Cultural fluency means all is okay, cultural disfluency implies otherwise☆,☆☆

Ying Lin[a], Sharon Arieli[b], Daphna Oyserman[a,*]

[a] *University of Southern California, United States of America*
[b] *The Hebrew University of Jerusalem, Israel*

A B S T R A C T

Being part of a culture means knowing what to expect in most everyday situations –with the implication that something may be awry if unfolding situation mismatches culture-based expectation. We tested the prediction that culture-based mismatches challenge people's sense that current patterns (e.g. the color of money, the taste of toothpaste) represent a natural order, calling into question whether social categories have stable essences. To do so, we asked people in China, Israel, and the U.S. (*N* = 1803) to rate products (e.g., breakfast plates, wedding photographs, Valentines) then complete unrelated scales, randomly assigning them to products that matched or mismatched their respective cultural expectations. Exposure to mismatch reduced psychological inherence –the feeling that existing patterns in the world reflect how things *ought to* be in unrelated domains and this reduced cultural essentializing (the feeling that cultures have fixed essences that *cannot* change). Effects were small-to-moderate-sized and consistent across countries.

Culture is the set of practices that people in a time and place come to accept (Chiu et al., 2015; Oyserman, 2017; Shteynberg, 2015; Triandis, 2007). Though cultures are not fixed and do change over time, within each point in time, being part of a culture provides a culture-specific vantage point or meaning-making organizing lens. People who are part of a culture know what to expect, what "we" do and how "we" do it, and for two reasons, mostly experience situations that seem to match these expectations. First, they have expertise about their culture in that time and place. Second, like other people, they have a tendency to see what they expect to see (variously termed confirmation bias, Wason, 1960; self-fulfilling prophecies; Merton, 1948; Snyder, 1984; stereotype confirmation, Hamilton & Trolier, 1986). Yet, people do sometimes experience violation of their culture-based expectations and in this paper we examine the downstream psychological consequences of these experiences for people's basic sense of the world as an orderly place, a place in which the way things are is the way they ought to be. We build on culture-as-situated-cognition theory (Oyserman, 2015, 2017) to make two original predictions. First, when people experience a mismatch between what their cultural expertise leads them to expect and what they actually observe, they experience a loss of what Cimpian (2015) describes as psychological inherence –the sense that the way currently things are is the way they should be. Second, as a result of this loss of inherence, people are less likely to essentialize social categories (Gelman, 1999) –to experience cultures and themselves as having fixed essences. Fig. 1 presents our theoretical process model. As we describe

below, we also explore a number of potential individual differences that might moderate this process.

1. Culture-as-situated-cognition

Culture-as-situated-cognition theory starts with the idea that people have available in memory an array of culturally rooted associative knowledge networks (Oyserman, 2011; Oyserman & Yan, 2018). These culturally rooted associative knowledge networks include content, procedures, and goals related to everyday life (e.g., what breakfast entails, what playing cards look like) and to overarching cultural themes (e.g., individualism, collectivism, and honor). As they go about their day, people use that subset of their available culturally-rooted associative knowledge networks that are accessible to them at the moment of judgment to make automatic, often tacit, predictions about what will happen next (Oyserman, 2017). Because predictions are tacit and automatic, people may not notice that they are making predictions at all and instead simply experiences the cognitive and psychological consequences of match and mismatch between prediction and observation (Oyserman & Yan, 2018). Matches yield the sense that all is fine, that one can 'go with the flow' and navigate one's everyday lives intuitively with minimal cognitive resources; mismatches yield the opposite sense that something might be awry, shifting people to deliberative, systematic, rule-based reasoning strategies. Indeed, culture-as-situated-cognition theory predicts that when culture-based
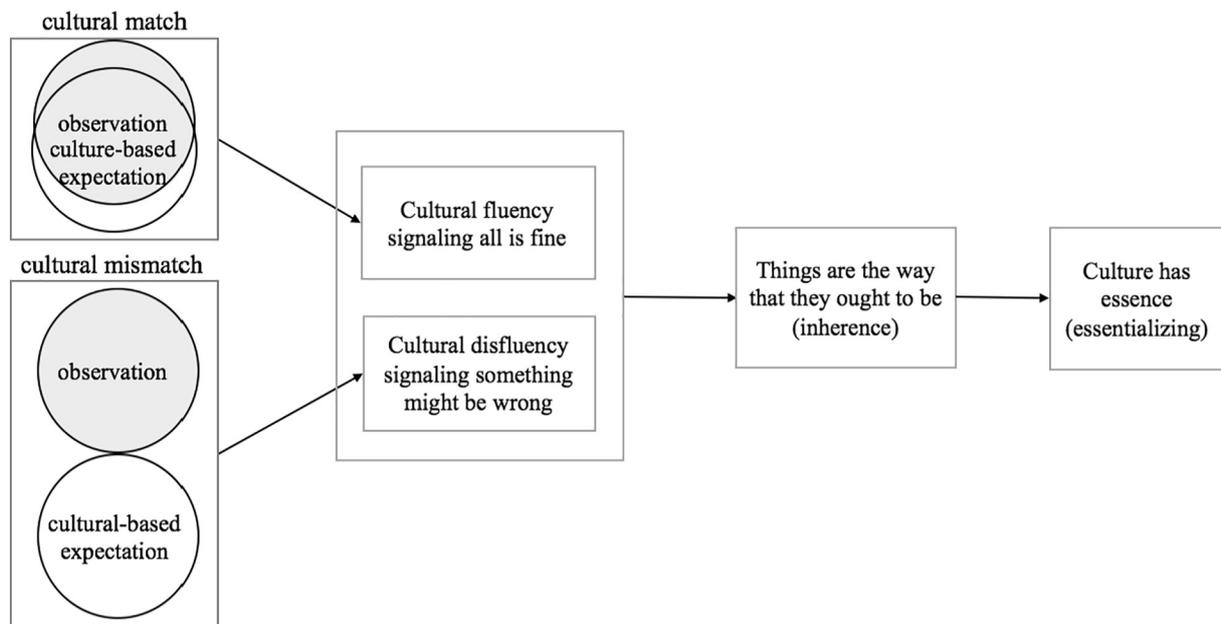

Fig. 1. Cultural fluency and disfluency theoretical process model: How match and mismatch between culture-based expectation and observation affects experienced inherence and, via inherence, essentializing.

predictions seem to match observation, thinking feels easy (fluent), in contrast, when culture-based predictions seem to mismatch observation, thinking feels difficult (disfluent). The terms *cultural fluency* and *cultural disfluency* were coined to capture these effects of cultural knowledge on people's experience and its downstream consequences (for extended reviews, Oyserman & Yan, 2018; Oyserman, 2011).

An early example documenting that culture-based predictions affect processing fluency comes from Bruner and Postman (1949). These researchers exposed American college students to cards with diamonds or hearts and assessed how long it took these students to correctly identify the image they were shown. The cards were playing cards, though students were not told so. The researchers modified some cards so that they mismatched with culture-based expectations as to what playing cards look like and divided students into four groups with each group differing in the cards they were exposed to. One group only saw cards that matched culture-based expectation about the link between shape (heart, diamond) and color (red, black) – so hearts and diamonds were red. A second group saw only cards that mismatched culture-based expectations about the link between shape and color – so hearts were black. The third and fourth groups saw different proportions of cards with color and shape combinations that matched and mismatched culture-based expectations – so sometimes hearts were red and other times hearts were black. The effect was clear; students took longer to correctly identify shapes that mismatched culture-based expectations of color and shape combinations for playing cards. Lag in response was especially pronounced in two situations: on first trials if that first card was a mismatch to culture-based expectation, and on the first mismatch to culture-based expectation after a run of matches to culture-based expectation.

Though not labeled a study of cultural fluency and disfluency by the original authors, this study does illuminate the basic idea that matches to cultural expectation make things easier (in this case, faster) to process and that mismatches carry signal value as well. Note that we consider the card study effects to be culture-based because the effect was not due to the ease of processing a particular shape or color – it is not that a specific shape was always easier to identify or that a particular color always made a shape easier to process. Rather, it is that participants came into the experiment with culture-based knowledge of how playing cards "ought" to look and applied this knowledge automatically to the situation. They did so even though the experimenters never labeled the cards as playing cards and never told them that the cards were supposed to match their knowledge of playing cards to the situation. Time lag effects were largest at the first instance of mismatch (first card, first after many matches) and diminished as participants came to see that their automatically recruited "playing cards" cultural knowledge might not be pragmatically relevant to the task at hand. Culture, of course, is dynamic, and that experiment will only replicate among current American college students if playing cards are as common a pursuit now as it seems to have been when the experiment was originally conducted in the 1940s.

As this example highlights, when something is *culturally fluent* or *culturally disfluent*, the source of fluency and disfluency is not a feature of the target of judgment (e.g., the diamond) alone or a general feature of the situation (e.g., the playing card, the lighting of the room, the color contrast between the shape and the card background). Rather, it is the result of the match or the mismatch between the target and culture-based expectation about the target. In the cultural context of "playing cards" diamonds are supposed to be red, not black. The experience of cultural fluency and disfluency is based in cultural knowledge, applied to situations in which it seems relevant. Cultural knowledge sets up implicit expectations, which if met, make processing easier, and if violated, make processing more difficult. Hence cultural fluency and cultural disfluency require that cultural expectations are triggered and experienced as relevant, otherwise culture-based predictions do not apply.

Cultural fluency and disfluency cues can come from central or peripheral features of cultural knowledge. Central features have meaning on their own while the meaning of peripheral features is more dependent on features of the context. Evidence for the downstream cognitive consequences of cultural fluency and disfluency cues comes from seven experiments in the U.S. and Hong Kong (Mourey, Lam, & Oyserman, 2015). In these experiments, the researchers randomly assigned participants to one of two groups, showing each group cultural products including wedding photographs, obituaries, and patterned plates. One group saw a version of the product that likely matched cultural expectations while the other group saw a version that likely mismatched cultural expectations. The downstream effect of engaging with products that matched or mismatched with likely culture-based expectation was tested in two ways: by assessing consumption in appetitive contexts–willingness to buy or the actual amount of food put on

plates, or by assessing systematic reasoning on a formal reasoning task.

For example, to test effects in appetitive contexts, Mourey et al. (2015) assessed willingness to buy an unrelated object (a shovel) after viewing wedding photographs in one study and the amount of food people put on their plates at holiday events in other studies. The wedding photographs (e.g., bride in white, groom in black vs. bride and groom in different colors) and match or mismatch between the holiday and the plate design served as cultural fluency and disfluency cues. Americans were more willing to buy a shovel after seeing the culturally fluent rather than the culturally disfluent weddings. Americans put more food on their plates at 4th of July and Memorial Day picnics if plates matched their culture-based expectation of a patriotic theme (stairs and stripes)–compared to plates that mismatched culture-based expectation and had a neutral (white only) or irrelevant theme (bats and pumpkins). Similarly, Hong Kong Chinese participants put more food on their plates at a Chinese New Year buffet if plate border color matched a peripheral cue, red, the color of Chinese New Year compared to when it mismatched that cue (black border).

To document that these effects were due to cultural fluency rather than to features of the product (e.g., maybe the color red is an appetite stimulant), the researchers designed follow-ups that capitalized on the fact that in the Chinese New Year study, the cue was peripheral and so dependent on other cues (e.g. time of year). In the first follow-up, red-bordered plate had no effect on how much food Chinese participants put on their plates a month after Chinese New Year when knowledge about Chinese New Year was no longer relevant. In the second follow-up, the researchers documented that cultural fluency effects require cultural knowledge by using a sample of Americans. In this sample, the red-bordered plate had no effect on the amount of food participants put on their plates because they had no cultural expertise about Chinese New Year (they were asked but could not identify when Chinese New Year occurs or what is done to celebrate it). These results reinforce a cultural fluency and disfluency interpretation of the picnic and buffet findings. That is, cultural fluency requires cultural knowledge and effects were due to cultural fluency (the match between automatic culture-based expectation about the holiday and designs) rather than to something about the design itself.

To test effects of cultural fluency and disfluency on gut-based versus rule-based reasoning style, the researchers used Valentine's Day and a peripheral cue, a Valentine's color, pink (Study 6), as well as central cues regarding weddings and funerals as detailed below. They tested participant responses during and a week after Valentine's Day, choosing participants from the U.S. and Hong Kong (both countries celebrate Valentine's Day in a similar way and on the same day). Participants completed a test of spontaneous rule-based (systematic) reasoning. They were randomly assigned to either take the test on a screen with a pink border or to take the test on a screen with no border or a black-and-white border. One group of participants completed the test on Valentine's Day; the other half completed the test a week later. Participants in the culturally fluent (pink border on Valentine's Day) condition were more likely to use gut-based reasoning than participants in the other conditions. Pink is a peripheral cue to Valentine's Day, effective on Valentine's Day; a week after Valentine's Day, it is just a color, neither culturally fluent nor culturally disfluent. The effect of cultural fluency and disfluency on reasoning style is quite stable; the researchers replicated the effect with central cultural cues using photographs of wedding and texts from obituaries. In the wedding studies, participants rated the quality of wedding photographs that were either of culturally fluent weddings (groom in black and a bride in white) or of culturally disfluent weddings (groom in purple, bride in green). In the funeral studies, participants were exposed to the texts of either culturally fluent obituaries (sadness, loss of a loved one, extol virtues) or culturally disfluent obituaries (no virtues, no sadness, not loved). Participants randomly assigned to the culturally fluent condition scored worse on the systematic reasoning task than participants exposed to culturally fluent condition.

The researchers tested the possibility that cultural fluency and disfluency effects are explained by positive and negative affect. They did not find that exposure to culturally fluent products was associated with positive affect or that exposure to culturally disfluent products was associated with negative affect. They also tested the possibility that cultural fluency and disfluency effects are driven by product quality, attractiveness, and traditionality ratings but again failed to find any mediation or moderation. The implication is that cultural fluency and disfluency are basic cues, informative of whether one can 'go with the flow' consume what is available, reason with one's gut or if caution and systematic reasoning in necessary.

1.1. Cultural fluency and disfluency may affect inherence, which underlies psychological essentialism and categorical reasoning

Prior studies are important, showing that cultural fluency affects processing speed, appetitive consumption, and cognitive processing style and that results cannot be explained as mood effects or as consequences of fluency effects on product quality and attractiveness ratings. However, prior research and theorizing do not address how cultural fluency and disfluency might shape worldview at a more basic level –by influencing one's sense that existing patterns in the world are ideal. This feeling that current patterns are the natural order; the way things *ought to be* is termed *psychological inherence* (Cimpian, 2015). It is an important cognitive precursor of category learning via its connection to psychological essentialism, the belief that categories are stable, inevitable, and immutable (Salomon & Cimpian, 2014).

People who score higher in inherence are more likely to essentialize the world around them (Salomon & Cimpian, 2014). Essentialist reasoning emerges at an early age, and is universal, sticky, and consequential. That is, children infer value from unseen essences and adult reasoning retains these patterns (Gelman & Echelbarger, 2019). They do so in part because essentialist reasoning facilitates efficient learning and category-based prediction by implying that categories are not haphazard but natural and include essences not visible to the naked eye (Gelman, 2003; Gelman & Diesendruck, 1999; Medin & Ortony, 1989; Rhodes, 2013). Essentialist reasoning about the self allows people to use self-knowledge to make predictions about future preferences (Oyserman, 2019). However, essentialist reasoning also has negative consequences. It is associated with acceptance of stereotypes (Bastian & Haslam, 2006) and race-based inequalities (Williams & Eberhardt, 2008). If people essentialize social categories, they are more likely to experience differences, including differences between cultures, as immutable, with potentially negative consequences for engagement, trust, and cooperation (Bastian & Haslam, 2006; Chiu, Dweck, Tong, & Fu, 1997). People are less likely to counter argue persuasion attempts linked to categories experienced as natural and true, especially if these categories, like culture, are experienced as self-relevant (about "me" or "us", Oyserman, 2019).

1.2. What else do we know about fluency and disfluency effects

People can experience processing fluency and disfluency at the perceptual level – a smudged picture, text written with hard-to-read font, poor color contrast. Each is visually more difficult to process than clear pictures, easy-to-read font, and sharp color contrast (see Reber, Schwarz, & Winkielman, 2004; Schwarz, 2004). These processing effects are perceptual rather than culture-based – sharp is easier to process than smudged due to the functioning of our visual systems. Perceptual fluency affects subsequent ratings of attractiveness, quality, innovativeness (Schwarz, 2015), and psychophysiological measures capture subtle effects on affect (Winkielman, Huber, Kavanagh, & Schwarz, 2012; Winkielman, Schwarz, Fazendeiro, & Reber, 2003). People are sensitive to their metacognitive experiences of processing ease and difficulty, but not to the source of these experiences and so may *misattribute* processing (dis)fluency that is not inherent to the

target of judgment as being due to the target of judgment (Schwarz, 2015). For example, when presented information about a product with difficult-to-read font, people will rate the product as less attractive, but more innovative.

People can also experience fluency and disfluency at a conceptual level, that is, people are quicker to recognize a key after seeing pictures of locks (see Reber et al., 2004). Effects of conceptual fluency parallel those of perceptual fluency (Schwarz, 2015). Though described as being due to familiarity with concepts, conceptual fluency requires culture. That is, people expect to see keys after seeing locks because they have culture-based knowledge about locks. Cultural fluency and disfluency research builds on this basic, but unspoken, premise of conceptual priming research (Oyserman & Yan, 2018).

As distinct from prior research, cultural fluency and disfluency research uses finely tuned cultural products like weddings and Valentine's Day cards. Using a culture-as-situated cognition perspective leads to questions not asked within the larger fluency literature in part because by neglecting culture, these questions have not come to mind and in part because the priming tasks used did not allow them to be addressed. For example, while seeing a key makes a lock easier (more fluent) to process, there is no parallel disfluent condition as is the case in cultural fluency and disfluency.

Until now, research on cultural fluency and disfluency focused on ecological validity, using available products varying on whether or not they meet cultural-based expectations. Participants have been incidentally exposed to cultural products in one setting and the effects of exposure were tested either in that same setting or in a subsequent one. Care has been taken to never explicitly forewarn participants that the cultural products may have unexpected components. Yet the logic of priming, generally (Bargh, 1994) and in the context of culture (Oyserman, 2016), suggests that people use what is on their mind at the moment of judgment if it is experienced as relevant to the judgment at hand. What this implies is that people are likely to experience the consequences of cultural fluency or disfluency whenever the intuitions that come to mind due to culture-based expectations are experienced as relevant to the judgment task. This should be the case whether or not people are explicitly forewarned that they will be examining expected or unexpected product designs, usual or unusual product combinations because the experience of fluency is inherent to cultural expertise and lack of fluency is a problem signal.

1.3. Are there individual differences in responsivity to cultural fluency and disfluency?

Until now, we have focused on the general process triggered by cultural expertise, describing how experiences of cultural fluency and disfluency facilitate everyday life by allowing people to know when something might be awry. Our prediction is that this will yield downstream effects for people's sense of inherence and hence for their essentializing. In this section, we briefly consider some possible individual difference variables that might moderate the effect of cultural fluency and disfluency. We focus on individual differences in cultural values and in response to the unexpected because they may affect the extent to which disfluency becomes cause for concern. Specifically, we consider individual differences in endorsement of cultural values relevant to concern about fitting in versus appreciation of uniqueness as well as individual differences in need for cognition, need for structure, and intolerance of uncertainty. In Fig. 2, we show these potential moderators of the effect of experienced disfluency on experienced inherence (we thank our reviewers for suggesting the addition of need for structure and intolerance of uncertainty as potential moderators).

We considered the possibility that endorsing the values of collectivism or the values of individualism might moderate the downstream consequences of experiencing cultural fluency and disfluency. With regards to collectivism, endorsing the values of collectivism implies one attributes importance to fitting in, following the norm, and accepting

tradition (Oyserman, Coon, & Kemmelmeier, 2002). Higher endorsement of these values might enhance the rattling effect of cultural disfluency on one's sense that all's right with the world. With regards to individualism, endorsing the values of individualism implies that one values uniqueness, difference, and distinction (Oyserman et al., 2002). Higher endorsement of these values might dampen the rattling effect of cultural disfluency on one's sense that all's right with the world. In exploratory analyses, we asked if experiencing cultural disfluency may be more problematic for people who value fitting in and connecting to the group and less problematic for people who enjoy being distinct, unique and sticking out. We assessed both values of individualism and of collectivism given that people endorse each of these sets of values to differing degrees (Markus & Oyserman, 1989; Oyserman, 1993).

Now consider individual differences in people's response to the unexpected, ambiguous, or unusual. Hofstede (2011) described differences in uncertainty avoidance as a cultural axis. At the individual level, people differ in how they respond to unusual situations.[1] Need for cognition was initially described by Cohen, Stotland, and Wolfe (1955) as "a need to structure relevant situations in meaningful, integrated ways. It is a need to understand and make reasonable the experiential world" (p. 291). The assumption was that people higher in need for cognition would find unstructured ambiguous situations more frustrating than people lower in need for cognition. Cohen and colleagues provided only an example item in their paper so subsequent researchers developed scales of need for cognition (NFC; Cacioppo & Petty, 1982, Cacioppo, Petty, & Kao, 1984) and personal need for structure (PNS, Neuberg & Newsom, 1993). NFC is operationalized with items such as "I prefer complex to simple problems" and was designed to distinguish individuals who dispositionally tend to engage in and enjoy effortful analytic activity from those who do not. Our exploratory prediction was that people who are high in NFC may find culturally disfluency particularly rattling, enhancing the effects of cultural disfluency on inherence.

PNS is operationalized with items such as "I become uncomfortable when the rules in a situation are not clear" (Neuberg & Newson, 19,933). In that sense, PNS may be closer to what Cohen and colleagues meant by a need for cognition as it assesses desire for simple structure with clear interpretation. Some researchers (e.g., Freund, Kruglanski, & Shpitzajzen, 1985) suggest that need for structure is contextually cued, that in ambiguous contexts in which choices must be made, people experience a momentary rise in need for structure, implying that a need for structure functions as a mediator rather than a moderator of cultural disfluency effects. Our exploratory prediction is that the experience of cultural disfluency may be particularly problematic for people who prefer simple structures and prefer not to engage in effortful thinking.

A related, though, less used, individual difference construct is intolerance of uncertainty (IU, Carleton, Norton, & Asmundson, 2007). IU entails fear or worry about the possibility of a negative occurrence and is operationalized by responses to items such as "Uncertainty makes me uneasy, anxious, or stressed" (Carleton et al., 2007). Fear of the unknown might be relevant to responses to cultural fluency and disfluency, yielding an exploratory prediction that people higher in IU might be more rattled by experiencing cultural disfluency and this might enhance the effect of cultural disfluency on their sense that all's right with the world. Though individual differences were not our main focus, we explored each of these possibilities.

2. Current studies

Our primary prediction is that experiencing cultural disfluency undermines inherence (Studies 1, 2, 3, 4, 5, 6, 7, 8). Our secondary

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[1] We initially focused on differences in need for cognition. We broadened our exploratory analyses to explore other individual difference variables more squarely focused on responses to uncertainty following reviewer suggestions.
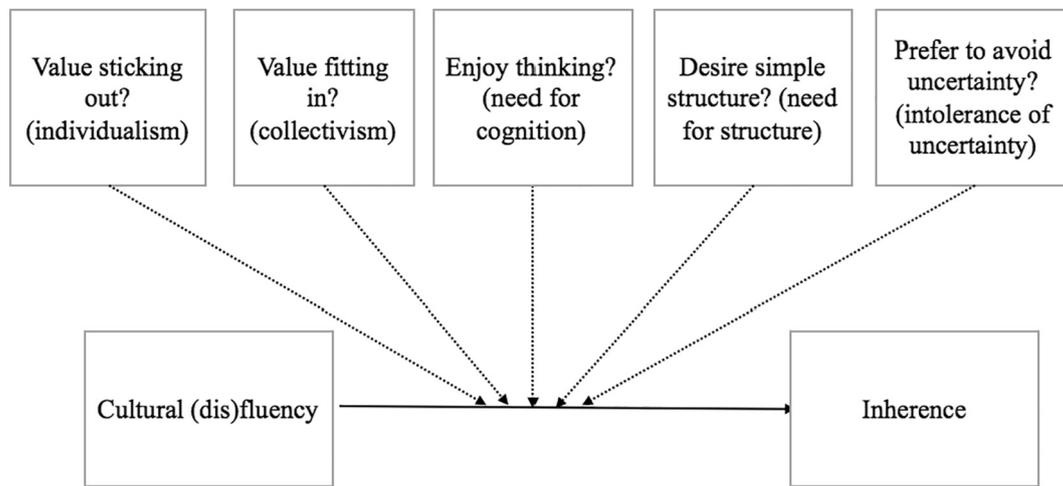
Fig. 2. Individual differences may moderate the effect of cultural fluency and cultural disfluency on inherence.

predictions are that undermined inherence carries forward to under-mine people's belief that cultures have fixed essences (Studies 2, 3, 4) and that explicit forewarning does not undermine the effect of cultural disfluency on inherence (Studies 7, 8). We explored momentary affect (Studies 1, 2) as a possible mediator, and individualism, collectivism, NFC (Studies 1, 2), PNS and IU (pre-registered Study 8) as possible individual difference moderators. We addressed reviewer questions as to whether the effects of cultural fluency and disfluency on inherence were due to effects on certainty about the world or if they would also affect certainty about the self (Study 6). Study 5: https://aspredicted. org/4c8th.pdf and Study 8: https://aspredicted.org/ir4bj.pdf) were preregistered for hypotheses, design, and analyses. Primes, primary and secondary dependent variables are all in the supplemental materials.

Prior cultural fluency and disfluency researchers used a mix of peripheral (pink border on Valentine's Day, red border on Chinese New Year) and central (wedding photographs) cues. We used cues likely to be central (e.g., a Valentine's Day card) to culture-based associative knowledge networks (e.g., Valentine's Day). Central cues should more stably affect experienced cultural fluency and disfluency. We validated this prediction of stability in Study 1 by repeating the experiment on Valentine's Day and a week after Valentine's Day (as detailed in the Supplemental Materials). As manipulation checks, we examined the extent that participants rated the products they saw as similar to ex-pectation, traditional or appropriate for the occasion and their im-mediate fluency response as reflected in product quality and attrac-tiveness ratings.

In each study, we screened for native speakers, including only na-tive speakers in our analytic samples for two reasons. First, and most importantly, native speakers are clearly members of the culture being studied. Second, a large body of evidence suggests that using a second language decreases processing fluency (e.g. Hayakawa, Costa, Foucart, & Keysar, 2016; Keysar, Hayakawa, & An, 2012). Hence non-native language might reduce experienced inherence through another route, reducing the clarity of our prediction and results.

In Amazon Mechanical Turk (Mturk) studies, we looked for parti-cipants with U.S. IP addresses who had not participated in our previous cultural fluency studies. We did so for two reasons. First, this insured that our participants had exposure to U.S. culture. Second, this insured that participants in each study were independent and no person parti-cipated in more than one study to the best of our knowledge.

Scales not already available in Hebrew or Chinese were translated and back-translated by bilingual researchers and questions screened for meaning following the standards of the American Association of Public Opinion Research for cross-cultural survey design (Harkness, Braun, Edwards, Johnson, & Lyberg, 2010). We provide our full experimental materials and dependent measures in our electronic Supplemental

Materials. All studies followed the same procedures as detailed next. To make the full set of results easier to digest, we describe our samples, the full set of procedures, and all results together. We present by-study information in the Supplemental Materials. To maintain a full record, we also include an exploratory study and an MTurk study in which we have concerns about data quality in Supplemental Materials though not in the main text.

2.1. Power and stop rules

We determined our target sample size prior to data collection using the combined effect size ($d = 0.47$) of Mourey et al.' (2015) two-con-dition cultural fluency studies. G*power analyses yielded a target sample of 102 participants (51 per condition) We verified this assumed effect size in an exploratory study (S1, detailed in Supplemental Ma-terials) and found a medium cultural (dis)fluency effect ($d = 0.50$) on inherence. We used this same stop rule until we calculated our actual effects from Studies 1 to 4. This resulted in a downward adjustment of expected effect size to $d = 0.40$ for pre-registered Study 5, which we used to determine an a priori sample size to achieve three-condition power of 0.80 and $p = .05$, yielding a target sample of 246 (82 per condition). In Study 6 we used the Study 1 prime and effect size ($d = 0.38$), yielding a target sample size of 440 (220 for each dependent variable order) to attain power of 0.80 and $p = .05$. Our subject pool yielded a smaller sample size of 332 once non-native English speakers and repeat responders were excluded. In Study 7 we used the average effect size of Studies 1 to 6 ($d = 0.38$), power of 0.80 and $p = .05$ to calculate that 270 (90 per condition) were needed for three conditions. In Study 8 we repeated this process using the final average effect size ($d = 0.34$) and the effect size found in Study 2 (same stimuli, $d = 0.34$) to calculate that 339 (113 per condition) were needed for three con-ditions.

2.2. Sample

Participants were adults (total $N = 1803$, $M_{age} = 30.67$, $SD = 7.86$). They were native speakers of English from the U.S., or native speakers of Chinese from China, or native speakers of Hebrew from Israel. Table 2 details demographics by study. In Studies 1, 3, 5, 7, participants were American Mturk workers paid $0.40. In Study 2, they were Jewish Israeli undergraduates at an Israeli university who re-ceived course credit as compensation. In Study 4, they were Chinese adults from a crowdsourcing website (zbj.com) paid the equivalent (¥3). In Study 6, they were native undergraduates at an American university who received course credit as compensation. In Study 8, participants were Jewish Israeli adults from a crowdsourcing website

Table 1
Overview of Studies 1 to 8.

Study	Language	Conditions	Potential mediators	Potential moderators	Primary DV	Secondary DV
1	English	Match, mismatch	Momentary affect	NFC, individualism, collectivism	Inherence	
2	Hebrew	Match, mismatch	Momentary affect	NFC, individualism, collectivism	Inherence	Essentialism
3	English	Match, mismatch			Inherence	Essentialism
4	Chinese	Match, mismatch			Inherence	Essentialism
5	English	Match, mismatch, control			Inherence	
6	English	Match, mismatch			Inherence	Self-certainty
7	English	Match, mismatch, explicit mismatch			Inherence	
8	Hebrew	Match, mismatch, explicit mismatch	PNS, IU		Inherence	

Note. DV = dependent variable, NFC = Need for Cognition, PNS = Personal Need for Structure, IU = Intolerance of Uncertainty.

(Panel4all) and paid about $2 (8.5 NIS).

2.3. Procedure

2.3.1. Study procedure

Table 1 summarizes each study design, listing all obtained variables, Study 2 provides sample sizes, exclusions and reasons for exclusions. Studies, programmed in Qualtrics, took 5 to 7 min to complete. We randomly assigned participants to one of two groups (Studies 1, 2, 3, 4, 6: Cultural Match, Cultural Mismatch) or to one of three groups: (Study 5: Cultural Match, Cultural Mismatch, Control; Studies 7, 8: Cultural Match, Cultural Mismatch, Explicit Mismatch). In each group, participants saw cultural products relevant to the culture being studied and rated each product for quality and attractiveness.

Rating products served two functions. First, it provided participants with a psychologically meaningful task that allowed us to expose them to either culturally fluent or culturally disfluent stimuli. Second, the ratings themselves allowed us document that we were manipulating fluency and disfluency. As detailed in Table 3, the products were American Valentine's Day cards (Studies 1, 6, 7), Israeli breakfasts (Studies 2, 8), a set of wedding photographs of European American couples (shown to European Americans, Study 3), a set of wedding photographs of a Han Chinese couple (shown to Han Chinese, Study 4), and Labor Day shopping bags (Study 5). Across studies, the Match group saw culturally fluent versions of the products and the Mismatch group saw culturally disfluent versions of the products.

In Study 5, People randomly assigned to the Control group saw culturally neutral versions of the products. In Studies 7 and 8, people randomly assigned to the Explicit group saw the same products as the Mismatch group, and were explicitly told that they would be seeing surprising or unexpected products that might lead them to question their beliefs. For Study 7, the instructions read: "In this study, you will be shown a sampling of Valentine's Day card design images with non-traditional, unexpected features. We are interested in how being exposed to unexpected designs has consequences for feeling that everything else in life is going well. For each one that you see, rate design quality, attractiveness, and traditionality." For Study 8 (English translation of the Hebrew): "In this study you will be presented with unexpected breakfast dishes with unusual ingredients. Looking at this kind of photos makes people question things they usually take for granted."

After the rating task, participants continued to an ostensibly unrelated second part in which they rated how much they agreed or disagreed to a series of statements. In all studies except Study 6, participants first were presented with our primary dependent variable, the inherence scale. Then came (in this order) the secondary dependent variable, essentialism (obtained in Studies 2, 3, 4) and then any potential moderator or mediator (obtained in Studies 1, 2, 8). In Study 6, we randomized the order of presentation of the statements in our

Table 2
Studies 1 to 8: study location, sample demographics, and size and reasons for exclusions.

Study, sample, and demographics					Sample size			
Study	Country	Gender	Age		Race-ethnicity	N	Total excluded	Rationale for exclusion (n per reason)
		% Women	M	SD	% Majority			Failed attention check n / Other criteria n

Study	Country	Gender % Women	Age M	Age SD	Race-ethnicity % Majority	N	Total excluded	Failed attention check n	Other criteria n
1	U.S.	48%	36.16	12.93	EA 77.7%[a]	197[b]	18	14	4 identified wrong holiday
2	Israel	48%	29.13	6.79	Jewish 100%	147	8	8	–
3	U.S.	62%	36.13	10.73	EA 100%[c]	120	40	8	35 not EA
4	China	48%	28.11	5.46	Han 100%[d]	100	8	5	3 not Han
5	U.S.	51%	34.53	10.22	EA 74.71%[e]	259	9	7	2 skipped dependent variable
6	U.S.	72%	19.98	2.61	EA 34.94%[f]	332	359	49	105 non-native English speaker; 205 repeat responders
7	U.S.	53%	34.92	11.02	EA 69.3%[g]	306	29	21	8 non-native English speaker
8	Israel	73%	30.64	5.59	Jewish 100%	342	12	10	1 vegetarian, 1 non-native Hebrew speaker

Note. N = Sample for analysis after excluding people who failed the manipulation check (Studies 1 to 6), could not name the holiday and/or date it occurs (Studies 1, 5, 6), whose first language is not English (Studies 1, 6, 7), repeat responders who took part in a pilot test to establish scale validity (Study 6) and/or whose racial-ethnic heritage was not the same as the stimuli materials (Studies 3, 4).

[a] EA = European American, others were African American (6.09%), Asian American (8.12%), Latino American (5.08)%, Native American (1.02%), Middle Eastern or other American (2.03%). 98.98% were native speakers of English.

[b] N = 102 on February 13 or 14, the day before or day of Valentine's Day and N = 95 five weeks after, March 23rd.

[c] EA = European American, all native speakers of English.

[d] Han Chinese are the main ethnic group (92% of Chinese population) in China.

[e] EA = European American, others were African American (7.78%), Asian American (8.56%), Latino American (5.06%), Native American (2.33%), Middle Eastern or other American (2.33%).

[f] EA = European American, others were African American (6.62%), Asian American (33.43%), Latino American (9.34%), Native American (6.02%), Middle Eastern (3.61%), and other American (11.45%).

[g] EA = European American, others were African American (8.50%), Asian American (8.50%), Latino American (5.23%), Asian American (11.76%), Native American (1.96%), Middle Eastern and other American (2.61%).

Table 3
Studies 1–8: manipulation of cultural match, mismatch, and control.

Study	Verbatim instructions and how many products were rated in each condition	Number of products	Condition		
			Match (n)	Mismatch (n)	Control[a] (n)
1, 6, 7[b]	"In collaboration with local paper and package companies, you will be asked to rate the quality and attractiveness of Valentine's Day card designs."	4	Pink Heart Valentine's Day Cards (n = 97 Study 1; n = 164 Study 6; n = 104 Study 7)	Heart-shaped skull Valentine's Day Cards (n = 100 Study 1; n = 168 Study 6; n = 97 Study 7)	–
2, 8[b]	"In collaboration with local restaurants (Study 2)/a website that offers different breakfast dishes (Study 8), you will be asked to rate the quality and attractiveness of plated breakfasts."	8	Breakfasts of raw vegetables, fresh cheeses, fresh bread, fried eggs (n = 70 Study 2, n = 111 Study 8)	Breakfasts of cooked vegetables, meats, fried breads, croissants, Eggs Benedict (n = 77 Study 2, n = 117 Study 8)	–
3	"In collaboration with local wedding photographers, you will be asked to rate the quality of wedding photographs."	4	Bride in a white gown, groom in a black tuxedo, a white fondant iced floral tiered wedding cake (n = 62)	Bride in a black gown, groom in an off-white tuxedo, a black fondant tiered wedding cake with the word "love" (n = 58)	–
4	"In collaboration with local wedding photographers, you will be asked to rate the quality of wedding photographs."	5	Bride in a white gown, groom in a sharply tailored suit, wedding car festooned with flowers (n = 54)	Same bride, groom and car, but bride in a black sparkling gown, wedding car festooned with fruit (n = 46)	–
5	"In collaboration with department stores, you will be asked to rate the quality and attractiveness of shopping bag designs."	4	Patriotic-themed (fireworks, stars, American flag) and colored (red, blue) shopping bags. "Happy Labor Day" logos (n = 85)	Environmental-themed (trees, animals) and colored (green, reddish brown) shopping bags. "Happy Labor Day" logos (n = 89)	Environmentally-themed (trees, animals) and colored (green, reddish brown) shopping bags. "Shopping Bag" logos (n = 95)

Note. Products were rated for *Quality* (1 = very poor, 7 = excellent) and *Attractiveness* (1 = extremely unattractive, 7 = extremely attractive). Wedding photographs were judged only on quality, not on attractiveness to avoid confusion with attractiveness of the couple. Study 1 consisted of two subsamples that were recruited on Valentine's Day (n = 102) and five weeks after Valentine's Day (n = 95). The Supplemental Materials show results separately. Effects did not differ by data collection date, thus they are combined.

[a] Control Group: Only Study 5 had a Neutral Control group.

[b] In Studies 7 and 8 the participant randomly assigned to the Explicit Match condition (Study 7 n = 105, Study 8 n = 114) rated the same products as participants in the Mismatch condition, what differed was the forewarning.

Table 4
Fluency (mean product quality and attractiveness ratings) by condition.

Study	Fluency (mean of quality and attractiveness) score reliability[a]		Fluency score (mean of quality and attractiveness) by condition							
	Number of ratings forming the score	α	Match M (SD)	Mismatch M (SD)	Control M (SD)	Explicit M (SD)	df	F-test	p	d
1	8	0.90	4.76 (1.00)	3.34 (1.42)	–	–	1193	65.13	< 0.001	1.16
2	16	0.79	3.55 (0.55)	3.12 (0.57)	–	–	1145	21.22	< 0.001	0.77
3	4	0.76	5.51 (0.87)	5.01 (1.00)	–	–	1118	8.46	0.004	0.53
4	5	0.58	4.43 (0.95)	4.34 (0.81)	–	–	1,97	0.24	0.63	0.10
5 Pilot	4	0.90	4.81 (1.11)	3.47 (1.57)	4.70 (0.89)	–	1,81	10.21	< 0.001	0.99
5	8	0.92	4.22 (1.20)	3.29 (1.06)	4.12 (1.13)	–	2254	17.85	< 0.001	0.82
6	8	0.92	4.56 (1.05)	2.56 (1.12)	–	–	1329	281.67	< 0.001	1.84
7	8	0.84	5.17 (0.76)	3.77 (1.51)	–	3.57 (1.70)	2303	41.31	< 0.001	1.17
8	16	0.87	3.91 (0.62)	3.36 (0.74)	–	3.23 (0.65)	2339	32.03	< 0.001	0.81

[a] We took the product ratings of quality and attractiveness and created a mean composite score, which yields a mean fluency score. For clarity, we report the total number of ratings and the Cronbach alpha (α) reliability (across conditions) of this fluency score. In Studies 1, 2, 5 to 8, each product was rated for quality and attractiveness. In studies 3, 4, and 5 Pilot, each product was only rated for quality. This yielded a total of 8 ratings in Studies 1, 5, 6 and 7, a total of 4 ratings in Studies 3 and 5 Pilot, a total of 5 ratings in Study 4, and a total of 16 ratings is Studies 2 and 8. Study 5 was the only study with a Control group and Studies 7 and 8 were the only studies with an Explicit Mismatch condition, people randomly assigned to this group saw the same products as people randomly assigned to the Mismatch condition saw, what different is that they were forewarned (Mean Quality and Attractiveness Composite did not differ between the Mismatch and the Explicit Mismatch conditions (Study 7: $t(203) = 0.95$, $p = .34$; Study 8: $t(229) = 1.42$, $p = .16$)). d = Cohen's d, which reflects the magnitude of the difference between Cultural Match and Cultural Mismatch conditions.

primary dependent variable (inherence) and our secondary dependent variable (self-certainty). At the end of each study, participants rated the extent products were similar to expectation, traditional, and appropriate and then completed demographics.

2.3.2. Inherence

We operationalized inherence (1 = *strongly disagree*, 7 = *strongly agree*) with Salomon and Cimpian's (2014) 15-item Inherence Heuristic Scale (Study 1 α = 0.87; Study 2 α = 0.76; Study 3 α = 0.81; Study 4 α = 0.75; Study 5 α = 0.86; Study 6 α = 0.75; Study 7 α = 0.85; Study 8 α = 0.82). We adjusted culture-bound elements to be relevant to each culture. "There are good reasons why dollar bills are green" was translated as "There are good reasons why currency is in different colors" (Hebrew) or "There are good reasons why 100-Yuan bills are red" (Chinese). In Study 3, we removed two items – "It seems right to use white for wedding dresses" and "It seems right that black is the color associated with funerals" – because white and black were part of the wedding study manipulation. We substituted an attention check: "Please choose 'strongly disagree' for this question so that we know you are paying attention" for the original culture-bound catch items.

2.3.3. Essentialism

We operationalized essentialism (1 = *strongly disagree*, 7 = *strongly agree*; Study 2 α = 0.79; Study 3 α = 0.75; Study 4 α = 0.77) with an 8-item scale based on Haslam, Rothschild, and Ernst (2000) and Chiu et al. (1997) essentialism scales. Example items are: "Traits of a culture are stable over time. They do not change much." "Though some phenomena can be changed, it is unlikely that the core dispositions of the world can be altered."

2.3.4. Self-certainty

We operationalized self-certainty (1 = *strongly disagree*, 7 = *strongly agree*; Study 6 α = 0.90) with a 10-item scale based on Campbell et al.'s (1996) self-concept clarity scale. Example items are: "I am certain about the kind of person I am." "I lack a clear sense of my skills" (reverse-coded).

2.3.5. Potential moderators

Cacioppo et al.'s (1984) 18-item Need-for-Cognition scale (1 = *extremely uncharacteristic of me*, 5 = *extremely characteristic of me*, Study 1 α = 0.94) was used in Study 1. Oyserman's (1993) Hebrew language 6-item individualism (e.g., "I determine my own destiny" α = 0.51) and 6-item collectivism (e.g., "In general, I accept the decisions made by my

group" α = 0.70) scales (1 = *strongly disagree*, 7 = *strongly agree*) were used in Study 2. Nine items from Neuberg and Newsom's (1993) Personal Need for Structure (α = 0.74) and Carleton et al.'s (2007) Intolerance of Uncertainty (α = 0.89, 12 items) were used in Study 8.

2.3.6. Potential mediators

Thompson's (2007) 10-item Positive (Study 1 α = 0.86; Study 2 α = 0.74) and Negative (Study 1 α = 0.87; Study 2 α = 0.78) Affect Scales (PANAS, 1 = *very slightly or not at all*, 7 = *extremely*) were used in Studies 1 and 2.

2.3.7. Manipulation checks

Participants rated quality and attractiveness of each presented cultural product as they viewed them, we created a mean fluent experience score from the mean of these items. Table 4 details individual items used in each study. At the end of the study, participants rated the products they saw overall for their similarity to expectation, traditionality, and appropriateness for the occasion, we created a mean similarity to expectation score from the mean of these three items. Table 5 details individual items used in each study.

2.3.8. Attention checks

The inherence scale included an attention check item and as recommended (Meade & Craig, 2012) we dropped participants who failed it. In Studies 1 to 5, the cultural products were linked to holidays and we asked participants what the holiday connected to the products they saw was and when that holiday is celebrated. Following Zayas, Pandey, and Tabak (2017) we dropped participants without cultural exposure – those who could not name the holiday or when it was celebrated.

3. Results

3.1. Preliminary analyses and manipulation checks

We used confirmatory factor analyses (CFA) to test the factor structure of our dependent variables – inherence, essentialism, and self-certainty, finding good-to-moderate fit in each study (using the criteria of Hu & Bentler, 1999). We present details of our CFA in Supplemental Materials (Table S4). Moreover, as detailed in Tables 4 and 5, our manipulation checks suggest that we succeeded manipulating cultural fluency and disfluency. Thus, participants in the Match condition rated the products that they saw as higher in attractiveness and quality (more fluent) and as more similar to what they expected, more traditional, and

Table 5
Product similarity to expectations ratings by condition.

| Study | Similarity to expectations scale and reliability | | Mean similarity to expectation by condition | | | | | | |
	Specific questions and response scale	α	Match M (SD)	Mismatch M (SD)	Explicit M (SD)	df	F-test	p	d
1[a]		–	–	–	–	–	–	–	–
2	1. "As a whole, how traditional were the images you saw previously?" (1 = *not at all traditional*, 7 = *very traditional*). 2. "As a whole, how similar were the images of the breakfasts you saw previously to typical Israeli breakfasts?" (1 = *very dissimilar*, 7 = *very similar*)	0.74	5.63 (0.94)	2.92 (1.25)	–	1,145	216.51	< 0.001	2.45
3	1. "As a whole, how traditional was the wedding you viewed?" (1 = *not at all traditional*, 7 = *very traditional*). 2. "As a whole, when you think of weddings, how similar were the images of the wedding you saw previously to the weddings you imagine?" (1 = *very dissimilar*, 7 = *very similar*).	0.89	6.35 (0.69)	4.23 (1.61)	–	1,118	89.59	< 0.001	1.71
4	1. "As a whole, did the images of the wedding you viewed fit your impression of weddings?" (1 = *not at all*, 7 = *very*) 2. "As a whole, how appropriate were the images of the wedding you viewed?" (1 = *not at all appropriate*, 7 = *very appropriate*) 3. "As a whole, how similar were the images of the wedding you saw previously to the weddings you see in real life?" (1 = *very dissimilar*, 7 = *very similar*).	0.70	5.31 (1.06)	3.04 (0.94)	–	1,98	1.82	0.18	2.27
5	1. "As a whole, how traditional were the shopping bag designs that you viewed?" (1 = *not at all traditional*, 7 = *very traditional*) 2. "As a whole, are the shopping bag designs you viewed similar to the ones that you expect to see during Labor Day?" (1 = *very dissimilar*, 7 = *very similar*).	0.62	5.52 (0.87)	3.34 (1.73)	–	1,172	110.05	< 0.001	1.59
6[b]	1. "As a whole, how traditional were the Valentine's Day cards that you viewed?" (1 = *not at all traditional*, 7 = *very traditional*) 2. "As a whole, how similar were the Valentine's day cards to the ones that you expect to see?" (1 = *very dissimilar*, 7 = *very similar*).	0.90	5.49 (1.01)	1.82 (0.88)	–	1,175	651.97	< 0.001	3.87
7	1. "As a whole, how traditional were the Valentine's Day cards that you viewed?" (1 = *not at all traditional*, 7 = *very traditional*) 2. "As a whole, how similar were the Valentine's day cards to the ones that you expect to see?" (1 = *very dissimilar*, 7 = *very similar*).	0.82	5.31 (1.08)	2.71 (1.72)	1.94 (1.34)	2,303	166.15	< 0.001	1.81
8	1. "As a whole, how traditionally Israeli were the breakfast dishes you viewed?" (1 = *not at al*, 5 = *very much*) 2. "As a whole, how similar were the breakfasts you saw to typical Israeli breakfasts?" (1 = *not at al*, 5 = *very much*) 3. "As a whole, how typical were the ingredients for Israeli breakfasts?" (1 = *not at all*, 5 = *very much*)	0.93	4.50 (0.61)	2.35 (0.90)	2.35 (0.79)	2,339	284.60	< 0.001	2.80

[a] In Study 1, manipulation check questions were omitted due to researcher error. α = Cronbach's alpha. d = Cohen's d, which reflects the magnitude of the difference between Cultural Match and Cultural Mismatch conditions.

[b] In Study 6, manipulation check questions were omitted for 47% of the sample due to researcher error. In Studies 7 and 8, participants rated the same products in Mismatch and Explicit Mismatch conditions; hence data were combined for ratings of cultural products. Products were rated less similar to expectations in Explicit Mismatch condition than in the Mismatch condition in Study 7, $t(203) = 3.65$, $p < .001$, but were rated similarly in Study 8, $t(229) = 0.06$, $p = .96$.

Table 6
Effects of cultural fluency and disfluency on inherence: study by study and meta-analytic summary.

Study			Effect of condition						
Number	Cultural product	Location	Match M (SD)	Mismatch M (SD)	df	F	p	Cohen's d	95% CI
1	Valentines' Day Cards	U.S.	4.97 (0.96)	4.61 (0.93)	1,195	6.94	0.01	0.38	0.10, 0.66
2	Plated Breakfasts	Israel	4.89 (0.66)	4.63 (0.83)	1,145	4.46	0.04	0.34	0.02, 0.67
3	Wedding Photographs	U.S.	4.92 (0.87)	4.57 (0.86)	1118	5.01	0.03	0.40	0.04, 0.76
4	Wedding Photographs	China	5.16 (0.51)	4.89 (0.61)	1,, 98	6.07	0.02	0.48	0.08, 0.88
5	Labor Day Shopping Bags	U.S.	4.99 (0.83)	4.68 (0.90)	1172	5.40	0.02	0.36	0.06, 0.66
6	Valentines' Day Cards	U.S.	4.79 (0.67)	4.62 (0.78)	1,330	4.63	0.03	0.23	0.02, 0.33
7	Valentines' Day Cards	U.S.	5.08 (0.78)	4.80 (0.94)	1,199	5.32	0.02	0.32	0.04, 0.52
8	Plated Breakfasts	Israel	5.09 (0.79)	4.88 (0.79)	1,226	3.95	0.05	0.26	0.01, 0.53
Weighted average effect size								0.32	**0.22, 0.43**
Heterogeneity statistic			Chi-square = 1.85, df = 7, p = .97, I^2 = 0%						

more appropriate than participants in the Mismatch condition. This conclusion is supported by our single paper meta-analysis of quality and attractiveness ratings (Studies 1 to 8) and of similarity to expectation ratings (Studies 2 to 8), both detailed in Supplemental Materials.

3.2. Cultural disfluency undermines inherence

Results, detailed in Table 6, and displayed graphically in Fig. 3, support our primary prediction that cultural fluency supports and cultural disfluency undermines inherence. Across our eight studies, participants randomly assigned to the Match Condition experienced higher psychological inherence than participants randomly assigned to the Mismatch Condition. At the same time, though consistent, the effect of cultural fluency and disfluency on inherence was small-to-moderate in size rather than the moderate-sized effect we had predicted. We followed up in two ways. First, we ran study-by-study sensitivity power analyses to determine the minimum detectable effect size with power of 0.80 and p = .05 for each study. The results of these analyses suggest that our found effects are smaller than what our samples are powered for (minimal detectable effects were: Study 1 d = 0.40, Study 2 d = 0.47, Study 3 d = 0.52, Study 4 d = 0.57, Study 5 d = 0.43, Study 6 d = 0.31, Study 7 d = 0.40, Study 8 d = 0.37). Second, we conducted a single-paper meta-analysis to obtain a more stable estimate of the effect of condition (Cultural Match and Cultural Mismatch) on psychological inherence. To do so, we used Review Manager 5.3 software. Our meta-analysis revealed that being exposed to cultural disfluency had a small-to-moderate sized effect on subsequent experience of inherence, d = 0.32 (95% CI: 0.22, 0.43, see Table 6 for details). Moreover, the non-significant test of heterogeneity, χ^2 = 1.85, df = 7, p = .97, I^2 = 0%, reveals that effects were not dependent on country or a particular operationalization of cultural fluency and cultural disfluency. Taken together, results suggest that there is a stable, small-to-moderate, effect of cultural fluency and disfluency on inherence.

In pre-registered Study 5 (Labor Day shopping bags), a control group (non-themed shopping bag) made sense, allowing us to test that cultural disfluency decreases inherence rather than cultural fluency increasing it. We used Planned Contrast Linear regression (Control = 1,

Cultural Match = 1, Cultural Mismatch = −2) which revealed a significant effect of Condition on inherence, $F(1, 257)$ = 6.69, p = .01, R^2 = 0.03. Inherence was lower among participants randomly assigned to the Cultural Mismatch Condition (M = 4.68, SD = 0.90) compared to participants randomly assigned to the other conditions (Cultural Match M = 4.99, SD = 0.83, Control M = 4.97, SD = 0.90). Inherence did not differ among participants randomly assigned to the Cultural Match or to the Control conditions $F(1, 168)$ = 0.02, p = .90, η^2 < 0.001.

To test our secondary prediction that explicitness does not undo the effect of cultural disfluency, we added an explicit instruction condition in Study 7 and pre-registered Study 8. A one-way ANOVA (Cultural Mismatch, Explicit Mismatch) revealed a significant effect of condition on inherence in Study 7, $F(2, 303)$ = 3.58, p = .03, η^2 = 0.02, and the same directional effect, though not significant at the 0.05 level in Study 8, $F(2, 339)$ = 2.81, p = .06, η^2 = 0.02. In both studies, participants randomly assigned to the Explicit Mismatch condition (Study 7: M = 4.78, SD = 0.96; Study 8: M = 4.85, SD = 0.89) experienced lower inherence than those assigned to the Cultural Match condition (Study 7: M = 5.08, SD = 0.78; Study 8: M = 5.09, SD = 0.79), and this difference was significant in Study 7, $F(1, 207)$ = 6.01, p = .02, d = 0.34, and in Study 8, $F(1, 223)$ = 4.60, p = .03, d = 0.29. Inherence did not differ between participants in the Explicit Mismatch condition and those in the Cultural Mismatch condition in Study 7, $F(1, 200)$ = 0.02, p = .90, or in Study 8, $F(1, 229)$ = 0.09, p = .77.

3.3. Cultural disfluency reduces tendencies to essentialize via inherence

In testing our mediation prediction, we followed Zhao, Lynch Jr, and Chen (2010) who state that the presence of a significant indirect effect establishes mediation and used Process Syntax Model 4 (Hayes, 2013) with 1000 bootstrapped samples. Results supported our prediction that inherence mediates the effect of cultural fluency and disfluency on essentialism, as displayed graphically in Fig. 4 and detailed in Table 7. We followed up with a single-paper meta-analysis using Comprehensive Meta-Analysis to provide a stable estimate of this effect. Experiencing cultural disfluency has a stable significant indirect effect (ab) on essentializing via inherence, ab = −0.16 (95% CI: −0.23,

Table 7
Effects of cultural fluency and disfluency on essentializing.

Study			Direct effect					Mediation analyses						
#	Location	Event	Match M (SD)	Mismatch M (SD)	df	F-test	p	ab	95% CI	SE	df	F-test	p	R^2
2	Israel	Breakfast	4.21 (0.89)	4.31 (1.02)	1,145	0.33	0.57	−0.16	−0.33–0.03	0.08	2,144	19.65	< 0.001	21%
3	U.S.	Wedding	4.33 (0.86)	4.24 (0.85)	1,118	0.36	0.55	−0.14	−0.28, −0.03	0.06	2,117	12.13	< 0.001	17%
4	China	Wedding	5.14 (0.76)	4.88 (0.73)	1, 98	2.94	0.09	−0.17	−0.33, −0.05	0.07	2, 97	14.16	< 0.001	23%

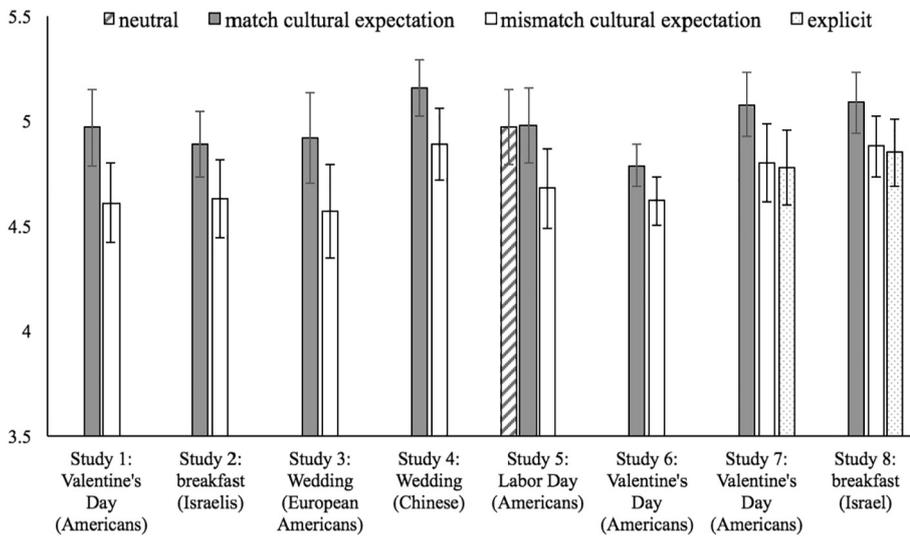Note. Essentializing was not assessed in Studies 1or in Studies 5 to 8.

-0.08). This effect does not vary by sample and country, as revealed by a non-significant between-study Q statistic, $Q = 0.05$, df = 2, $p = .97$, $I^2 = 0\%$.

3.4. Cultural disfluency reduced feelings of self-certainty via inherence

To address a reviewer question as to whether the effect of cultural disfluency on inherence (uncertainty about the world) is also found for uncertainty about the self, in Study 6 we added uncertainty about the self as a secondary dependent variable. We found no direct effect of condition on feelings of self-certainty, $F(1, 330) = 0.02$, $p = .91$. Instead, we found that cultural disfluency reduced feelings of self-certainty through its effect on inherence, $ab = -0.04$, $SE = 0.02$, 95% CI = $[-0.10, -0.003]$. The overall model was significant, $R^2 = 0.04$, $F(2, 329) = 6.00$, $p = .003$. The implication is that cultural disfluency induces a sense of uncertainty about the world and this carries over to induce a lack of certainty about the self.

3.5. Analyses of potential moderators and mediators and exploratory follow-up analyses

We tested three potential mediators and five potential moderators of the effect of cultural fluency and disfluency on inherence. These null findings are detailed in Tables S1 and S2 (Supplemental Materials). Condition effects were not moderated by Need for Cognition (Study 1), by Individualism or Collectivism (Study 2), or by Perceived Need for Structure or Intolerance of Uncertainty (Study 8). Neither Positive nor Negative Affect mediated the cultural fluency and disfluency effect (Studies 1, 2).

As a final set of exploratory supplemental analyses, we also explored whether product quality and attractiveness or product similarity to expectation ratings affected inherence and whether this mediated the

effect of cultural fluency and disfluency. These exploratory analyses, detailed in Table S3, focus on a final post hoc set of alternative explanations for our results, which is that results are carried by the fluency of processing the products or similarity to expectation rather than by triggering a culture-based response. Taken as a whole, these analyses rule out alternative explanations for cultural fluency and disfluency effects via the effect of fluency on experienced quality, attractiveness, and similarity to expectations. Specifically, product quality and attractiveness ratings did not mediate the effect of condition on inherence in six of eight studies (Studies 1, 2, 4, 6, 7, 8). Product similarity-to-expectation ratings did not mediate the effect of condition on inherence in seven of eight studies (Studies 1, 2, 3, 4, 5, 6, 8).

4. Discussion

We start with a culture-as-situated cognition perspective on culture, which suggests that people's culture-based expertise means that they have tacit knowledge about how the everyday situations in their lives are likely to unfold and that this tacit knowledge matters. That is, people have tacit knowledge about what breakfast, shopping bags, Valentine's cards and weddings look like. This tacit knowledge allows them to 'nod along' and use gut-based heuristic strategies when observations match implicit predictions and shifts them to rule-based systematic strategies when they do not. We predicted and showed that matches between tacit cultural expectation and observation reinforce people's sense of inherence, the feeling that the current order is the natural and legitimate one. In contrast, mismatches open people to the possibility that alternatives are possible, with downstream effects on essentialist reasoning and certainty about the self.

We used everyday cultural products (Valentines, breakfasts, wedding photographs, Labor Day shopping bags) to documents these effects. Americans who were shown Valentine's Day cards with grey
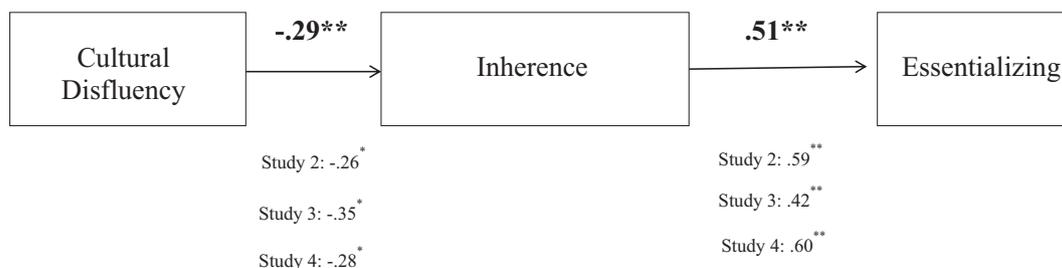

Fig. 4. The effect of cultural disfluency on essentializing via inherence (Studies 2–4).
Note: The meta-analytic synthesized effect is shown in bold, study specific effects are labeled by study. * $p < .05$, ** $p < .01$.

hearts made of skulls or Labor Day shopping bags with unexpected eco-themed designs experienced lower inherence than Americans who were shown Valentine's Day cards with pink hearts (Studies 1, 6, 7) or Labor Day shopping bags with expected patriotic-themed designs (Study 5). Similarly, Israelis who were shown unexpected breakfast ingredients for Israel such as meats and fried food experienced lower inherence than Israelis who were shown expected breakfast ingredients such as raw vegetables and fresh cheese (Studies 2 and 8). The same was true for Chinese (Study 4) and Americans (Study 3) who were shown weddings with unexpected elements such as a black wedding dress. They also reported lower inherence than those who were shown culturally expected weddings.

We showed that experiencing match and mismatch has small-to-moderate-sized effects on inherence and that this effect is stable across manipulations and countries (China, Israel, and the U.S.). We showed that the effect of our cultural fluency and disfluency carries over to cultural essentializing and self-certainty across various cultural cues, suggesting that cultural (dis)fluency effects are robust. Our manipulation checks confirmed that we manipulated cultural fluency and disfluency. That is, people randomly assigned to the Cultural Mismatch Condition (e.g. saw Valentines with grey hearts made of skulls) rated the products they saw as less traditional and less similar to what they expected than people randomly assigned to the Cultural Match Condition (e.g., saw Valentines with pink hearts). Products that mismatched cultural expectations were processed less fluently than those that matched cultural expectations, as revealed by the lower ratings of these products on quality and attractiveness. Psychological consequences of cultural disfluency remained when people were explicitly warned, were not mediated by product attractiveness, quality, or traditionality ratings, and were not a function of momentary affect or of individual differences in cultural values (individualism, collectivism) or in need for cognition, perceived need for structure, or intolerance of uncertainty. These null results suggest that cultural fluency and disfluency effects are not a function of these processes or of individual differences but rather are a function of people's automatic tendency to draw on their cultural expertise to make predictions about how everyday life will unfold.

4.1. Theoretical implications

We document that an as yet underappreciated aspect of culture, cultural fluency and disfluency, is psychologically consequential. It supports people's situated and pragmatic reasoning, in part by preserving or disrupting their sense of inherence. Our results build on an assumption made in culture-as-situated cognition theory which is that cultural expertise makes it easier to navigate everyday life by providing a road map of how "we" act and what "we" do (Oyserman, 2017). We subtly manipulated an immediate situation to support or undermine the seeming applicability of people's culture-based road map and documented that people were sensitive to the pragmatic implications of situations at hand as would be predicted by culture-as-situated cognition theory (Oyserman & Yan, 2018).

Our results have several important theoretical implications for understanding how people respond to disruptions in their everyday expectations. First, our results enrich the growing body of research on psychological inherence. We showed that cultural fluency and disfluency affects people's endorsement of inherence, the general sense that current patterns are natural and legitimate, and through that sense, affects essentialist reasoning about cultures and self-certainty. While some have argued that the relationship between psychological inherence and essentialism is specific to individualistic cultures, arguing that individualistic (inductive and causal) reasoning is required to move from inherence to essentialism (Baron, 2014). We document effects in China and Israel, suggesting the relationship between inherence and essentialism is not limited to individualistic cultures.

Second, our results are relevant to research on the relationship

between inherence (Cimpian, 2015) and essentialism, the sense that social categories have fixed essences (Gelman, 2003). Our results support the Salomon and Cimpian (2014) assertion that inherence affects essentialism. We show that essentialism is disrupted by cultural disfluency and supported by cultural fluency via the effects of cultural fluency and disfluency on inherence. These results matter given that essentialism is a double edged-sword. It is necessary, serving as precursor to categorical reasoning, which allows for predictions about the world (Gelman, 2003) and the self (Oyserman, 2019), but also increases the likelihood of stereotyping and prejudice (Bastian & Haslam, 2006).

Third, our results support the contention of culture-as-situated cognition theory that people are sensitive to the pragmatic implications of situational support or violation of their tacit, automatic culture-based predictions (Oyserman, 2011, 2017). We show that explicit warning does not undermine the effect of cultural (dis)fluency, implying that people experience cultural fluency and disfluency as pragmatically useful to their reasoning about the world. When things are not as expected and processing is difficult, one experiences the world as a less certain place. Accessible information is used in making judgments when it is experienced as relevant to the judgment task at hand, no matter why it is on the mind.

Fourth, our results support adding the concept of culture to our understanding of what a situated cognition "thinking is for doing" notion means. That is, thinking is both situated and *culture-based* and pragmatic. Situated cognition approaches predict and show that people use their metacognitive experiences of fluency and disfluency in making inferences about product quality and attractiveness, for example, rating a key as more attractive after being exposed to a lock (Schwarz, 2015). In our studies, we document that culture-based expertise matters, affecting people's automatic predictions, and that when these predictions are maintained, people rate products rate as higher in quality and in attractiveness than when these predictions are violated. However, in our studies quality and attractiveness ratings do not affect inherence; inherence was directly affected by cultural fluency and disfluency. The implication we draw is that prior models are insufficient to explain the process underlying cultural fluency and disfluency and that a broader culture-as-situated cognition model is needed to understand how culture supports pragmatic inference.

Fifth, our results support a broadened understanding of the interface between situated cognition and other approaches to meaning making. Our situated approach predicts that people make a pragmatic inference when their culture-based predictions are supported – that things are as they ought to be, paving the way for using essentialistic reasoning and the self as a predictive anchor. The alternative, when culture-based predictions are violated –that things do not have to be as they are now, paves the way to be open to new possibilities, requiring that essentialist reasoning be put aside.

Thus, our cultural fluency and disfluency model posits and shows that people's response to the unexpected entails increased openness to the possibility that things are not as they had assumed them to be. As one of our reviewers helpfully noted, the unexpected can be threatening, as highlighted by terror management theory (TMT; Greenberg, Solomon, & Pyszczynski, 1997) and the meaning maintenance model (MMM, Proulx & Heine, 2008). TMT focuses on existential threat to meaning (for example by considering what death does to one's body, Greenberg et al., 1997). MMM focuses on violation of meaningfulness, for example by switching experimenter mid-study without explanation (Proulx & Heine, 2008), evaluating surrealistic art or considering absurdist literature (Proulx, Heine, & Vohs, 2010), or even trying to solve problems with no clear solution (Grieve & Hogg, 1999). These violations increase certainty in another domain. People respond to existential threat and violation of meaning by finding certainty and meaning. For example, experiencing a switch in experimenter mid-study increased certainty in one's moral beliefs compared to not experiencing a switch. In contrast, cultural fluency and disfluency is not about existential threat or loss of meaning, it is about the automatic

predictions people make as everyday life unfolds. A breakfast plate, a wedding photograph, a Valentine's Day card can hardly be construed as implying that life may have no meaning, but do shift the pragmatic inferences people draw about whether to go with current assumptions or to be open to other possibilities.

4.2. Limitations

Like any set of studies, our studies have a number of limitations. First, our focus on adults means that we cannot make inferences about developmental patterns, which may be important in understanding the experience of inherence. Cimpian and Steinberg (2014) show that children demonstrate stronger reliance on inherence to make sense of their daily experiences than adults. It is possible that our effects would be stronger with children, but our studies cannot address this possibility. Second, our focus on modern cultures exposed to Western-style education means that we cannot address questions of whether our effects would have been found in premodern cultures not exposed to Western-style education. Compared to premodern societies, modern societies experience more rapid change, so it is possible that effects would have been larger in premodern societies. Compared to traditional, religious-based education, which focuses on the idea of a stable, revealed truth, Western-style education focuses on the idea that truth is contingent, what seems to be true in the moment may later need to be revised. It is possible that our effects would be larger if we included people from societies not exposed to Western-style educational models. Third, our focus on documenting that cultural fluency and disfluency effects could occur means that we did not attempt to enumerate the entire population of cultures and cultural experiences and randomly draw from them. Each of these strategies increases statistical power and the generalizability of found effect sizes (e.g., Westfall, Kenny, & Judd, 2014). While theoretically desirable, enumerating the population of respondents (all residents of all modern cultures) and of dependent variables (all everyday cultural experiences) and randomly sampling from them is not practically feasible. To address issues of generalizability, we used on-line panels to reduce the age and social class bias that student-only samples entail and we used a variety of everyday cultural experiences to increase the everyday realism of our stimuli. Having said that, lacking such sampling, we cannot be sure that the small-to-moderate effect that we found would apply to all possible experiences of cultural fluency and disfluency.

5. Conclusions

Based on the assumption that thinking is situated, pragmatic, and based in cultural experience, we articulate how people's culture-based expertise supports their thinking, allowing them to filter expected from unexpected situations and guiding pragmatic reasoning about the world. Our results provide support for this broader understanding of what cultural expertise is and highlight some potential upsides to the kind of disruptions that may occur in heterogeneous societies. When observed reality does not match culture-based expectations, cultural disfluency disrupts people's sense of inherence – that the current pattern of everyday life is the natural way for things to be. This, in turn, undermines people's belief in stable essences, a potentially positive turn of events in two ways. It may increase tolerance for others since essentializing may have the effect of bolstering out-group stereotyping and in may reduce certainty about one's self, opening chances to explore new possibilities.

Open practices

The experiments in this article earned open materials and open data badges as well as pre-registration badge (Study 5, Study 8) for transparent practices. The materials are located in our Supplemental Materials. The data and Qualtrics are located at our ICPSR data

repository: https://www.openicpsr.org/openicpsr/project/101920/version/V3/view. The preregistration of Study 5 is located at https://aspredicted.org/4c8th.pdf. The pregistration of Study 8 is located at https://aspredicted.org/ir4bj.pdf.

Author contributions

D. Oyserman and Y. Lin developed the study concept and study design. Y. Lin performed data collection except for Studies 2 and 8 for which S. Arieli was responsible. Y. Lin performed the data analysis and interpretation under the supervision of D. Oyserman. D. Oyserman and Y. Lin drafted the manuscript, and S. Arieli provided critical revisions. All authors approved the final version of the manuscript for submission.

Appendix A. Suppplementary data

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