19)

Means in the same row with different superscripts differ at  $P < 0.05$ . s.d. values are shown in parentheses.

customs and behaviours and, as such, probably more valid as indicators of acquired cultural tendencies<sup>14</sup>. At the same time, we acknowledge that precisely because of the implicit nature of these measures, their specific psychological meaning could be open to interpretation. This may especially be the case when any given task is taken in isolation, out of context and with no reference to other related tasks. We believe that this ambiguity may best be addressed through comparisons of multiple cultures with multiple tasks. The overarching pattern of the current set of studies in conjunction with the pattern observed in previous work<sup>14</sup> converges to support our key theoretical propositions. In particular, our data suggest a hitherto neglected form of interdependence that is also highly self-assertive in one broad Arab cultural group.

We formulated our work within a socioecological perspective of cultural variation<sup>19–23</sup>. For the current analysis, we traced the contemporary Arab psychological profile of self-assertive interdependence to the Bedouin ethos that is thought to have been shaped by a confluence of socioecological factors unique to the climates of the desert (for example, harsh ecology, sparse population, the necessity of exchange of tangible and movable or ‘portable’ goods, and the resulting absence of central authority that ensures security). This viewpoint is consistent with an early analysis by Nisbett and Cohen<sup>31</sup>, who hypothesized that the combination of the availability of portable wealth (for example, animals) and the absence of a centralized policing authority results in an honour ethic. One typical example of the condition for honour ethics is the herding culture imported by Celtic immigrants to the southern United States, resulting in a culture of honour that prevails in such areas to the present day. However, this logic can be extended to cover a wide variety of conditions that are functionally similar, including cultures of inner-city gangs, as well as outlaws or pirates, ‘boys club’ business networks, the knight’s code of chivalry in medieval Europe, and long-distance fishing and shipping business. Here, we suggest that the socioecological conditions that confronted Arabs in the desert during the formative years of Arab civilization incentivized the creation of similar cultural attributes.

The current ecological perspective can be extended to the recent theorizing that traces macroscopic cultural variation to the corresponding variation in ecology over a long time span<sup>19–23</sup>. For example, while the ecology of the ancient Bedouin ethos was shaped by the physical harshness of the desert on the Arabian Peninsula, the ecology of ancient China consisted of fertile plains, navigable rivers and low mountains. This rather different ecology in ancient China favoured large-scale agriculture that necessitated continuous coordination (particularly rice farming<sup>21</sup>), which, in turn, helped the emergence of a stable and hierarchized society and incentivized individuals to maintain cooperative, harmonious long-term relationships within large collectives<sup>31</sup>. Thus, the initial difference in ecological contexts might explain why Arabs exhibit a self-assertive form of interdependence, whereas Chinese exhibit a self-effacing form of interdependence.

Our socioecological perspective also implies that many cultural elements, including aspects of both interdependence (for example, social harmony as a basis for happiness for Arabs) and self-assertion (for example, inflated representations of the self for Arabs) were

incorporated into a cultural group, elaborated and conventionalized over many generations, as a form of adaptive responses to specific features of the socioecological environment. These elements exist in community practices, rituals, cultural texts, discourses and lay theories. They are shared, not uniformly or evenly for each individual, and yet at the same time exist widely and pervasively across the entire cultural region. There is no question that these cultural elements are in constant flux, undergoing various changes. However, these changes are not necessarily systematic, and as a consequence, they tend to stay more or less similar over time, as long as they provide enough utility for organizing daily life across generations. Thus, for example, the culture of honour in the American South, which was once derived from the Celtic herding culture, persisted over time and continues to do so today, even though herding is no longer the mainstay of life either among Southern Americans or Europeans of Celtic descent. Such ‘cultural inertia’ might indeed apply equally to all other cultural groups, including Arab culture.

Building on the hypothesis that to socialize in a cultural context is to ‘have access to’ various cultural components available in the social context, Kitayama et al.<sup>14</sup> have proposed that each individual acquires certain components of their culture in lieu of certain others and, by so doing, crafts their own idiosyncratic cultural identity. For example, Youssef may achieve his identity as an Arab by incorporating into himself the cultural element of interdependence, whereas Khalid may do so by incorporating into himself a different cultural element(s)—perhaps expressing self-assertive emotions. These two individuals are thus equally Arab in their cultural outlooks and, yet, the specific profiles vary between the two. Only when the two individuals are aggregated will a collective identity of Arabs who are both interdependent and self-assertive emerge. According to this view of culture as collectively constructed, various elements of culture are distributed across individuals. This distribution is idiosyncratic depending on numerous dispositional, situational and more macroscopic social structural variables, and for all practical purposes, it can be seen as random. This explains why the correlations among the different components of the cultural tasks that we used (study 1a,b) are very close to zero—a finding that has been repeatedly found in the current literature<sup>14,50</sup>.

Although we believe our work makes an important contribution, it also has several limitations. First, we used measures developed in previous research involving Westerners and East Asians. This leaves open the possibility that we might have missed out certain aspects of Arab culture that are not particularly salient in either the West or East Asia. Future work should make use of a more extensive, deeper understanding of Arab culture and history to address this issue.

Second, and relatedly, our studies demonstrate that the same psychological tendency (for example, self-assertion) might serve opposite cultural mandates (for example, interdependence for Arabs versus independence for Westerners; studies 2 and 3). Likewise, the same cultural mandate (for example, interdependence) might be achieved by enacting opposite psychological tendencies (for example, self-assertion for Arabs versus self-effacement for East Asians). Hence, there is a need to cautiously interpret the results of a single implicit measure within the whole set of implicit measures of cultural orientations and, even more critically, within the larger socioecological context.

Third, we anchored our theorizing on socioecological conditions faced by Bedouins in the Arabian Desert before the subsequent emergence of Islam and urban, Islamic civilizations, despite the fact that subsequent and modern Arabic societies have been highly varied in their ecologies (predominantly urban and farmlands<sup>3</sup>). Future work should test how these relatively contemporary ecological factors might interact with the more distal socioecological factors we focused on in the current work.

Fourth, and relatedly, future work should also address the issue of whether and how the self-assertive form of interdependence, identified here for Arabs, might be similar or different from cultures in similar parts of the world, such as the Mediterranean region, Iran and Turkey. It is currently unknown to what extent Arab culture may be prototypical of many cultures that originally evolved from a relatively harsh environment and developed a unique type of self-assertive interdependence that is not covered well in the present cultural psychology.

Fifth, while we focused on cognitive, emotional and motivational implicit psychological tendencies, future work with Arab populations may explore how these psychological tendencies are potentially related to various individual difference dimensions, including personality traits, self-esteem or perceptions of control.

In short, our work unveils important features of a cultural profile—self-assertive interdependence—that may help the behavioural science on culture go beyond the prevailing East versus West, interdependence versus independence paradigm.

## Methods

**Overview.** We conducted a two-part study (study 1a,b) to test our hypothesis that, for Arabs, a strong interdependent tendency (both social interdependence and holistic cognition) co-exists with a high degree of self-assertion. We also conducted two experiments (studies 2 and 3) to test that, for Arabs, self-assertion results from interdependence.

Sample sizes in study 1a,b were targeted to reach similar levels to those of Kitayama et al.<sup>14</sup>, in which Cohen's  $f$  across implicit measures varied between 0.24 and 0.43, with values of  $n$  ranging from 94 to 128 across countries. Given these effect sizes from extant research, an  $\alpha$  level of 0.05 and a  $\beta$  level of 0.20, we estimated that the required sample sizes should vary between 45 (for Cohen's  $f=0.43$ ) and 139 (for Cohen's  $f=0.24$ ) participants per country (G\*Power, version 3.1; ref. <sup>59</sup>). In studies 2 and 3, we estimated that the required sample sizes should reach 125 participants, given an expected effect size of Cohen's  $f=0.25$ ,  $\alpha$  level of 0.05 and  $\beta$  level of 0.20 (G\*Power, version 3.1; ref. <sup>59</sup>).

Research collaborators responsible for collecting and inputting data in studies 2 and 3 were blinded to both experimental conditions and hypotheses.

The assumptions of normality and/or homogeneity of variance were in some cases violated (see Supplementary Methods). Thus, we carried out non-parametric tests<sup>60,61</sup>, which yielded identical findings to the parametric ones (see Supplementary Methods). This applies to all studies reported in this paper. Therefore, these violations were not consequential to our substantive conclusions; the results were the same regardless of how the data were analysed. Because parametric tests have typically been reported in most extant studies using the same or similar methods, we have kept these analyses in the current paper.

**Study 1a participants and procedure.** A total of 261 undergraduates participated in this study: 128 undergraduates from Prince Sultan University, Riyadh, Saudi Arabia (64 men and 64 women; mean age = 19.87 years; s.d. = 2.13), 47 undergraduates from the American University of Beirut, Lebanon (17 men and 30 women; mean age = 18.96 years, s.d. = 1.25) and 139 undergraduates from the Ben-Gurion University of the Negev, Beer-Sheva, Israel (47 men and 92 women; mean age = 24.30 years, s.d. = 2.46). Consistent with our research objectives for this study, we considered participants of Ashkenazi Jew descent only, which reduced the Israeli sample to 86 undergraduates (33 men and 53 women; mean age = 24.76 years, s.d. = 1.80). Subjects were recruited at their universities. They were all nationals of their respective country. Israeli subjects received ILS 50 (around €10) for their participation. Other subjects completed the study as part of their coursework. Although Israeli participants were older on average than the rest, preliminary analyses showed no effect of age. There were no gender or gender  $\times$  culture effects either.

In Saudi Arabia and Lebanon, all materials and instructions were presented in English, which was the language of instruction for all courses, and in which all participants were fluent. The materials were administered in Hebrew in Israel. Hebrew-English bilinguals translated and back-translated the materials to ensure that all versions were comparable and equivalent in meaning. The university in

Saudi Arabia was gender specific, so one male experimenter supervised the study in the male classes, and one female experimenter supervised the female classes.

Participants completed a paper-and-pencil survey ostensibly on social relationships and cognitive styles. Whenever technically feasible, Israelis completed their tasks using desktop computers at the laboratory. The questionnaire packet consisted of the four tasks from Kitayama et al.<sup>14</sup>, which yielded the five measures of implicit psychological tendencies previously mentioned. All participants gave written informed consent. The study protocol was approved by the Research and Development Committee at INSEAD.

Interdependence was assessed with personal versus social correlates of happiness. We administered the implicit social orientation questionnaire (ISOQ)<sup>14</sup>, in which participants are asked to recall ten different mundane situations (for example, the last time they read a book) and report how much they had experienced a variety of emotions during each situation on a six-point rating scale (1 = not at all; 6 = very strongly). For each participant, we performed a series of computations. First, we calculated the average rating of positive general emotions (happiness, elation and calmness) in each situation. Next, for each situation, we calculated the average ratings of positive socially disengaged emotions (pride and self-esteem) and socially engaged emotions (friendly feelings and feelings of closeness to others). Therefore, for each participant, we had ten observations. We proceeded, in turn, to regress for each participant the average rating of general positive emotions on the average rating of positive socially disengaged emotions and the average rating of socially engaged emotions. Finally, we subtracted the standardized regression coefficient of socially disengaged emotions from that of socially engaged emotions, such that positive (versus negative) individual scores constitute an index of interdependence (versus independence). In computing this index, we followed the earlier, previously established protocol of Kitayama et al.<sup>14</sup>. Overall, this index taps into how much happiness is associated with social harmony rather than personal achievement.

Holistic (versus analytic) cognition was assessed with two indices. First, we administered the FLT<sup>14,54</sup>. Participants were shown a vertical line embedded in a square frame for 5 s, followed by a new frame that varied in size. Within the new frame, they were to reproduce a line that was identical to the first line either in absolute length (absolute judgement) or in proportion to the height of the surrounding square (relative judgement). This was repeated for six different line-square combinations in each type of judgement. Error size in reproduction in the absolute (versus relative) judgement indicates difficulty ignoring the surrounding square and, thus, constitutes a measure of holistic cognition.

Second, we administered a causal attribution task developed by Kitayama et al.<sup>14,62</sup> in which participants were presented with four social scenarios—two socially desirable (for example, a soccer player holding free training camps) and two socially undesirable (for example, a surgeon covering up a fatal mistake). Participants indicated for each scenario the degree to which the action was caused by dispositional factors (for example, personality trait and motivation) and the degree to which it was caused by situational factors (for example, norms and atmosphere of the situation). In all four questions, we used a seven-point rating scale (1 = strongly disagree; 7 = strongly agree). We subtracted the average situational attribution score from the average dispositional attribution score to yield a measure of holistic cognition (less pronounced dispositional judgement).

**Propensity to experience socially disengaged (versus engaged) emotions.** Using the ISOQ (described above), we computed the relative prominence of socially disengaged (for example, pride and anger) versus engaged emotions (for example, friendly feelings and guilt)<sup>14</sup> to capture the degree of self-assertiveness in emotional experience. For each of the ten situations that participants recalled, we used participants' relative intensity of experienced general positive emotion (happiness, elation and calmness) and general negative emotion (unhappiness) to determine their valence as perceived by each participant. For situations seen as positive, we subtracted the average intensity of experienced positive socially engaged (that is, non-assertive) emotions from the average intensity of experienced positive socially disengaged (that is, assertive) emotions. For situations seen as negative, we obtained the corresponding difference by subtracting the average intensity of experienced negative engaged (that is, non-assertive) emotions from the average intensity of experienced negative disengaged (that is, assertive) emotions. Across the ten situations, we averaged the disengaged/assertive (versus engaged/non-assertive) emotion scores to yield a summary measure of self-assertion.

**Symbolic self-inflation.** We used symbolic self-inflation<sup>14,56</sup> as another way to measure self-assertion. Participants drew their social network using circles to designate people in the network (including the self) and then connecting the circles. The size of the self-circle (measured in mm) minus the average size of all the other circles constitutes a measure of self-assertion. Cultural difference exists primarily in the self-size, not in other elements in the sociogram, such as distance between the self-circle and other circles<sup>14,56</sup>.

We administered the four tasks in a fixed order (FLT  $\rightarrow$  social network  $\rightarrow$  causal attribution task  $\rightarrow$  ISOQ) in all study sites. In addition, we used the raw data from the Kitayama et al.<sup>14</sup> study—which used an identical set of measures—to obtain scores for Americans ( $n=94$ ), British ( $n=95$ ), Germans ( $n=128$ ) and

Japanese ( $n = 122$ ). Kitayama et al.<sup>14</sup> used comparable samples of college students in these countries.

**Study 1b participants and procedure.** A total of 127 Arab undergraduates from the American University of Beirut, Lebanon (61 men and 66 women; mean age = 19.43 years,  $s.d. = 1.06$ ) completed this study as part of their coursework. Some 72 participants were Muslims. The remaining 55 were non-Muslims, 36 of which were Christians. Participants completed an identical paper-and-pencil survey to that in study 1a, from which we then derived the same set of implicit measures of psychological tendencies<sup>14</sup>. The Research and Development Committee at INSEAD approved the study protocol. All participants gave written informed consent. Preliminary analyses indicated no effects of either gender or age.

**Study 2 participants and procedure.** A total of 118 Arab undergraduates at the Institute of Advanced Management Studies (HEM) in Casablanca, Morocco (69 females; mean age = 21.24) participated in this study for course credit. Participants were randomly assigned to list either similarities with family and friends<sup>38</sup> or differences from family and friends. This priming task has been shown to reliably manipulate interdependence (similarities) and independence (differences)<sup>63</sup>. There were 61 participants in the similarities condition and 57 participants in the differences condition. After working on this task for 10 min, participants were administered a modified version of the ISOQ<sup>14</sup>. Specifically, we used the same items in the ISOQ as in the previous studies, but adapted the verbal framing of the task to our experimental purpose. Instead of recalling the last time they had encountered a number of mundane situations, participants were asked to imagine how they would experience those situations and then report how much they would experience the emotions listed in the ISOQ in each imagined situation. In short, we changed the verbal tense of the ISOQ from the past to the conditional. Then, we derived the measures of socially disengaged (that is, assertive) as opposed to engaged (that is, non-assertive) emotions and social (versus personal) correlates of happiness as in study 1a,b. The Ethics Committee at HEM approved the study protocol. All participants gave written informed consent. Preliminary analyses indicated no effects of gender or age.

**Study 3 participants and procedure.** A total of 74 Arabs (undergraduates at HEM in Casablanca, Morocco; 40 females; mean age = 19.23) participated in the study. For the sake of direct comparison, we also enrolled 60 Caucasian Americans (undergraduates in Psychology from the University of Michigan, USA; 27 women; mean age = 18.62). As in study 2, participants were asked to list either similarities with or differences from family and friends<sup>38,63</sup>. They worked on this experimental priming task for 10 min. Participants were randomly assigned to experimental conditions. There were 38 Moroccans and 29 Americans in the similarities condition, and 36 Moroccans and 31 Americans in the differences condition. After the priming manipulation, participants completed the same symbolic self-inflation task as in study 1a,b. The Research and Development Committee at INSEAD and the Ethics Committee at HEM University approved the study protocols. All participants gave written informed consent.

**Reporting Summary.** Further information on research design is available in the Nature Research Reporting Summary linked to this article.

## Data availability

All datasets are available through the following links: study 1a,b, <https://www.dropbox.com/s/o9wclzjyvicp2ug/Study%201ab.sav?dl=0>; study 2, <https://www.dropbox.com/s/9m260jqyaa0mti6/Study%202.sav?dl=0>; study 3, <https://www.dropbox.com/s/guk2pbnz99pmy4b/study%203.sav?dl=0>.

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### Author contributions

A.S.M., M.S., W.W.M. and S.K. designed the research. A.S.M., A.M. and S.T. collected the data. A.S.M. and S.T. analysed the data. A.S.M., M.S., W.W.M. and S.K. wrote the paper.

### Competing interests

The authors declare no competing interests.

### Additional information

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*Give  $P$  values as exact values whenever suitable.*
- For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
- For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
- Estimates of effect sizes (e.g. Cohen's  $d$ , Pearson's  $r$ ), indicating how they were calculated
- Clearly defined error bars  
*State explicitly what error bars represent (e.g. SD, SE, CI)*

Our web collection on [statistics for biologists](#) may be useful.

### Software and code

Policy information about [availability of computer code](#)

Data collection

Qualtrics

Data analysis

SPSS v. 23, G\*Power 3.151

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors/reviewers upon request. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research [guidelines for submitting code & software](#) for further information.

### Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A list of figures that have associated raw data
- A description of any restrictions on data availability

All datasets are available through these links:

- Studies 1 and b (<https://www.dropbox.com/s/o9wclzjyvicp2ug/Study%201ab.sav?dl=0>)

- Study 2 (<https://www.dropbox.com/s/9m260jqyaa0mti6/Study%202.sav?dl=0>)  
 - Study 3 (<https://www.dropbox.com/s/guk2pbnz99pmy4b/study%203.sav?dl=0>)

## Field-specific reporting

Please select the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

Life sciences  Behavioural & social sciences  Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see [nature.com/authors/policies/ReportingSummary-flat.pdf](https://www.nature.com/authors/policies/ReportingSummary-flat.pdf)

## Life sciences study design

All studies must disclose on these points even when the disclosure is negative.

Sample size	Samples sizes in Studies 1a and 1b were targeted to reach similar levels to those of Kitayama et al (2009), in which Cohen's $f$ across implicit measures varied between .24 and .43, with $N$ s ranging from 94 to 125 across countries. Given these effect sizes from extant research, $\alpha$ -level of .05, and $\beta$ -level of .20, we estimated that the required sample sizes should vary between 45 (for a Cohen's $f = .43$ ) and 139 (for a Cohen's $f = .24$ ) participants per country. In Studies 2 and 3, we estimated that the required sample sizes should reach 125 participants, given an expected effect size of Cohen's $f = .25$ , $\alpha$ -level of .05, and $\beta$ -level of .20. At the end, these were the sample sizes: Study 1a: $N = 261$ , Study 1b: $N = 127$ , Study 2: $N = 118$ ; Study 3: $N = 134$ .
Data exclusions	In Study 1a, we collected data from 139 Israeli undergraduates. Consistent with our research objectives for this study, however, we considered participants of Ashkenazi Jew descent only, which reduced the Israeli sample to 86 undergraduates.
Replication	In Studies 1a and 1b, we closely followed the previously established protocol of Kitayama et al. (2009).
Randomization	We randomly assigned participants to experimental conditions in Studies 2 and 3.
Blinding	Experimenters in Studies 2 and 3 were blinded to both experimental conditions and hypotheses.

## Behavioural & social sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	We predicted that Arabs demonstrate a self-assertive form of interdependence. To test this prediction, we administered previously validated implicit measures of interdependence and self-assertion to participants in Arab countries. We then compared these samples with the ones published in Kitayama et al (2009). Finally, we conducted two experiments to show that self-assertion for Arabs derives from interdependence, not independence.
Research sample	To match our samples with those of Kitayama et al (2009), we targeted undergraduate students. Participants were nationals of their respective countries (Saudi Arabia, Morocco, Lebanon, the US, and Israel). Mean age = 20.76 years. 55% female
Sampling strategy	In all countries, we used random sampling procedures. Samples sizes in Studies 1a and 1b were targeted to reach similar levels to those of Kitayama et al (2009), in which Cohen's $f$ across implicit measures varied between .24 and .43, with $N$ s ranging from 94 to 125 across countries. Given these effect sizes from extant research, $\alpha$ -level of .05, and $\beta$ -level of .20, we estimated that the required sample sizes should vary between 45 (for a Cohen's $f = .43$ ) and 139 (for a Cohen's $f = .24$ ) participants per country. In Studies 2 and 3, we estimated that the required sample sizes should reach 125 participants, given an expected effect size of Cohen's $f = .25$ , $\alpha$ -level of .05, and $\beta$ -level of .20.
Data collection	Studies were administered in paper and pencil in all countries except Israel (i.e., Morocco, Lebanon, Saudi Arabia, the US). In Israel, participants completed the Framed-Line Test and sociogram in paper and pencil, but then completed the other measures using Quattrics software. Research collaborators responsible for collecting and inputting data in Studies 2 and 3 were blinded to both experimental conditions and hypotheses.
Timing	Data in Saudi Arabia were collected in 2010; in Lebanon, in 2012 (Study 1a) and 2017 (Study 1b); in Morocco, in 2012 (Study 3) and 2017 (Study 2); in Israel, in 2011; in the US, in 2012 (Study 3). There was no effect of data collection date on any of our measures.
Data exclusions	In Study 1a, we collected data from 139 Israeli undergraduates. Consistent with our research objectives for this study, however, we considered participants of Ashkenazi Jew descent only, which reduced the Israeli sample to 86 undergraduates.
Non-participation	No participants declined participation
Randomization	Participants in Studies 2 and 3 were randomly assigned to experimental conditions. Experimenters were blind to both experimental conditions and hypotheses.

# Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	Briefly describe the study. For quantitative data include treatment factors and interactions, design structure (e.g. factorial, nested, hierarchical), nature and number of experimental units and replicates.
Research sample	Describe the research sample (e.g. a group of tagged <i>Passer domesticus</i> , all <i>Stenocereus thurberi</i> within Organ Pipe Cactus National Monument), and provide a rationale for the sample choice. When relevant, describe the organism taxa, source, sex, age range and any manipulations. State what population the sample is meant to represent when applicable. For studies involving existing datasets, describe the data and its source.
Sampling strategy	Note the sampling procedure. Describe the statistical methods that were used to predetermine sample size OR if no sample-size calculation was performed, describe how sample sizes were chosen and provide a rationale for why these sample sizes are sufficient.
Data collection	Describe the data collection procedure, including who recorded the data and how.
Timing and spatial scale	Indicate the start and stop dates of data collection, noting the frequency and periodicity of sampling and providing a rationale for these choices. If there is a gap between collection periods, state the dates for each sample cohort. Specify the spatial scale from which the data are taken
Data exclusions	If no data were excluded from the analyses, state so OR if data were excluded, describe the exclusions and the rationale behind them, indicating whether exclusion criteria were pre-established.
Reproducibility	Describe the measures taken to verify the reproducibility of experimental findings. For each experiment, note whether any attempts to repeat the experiment failed OR state that all attempts to repeat the experiment were successful.
Randomization	Describe how samples/organisms/participants were allocated into groups. If allocation was not random, describe how covariates were controlled. If this is not relevant to your study, explain why.
Blinding	Describe the extent of blinding used during data acquisition and analysis. If blinding was not possible, describe why OR explain why blinding was not relevant to your study.
Did the study involve field work?	<input type="checkbox"/> Yes <input type="checkbox"/> No

## Field work, collection and transport

Field conditions	Describe the study conditions for field work, providing relevant parameters (e.g. temperature, rainfall).
Location	State the location of the sampling or experiment, providing relevant parameters (e.g. latitude and longitude, elevation, water depth).
Access and import/export	Describe the efforts you have made to access habitats and to collect and import/export your samples in a responsible manner and in compliance with local, national and international laws, noting any permits that were obtained (give the name of the issuing authority, the date of issue, and any identifying information).
Disturbance	Describe any disturbance caused by the study and how it was minimized.

## Reporting for specific materials, systems and methods

### Materials & experimental systems

n/a	Included in the study
<input type="checkbox"/>	<input type="checkbox"/> Unique biological materials
<input type="checkbox"/>	<input type="checkbox"/> Antibodies
<input type="checkbox"/>	<input type="checkbox"/> Eukaryotic cell lines
<input type="checkbox"/>	<input type="checkbox"/> Palaeontology
<input type="checkbox"/>	<input type="checkbox"/> Animals and other organisms
<input type="checkbox"/>	<input checked="" type="checkbox"/> Human research participants

### Methods

n/a	Included in the study
<input checked="" type="checkbox"/>	<input type="checkbox"/> ChIP-seq
<input type="checkbox"/>	<input type="checkbox"/> Flow cytometry
<input type="checkbox"/>	<input type="checkbox"/> MRI-based neuroimaging

## Unique biological materials

Policy information about [availability of materials](#)

Obtaining unique materials *Describe any restrictions on the availability of unique materials OR confirm that all unique materials used are readily available from the authors or from standard commercial sources (and specify these sources).*

## Antibodies

Antibodies used *Describe all antibodies used in the study; as applicable, provide supplier name, catalog number, clone name, and lot number.*

Validation *Describe the validation of each primary antibody for the species and application, noting any validation statements on the manufacturer's website, relevant citations, antibody profiles in online databases, or data provided in the manuscript.*

## Eukaryotic cell lines

Policy information about [cell lines](#)

Cell line source(s) *State the source of each cell line used.*

Authentication *Describe the authentication procedures for each cell line used OR declare that none of the cell lines used were authenticated.*

Mycoplasma contamination *Confirm that all cell lines tested negative for mycoplasma contamination OR describe the results of the testing for mycoplasma contamination OR declare that the cell lines were not tested for mycoplasma contamination.*

Commonly misidentified lines (See [ICLAC](#) register) *Name any commonly misidentified cell lines used in the study and provide a rationale for their use.*

## Palaeontology

Specimen provenance *Provide provenance information for specimens and describe permits that were obtained for the work (including the name of the issuing authority, the date of issue, and any identifying information).*

Specimen deposition *Indicate where the specimens have been deposited to permit free access by other researchers.*

Dating methods *If new dates are provided, describe how they were obtained (e.g. collection, storage, sample pretreatment and measurement), where they were obtained (i.e. lab name), the calibration program and the protocol for quality assurance OR state that no new dates are provided.*

Tick this box to confirm that the raw and calibrated dates are available in the paper or in Supplementary Information.

## Animals and other organisms

Policy information about [studies involving animals](#); [ARRIVE guidelines](#) recommended for reporting animal research

Laboratory animals *For laboratory animals, report species, strain, sex and age OR state that the study did not involve laboratory animals.*

Wild animals *Provide details on animals observed in or captured in the field; report species, sex and age where possible. Describe how animals were caught and transported and what happened to captive animals after the study (if killed, explain why and describe method; if released, say where and when) OR state that the study did not involve wild animals.*

Field-collected samples *For laboratory work with field-collected samples, describe all relevant parameters such as housing, maintenance, temperature, photoperiod and end-of-experiment protocol OR state that the study did not involve samples collected from the field.*

## Human research participants

Policy information about [studies involving human research participants](#)

Population characteristics *See above*

Recruitment *Participants were recruited directly at their universities*

## ChIP-seq

### Data deposition

- Confirm that both raw and final processed data have been deposited in a public database such as [GEO](#).
- Confirm that you have deposited or provided access to graph files (e.g. BED files) for the called peaks.

#### Data access links

May remain private before publication.

For "Initial submission" or "Revised version" documents, provide reviewer access links. For your "Final submission" document, provide a link to the deposited data.

#### Files in database submission

Provide a list of all files available in the database submission.

#### Genome browser session

(e.g. [UCSC](#))

Provide a link to an anonymized genome browser session for "Initial submission" and "Revised version" documents only, to enable peer review. Write "no longer applicable" for "Final submission" documents.

### Methodology

#### Replicates

Describe the experimental replicates, specifying number, type and replicate agreement.

#### Sequencing depth

Describe the sequencing depth for each experiment, providing the total number of reads, uniquely mapped reads, length of reads and whether they were paired- or single-end.

#### Antibodies

Describe the antibodies used for the ChIP-seq experiments; as applicable, provide supplier name, catalog number, clone name, and lot number.

#### Peak calling parameters

Specify the command line program and parameters used for read mapping and peak calling, including the ChIP, control and index files used.

#### Data quality

Describe the methods used to ensure data quality in full detail, including how many peaks are at FDR 5% and above 5-fold enrichment.

#### Software

Describe the software used to collect and analyze the ChIP-seq data. For custom code that has been deposited into a community repository, provide accession details.

## Flow Cytometry

### Plots

Confirm that:

- The axis labels state the marker and fluorochrome used (e.g. CD4-FITC).
- The axis scales are clearly visible. Include numbers along axes only for bottom left plot of group (a 'group' is an analysis of identical markers).
- All plots are contour plots with outliers or pseudocolor plots.
- A numerical value for number of cells or percentage (with statistics) is provided.

### Methodology

#### Sample preparation

Describe the sample preparation, detailing the biological source of the cells and any tissue processing steps used.

#### Instrument

Identify the instrument used for data collection, specifying make and model number.

#### Software

Describe the software used to collect and analyze the flow cytometry data. For custom code that has been deposited into a community repository, provide accession details.

#### Cell population abundance

Describe the abundance of the relevant cell populations within post-sort fractions, providing details on the purity of the samples and how it was determined.

#### Gating strategy

Describe the gating strategy used for all relevant experiments, specifying the preliminary FSC/SSC gates of the starting cell population, indicating where boundaries between "positive" and "negative" staining cell populations are defined.

- Tick this box to confirm that a figure exemplifying the gating strategy is provided in the Supplementary Information.

## Magnetic resonance imaging

### Experimental design

#### Design type

Indicate task or resting state; event-related or block design.

Design specifications *Specify the number of blocks, trials or experimental units per session and/or subject, and specify the length of each trial or block (if trials are blocked) and interval between trials.*

Behavioral performance measures *State number and/or type of variables recorded (e.g. correct button press, response time) and what statistics were used to establish that the subjects were performing the task as expected (e.g. mean, range, and/or standard deviation across subjects).*

## Acquisition

Imaging type(s) *Specify: functional, structural, diffusion, perfusion.*

Field strength *Specify in Tesla*

Sequence & imaging parameters *Specify the pulse sequence type (gradient echo, spin echo, etc.), imaging type (EPI, spiral, etc.), field of view, matrix size, slice thickness, orientation and TE/TR/flip angle.*

Area of acquisition *State whether a whole brain scan was used OR define the area of acquisition, describing how the region was determined.*

Diffusion MRI  Used  Not used

## Preprocessing

Preprocessing software *Provide detail on software version and revision number and on specific parameters (model/functions, brain extraction, segmentation, smoothing kernel size, etc.).*

Normalization *If data were normalized/standardized, describe the approach(es): specify linear or non-linear and define image types used for transformation OR indicate that data were not normalized and explain rationale for lack of normalization.*

Normalization template *Describe the template used for normalization/transformation, specifying subject space or group standardized space (e.g. original Talairach, MNI305, ICBM152) OR indicate that the data were not normalized.*

Noise and artifact removal *Describe your procedure(s) for artifact and structured noise removal, specifying motion parameters, tissue signals and physiological signals (heart rate, respiration).*

Volume censoring *Define your software and/or method and criteria for volume censoring, and state the extent of such censoring.*

## Statistical modeling & inference

Model type and settings *Specify type (mass univariate, multivariate, RSA, predictive, etc.) and describe essential details of the model at the first and second levels (e.g. fixed, random or mixed effects; drift or auto-correlation).*

Effect(s) tested *Define precise effect in terms of the task or stimulus conditions instead of psychological concepts and indicate whether ANOVA or factorial designs were used.*

Specify type of analysis:  Whole brain  ROI-based  Both

Statistic type for inference (See [Eklund et al. 2016](#)) *Specify voxel-wise or cluster-wise and report all relevant parameters for cluster-wise methods.*

Correction *Describe the type of correction and how it is obtained for multiple comparisons (e.g. FWE, FDR, permutation or Monte Carlo).*

## Models & analysis

n/a | Involved in the study

Functional and/or effective connectivity

Graph analysis

Multivariate modeling or predictive analysis

Functional and/or effective connectivity *Report the measures of dependence used and the model details (e.g. Pearson correlation, partial correlation, mutual information).*

Graph analysis *Report the dependent variable and connectivity measure, specifying weighted graph or binarized graph, subject- or group-level, and the global and/or node summaries used (e.g. clustering coefficient, efficiency, etc.).*

Multivariate modeling and predictive analysis *Specify independent variables, features extraction and dimension reduction, model, training and evaluation metrics.*