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Title: Achievement attributions and persistence: A Cross-cultural comparison among American, Chinese-American, and Taiwanese college students.

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ABSTRACT

The purpose of the current study was to examine, under experimentally controlled achievement situations, whether there were differences in students' attributions as well as manifested persistence among (Caucasian) American, Chinese-American, and Taiwanese college students.

A total of 285 college students (148 males and 137 females) were recruited to represent the American (N = 62), the Chinese-American (N = 53), and the Taiwanese students (N = 170). The experimental procedure involved, in this order, (1) outcome-manipulated treatment tasks aimed at inducing either relatively good or poor performance, (2) an attribution questionnaire (CDS II), and (3) a difficult untimed task containing unsolvable items.

Results indicated a significant main effect for culture. Specifically, locus of causality was the primary contributor to the significance for culture. Taiwanese students demonstrated significantly higher internal attributions than their Chinese-American counterparts alone and the combined group of American heritage. No significant interaction was found between culture and treatment effect in that the three cultural groups did not show significant differences on their causal attributions when confronted with different treatment tasks. Analyses of the persistence task showed that, when the effects of age, gender, and treatment were statistically controlled, the combined group of Chinese heritage persisted significantly longer than their American counterparts.

Finally, various contrasts conducted between/among the cultural groups revealed that the Chinese-Americans appeared more similar to the Americans attribution-wise but more akin to the Taiwanese persistence-wise. Implications of these findings for research and educational purposes were discussed.

Theoretical Framework

Weiner (1986) first applied the attribution theory to achievement motivation and proposed that causal attributions perceived by individuals can influence their future expectations and emotional reactions, which in turn influence the achievement outcome. Since causal beliefs mediate between the perceptions of an achievement task and the final performance, they provide not only helpful indices of students' achievement motivation but indirect explanations of their achievement level.

Weiner's attribution model posits three causal dimensions, termed locus of control, stability, and controllability. Locus of control refers to the site of a cause -- whether or not the outcome of an event is attributed to something inside (internal to) or outside (external to) the person involved. Stability is the degree to which a cause is perceived as either enduring in time or short-lived. Finally, controllability refers to the degree of perceived volitional power one has over a cause. Four elements in reflection of the three causal dimensions are important, argued by Weiner (1986), when studying attributions in achievement-related contexts; that is, ability, effort, task difficulty, and luck. In terms of the three causal dimensions, ability represents an internal, stable, and uncontrollable factor whereas effort represents a factor that is internal, controllable, yet variable from situation to situation on the stability dimension. Task ease/difficulty and luck are two external and uncontrollable factors with task being viewed as rather stable and luck as unstable. Note that effort is the only factor among the four that is subject to one's volitional influence; i.e., a controllable factor, whereas all other factors are uncontrollable in nature.

Since causal perceptions are, to a large extent, subjective value judgments, which are themselves highly susceptible to cultural influences, examinations of students' causal beliefs in cross-cultural contexts may shed light on their achievement motivation which in turn may influence their school performance. In fact, Weiner's

attribution model has been employed by researchers into various cross-cultural settings and revealed fruitful results (Chandler, Shama, Wolf, & Planchard, 1981; Bar-Tal, Goldberg, & Knaani, 1984; Crittenden & Lamug, 1988; Schuster, Forsterling, & Weiner, 1989).

Literature Review

Hsieh, Shybut, & Lotsof (1969) compared Chinese, American-born Chinese, and Anglo-American students in their responses to Rotter's Internal-External Control Scale (Rotter, 1966). The results showed that the Hong Kong Chinese group demonstrated a significantly higher external score than did the Anglo-American group with the American-born Chinese group falling in between.

Lao (1978) examined the cross-cultural feasibility of the internal-external control of reinforcement among 423 American college students and 517 Chinese college students in Taiwan. A refined I-E scale by Levenson (1974) -- the Internal, Powerful Others, and Chance Scale (IPC) -- was used in this study. The author reported correlations between I, P, C scores and other variables such as academic performance, SES, and confidence measures for both groups and suggested that the pattern of relationships between I, P, C, and other meaningful variables was similar for both countries.

Chiu (1986) compared 360 American and 360 Chinese (in Taiwan) children in sixth and eighth grades (equal number in both grades and genders for both groups) in patterns of internality for success and failure situations by using the Intellectual Achievement Responsibility (IAR) scale. With the same measure -- IAR, Chiu (1987) conducted another study examining 194 American and the same number of Chinese (in Taiwan) tenth grade students (equal number of males and females for both groups) in their beliefs in the locus of control in success and failure conditions. The contrasts between American and Chinese groups (in Taiwan) in the two studies suggest that, in general, American children show a higher degree of internality in successes than in failures while Chinese children tend to assume personal responsibility more for failure than for success

situations (Chiu, 1986, 1987). However, both American and Chinese students tend to become more externally oriented as they grow older.

Leung (1993) investigated the relationship between socio-cultural variables (i.e., ethnicity, gender, SES, age, and self-perceived academic achievement) and academic motivational orientations (i.e., meaning of success, achievement causal attributions, and achievement goal orientations) among 333 American (white, non-Hispanic) and 375 Chinese (in Hong Kong) students in grades 8, 10, and 12. Russell's Causal Dimension Scale (CDS) (1982) was used in this study. Results indicate that attribution of academic success to ability seemed to transcend cultural boundaries in that both American and Chinese students demonstrated a greater amount of ability attributions for their academic successes as their self-perceived academic achievement increased.

Tuss, Zimmer, & Ho (1995) compared 738 fourth-grade underachieving children (226 from China, 308 from Japan, and 204 from the United States) in their beliefs about the reasons for successful and unsuccessful mathematics performance through open-ended written responses. Comparisons by nation showed that Asian students as a whole perceived controllable causes, particularly effort, to play a greater role in performance outcomes than did their American peers. A further breakdown showed that students from China perceived the reasons for math achievement to be internal and controllable to the greatest degree; students from Japan were in the middle for both locus and controllability dimensions; and students from the United States perceived the greatest external and uncontrollable causes.

Yan & Gaier (1994) studied causal attributions for college success and failure in 69 American (34 females, 35 males) and 289 Asian undergraduate and graduate students using the Multidimensional-Multiattributonal Causality Scale (MMCS) (Lefcourt, VonBaeyer, Ware, & Cox, 1979). Scheffe test between American group and Asian groups as a whole revealed that American students attributed their

academic achievement significantly more to ability than did the students from China, Japan, Korea, and Southeast Asia. Among the four causal attributions, effort and luck were the two that differentiated nationality groups in how they attributed their successes or failures. Specifically, on the effort dimension, American students attributed more effort to success than to failure whereas the Asian groups as a whole judged effort to be equally important for success and failure. On their attributions to luck, all except Korean group attributed luck equally for success and failure; Korean students attributed luck more to their successes than to their failures.

Ryckman & Mizokawa (1988) compared 545 Asian-American and 561 American 4th-11th graders in their causal attributions to effort and ability for academic success and failure in language arts as well as in mathematics/ science. The general conclusions made by the authors were that while academic success or failure was attributed more to effort by both groups, the Asian-Americans as a group tended to emphasize effort more than White Americans. The pattern was reversed for ability.

Mizokawa & Ryckman (1990) investigated the attributional variations among American students with different Asian heritage. The general findings showed that, although Asian-Americans, as a group, attributed academic successes and failures primarily to effort than to ability, different ethnic groups still demonstrated differing patterns of attributions when SES, achievement outcomes (success/failure), and subject-areas (math/science, language arts) were taken into consideration.

Lee, Ichikawa, & Stevenson (1987), Stevenson, Lee, Chen, Stigler, Hsu, & Kitamura (1990) conducted a series of cross-national, longitudinal studies during a ten-year period from 1980 to 1990 with first and fifth graders attending elementary schools in the Minneapolis metropolitan area, Taipei (Taiwan), and Sendai (Japan). The initial study was conducted with 1,440 children (240 first graders and 240 fifth graders in

each city) in 1980-1981 and the follow-up study with the original first graders in 1984-1985, when the children were in the fifth grade.

Findings of these two studies (Stevenson et al., 1990; Lee et al., 1987) suggested that, among other things, although more emphasis was given to effort than to ability as attributions for achievement in all three countries, Americans generally placed greater emphasis on ability relative to their Chinese and Japanese counterparts who tended to consider effort as more crucial to achievement.

Hess et al. (1987) examined beliefs about children's performance in mathematics through interviews with mothers and their sixth-grade children in China and in Chinese-American and Caucasian-American groups in the United States. Results showed that, in general, although all three groups tended to give more weight to lack of effort than to other sources for poor performance, Chinese families placed the greatest weight on lack of effort and Caucasian-American group distributed blame more evenly across all five causes. While the Chinese-American group demonstrated a similar pattern with their Chinese counterparts, the weight to effort was somewhat less.

Summary of Findings

In general, contrasts in patterns of attribution between American students (predominantly Caucasian) and Asian students as an aggregated group suggest that Asian students perceive controllable causes, particularly effort, to play a greater role in performance outcomes than do their American peers. Specifically, when performance outcomes are further differentiated between success and failure, American students tend to attribute their academic successes to internal factors such as inherent ability and personal effort and their failures to external causes such as hard task and bad luck. The opposite pattern seems to be true with the Asian groups; that is, while Asian students tend to assume personal responsibility for failure, they tend to attribute their successes to external causes.

Variations in causal attributions, however, do seem to exist among Asian students. Immigrant Asian students in the U.S., in general, demonstrate a pattern of attribution seemingly approaching the American pattern as described above while still retaining some characteristics demonstrated by students of Asian countries. Therefore, Asian-Americans generally appear to be a "mixture" of American and Asian students in terms of their attributional orientation. On the other hand, later studies further indicate the possibility of variability in causal beliefs within the Asian-American group. Specifically, students of Southeast Asian origins tend to have different attributional profiles when compared to those Asian descendants from China, Japan, Korea, and Taiwan, etc.

Significance of the Current Study

Previous attribution research in the cross-cultural settings typically employed methodologies that aimed to investigate how students' ethnic/social background would link to their attributional orientations. Generally, subjects' causal beliefs in these studies were surveyed based on a particular achievement-related incident that subjects recalled from their past. The current study is aimed at investigating students' causal beliefs based on commonly provided achievement experiences and how their causal ascriptions relate to their cultural/ethnic background. It is to be argued that, only when the same achievement context is provided by the experimenter and experienced by all participants can the resulting attributions be more comparable than those derived from subject-provided, different incidents, which may very likely have varying degrees of psychological impact. Therefore, one purpose of the current study is to further fine-tune the experimental conditions in the attributional research by subjecting students to an outcome-manipulated learning task – a relatively easy or difficult task – designed to elicit either good or poor performance. Based on the predisposed performance experience, students then make their causal attributions.

Another purpose is to document the said-to-be existent attributional differences among American students and students of different Asian origins as an aggregated group. In order to avoid confounding effects of having too many ethnic groups involved at the same time, the current study, with an intention to replicate and extend the existent findings, concentrates on contrasts between American and Chinese students. Specifically, American college students, Chinese college students in Taiwan, and Chinese-American college students are the three subject groups. Moreover, the same concern applies to the American sample. Caucasian-American students will be the target students for the American group in the present study.

We argued that the three cultural groups would demonstrate different attributional patterns in response to the treatment tasks, that the groups of Chinese origin, upon engaging in an untimed difficult task, would persist on the task longer than their American counterparts, and that the Chinese-American sample would resemble a mixture of American and Chinese features in their attributional orientation and persistence tenacity.

Method

Participants

The current study employed a voluntary nonrandom sample of 285 college students (148 males and 137 females) between the ages 17-38 to represent the three target cultures. The American sample (N = 62) was recruited from three undergraduate classes of mixed majors at a northeastern university. The Chinese-American sample (N = 53) was obtained from the Chinese Student Association (CSA) at the university. The third group, the Taiwanese sample (N = 170), was recruited from seven undergraduate classes of various disciplines at two different universities in Taipei, Taiwan. The 285 students consisted of 62 White Americans (28 males and 34 females), 53 Chinese-Americans (29 males and 24 females), and 170 Taiwanese students (91 males and 79 females).

Instruments

All instruments were compiled in a single booklet consisting of the following, in this order: (1) general instructions, (2) a consent form, (3) a demographic data sheet, (4) 1-3 pages of puzzles for the designated treatment task, including 1-2 page(s) of instructions with sample and practice items, (5) colored blank pages that separated the three trials of the treatment tasks, (6) the attribution questionnaire, and (7) three pages of the persistence task, including two pages of instructions. The "Flexibility of Closure" tests in the "Kit of Reference Tests for Cognitive Factors," developed by Educational Testing Service (French, Ekstrom, & Price, 1963), were non-verbal tasks that required the ability to keep one or more specific configurations in mind so as to make identification in spite of perceptual distractions. They can be easy or difficult, depending upon complexity of the figure-ground patterns and the number of items to be completed in a given time period.

Note that all instruments were presented in both English and Chinese languages for all three groups. The bilingual version of the instruments was formatted such that, when read by a bilingual, the other language was made conveniently accessible but not interfering with the flow of reading in the first language. The back-translation method was used to develop the Chinese version of the instruments.

Easy task (*Hidden Patterns Test*). The task for the "easy treatment" groups is an adaptation of the Hidden Patterns Test -- one of the three "flexibility of closure" tests in the kit. This task required students to search a perceptual field containing irrelevant or distracting material in order to find one given configuration. After being shown a specific figure, students under this treatment were presented with many rows of patterns and required to mark an X below each pattern in which the designated figure is embedded. A total of three trials were given.

Difficult task (*Hidden Figures Test 1*). The task for difficult treatment groups was adapted from another "flexibility of closure" test -- the Hidden Figures Test. Instead of identifying a single given configuration

in a distracting field, participants under this treatment were to distinguish which one of three geometrical figures could be found in a more complex pattern. This test was considerably more difficult since the three geometrical figures for each item in question would further distract students' visual perceptions in addition to the complexity already involved in each target item. Participants under this treatment also received three trials.

Persistence task (*Hidden Figures Test 2*). The persistence task was similar to the difficult task only that it contained five, instead of three, answer choices. Also, among the items, two of them had been tactfully altered to be insoluble. Students were given as much time as they wished -- up to 30 minutes -- to attempt to solve the puzzles.

Attribution Questionnaire. The attribution questionnaire was adapted from the Revised Causal Dimension Scale (CDSII), developed by Russell and his colleagues to assess a respondent's causal explanation for an event and the respondent's perceptions of the causes s/he had stated (Russell, 1982; McAuley, Duncan, & Russell, 1992). The scale measures causal perceptions in terms of the locus of causality, stability, and controllability dimensions described by Weiner (Russell, 1982). Rather than assess how an individual *generally* attributes outcomes, the CDSII is a *state* measure assessing individual perceptions of causes in particular situations. The coefficient alphas for the four subscales ranged from .60 to .92 across four different studies (McAuley, Duncan, & Russell, 1992).

Following performance of the puzzle tasks, students first answered an open-ended question regarding what they believed to be the primary cause for their performance, and then matched this cause with the four attribution factors (i.e., ability, effort, task difficulty, and luck). Based on the primary cause they had indicated, students then completed the CDSII scale by coding the cause, on a 1-9 point scale, into the following four attributional dimensions: locus of causality, stability, personal control, and external control.

Pilot Study

The time limits and number of items included in the easy and difficult tasks were determined by the results of a pilot study. A total of 23, mostly graduate students at a northeastern university (9 males and 14 females) were recruited to complete various tasks in the pilot study. The time limit for the easy task was set to be 3 minutes for 130 items in each of the final three trials, which should make the task perceptively easy for most participants.

To counterbalance the time limit given to both treatment groups, a 3-minute period was also chosen, as in the easy task, for each of the three trials in the final difficult task. This time limit would make the task very difficult, if not impossible, considering the fact that the average amount of time spent by the students in the pilot study (3 minutes and 52 seconds) was much longer than 3 minutes. However, also shown in the pilot was an average of 1-minute decrease in time spent by students between their first trial and the third trial. This suggested the presence of learning effects as students proceeded through the task. Therefore, the test may become a reasonably challenging task, although initially extremely difficult, by the time students progress into their third trial.

In summary, the pilot study helped determine a reasonable time frame as well as the number of items to be included for the tasks of both treatments.

Procedure

Participants were recruited at their meeting or class, informed that the experiment would take about 30 minutes, and required (1) to fill out a consent form and a personal data form, (2) to solve a series of puzzle-like problems, and (3) to complete a questionnaire. Students in Taiwan received these same instructions in Chinese.

Students in each session were then randomly assigned to either an "easy task" treatment or a "difficult task" treatment, stratified by gender. After separating the two groups into different rooms, all participants were

again briefly informed of the purpose of the study and the experimental procedure. Then each student was given one test booklet appropriate to his or her assigned treatment. Questions, if any, were addressed before starting the tasks. Both easy and difficult treatment groups received three trials for their tasks and a 15-second recess between trials. Following treatment tasks was the attribution questionnaire. Finally, students of both treatments completed the same persistence test. The examiner also recorded this time herself. The students then started the task. When students individually handed in their booklets, the examiner recorded the finishing time for the individual on his or her booklet. At this time students were given a written report of the study as the debriefing instrument.

Persistence Task: Special Problems

To rule out those environmental factors that compromised the persistence task and to sustain data of good quality, it was decided that only a sub-sample -- those students who were given at least 30 minutes of class time for the persistence task without other unfavorable experimental conditions -- be used for the data analyses of persistence task. This resulted in a sub-sample of 137 cases consisting of 45 Americans (21 males, 24 females), 42 Chinese-Americans (24 males, 18 females), and 50 Taiwanese students (26 males, 24 females). The class time allowed for the test among these sessions ranged from 32 to 63 minutes while two of the sessions were conducted after class and thus did not have the time limit of a class. This sub-sample of students were all tested in groups ranging in size from 7 to 35.

Results and Interpretation

Preliminary Analyses

Coefficient alphas were calculated to determine the internal consistency of the four sub-scales of CDS II -- Locus of Causality, Stability, Personal Control, and External Control. The coefficient alphas for the

Locus of Causality sub-scale in the present study were .59 over the entire sample and .61, .78, and .47 for the American, Chinese-American, and Taiwanese samples, respectively.

Coefficient alphas ranging from .67 to .74 were obtained for the Stability subscale. As for the internal consistency of the Personal Control subscale, the entire sample of the present study yielded a coefficient alpha of .84 and separately for the American, Chinese-American, and Taiwanese samples as .78, .92, and .84, respectively.

Finally, the External Control subscale measuring the amount of environmental influence perceived by the respondents (i.e., degrees of perceived uncontrollability) yielded a coefficient alpha of .78 over the entire sample and .78, .87, and .77 for the American, Chinese-American, and Taiwanese samples, respectively.

Descriptive Statistics

Pearson correlations were calculated on all variables over the entire sample to determine the degree of association among the variables, especially the five dependent measures (locus of causality, stability, personal control, external control, and persistence). Although the degree of association was not large, many of the correlations reached significant levels. Not surprisingly, the four attributional subscales were all intercorrelated as in the original validity tests of the scale (McAuley et al., 1992). The intercorrelations among the subscales provided evidence for the expected discriminant and convergent validities of the various constructs for the total sample.

On the other hand, persistence as indicated by the amount of time spent on the final difficult task was positively correlated with personal control ($r = .18, p < .05$), indicating that a person's persistence level is associated with his perceived controllability. Rather unexpectedly, however, locus of causality was not significantly related to the level of persistence in the current sample. Table 1 shows the correlations among the five dependent variables.

Table 1**Correlation Matrix of the Five Dependent Variables over the Entire Sample**

Variable	1	2	3	4
1. Locus of Causality				
2. Stability	.298***			
3. Personal Control	.362***	.065		
4. External Control	-.268***	.021	-.158**	
5. Persistence (time)	.106	.011	.184*	-.030

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: $N = 285$ except for persistence task where a subsample ($N = 137$) was used.

Moreover, correlational analyses were performed on the three cultural samples separately to assess

whether the pattern of associations resembled findings on the overall sample. Results are presented in Table 2.

Table 2**Correlation Matrices of the Five Dependent Variables by Cultural Groups**

Culture	Variable	1	2	3	4
American	1. Locus				
	2. Stability	.188			
	3. Psl contrl	.429***	-.005		
	4. Ext'l contrl	-.331**	.295*	-.239	
	5. Persistence	.053	-.310*	.001	-.067
Chinese-American	1. Locus				
	2. Stability	.360**			
	3. Psl contrl	.540***	.337*		
	4. Ext'l contrl	-.261	.111	-.172	
	5. Persistence	.230	.192	.116	-.053
Taiwanese	1. Locus				
	2. Stability	.328***			
	3. Psl contrl	.252***	.003		
	4. Ext'l contrl	-.222**	-.103	-.112	
	5. Persistence	.175	.098	.409**	-.036

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: American group, $N = 62$; subsample ($N = 45$) for persistence task.

Chinese-American group, $N = 53$; subsample ($N = 42$) for persistence task.

Taiwanese group, $N = 170$; subsample ($N = 50$) for persistence task.

In general, the pattern of associations found in the overall sample holds true to a reasonable degree across the three cultural samples, especially the associations involving locus of causality. Minor variations, however, did exist among the three cultural groups, thus pointing to the possibility that some variables may be better indicators than others for a particular group. Among the three cultural groups, the Taiwanese group seemed to resemble the overall sample the most, possibly due to its relatively large sample size.

On the other hand, categorical variables were all number-coded into the data set before performing the correlational analyses. Parents' educational levels (coded 1 to 4 from primary school to beyond college) -- a socio-economic status index in the current study -- were not correlated with any of the 5 dependent variables, either in the overall sample or separately in the three cultural sub-samples. These insignificant correlations thus suggested to exclude the SES effect from the main analyses.

Students' academic majors were coded from 1 to 6 representing Undecided, Humanities, Management, Health-related professions, Natural Sciences, and Engineering, respectively -- an order roughly reflecting students' mathematical or geometrical knowledge, presumably related to the experimental tasks. As shown in Table 3, students' major was not correlated with any of the five dependent variables ($r_s = .03, .05, -.06, .00, -.04$ with locus of causality, stability, personal control, external control, and persistence, respectively), thus indicating that students' academic background did not mediate between the experimental tasks and their attributional responses.¹

Moreover, culture -- American, Chinese-American, and Taiwanese coded in order as 1, 2, and 3 -- was positively correlated with both locus of causality ($r = .15, p < .01$) and persistence ($r = .25, p < .01$), and negatively with external control ($r = -.13, p < .05$), suggesting that Taiwanese students were more likely

¹A separate multivariate ANOVA procedure, treating "major" as a categorical variable, was also performed on the four attributional measures. The result ($F_{(20, 909)} = .89, p = .60$) further confirmed the insignificant correlations reported above. In

to have had internal attributions, higher persistence level, yet less external control perceived over the cause.

Also, students' length of stay in the United States (US years), a factor particularly meaningful for the Chinese-Americans, was negatively related to both locus of causality ($r = -.16, p < .01$) and persistence ($r = -.19, p < .05$), meaning that length of time in the United States was associated with more external attributions and lower persistence level.

The experimental treatment, with easy and difficult coded as 1 and 2, was negatively correlated with one of the attributional variables -- personal control ($r = -.15, p < .05$). Although the correlation was low, higher perceived controllability was associated with treatment of less difficulty, suggesting that students' perceptions about the two treatments were relatively in accordance with what the treatments were meant to induce. Finally, gender, with male and female coded as 1 and 2, was not related to any of the four attributional variables.

On the other hand, gender was significantly related to persistence ($r = .19, p < .05, N = 137$); that is, female students were more likely to spend more time on the persistence task than male students. One final note regarding the persistence task was that age was negatively correlated with persistence in the overall sample ($r = -.22, p < .01$), but not in any of the three cultural groups ($r_s = -.09, -.06, \text{ and } .05, p_s = .57, .69, \text{ and } .71$ for the Americans, the Chinese-Americans, and the Taiwanese, respectively), suggesting a convergent tendency for younger students to persist longer. Again, this finding was based on a subsample with three roughly equal-sized groups. Readers may recall that age was also correlated with culture ($r = -.40, p < .001$), which itself was correlated with persistence ($r = .24, p < .01$). Given the intercorrelations among these three variables, necessary procedures will be taken later to control the effect of age when conducting the main analysis. Correlations among all the variables over the total sample are presented in Table 3.

addition, students in different majors did not differ significantly on their persistence performance as well ($F_{(5, 131)} = 1.99, p$

Table 3 **Correlation Matrix of All Variables over the Total Sample**

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Age												
2. Treatment	-.017											
3. Gender	.009	.025										
4. Major	-.131*	-.015	-.389***									
5. Father's education	-.010	-.082	-.086	.137*								
6. Mother's education	.004	-.078	-.057	.025	.708***							
7. Culture	-.402***	-.005	-.059	.154**	-.180**	-.313***						
8. US years	.535***	-.012	.022	-.135*	.161**	.271***	-.937***					
9. Locus	-.047	.005	-.030	.028	-.009	-.070	.152**	-.161**				
10. Stability	-.002	-.040	-.054	.049	.022	.050	-.026	.008	.298***			
11. Personal Control	.018	-.147*	.052	-.063	-.015	-.028	.084	-.081	.362***	.065		
12. External Control	.029	-.071	-.013	.002	.064	.093	-.130*	.110	-.268***	.021	-.158**	
13. Persistence (Time)	-.223**	-.010	.191*	-.038	-.021	-.040	.248**	-.192*	.106	.011	.184*	-.030

* $p < .05$; ** $p < .01$; *** $p < .001$.

Note: **1.** N = 285 except for Persistence (Time) where a subsample (N = 137) was employed.

2. Coding:

Treatment:	1 - Easy 2 - Difficult	Culture:	1 - American 2 - Chinese-American 3 - Taiwanese
Gender:	1 - Male 2 - Female	Major:	1 - Undecided 2 - Humanities 3 - Management 4 - Health-related professions 5 - Natural Sciences 6 - Engineering
Father's/mother's education:	1 - Primary school 2 - High school 3 - College 4 - Beyond college		

3. Four numerical attribution measures:

Locus:	high - internal low - external	Stability:	high - stable low - unstable
Personal control:	high - more volitional power low - less volitional power	External control:	high - more environmental influence low - less environmental influence

Further examination of the descriptive statistics included a brief review of the means and standard deviations of the five dependent variables broken down by culture. Table 4 shows the results.

Table 4

Means and Standard Deviations for the Five Dependent Measures by Cultural Group

Culture	Locus		Stability		Psl ctrl		Ext'l ctrl		Persistence	
	M	SD	M	SD	M	SD	M	SD	M	SD
American	19.8	5.0	13.8	5.5	19.1	5.4	11.6	6.1	15.7	7.0
Chinese-American	18.8	6.0	13.1	6.1	18.9	6.6	10.7	6.3	23.2	6.1
Taiwanese	21.3	4.6	13.3	6.5	20.2	6.3	9.7	5.6	20.4	7.6

Note: American group, N = 62; subsample (N = 45) for persistence task.

Chinese-American group, N = 53; subsample (N = 42) for persistence task.

Taiwanese group, N = 170; subsample (N = 50) for persistence task.

Among the three cultural groups, the Taiwanese students scored the highest on locus of causality and personal control, whereas the Chinese-American group the lowest. Of the five dependent measures, persistence was the one that distinguished the three cultural groups the most. The Chinese-American students obtained the highest group mean and the lowest standard deviation among the three groups with the Taiwanese students right behind and the American students distanced farther away.

One important preliminary check concerned the homogeneity within the current Chinese-American group. A multivariate F -test performed on the four attributional variables showed that students from these four categories did not differ significantly ($F_{(12, 122)} = 1.53, p = .12$). As for their persistence performance, among the 42 valid cases (descendants from China, N = 27; Taiwan, N = 5; Hong Kong, N = 3; and those otherwise, N = 7), an univariate F -test indicated an insignificant difference among the sub-groups as well ($F_{(3,$

$_{38}) = .31, p = .82$). Therefore, the current Chinese-American group was considerably homogeneous in terms of their attributions and persistence performance.

Primary Analyses

Attributions. To test whether the three groups differ significantly on the dependent variables, a 2 (gender) \times 2 (treatment) \times 3 (culture) MANOVA with the four attributional measures as the dependent variables was performed. The three independent variables were entered hierarchically in the order stated above so that sequential sums of squares could be obtained. Results are presented in Table 5.

Main Effects: In Table 5, the multivariate F-test showed no significant gender effect ($F_{(4, 270)} = .53, p < .71$). This finding is in line with the insignificant correlations (ranging from $-.05$ to $.05$) between gender and the 4 attributional variables.

The main effect for treatment showed a significant difference between the two groups ($F_{(4, 270)} = 2.49, p < .05$); that is, students in the easy condition tend to have significantly different attributions from those in the difficult condition. Follow-up univariate ANOVAs, however, indicated that the only contributor among the four measures to the multivariate significance was perceived controllability ($F_{(1, 273)} = 6.4, p < .05$). A specific contrast between the two treatment groups on the Personal Control Scale showed that students in the easy condition ($M = 20.63$) tended to perceive significantly higher controllability than those in the difficult condition ($M = 18.82$) ($t_{(283)} = 2.49, p < .05$). None of the other univariate F-ratios were significant at $\alpha = .05$ (Locus: $F_{(1, 273)} = .008, p < .928$; Stability: $F_{(1, 273)} = .41, p < .52$; External control: $F_{(1, 273)} = 1.41, p < .24$).

Table 5

Multivariate and Univariate ANOVAs for the Effects of Gender, Treatment, and Culture on the

Four Attribution Measures

Source	Multivariate <i>F</i> -ratio (D.F.)	Univariate			Mean (SD)	
		Variable	D. F.	<i>F</i> -ratio	Level 1	Level 2
Sex (S)	.53 (4, 270)	Locus =	1, 273	.26	Male 20.6 (5.0)	Female 20.3 (5.1)
		Stability =	1, 273	.82	13.7 (6.3)	12.9 (6.1)
		Psl cntrl =	1, 273	.80	19.4 (6.5)	20.1 (5.9)
		Ext'l cntrl =	1, 273	.05	10.4 (5.9)	10.2 (6.0)
Treatment (T)	2.49* (4, 270)	Locus =	1, 273	.01	Easy 20.5 (5.0)	Difficult 20.5 (5.1)
		Stability =	1, 273	.41	13.6 (6.0)	13.1 (6.4)
		Psl cntrl =	1, 273	6.40*	20.6 (6.0)	18.8 (6.3)
		Ext'l cntrl =	1, 273	1.41	10.7 (6.2)	9.9 (5.6)
Culture (C)	2.00* (8, 540)	Locus =	2, 273	5.86**	(see Table 6)	
		Stability =	2, 273	.25		
		Psl cntrl =	2, 273	1.41		
		Ext'l cntrl =	2, 273	2.43 [#]		
S × T	.29 (4, 270)	Locus =	1, 273	.71	-	-
		Stability =	1, 273	.12	-	-
		Psl cntrl =	1, 273	.02	-	-
		Ext'l cntrl =	1, 273	.09	-	-
S × C	1.15 (8, 540)	Locus =	2, 273	.51	-	-
		Stability =	2, 273	.61	-	-
		Psl cntrl =	2, 273	3.63*	-	-
		Ext'l cntrl =	2, 273	.25	-	-
T × C	.88 (8, 540)	Locus =	2, 273	.78	-	-
		Stability =	2, 273	1.14	-	-
		Psl cntrl =	2, 273	.81	-	-
		Ext'l cntrl =	2, 273	1.46	-	-
S × T × C	.73	Locus =	2, 273	1.34	-	-

	(8, 540)	Stability = 2, 273	.10	-	-
		Psl cntrl = 2, 273	.48	-	-
		Ext'l cntrl = 2, 273	.37	-	-
Error	Mean squares	Locus = 25.01			
		Stability = 39.03			
		Psl cntrl = 37.21			
		Ext'l cntrl = 34.78			

Note. Each effect tested holding constant preceding effects

$p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$

The third main effect was culture, for which the multivariate F-test was significant ($F_{(8, 540)} = 2.0, p < .044$), meaning that, on average, the three cultural groups differ significantly on their attributional perceptions. The univariate F -tests revealed, however, that locus of causality was the strongest contributor to the overall multivariate significance ($F_{(2, 273)} = 5.86, p < .003$), since none of the other measures reached significance at $\alpha = .05$ (Stability: $F_{(2, 273)} = .25, p < .78$; Personal control: $F_{(2, 273)} = 1.41, p < .25$; External control: $F_{(2, 273)} = 2.43, p < .09$).

A series of follow-up contrasts were performed to identify specific differences among the three cultural groups. Table 6 shows that the American students ($M = 19.76$) did not differ significantly from their Chinese-American counterparts ($M = 18.76$) on the Locus of Causality scale ($t_{(282)} = 1.07, p = .28$). The contrast between the American and the Taiwanese students ($M = 21.27$), however, reached significance ($t_{(282)} = -2.04, p = .04$). In addition, significant differences were also obtained between the Chinese-American and the Taiwanese groups at $\alpha = .01$ ($t_{(282)} = -3.21, p = .002$).

A further contrast showed that the American students were not significantly different from students of Chinese origin (a combined group of the Chinese-Americans and the Taiwanese, $M = 20.01$) with regard to their internal-external orientation ($t_{(282)} = -.34, p = .74$). Rather, the difference is between students of

American heritage (a combined group of the Americans and the Chinese-Americans, $M = 19.26$) and those in Taiwan ($t_{(282)} = 3.34, p < .001$). Table 6 shows the various contrasts conducted and the results.

Table 6

Follow-up Contrasts among the Three Cultural Groups on Locus of Causality

Contrast	Mean	<i>t</i> -statistic
American vs. Chinese-American	19.76 vs. 18.76	1.08
American vs. Taiwanese	19.76 vs. 21.27	-2.04*
Chinese-American vs. Taiwanese	18.76 vs. 21.27	-3.21**
American vs. (Chinese-American +Taiwanese)/ 2	19.76 vs. 20.01	-.34
Taiwanese vs. (American + Chinese-American)/2	21.26 vs. 19.26	3.34***

* $p < .05$ ** $p < .01$ *** $p < .001$

Interaction Effects: Multivariate F tests showed no significant interaction effects, either 2-way or 3-way (Sex \times Treatment: $F_{(4, 270)} = .29, p = .89$; Sex \times Culture: $F_{(8, 540)} = 1.15, p = .33$; Treatment \times Culture: $F_{(8, 540)} = .88, p = .53$; Sex \times Treatment \times Culture: $F_{(8, 540)} = .73, p = .67$), suggesting that, for example, males and females from the different cultural groups and in the two treatments responded in much the same way. No follow-up univariate tests were necessary since the overall multivariate results were not significant.

Given the insignificant interaction effect between treatment and culture on the four attributional variables, the first two hypotheses, which predicted a directional difference between the American students and their Chinese counterparts on their internal-external orientation when engaged in either a relatively easy or a relatively difficult task, are not supported. Despite a significant main effect for treatment as well as for culture, these effects did not carry on to the interaction levels and thus rendered the two hypotheses unconfirmed.

Persistence. By adjusting the effect of age on persistence across all three cultural groups, with age being the covariate, the same three independent variables -- gender, treatment, and culture -- were entered hierarchically into the ANCOVA model. Results are presented in Table 7.

Table 7

Univariate ANCOVA for the Effects of Sex, Treatment, and Culture on Persistence

Source	SS	D.F.	MS	F-ratio
Regression	3.49	1	3.49	.07
Sex (S)	279.29	1	279.29	5.95*
Treatment (T)	4.26	1	4.26	.09
Culture (C)	978.44	2	489.22	10.43****
Sex × Treatment	33.00	1	33.00	.70
Sex × Culture	101.40	2	50.70	1.08
Treatment × Culture	102.91	2	51.46	1.10
S × T × C	34.07	2	17.04	.36
Within + Residual	5818.47	124	46.92	
Total	7739.68	136	56.91	

Note. Each effect tested holding constant preceding effects

* $p < .05$ ** $p < .01$ *** $p < .001$

Main Effects: The ANCOVA also yielded a significant main effect for culture ($F_{(2, 124)} = 10.43, p < .000$), showing that, while adjusting for the differences among the three cultural groups due to their

differences in age, gender, and treatment condition, the three cultural groups still differed significantly on how long they would persist through a task. Specific contrasts were calculated to unveil the group differences. The American students ($M = 15.75$ min.) differed significantly from the Chinese-Americans ($M = 23.23$ min.) ($t_{(134)} = -5.01, p < .000$) as well as from their Taiwanese counterparts ($M = 20.39$ min.) on their persistence performance ($t_{(134)} = -3.25, p < .01$). The American students showed less persistence when compared to the combined group of the Chinese-Americans and the Taiwanese ($M = 21.81$) ($t_{(134)} = -4.78, p < .000$).

Results of the contrasts are included in Table 8.

Table 8

Follow-up Contrasts among the Three Cultural Groups on Persistence

Contrast	Mean (minute)	<i>t</i>-statistic
American vs. Chinese-American	15.75 vs. 23.23	-5.01***
American vs. Taiwanese	15.75 vs. 20.39	-3.25**
Chinese-American vs. Taiwanese	23.23 vs. 20.39	1.94
American vs. (Chinese-American +Taiwanese)/ 2	15.75 vs. 21.81	-4.78***

* $p < .05$ ** $p < .01$ *** $p < .001$

The significant contrast between the American group and the combined Chinese groups confirmed one of our hypotheses that, when engaged in an untimed difficult task, the students of Chinese origin would persist longer than their American counterparts, especially since this finding rested on the premise that the effects of age, gender, and experimental treatments had been statistically controlled and equated across all students.

Interaction Effects: Again, none of the interaction effects, either 2-way or 3-way, were significant (Sex \times Treatment: $F_{(1, 124)} = .70, p = .40$; Sex \times Culture: $F_{(2, 124)} = 1.08, p = .34$; Treatment \times Culture: $F_{(2, 124)} = 1.10, p = .34$; Sex \times Treatment \times Culture: $F_{(2, 124)} = .36, p = .70$).

As for the hypothesis -- Chinese-American students are expected to demonstrate a pattern of attribution and persistence which resembles a mixture of American and Chinese features -- can not be answered by a singular statistical procedure and will be approached via a composite of results. Various contrasts conducted among the cultural groups on locus of causality as well as persistence revealed further information. On the one hand, the major differences among the groups on locus of causality existed between students of American heritage (a combined group of the Americans and the Chinese-Americans) and those in Taiwan ($t(282) = 3.34, p < .001$) followed by another significant difference between the Chinese-Americans and the Taiwanese ($t(282) = -3.21, p < .01$). The differences on persistence, on the other hand, existed primarily between students of Chinese origin and the American students ($t(134) = -4.78, p < .001$). Also, the Chinese-American group persisted significantly different from the American group ($t(134) = -5.01, p < .001$) but not from the Taiwanese group ($t(134) = 1.94, p = .054$). Taken all together, the Chinese-American students seemed to demonstrate a pattern of attribution akin to the American students' but a level of persistence similar to their Taiwanese counterparts. The hypothesis, therefore, is at least partially confirmed given the current findings.

Summary of Hypothesis Tests

Despite a significant main effect for treatment as well as for culture on students' attributions, no significant interaction was found between the two factors. The three cultural groups did not show significant differences on their causal attributions when confronted with different treatment tests, whether relatively easy or difficult. Although both main effects were statistically significant ($\alpha = .05$), the difference between/among the groups involved was not practically significant. Moreover, follow-up univariate tests showed that each main effect had different dependent variables contributing to its significance (see Table 5), thus further diminishing the overall impact as it continued on to the interaction levels.

The hypothesis -- Chinese descendants (i.e., both Chinese-Americans and the Taiwanese) would persist longer than their American counterparts when engaged in an untimed difficult task -- was supported. When the effect of age, previously shown having a potentially confounding influence, was statistically controlled along with gender and treatment, culture still appeared to be an important factor that significantly distinguished students on their performance of persistence. Furthermore, a specific contrast between the American group and a combined group of the Chinese-Americans and the Taiwanese showed a significant difference and thus confirmed the hypothesis.

A composite of results was called for in order to answer another hypothesis -- the Chinese-American students are expected to demonstrate a pattern of attribution and persistence that resembles a mixture of American and Chinese features. Although the Chinese-American group constantly scored on the extreme sides of the spectrum among the three cultural groups, thus seemingly negating the hypothesis, various contrasts conducted between/among the groups revealed that the Chinese-Americans appeared more similar to the

Americans attribution-wise but more akin to the Taiwanese persistence-wise. Therefore, the hypothesis was partially supported in the current study.

DISCUSSION

The two research hypotheses, which predicted a directional difference between the American students and their Chinese counterparts on their internal-external orientations towards the assigned treatment tasks, were not supported. Despite a significant main effect for treatment as well as for culture on students' attributions, no significant interaction between the two factors was found. Further examination employing univariate tests revealed that each main effect had different dependent variables contributing to its significance. Personal control was the only dependent variable among the four contributing to the significant main effect for treatment whereas locus of causality was the primary contributor to the significance for culture. These differential contributions thus weakened the overall impact as it continued on to the interaction levels.

Despite the unconfirmed hypotheses, the current results still revealed valuable findings regarding the three cultural groups. One of the purposes of the current study was to experimentally equate all participants with the same achievement experiences so as to elicit more comparable attributions. The significant main effect for treatment and the specific contrast provided evidence that the two treatment tasks had indeed achieved the desired experimental effect; that is, the easy treatment task induced higher perceived controllability and presumably more sense of achievement than the difficult task.

When the treatment effect was held constant in the hierarchical model, culture still obtained a significant main effect, above and beyond the treatment effect. In other words, students from the three cultural groups still differed significantly on their attributions, specifically their locus of causality scores, given the same achievement

conditions. Various contrasts conducted among the three cultural groups on the locus of causality measure showed that the Taiwanese students demonstrated significantly higher internal attributions than their Chinese-American counterparts alone as well as the combined group of American heritage.

Amidst the previous research employing the similar subject groups -- the Chinese (China, Hong Kong, or Taiwan), Chinese-Americans, and Caucasian-Americans, the most comparable findings to the current ones were from the study by Hsieh et al. (1969). Their study, however, was not necessarily achievement-related. In addition, Rotter's I-E scale -- the predecessor of all locus of control measures -- was later criticized for its indiscriminate, uni-dimensional features (Munro, 1979), thus rendering their results questionable. In short, the current findings concerning the internal-external orientation among the three cultural groups are methodologically sound but have limited prior research of comparable groups with which to validate the results.

The findings that the Chinese-American students persisted significantly longer than their American counterparts but not necessarily so than their Taiwanese counterparts suggested their departure from the American orientation and their resemblance to the Taiwanese students on persistence.

One intriguing finding was that the Chinese-American students scored the lowest on both the locus of causality measure and the personal control measure (see Table 4) but attained the highest mean for the persistence task among the three groups. Presumably a person who perceives high internality and controllability is likely to persist through a difficult task longer than a person who perceives otherwise. The current finding seemed to present counter-evidence. However, as revealed from the correlational analyses, persistence was significantly correlated only with personal control in the overall sample, suggesting personal control was a better indicator of persistence than locus of causality for the current sample. Also, separate

correlational analyses conducted for each cultural group showed that persistence was not related with any of the four attributional variables for the Chinese-Americans, that stability seemed to index persistence well for the Americans, and that personal control was the relevant factor for the Taiwanese students. This suggested a differential power among the four attributional variables in predicting persistence for the three cultural groups.

Recent researchers (Eaton & Dembo, 1997) investigated differences in motivational beliefs between Asian-American and non-Asian American students. They found that what best explained the achievement performance of Asian-Americans (i.e., fear of the consequence of academic failure) least explained the results for non-Asian American students. This may shed light on the current findings in that the Chinese-Americans may have persisted for reasons undetected by the current set of variables in the study; this requires further research for clarification.

Finally, a composite of results was called for in order to answer the hypothesis -- that Chinese-American students are expected to demonstrate a pattern of attribution and persistence that resembles a mixture of American and Chinese features. Although descriptive statistics showed that the Chinese-American group constantly scored on the extreme sides of the spectrum among the three cultural groups, thus seemingly negating the hypothesis, various contrasts conducted between/among the groups revealed that the Chinese-Americans appeared more similar to the Americans attribution-wise but more akin to the Taiwanese students persistence-wise. Therefore, the hypothesis was partially supported in the current study.

Theoretical Implications

This study produced empirical evidence that, given the same achievement contexts experimentally controlled, college students from three cultural groups -- the (Caucasian) American, the Chinese-American,

and the Taiwanese cultures -- differed significantly on their internal-external orientation. The successfully executed treatment effect across the cultural groups, indicated by its significant main effect as well as the insignificant interaction effect at all levels, allowed specification of the achievement conditions under which the three groups differed, thus fine-tuning the current attribution research.

Furthermore, as mentioned earlier, personal control was the only variable among the four attributional measures contributing to the significant main effect of treatment. Despite a significant correlation between personal control and external control -- two related but rival measures -- the external control did not contribute to the main effect as expected, suggesting that the two measures may have targeted related but different constructs. This implication further affirmed the decision made by McAuley et al. (1992) to separate the single control subscale in the original Causal Dimension Scale (Russell, 1982) into the current two subscales. The current results also confirmed the speculation proposed by McAuley et al. (1992) that, in most achievement situations, personal control would likely be perceived as more salient whereas, in the case of outcomes such as health or interpersonal strife, external control would play a more prominent role.

Educational Implications

One important difference, among other things, found between the American and the Chinese-American students in the current study was revealed from the correlational analyses (see Table 3). While the American students perceived causes susceptible to environmental forces (external control) as more stable, the Chinese-Americans viewed causes personally controllable as more stable. Stability, however, was not related to either of the two control measures for the Taiwanese students. This carries a strong educational implication for teachers in that students from different cultures may perceive a math task, for example, as environmentally

imposed and consequently unchangeable in nature or, to the contrary, as personally accountable and predictable outcome-wise. As a result, students may take completely different actions when dealing with the task. Teachers' awareness to these differential perceptions may help them to provide tailored assistance or appropriate interventions, if necessary, to their students.

Along the same line, as revealed by the correlational analyses, stability was the significant indicator of persistence for the American students, whereas personal control was the relevant factor in predicting persistence for the Taiwanese students. But none of the attributional variables seemed to serve the Chinese-Americans well in explaining their exceptional performance. This implies that students from these three cultural groups may persist, or not persist, through a task for different motivational reasons and that teachers may need to provide incentives tapping into these motivational needs in order to develop appropriate persistence behavior.

Finally, the emphasis on ability versus effort demonstrated between the American and the Taiwanese students during the interviews suggested a tendency for either group to overemphasize one and overlook the other when explaining their achievement performance. Weisz (1984) proposed that effective achievement behavior requires selectivity -- the capability to distinguish between outcomes that are contingent upon human influence and those that are not -- and that erroneous judgments about the contingency of outcomes often cause fruitless achievement attempts. Students who fail to recognize the non-contingency that prevails in a currently involved task (e.g., environmental forces) tend to persist unreasonably in their effort to achieve and thus may be susceptible to frustration and disappointment. On the other hand, students who mistakenly believe that outcomes are highly non-contingent, when they are not necessarily so (e.g., belief in the immutability of

intelligence), may not persist to a reasonable degree before terminating their pursuit. The question then becomes how we teachers, after knowing the attributional beliefs held by our students, can intervene and shape their perceptions of achievement tasks.

For example, typical advice to American teachers (e.g., Gentile & Monaco, 1986; Gentile & Monaco, 1988) suggests emphasizing attributions to effort and acquisition of better strategies rather than to ability. As for advice to Asian teachers and parents who tend to over-emphasize effort, if not exclusively, and show anger or criticism at children's low performance (Dix & Grusec, 1984; Hess et al., 1987), no substantial advice has appeared in the previous literature. However, in light of Weisz's suggestions, which seem to apply to both cases, teachers may need to include practice for students to discriminate when outcomes are contingently vs. non-contingently related to efforts and strategies, and to provide necessary support when non-contingent events are involved.

Limitations and Future Research

One major limitation of the current study was a relatively low coefficient alpha (.47) obtained by the Taiwanese group on the locus of causality measure. This variable turned out to be the one that distinguished the three cultural groups from one another on their causal attributions. Although the original validation studies did not attain extremely high coefficient alphas (ranging from .60 to .71) and thus proposed a "limit" on the reliability of the measure, the current internal consistency still may have rendered the results regarding the Taiwanese group arguable.

Secondly, in addition to the common concerns associated with employing small sample sizes, as is the case with the current American and Chinese-American groups, a relatively unbalanced sample size among the

three cultural groups, particularly between the two groups in the United States and the Taiwanese group, may have caused some correlations performed on the entire sample to lean towards the pattern exhibited by the size-dominant group -- the Taiwanese group -- and thus clouded the "real" overall correlations that would have emerged if the three groups had been more equal in size.

Regarding the truthfulness of the translated experimental instruments to the original ones, although painstaking care was taken to ensure the parallelism of the two versions, a pilot test involving the same group of bilinguals on both versions at two different times may have made the translated version even more reliable.

Finally, as reported earlier, it was suspected that students who were more vulnerable to the environmental factors during the persistence task may have compromised their performance due to various psychological concerns. Therefore, it may be more desirable to measure persistence utilizing computer-assisted programs where the participants will be individually administered the experimental tests, preferably under remote surveillance, so as to reduce the environmental distractions to the minimum. In addition, as documented by Cooley et al. (1994), it may be advisable to record not only the time spent on task but also the total number of items attempted in the task to present cross-referable evidence.

More refined research studies addressing the aforementioned methodological issues are called for. In addition, as revealed by the differential correlations between the various dependent variables among the three cultural groups, further research is recommended to identify what causal attribution best explains or predicts the achievement behavior observed in a particular cultural group, especially the Chinese-Americans, whose persistence performance in the present study could not be accounted for by the current set of variables.

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