Cross Cultural Differences in Decisions from Experience: Evidence from Denmark, Israel and Taiwan

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ABSTRACT

This paper examines the effects of different cultural backgrounds on decisions from experience. In Experiment 1, participants from Denmark, Israel, and Taiwan faced each of six binary choice problems for 200 trials. The participants did not receive prior description of the payoff distributions, but obtained complete feedback after each choice. Comparison of choice behavior across cultural groups reveals similar overall choice rates, and similar indications of underweighting of rare events and of the payoff variability effect. In addition, subjects from Taiwan exhibited a stronger tendency to chase recent outcomes. That is, subjects from East Asia behaved "as if" they expected less change in the environment than subjects from West Asia and West Europe. Experiment 2 shows that an increase in the complexity of the choice tasks (i.e., adding slight variability to the safe option, and increasing the number of replicas for each option) does not break the similarity of choice rates across cultural groups, but reverses the observed chasing pattern: In Experiment 2, Israeli participants tended to chase recent outcomes more than did the Taiwanese. These results can be summarized with the assumption that the tendency to rely of small samples of past experiences (a sufficient condition for underweighting of rare events and the payoff variability effect) is robust to cultural differences, but the exact sampling process is culture- and framing-specific. An increase in the number of possible outcomes increases the probability of sampling the most recent trial in the West, but not in the East. Thus, behavior in the East appears less sensitive to task complexity.

Key words: cross-cultural decision making; rare events; decisions from experience; clicking paradigm; recency effect.

INTRODUCTION

Previous research shows that individuals from East Asian cultures tend to expect more changes in the environment than individuals from Western cultures (Ji et al., 2001, 2008). For example, when presented with a graph that summarizes a decreasing trend in economic growth rates, subjects from the Peoples' Republic of China (PRC) were twice more likely than American to predict a change of the trend in the next period (Ji et al., 2001). A similar pattern was documented in reaction to recent price changes in a simulated investment task (Ji et al., 2008). Chinese subjects were less likely than Canadians to behave as if they chased recent returns: That is, the Chinese behaved as if they assigned higher probability to the possibility of a change in the trend. This observation is consistent with the hypothesis that dialectical thinking, a tolerance to contradictory beliefs, is more common in Eastern cultures (Peng & Nisbett, 1999; Spencer-Rodgers et al., 2010). The impact of dialectical thinking, however, is not always obvious. For example, it can lead to more ambivalence and moderacy (Hamamura et al., 2008), but also to more overconfidence (Yates et al., 1989, 1998; Wallsten & Gu, 2003).

The main goal of the current paper is to clarify the implications of these cultural differences in the context of repeated decisions from experience. We examine behavior in repeated choice tasks in which people had to rely on their own personal experience. Specifically, we focus on behavior in the basic clicking paradigm described in Figure 1.

The current experiment includes many trials. Your task, in each trial, is to click on one of the two keys presented on the screen. Each click will be followed by the presentation of the keys' payoffs. Your payoff for the trial is the payoff of the selected key.

Figure 1. The typical instructions screen in studies of decisions from experience adopting the "clicking paradigm"–the full-feedback paradigm in Hertwig & Erev's (2009) classification. Participants do not receive a description of the payoff distributions but receive feedback about their choices. The feedback after each choice includes the outcome from the payoff distributions associated with each key.

A second goal of the present investigation is to evaluate the generality of the basic properties of decisions from experience. Most of the previous studies of behavior in the clicking paradigm were run at the Technion (Israel Institute of Technology). Thus, participants in these studies were not just WEIRD (i.e., Western, Educated, Industrialized,

Rich, and Democratic; Henrich et al., 2010), but e-WEIRD: The added "e" stands for experienced. Indeed, many of the students at the Technion had already participated in several clicking experiments, and/or had known many other people that participated in studies that used this paradigm.

The main results of the clicking experiments that were conducted in the Technion are summarized by the six conditions (problems) described in Table 1. Problems 1 and 2 consider situations in which the prospect that maximizes expected returns leads to the worst outcome in most of the trials. Both conditions imply choice between a status quo option (0 with certainty) and an action that can lead to positive or negative outcomes. In Problem 1, the action corresponds to the gamble (-10 with p = .1; +1 otherwise); this choice has negative expected return (EV = -0.1), but it yields the best payoff in 90% of the trials. In Problem 2, the action, which corresponds to (+10 with p = .1; -1 otherwise), has positive expected return (EV = +0.1), but yields the worst payoff in 90% of the trials. Participants received a show up fee of 25 Israeli Shekels (1 Shekel ≈ $0.25) plus the payoff (in Shekels) from one randomly selected trial. Results reveal that the typical participant favors the risky prospect when it impairs expected return (R-rate of 60% in Problem 1, when the EV of the risky prospect is -0.1), but not when it maximizes expected returns (R-rate of 27% in Problem 2, when the EV of the risky prospect is +0.1). Thus, the typical result in both problems reflects deviation from maximization. In addition, participants appear to be risk seekers in Problem 1, and risk averse in Problem 2. Another way of interpreting choice behavior in these two problems is that, in both cases, it reflects underweighting of rare events (Barron & Erev, 2003; Hertwig et al., 2004; Rakow & Newell, 2010). That is, the typical participant behaves "as if" he/she does not pay enough attention to the rare (10%) outcomes.

Comparison of Problems 3, 4, 5, and 6 highlights a payoff variability effect (Myers & Sadler, 1960; Busemeyer & Townsend, 1993): High maximization rate when the payoff variability is low (Problems 3 and 4), and near random choice in Problems 5 and 6. Notice that the observed deviations from maximization in Problem 5 and 6 cannot be explained as consistent indications of risk aversion or risk seeking: If the difference between Problems 3 and 5 appears to suggest risk aversion (lower maximization rate when the high EV prospect has higher variance), the difference between Problems 4 and 6 appears to reflect risk seeking.

Table 1 also shows two sequential dependency statistics. The inertia score is the proportion of trials in which participants made the same choice as in the previous trial. The best reply rate is the proportion of trials in which participants selected the option that led to

the best payoff in the previous trial. Typically, experimental results reveal a higher tendency to inertial choice than to best reply.

Table 1: Summary of previous results observed in the six experimental conditions (from Erev & Haruvy, 2013, and from Di Guida et al., 2012) that examine choice behavior using the clicking paradigm described in Figure 1

		Erev & Haruvy (2013)			Di Guida et al. (2012)		
Problem	Action	Action rate	Inertia rate	Best Reply rate	Action rate	Inertia rate	Best Reply rate
1	(10, .1; -1)	.28 (.24)	.86 (.13)	.69 (.20)	.22 (.23)	.94 (.06)	.73 (.19)
2	(-10, .1; 1)	.58 (.30)	.81 (.17)	.57 (.25)	.50 (.28)	.86 (.13)	.52 (.23)
3	(11, .5; -9)	.57 (.22)	.66 (.16)	.64 (.13)	.46 (.35)	.83 (.16)	.56 (.09)
4	(9, .5; -11)	.47 (.26)	.70 (.20)	.60 (.16)	.29 (.26)	.81 (.17)	.60 (.11)
5	1 with certainty	.96 (.12)	.97 (.08)	.96 (.12)	.95 (.11)	.98 (.03)	.95 (.11)
6	-1 with certainty	-	-	-	.03 (.11)	.99 (.02)	.98 (.11)
Risk (mean of A1, A2, A3, and A4)			.44 (.19)			.37 (.18)	
Underweighting of rare events [(A2 - .5) + (.5 - A1)] / 2			.16 (.19)			.14 (.15)	
Payoff variability effect (A5 - A3 + A4 - A6) / 2, or A5 - A3			.40 (.22)			.37 (.18)	
Best reply (mean of B1, B2, B3, and B4)			.63 (.16)			.60 (.08)	
Inertia (mean of I1, I2, I3, and I4)			.81 (.15)			.86 (.11)	

Note. All six conditions involve repeated choices (100 to 200 trials) between the status quo (a prospect that provides zero with certainty, or the "Zero" option) and the payoff distribution presented in the first column (the "Non-zero option"). The distribution (x, p; y) implies x with probability p, y otherwise. The result columns present the proportion of choices of the "status-quo prospect" over all trials.

PREDICTIONS

The natural generalization of the observation that people from East Asian cultures expect more changes in the environment (Ji et al., 2001, 2008) implies that decisions from experience in East Asia will be characterized by lower best reply rates than in the West. The

belief that the environment is likely to change should reduce the attractiveness of the action that has led to the best payoff in the previous trial. In addition, this generalization implies less underweighting of rare events and weaker payoff variability effect. Less underweighting of rare events is predicted because the expectation of a change implies the belief that the rare outcome is likely to occur after the most common outcome (i.e., in 90% of the trials in Problems 1 and 2). Weaker payoff variability effect is predicted because the expectation of a change implies less maximization in the trivial Problems (5 and 6). Finally, dialectical thinking would imply higher choice variability and, for this reason, less inertia in the East.

EXPERIMENT 1

Experiment 1 replicates the experiments summarized in Table 1, and was run in three locations: At the Lab@SDU (University of Southern Denmark, Odense, Denmark), at the Interdisciplinary Center (IDC) Herzliya (Israel), and at the AI-Econ Lab of the National Chengchi University (Taipei, Taiwan).[2]

Method

Design

Participants played for 201 times (200 decisions with feedback) each of the six binary problems presented in Table 1. The order of the problems was independently randomized for each participant. Participants were told that the experiment would include many trials and that their task would be to choose between two unmarked keys that appear on the screen. Participants were given no information about the problems' incentive structure. After each selection, the payoffs from the selected and the non-selected keys were presented on the screen. The zero and action options were randomly assigned to keys, independently for each participant, and each option was maintained in the same position in all trials of the same problem. Subjects were told when each problem had terminated.

Instructions and payment

In Denmark and in Israel, instructions were given in English, whereas in Taiwan the English text was next to the translated one (the two languages method mimics the original Technion study). The translation to Chinese Mandarin was made by a mother tongue fluent in English.

[2] The three Countries considered in this study greatly differ in the six Dimensions of National Culture, which account for the fundamental traits of societies and their culture (Hofstede, Hofstede, & Minkov, 2010).

It is worth noting that in the clicking paradigm, due to the simplicity of the task, instructions are minimal (see Figure 1), and their impact on participants' performance is limited. The two buttons on the screen were simply referred to as the "right" and "left" alternative. Instructions appeared on the screen at the beginning of the experiment.

Participants were paid according to the amount of experimental points they earned with their decisions during the experiment. Specifically, participants received an initial endowment of 150 experimental points, plus the positive or negative outcome (in experimental points) from six of their choices (one for each problem), randomly selected at the end of the experiment.

The conversion rate between experimental points and the local currency was clearly stated at the beginning of the experiment. In order to make payments' purchasing power comparable across the three Countries, we used the "The Economist's Big Mac Index." One experimental point was worth 0.4 Danish Kroner, 0.2 Israeli Shekels, and 1 Taiwanese Dollar, so that the initial endowment of 150 points was equivalent to the price of two Big Mac sandwiches.

Participants

Thirty-two Danish students (15 females, 17 males, M_{age} = 22.7 years, age range: 19-28 years), thirty-one students from IDC (16 females, 15 males, M_{age} = 24.6 years, age range: 22-33 years),[3] and forty-eight Taiwanese students (34 females, 14 males, M_{age} = 21.7 years, age range: 19-26 years) served as participants in the experimental sessions.

Results

The main experimental results are presented in Table 2 using the format of Table 1. Results reveal a significant reversal of our main hypothesis. Taiwanese subjects did not behave as if they expected more changes in the environment. On the opposite, they showed higher best reply rates (.79) than in Denmark (.68) and in Israel (.72); the difference is significant (F(2, 108) = 4.26, p = .02, η^2 = .07, see Table A1 for pairwise comparisons). That is, Taiwanese subjects behaved as if they expected the outcome from the previous trial to occur again. Subjects from Taiwan did exhibit less inertia (.71) than those from Denmark (.77) and Israel (.75) (F(2, 108) = 3.77, p = 0.03, η^2 = .07, see Table A2 for pairwise comparisons).

[3] Twenty-one Israeli students and ten students from the IDC International Psychology and International Business Programs (four from the US, three from Italy, two from France, and one from Venezuela).

In addition, results show that the main properties of decisions from experience (i.e., underweighting of rare events and the payoff variability effect) are robust to cultural differences. Moreover, the estimated tendencies to underweight rare events in the three subject pools are larger than the estimates based on the data from the Technion ($F(4, 264) = 4.28$, $p < .01$, $\eta^2 = .03$, for the underweighting scores; $F(4, 156) = 0.42$, ns, for the payoff variability scores; see Tables A3 for pairwise comparisons). The underweighting of rare events score is .53 in Taiwan, .46 in Denmark, and .43 in Israel. The difference is not significant ($F(2, 108) = 0.87$, ns), and all rates are significantly larger from 0 ($t(31) = 8.16$, $p < .001$ in Denmark; $t(30) = 6.20$, $p < .001$, in Israel; and $t(47) = 10.57$, $p < .001$, in Taiwan). The payoff variability score is .32 in Taiwan and in Denmark, and .37 in Israel ($F(2, 108) = 0.51$, ns). These rates are significantly larger than 0 ($t(31) = 7.43$, $p < .001$ in Denmark; $t(30) = 9.77$, $p < .001$, in Israel; and $t(47) = 11.74$, $p < .001$, in Taiwan).

Comparison of the best reply and inertia statistics to the Technion data (Table 1) reveal similar patterns in the three Western locations.

Table 2. Summary of Experiment 1 results

		West Europe (Denmark)			West Asia (IDC, Israel)			East Asia (Taiwan)		
Prob.	Action	Action rate	Inertia rate	Best Reply rate	Action rate	Inertia rate	Best Reply rate	Action rate	Inertia rate	Best Reply rate
1	(10, .1; -1)	.21 (.18)	.90 (.06)	.76 (.17)	.27 (.29)	.87 (.14)	.73 (.26)	.22 (.20)	.86 (.09)	.80 (.20)
2	(-10, .1; 1)	.67 (.23)	.82 (.14)	.67 (.21)	.70 (.28)	.82 (.13)	.72 (.27)	.75 (.24)	.82 (.14)	.80 (.24)
3	(11, .5; -9)	.46 (.22)	.65 (.15)	.70 (.18)	.47 (.25)	.67 (.19)	.71 (.21)	.51 (.16)	.59 (.15)	.78 (.20)
4	(9, .5; -11)	.34 (.19)	.70 (.17)	.62 (.14)	.45 (.22)	.64 (.18)	.73 (.21)	.44 (.13)	.57 (.14)	.80 (.19)
5	1 with certainty	.91 (.21)	.95 (.16)	.91 (.21)	.89 (.26)	.95 (.13)	.89 (.26)	.89 (.23)	.94 (.14)	.89 (.23)
6	-1 with certainty	.15 (.30)	.97 (.07)	.86 (.30)	.12 (.23)	.95 (.16)	.88 (.23)	.09 (.20)	.97 (.08)	.91 (.20)
Risk (mean of A1, A2, A3, and A4)			.42 (.13)			.47 (.18)			.48 (.12)	
Underweighting of rare events [(A2 - .5) + (.5 - A1)] / 2			.23 (.16)			.22 (.19)			.26 (.17)	
Payoff variability effect (A5 - A3 + A4 - A6) / 2			.32 (.25)			.38 (.21)			.37 (.22)	
Best reply (mean of B1, B2, B3, and B4)			.68 (.12)			.72 (.18)			.79 * (.18)	
Inertia (mean of I1, I2, I3, and I4)			.77 (.08)			.75 (.12)			.71 * (.10)	

Note. The distribution (x, p; y) implies x with probability p, y otherwise. The "Action rate" represents the proportion of choices of the non-zero option over all trials; the "Inertia" rate is the proportion of repeating the last choice; finally, the "Best Reply" rate indicates the proportion of choices at time t that best respond to the lottery outcome at t - 1, over all trials. The standard deviations of the rates are reported between parentheses. A star (*) implies a significant effect ($p < .05$) of the group factor for the statistics reported on the lower part of the table.

The unpredicted difference between Taiwan and the western locations can be explained with a refinement of our generalization of Ji et al.'s (2001, 2008) findings to the current setting. The generalization presented above assumes that (1) Taiwanese subjects are more likely to expect a change, and (2) they select the payoff maximizing option under the assumption that a change will occur in the next trial. The refined generalization keeps the

first part, and replaces the second with the assertion that the expectation of a change leads the Taiwanese to take the last outcome as the indication of this change. Thus, they pay more attention to the most recent payoff because they think that a change has just occurred, and, for this reason, older experiences are less informative.

According to an alternative explanation, the apparent difference between the current results and the pattern documented by Ji et al. (2001, 2008) is a reflection of the different tasks and framings used in the two studies. It is possible that the "prediction" framings used in Ji et al. (2001), and the stock market tasks examined in Ji et al. (2008), led the subjects from the East to rely on past experiences in situations in which "the predictions of a change" was more likely to be reinforced, and that our abstract binary choice framing led to the opposite effect. This hypothesis is consistent with the observation that the expectation about future changes is heavily affected by manipulations of subjects' attention to distal or proximal information (Guo et al., 2012; Ji et al., 2009). Ji et al. (2009) report that both European Canadian and Chinese from the PRC who were induced to focus on recent information were less likely to predict future changes–compared to those who were induced to focus on more remote information–, and that this manipulation was sufficient for eliminating cultural differences. The current hypothesis is also supported by the result that the higher overconfidence in probability judgment tasks observed in the East does not lead to higher risk taking in betting tasks (Yates at el., 1997). In addition, the current hypothesis is consistent with the finding that sequential dependencies in decisions from experience are sensitive to factors that do not affect aggregate choice rates. For example, framing the choice task as a card game leads to low best reply rates (negative recency), but does not appear to have other effects (Erev & Haruvy, 2013). Estes (1962) suggests that sequential dependencies are often reflections of habits rather than indications of the basic properties of human learning.

In order to compare these hypotheses, we chose to study a multi-alternative multi-outcome environment, which is more similar (compared to Experiment 1) to the stock market environment examined by Ji et al. (2008). The hypothesis that "subjects in the east are more sensitive to recent changes" predicts that this focus will magnify cultural differences. It will lead to clear cultural differences not only in sequential dependencies, but also in aggregate choice rates: As explained below, high sensitivity to recent changes implies that an increase in the number of alternatives would increase risk seeking, and lead to overweighting of attractive rare events. In contrast, the framing hypothesis implies that the new framing will trigger the "more chasing in the West" pattern documented by Ji et al. (2001, 2008).

EXPERIMENT 2

This experiment replicated the second study in Ert & Erev (2007) in Taiwan (National Chengchi University, Taipei), and in Israel (Technion, Haifa). It used the clicking paradigm, described above, and focused on the six problems presented in Table 3. The six problems included two basic problems (7.1 and 8.1), and two variants to these problems. Problems 7.3 and 8.3 were identical to the original problems with the exception of the addition of two replicas of each alternative. Problems 7.25 and 8.25 included 24 replicas of each alternative. At each trial, the different replicas yielded an independent draw from the same distribution. Figure 2 presents the typical experimental screens.

Table 3. Summary of Experiment 2 results

			Israel			Taiwan		
Prob.	Basic alternatives	Number of replicas	R rate	Inertia rate	Best Reply rate	R rate	Inertia rate	Best Reply rate
7.1	R: (32, .09; 0) S: A draw from {1, 2, 3, 4, 5}	0	.20 (.24)	.79 (.22)	.90 (.09)	.29 (.27)	.68 (.24)	.80 (.14)
8.1	R: (32, .1; 0) S: A draw from {1, 2, 3, 4, 5}	0	.20 (.24)	.79 (.24)	.89 (.10)	.33 (21)	.68 (.20)	.69 (.19)
7.3	R: (32, .09; 0) S: A draw from {1, 2, 3, 4, 5}	2	.24 (.19)	.52 (26)	.42 (.29)	.26 (.19)	.38 (.16)	.32 (.29)
8.3	R: (32, .1; 0) S: A draw from {1, 2, 3, 4, 5}	2	.32 (.28)	.45 (.29)	.50 (.35)	.30 (.24)	.37 (.17)	.29 (.25)
7.25	R: (32, .09; 0) S: A draw from {1, 2, 3, 4, 5}	24	.52 (.32)	.30 (.30)	.32 (.34)	.40 (.32)	.17 (.18)	.25 (.29)
8.25	R: (32, .1; 0) S: A draw from {1, 2, 3, 4, 5}	24	.54 (.32)	.32 (.32)	.25 (.25)	.40 (.31)	.18 (.15)	.22 (.31)
Risk				.34 (.20)			.33 (.17)	
Underweighting of rare events .5 - P(R in problems 8.*)				.15 (23)			.16 (.18)	
Best reply				.53 (.21)			.41 * (.13)	
Inertia				.55 (.19)			.43 . (.18)	

Note. For the statistics reported on the lower part of the table, a star (*) indicates that the group factor is significant at the 5% confidence level, whereas a dot (.) indicates significance at the 10% confidence level.

Notice that in the basic problems, perfect best reply to recent payoffs implies an R-rate of 10%: That is, extreme underweighting of rare event in Problem 8.1 (when R

maximizes expected return), and strong risk aversion. In contrast, in Problems 7.25 and 8.25 the probability that at least one of the 25 risky prospects will lead to a large gain is very high (.91 in 7.25, and .93 in 8.25). Thus, perfect best reply implies overweighting of rare event in Problem 7.25 (when R impairs expected return), and high risk seeing rates.

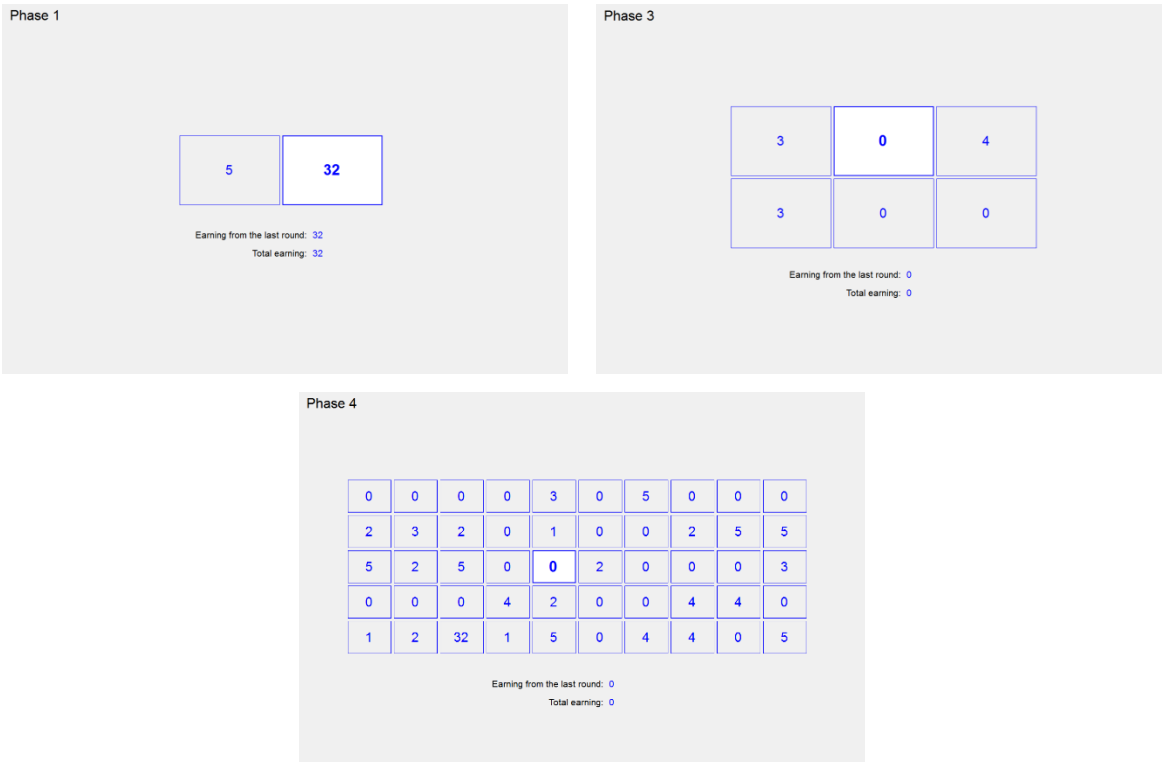

Figure 2. Sample screenshots from Experiment 2 after the first choice in the three experimental conditions (with 0, 2, and 24 replicas for each alternative). The selected key is highlighted with a white background.

Method

Design

As in Experiment 1, at each trial, subjects had to select (click on) one of the unmarked keys presented on the screen, and, after each selection, they were given feedback about the outcomes from both the selected and unselected keys.

Each subject faced each of the six problems for 50 trials. The order of the problems was independently randomized for each subject, as well as the order of the keys presented on the screen. Participants were not given any information about the exact length of the experiment, but that it would include six distinct phases.

Instructions and payment

Instructions were translated in the local language by mother tongues, and appeared on the screen at the beginning of the experiment both in the local language and in English. The conversion rate between experimental points and the local currency was communicated at the beginning of the experiment, and was the same as in Experiment 1 (one experimental point was worth 1 TWD, and 0.2 ILS).

Participants were paid according to the amount of experimental points gained during the experiment. Specifically, participants received a show up fee of 24 Shekels or 120 TWD, plus a bonus corresponding to the experimental point cumulated in one of the phases (randomly selected at the end of the experiment).

Participants

One experimental session was run at the Technion (Haifa, Israel), whereas the other at the AI-Econ Lab of the National Chengchi University (Taipei, Taiwan). Twenty students from the Technion (9 females, 11 males, M_{age} = 24.2 years, age range: 20-28 years) and twenty-two Taiwanese students (15 females, 7 males, M_{age} = 22.5 years, age range: 20-26 years), who did not participate in Experiment 1, participated in the experimental sessions.

Results

Experimental results are presented in the right hand columns of Table 3. They reflect a clear violation of the hypothesis that "subjects from the East are more sensitive to recent changes." In the current study, the Taiwanese were less likely to select the option that led to the best payoff in the previous trial. The mean best reply rate is .41 in Taiwan, and .52 in Israel. This difference is significant ($F(1, 40) = 4.80$, $p = .03$, $\eta^2 = .11$) and robust: The best reply rates in Taiwan are smaller than the rates in Israel in all six problems. Moreover, in the current study, the inertia rate in Taiwan (.43) is smaller than that in Israel (.55) ($F(1, 40) = 4.04$, $p = .051$, $\eta^2 = .09$).

Analysis of aggregate choice rates shows no cultural differences. The data from Israel and Taiwan show very similar maximization rates (respectively, .51 and .52; $F(1, 40) = 0.04$, ns), similar risk taking rates (respectively, .34 and .33; $F(1, 40) = 0.01$, ns), and similar indications for underweighting of rare events (respectively, .15 and .16; $F(1, 40) = 0.02$, ns). As already observed in Ert & Erev (2007) (see also Grosskopf et al., 2006), the joint effect of chasing and confusion dramatically lowers the tendency to underweight rare positive

outcomes. However, in both cultures, the underweighting rates are significantly larger than 0 ($t(19) = 2.90$, $p = .01$, in Israel; and $t(21) = 4.02$, $p = .001$, in Taiwan).

GENERAL DISCUSSION

The current experimental studies document two pairs of apparently inconsistent observations. The first pair is suggested by comparison of the best reply rates in Experiment 1 and 2. In Experiment 1, Taiwanese subjects were more likely to select the option that led to the best payoff in the previous trial than Westerners. Results from Experiment 2 show the exact opposite: the Taiwanese were less likely to select the best reply option. Thus, subjects from East Asia behaved as if they are more likely to expect a change (as documented in Ji et al., 2001, 2008) in Experiment 2, but the opposite occurred in Experiment 1.

The second pair of inconsistent observations is suggested by comparison of aggregate choice rates, and of sequential dependencies in the data. Analysis of aggregate choice rates does not detect significant cultural differences. Indeed, the aggregated results in East Asia, West Asia, and West Europe reveal very similar patterns. All three locations replicated the basic properties of decisions from experience: Underweighting of rare events, and the payoff variability effect. In contrast, analysis of sequential dependencies reveals significant cultural differences: As noted above, the Taiwanese were more likely to chase recent payoffs in Experiment 1, and less likely to do so in Experiment 2.

We believe that there is a simple explanation to this apparently complex pattern. The explanation builds on Skinner's (1953; see also Gonzalez et al., 2003) assertion that behavior is selected by the contingencies of reinforcements. That is, people from all cultures, like other animals (Shafir et al., 2008), tend to select the options that led to the best payoff in the most similar situations in the past. Recent research (e.g., Hertwig & Erev, 2009; Plonsky et al., 2014) reveals that this assumption implies sufficient conditions to the basic properties of decisions from experience: The focus on the most similar past experiences implies reliance on small samples (because only few past experiences are most similar to the current trial), which, in turn, implies underweighting of rare events, as well as the payoff variability effect.

Under this account, cultural differences affect choice behavior because they differently affect the contingencies of reinforcements. That is, they affect the similarity functions that people use in different settings and/or under different framings. To see how the use of distinct similarity functions can lead to the current "Culture by Study" interaction, it is convenient the start with the ACT-R model that won the clicking contest in the Technion choice prediction competition (Erev et al., 2010). This model assumes that people use two

types of similarity rules, i.e., temporal similarity, and sequence-based similarity. The use of temporal similarity implies that the current trial is more similar to the most recent one, and, for that reason, leads to high best reply rates. The use of sequence-based similarity implies that a trial that occurs after a particular outcome pair (e.g., 0 from S, +10 from R) is more similar to the previous trials that have occurred after that specific outcome pair. The use of this similarity function implies low best reply rates. To capture the Culture by Study interaction with this model, it is enough to add one assumption: The hypothesis that the subjects from the West are more likely to use sequence-based similarity rules when the sequences of recent outcomes are relatively simple (i.e., with only three possible outcomes, as in Study 1), but are less likely to use sequence-based similarity rules when the number of possible outcomes is large (i.e., at least seven possible outcomes, as in Study 2). That is, the complexity of the sequences in Study 2 leads Westerners to follow simple temporal rules, and, for this reason, it leads to an increase in the best reply rates.

The current post-hoc explanation is, of course, only one of the possible explanations for the observed interaction. Yet, it has several attractive features. First, it involves only one new hypothesis. Second, as suggested by this explanation, the results show that the main difference between Study 1 and 2 occurred in the West. For example, Israeli subjects were more likely to behave as if the most recent trial was very similar to the current trial in Study 2 (e.g., 89% in Problem 7.1 and 8.1), and less likely to feel so in Study 1 (e.g., 71% in Problem 1). In contrast, Taiwanese subjects were less sensitive to the difference between the two experiments (e.g., best reply 75% in Problem 7.1 and 8.1, and 80% in Problem 1). A third source of support comes from analysis of other data sets showing that an increase in the number of possible outcomes increases the best reply rate in the West.[4] A forth, and most dialectic source of support is the observation that the current explanation is consistent with the view of more tolerance for complexity in the East. Finally, our explanation implies a rare agreement between Skinner and Chomsky. It implies that, although the way people make inferences can be affected by the general beliefs imposed by different cultural backgrounds, the basic underlying cognitive processes of reasoning appear to be as cultural universal (Chomsky, 1995; Johnson-Laird & Lee, 2006).

[4] In one analysis, we examined a study that focuses on the effect of adding noise (a random draw from the U(0, 1) distribution) to all payoffs. The basic task involved a choice between the status quo (0 for sure) and a gamble that pays +1 or -1 with equal probability. The results reveal that the addition of the noise increased the best reply rate (at the Technion) from 65% to 81%.

In summary, our study reveals significant cultural differences in the responses to recent outcomes, but also the robustness of the basic properties of decisions from experience. It highlights similar indications of underweighting of rare events, and of the payoff variability effect in Denmark, Israel, and Taiwan. The distinct reactions to recent outcomes can be explained with the assertion that subjects from the West are less likely to expect a change in a multi-outcome world, and more likely to expect a change when the set of possible outcomes is small. These results are consistent with the view that people from all cultures tend to select the option that led to the best outcomes in similar situations in the past, and that culture can affect the similarity functions that they tend to use.

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APPENDIX

Table A1: *Comparisons of average Best Reply rates across cultural groups in Experiment 1*

Comparison	Difference	lower	upper	Adjusted p-value
IL-DK	0.040	-0.059	0.139	.61
TW-DK	0.107	0.017	0.197	.01
TW-IL	0.067	-0.023	0.158	.19

Note. The label DK refers to Denmark, IL to Israel, and TW to Taiwan. We report values for the 95% family-wise confidence level, Tukey's 'Honest Significant Difference' method.

Table A2: *Comparisons of average Inertia rates across cultural groups in Experiment 1*

Comparison	difference	lower	upper	Adjusted p-value
IL-DK	-0.017	-0.076	0.042	.77
TW-DK	-0.058	-0.112	-0.005	.03
TW-IL	-0.041	-0.095	0.012	.16

Note. The label DK refers to Denmark, IL to Israel, and TW to Taiwan. We report values for the 95% family-wise confidence level, Tukey's 'Honest Significant Difference' method.

Table A3: *Comparisons of average underweighting rates across cultural groups in Experiment 1 and the two groups from the Technion*

Comparison	difference	lower	upper	Adjusted p-value
DK-DG	0.177	-0.077	0.432	0.31
EH-DG	0.031	-0.173	0.234	0.99
IL-DG	0.152	-0.105	0.408	0.49
TW-DG	0.251	0.017	0.484	0.03
EH-DK	-0.147	-0.345	0.051	0.25
IL-DK	-0.026	-0.279	0.227	1.00
TW-DK	0.073	-0.156	0.302	0.90
IL-EH	0.121	-0.080	0.322	0.46
TW-EH	0.220	0.050	0.390	0.004
TW-IL	0.099	-0.132	0.330	0.76

Note. The label DK refers to Denmark, IL to Israel, TW to Taiwan, EH to the Technion data by Erev & Haruvy, 2013, and DG to the Technion data from Di Guida et al., 2012. We report values for the 95% family-wise confidence level, Tukey's 'Honest Significant Difference' method.