Relationship of perceived stress with depression: Complete mediation by perceived control and anxiety in Iran and the United States

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Relationship of perceived stress with depression: Complete mediation by perceived control and anxiety in Iran and the United States

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*T*his study sought to clarify the importance and cross-cultural relevance of associations between generalized perceived stress and depression. Also tested was the hypothesis that perceived stress would correlate more strongly with anxiety than with depression, whereas control would be more predictive of depression than of anxiety. Relationships between perceived stress, anxiety, depression, and perceived control were examined in samples of Iranian ($n = 191$) and American ($n = 197$) undergraduates. Correlations among these variables were generally similar across the two societies. Perceived stress did predict anxiety better than depression, but perceptions of control predicted depression significantly better than anxiety only in the United States. Best fitting structural equation models revealed that anxiety and perceived control completely accounted for the linkage between perceived stress and depression in both societies. An equally acceptable and more parsimonious model described perceived stress as a consequence rather than as an antecedent of anxiety and perceived control. Structural equation models were essentially identical across the two cultures except that internal control displayed a significant negative relationship with anxiety only in Iran. This result seemed to disconfirm any possible suggestion that a supposedly individualistic process like internal control could have no noteworthy role within a presumably more collectivistic Muslim society like Iran. Overall, these data documented the importance of anxiety and perceived control in explaining the perceived stress–depression relationship cross-culturally and therefore questioned the usefulness of perceived stress in predicting depression. Whether this understanding of the stress–depression relationship deserves general acceptance will require additional studies that measure the frequency of stressful life events and that utilize a longitudinal design.

*C*ette étude visait à clarifier l'importance et la pertinence interculturelle des associations entre le stress perçu généralisé et la dépression. En outre, l'hypothèse testé proposait que le stress perçu devrait être plus fortement corrélé avec l'anxiété qu'avec la dépression, tandis que le contrôle devrait être plus prédictif de la dépression que de l'anxiété. Les associations entre le stress perçu, l'anxiété, la dépression et le contrôle perçu ont été examinées dans des échantillons d'étudiants universitaires iraniens ($n = 191$) et américains ($n = 197$). Les corrélations entre ces variables étaient généralement similaires pour les deux sociétés. Le stress perçu a mieux prédit l'anxiété que la dépression, mais les perceptions de contrôle ont prédit la dépression significativement mieux que l'anxiété seulement aux États-Unis. Les modèles d'équation structurelle ayant le meilleur ajustement ont révélé que l'anxiété et le contrôle perçu ont expliqué entièrement le lien entre le stress perçu et la dépression dans les deux sociétés. Un modèle également acceptable et davantage parcimonieux a montré que le stress perçu serait une conséquence plutôt qu'un antécédent de l'anxiété et du contrôle perçu. Les modèles d'équation structurelle ont essentiellement été identiques pour les deux cultures, excepté que le contrôle interne et l'anxiété ont présenté une relation négative significative seulement en Iran. Ce résultat semblait infirmer toute suggestion possible qu'un soi-disant processus individualiste comme le contrôle interne ne peut avoir de rôle remarquable dans les sociétés musulmanes supposément plus collectivistes comme l'Iran. Dans l'ensemble, ces données ont

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soutenu l'importance de l'anxiété et du contrôle perçu dans l'explication de la relation entre le stress perçu et la dépression à travers les cultures et, par conséquent, ont questionné l'utilité du stress perçu pour la prédiction de la dépression. Afin de pouvoir affirmer que cette compréhension de la relation entre le stress et la dépression mérite un consentement général, il faut des études additionnelles mesurant la fréquence des événements de vie stressants et utilisant un design longitudinal.

El presente estudio aspira a clarificar la importancia y la relevancia intracultural de las asociaciones entre la percepción generalizada del estrés y depresión. Además se somete a prueba la hipótesis de que el estrés percibido correlacionaría con mayor consistencia con ansiedad que con depresión, mientras que el control sería más predictivo de depresión que de ansiedad. Con este objetivo se examinó las relaciones entre estrés percibido, ansiedad, depresión y control percibido en muestras de Iraníes ($n = 191$) y Estadounidenses ($n = 197$) aún no graduados. Las correlaciones entre estas variables fueron generalmente similares en ambas sociedades. El estrés percibido permitió predecir ansiedad mejor que depresión, mientras que únicamente en la muestra de estadounidenses la percepción del control premitió predecir depresion significativamente mejor que ansiedad. Modelos de ecuación estructural más precisos revelaron que ansiedad y control percibido fortalecen la vinculación entre estrés percibido y depresión en ambas sociedades. Un modelo igualmente aceptable y más circunspecto, describió estrés precibido como una consecuencia más que como un antecedente de ansiedad y control percibido. Los modelos de ecuación estructural fueron casi idénticos en ambas culturas, con la excepción de que solamente para los iraníes el control interno mostró una relación considerablemente negativa con ansiedad. Este resultado parece desalentar toda posible sugerencia acerca de que un proceso supuestamente individualista como control interno podría no tener un rol notorio en una sociedad musulmana presumiblemente más colectivista, como Irán. En todo caso, estos datos documentan la importancia de la ansiedad y el control percibido en la explicación de la relación intracultural entre percepción del estrés y depresión, y, por tanto, cuestiona la utilidad del estrés percibido en la predicción de la depresión. Para poder evaluar si es que el enfoque sobre la relación entre estrés y depresión merece una aceptación general, se requiere estudios adicionales que midan la frecuencia de eventos estresantes en la vida diaria y que utilicen un diseño longitudinal.

With symptoms that include sadness, lowered self-esteem, guilt, thoughts of suicide, and sleep and eating disorders, depression is one of the greatest causes of disability worldwide (World Health Organization, 2001). Considerable research points toward a robust relationship between stress and depression. Some studies identify stress as a causal factor (e.g., Kessler, 1997). Stress, nevertheless, correlates with other psychological processes, like perceived control and anxiety, which have also been implicated as causes of depression (e.g., Alloy, Kelly, Mineka, & Clements, 1990; Beekman et al., 2000). Two broad possibilities exist, therefore: Stress might operate as a causal factor that *mediates* the psychological dynamics underlying depression, or stress might instead be a *byproduct* of those dynamics. This project sought to evaluate these Mediational and Byproduct Models of the stress–depression relationship. Given the worldwide significance of depression, these models also were examined in two different societies, Iran and the United States.

Perceived stress and depression

Perceived stress occurs when an individual experiences events as "taxing or exceeding his or her resources and endangering his or her well-being"

(Lazarus & Folkman, 1984, p. 19). Lazarus (1966) originally conceptualized perceived stress as a state occurring in response to a specific threatening and uncontrollable event, but researchers have also examined more generalized perceptions of stress. Cohen, Kamarck, and Mermelstein (1983), for instance, developed a measure that assesses the degree to which life in general is seen as stressful during the past month.

Again, two basic perspectives can be articulated for understanding the role of such generalized perceptions of stress in depression and in the correlated processes of perceived control and anxiety. In the first, each uncontrollable and threatening life circumstance would create an event-specific perception of stress. These specific stresses would then accumulate into a generalized perception of stress that would affect depression through changes in global perceptions of control and associated negative emotional reactions like anxiety. In this Mediational Model, perceived stress would serve as an essential antecedent in the causal sequence underlying the perceived stress–depression relationship. In a second perspective, however, generalized perceptions of stress might instead arise from an anxiety-inducing view of the world as uncontrollable. In this Byproduct Model, perceived stress would be a consequence rather than an antecedent of low perceived control

and greater anxiety, and thus would not be critical in attempts to understand depression.

Typically, the Mediational and Byproduct Models have not been clearly distinguished (e.g., Fleming, Baum, & Singer, 1984). Both receive obvious support in the frequent finding that perceived stress is highly correlated with depression. Cohen et al. (1983), for example, observed that perceived stress correlated as high as .76 with depressive symptomatology. In the present study, structural equation modelling techniques were used to determine if the Mediational or the Byproduct Model would supply a more defensible interpretation of such linkages.

Perceived control, anxiety, and depression

Tests of these two models obviously had to operate within background assumptions about the roles of perceived control and anxiety in depression. With regard to the Byproduct Model, much research has identified perceived control as a potential explanation of the stress–depression relationship. Some of the earliest investigations focused on how locus of control (e.g., Levenson, 1973) might influence the impact of stress on depression (e.g., Beekman et al., 2000). Within the helplessness/hopelessness model, the causes of depression are located in attributions that one has no control over stressful life events (Abramson, Seligman, & Teasdale, 1978; Alloy et al., 1990). In self-efficacy theory (Bandura, 1992; Maddux & Meier, 1995), depression results when individuals believe they are unable to perform satisfactorily, to maintain rewarding relationships, or to control their own thoughts. In short, wide-ranging theoretical assumptions suggest that perceptions of control might explain the stress–depression relationship.

Empirical efforts to confirm these theoretical suggestions have been largely unsuccessful (Skinner, 1996). When examining this issue, researchers have, nevertheless, tended to examine only selected facets of perceived control, such as locus of control (e.g., Beekman et al., 2000) or self-efficacy (e.g., Maciejewski, Prigerson, & Mazure, 2000). Such limited assessments may not fully or adequately record perceived control (Skinner, 1996). Procedures for assessing perceived control as a latent construct also yield more definitive evidence with a larger number of manifest indicators (e.g., Kline, 2005, p. 314). The present study, therefore, employed multiple indicators of perceived control, including the Locus of Control (Levenson, 1973), Self-Efficacy (Sherer et al., 1983), Desirability of Control (Burger & Cooper, 1979), and Hardiness Control (Maddi, 1997) scales.

Anxiety has been increasingly identified as a stress-related precursor of depression. The prevalence of comorbid anxiety disorders and depression is high, and anxiety disorders are much more likely to occur before, rather than after, depression (Alloy et al., 1990). Based on an extensive literature review, Chorpita and Barlow (1998) concluded that anxiety is a key component of and a risk factor for depression. Frequently observed correlations of anxiety with greater perceived stress could implicate either anxiety or perceived stress as the causal influence. In other words, research suggests that anxiety might be a causal factor in depression and that perceived stress might serve as the cause of anxiety as predicted by the Mediational Model or as the effect of anxiety as suggested by the Byproduct Model.

Explanations of the stress–depression relationship in terms of control and of anxiety are not incompatible, of course, because much research indicates that a perceived lack of control can produce anxiety (Chorpita & Barlow, 1998). Sanderson, Rapee, and Barlow (1989), for instance, found that giving participants an illusion of control in a stressful situation caused a 75% reduction in panic attacks and also significantly lowered their reported anxiety levels. Thus, perceptions of control could mediate the relationship between stressors and anxiety.

The Helplessness/Hopelessness Model of depression (Alloy, Clements, & Koenig, 1993) also suggests that anxiety is created by the uncertainty aroused by stress. In contrast, depression is presumably caused by feelings of hopelessness, and thus by a certainty that outcomes will be negative. This theoretical framework implies that anxiety in general will be better predicted from stress than will depression, and that perceptions of control will predict depression better than anxiety.

Iranian and American comparison

Variables with mental health implications may operate differently across cultures (e.g., Kitayama & Markus, 1999). Most research into potential mediators of the stress–depression relationship has been conducted in the West; it remains unclear whether perceived control and anxiety might function as mediators of the stress–depression relationship in a non-Western context. Indeed, the arguments of Markus and Kitayama (1991, 1994) imply that perceived internal control might not be

as strong a mediator of the stress–depression relationship in more collectivistic cultures.

Iran is a society formally committed to Islamic principles. The word "Islam" literally means "surrender" and makes reference to the fact that Muslims are those who have submitted "their entire being to Allah and his demand that human beings behave to one another with justice, equality, and compassion" (Armstrong, 2000, p. 5). Muslims also have as "their first duty to build a community (ummah) characterized by practical compassion" (Armstrong, 2000, p. 6). Within a collectivistic emphasis on surrender and community, perceived internal control might not be as important a mediator of the stress–depression relationship as in a presumably more individualistic culture like the United States (Ghorbani, Bing, Watson, Davison, & Mack, 2003b).

On the other hand, recent research has questioned whether Islamic societies are appropriately described as wholly collectivistic and has suggested that individualistic potentials assume an important role in Muslim personality functioning (e.g., Ghorbani, Bing, Watson, Davison, & LeBreton, 2003a; Imamoglu, 1998). Psychological abilities to "surrender" might also require considerable internal control (e.g., Sorokin, 1941/1992). Arguments that place the stress–depression relationship within the context of anxiety and especially of perceived control, therefore, may be as relevant in Muslim societies as in the West. The hypothesis of the present study was that internal control would be as important a mediator of the perceived stress–depression relationship in Iran as it is in the United States.

Overview

In summary, this study used Iranian and American samples to examine three issues. First, and most importantly, Mediational and Byproduct Models of the stress–depression relationship were evaluated using structural equation modelling. Three basic outcomes were logically possible: (1) neither model might fit the data; (2) only one model might display adequate fit, thus documenting its relative superiority; or (3) both models might fit the data. In this last instance, the Mediational Model would specify perceived stress, perceived control, and anxiety as causal factors whereas the Byproduct Model would identify only perceived control and anxiety as causes. The Byproduct Model would, consequently, be preferable on the grounds of parsimony alone.

Second, the hypothesis was tested that perceived stress would be more strongly related to anxiety than to depression, whereas control would be more predictive of depression than of anxiety. This was the prediction suggested by the Helplessness/Hopelessness Model of depression.

Finally, given recent evidence that individualistic potentials assume important roles in Muslim personality functioning, the hypothesis was that the psychological dynamics underlying depression, including most importantly those associated with perceived control, would be similar for Iranians and Americans.

METHOD

Participants

Research participants included 197 American and 191 Iranian undergraduate volunteers. The American sample was composed of 70 male and 127 female students who were enrolled at the University of Tennessee at Chattanooga. These Americans were 76.6% Caucasian, 17.8% African-American, 2.0% Hispanic, and 3.6% other ethnicities. Their average age was 21.2 years ($SD = 5.6$). The Iranian sample contained 92 male and 99 female students from the University of Tehran. They had an average age of 22.1 years ($SD = 2.7$).

Measures

Questionnaire booklets presented both samples with the same basic instructions. In preparation for the present and previous projects, procedures sought to guarantee the adequacy of all Persian translations. Extensive discussions of the meaning of questionnaire items preceded their translation from English into Persian. Persian wordings of all statements then were back-translated into English by an individual not previously involved in the translations process. Substantive discrepancies between the original and back-translated versions of statements were rare. When they did occur, discrepancies were discussed and successfully resolved through revisions of the Persian translations.

The Perceived Stress Scale (Cohen et al., 1983) used a 5-point format ranging from *never* to *very often*. This 14-item instrument was designed to measure general perceived stress. An illustrative item is, "In the last month, how often have you felt nervous and 'stressed'?" One item lowered internal consistency in both samples, and so was dropped. The Persian version of this instrument was clearly

valid in a number of previous Iranian investigations (e.g., Ghorbani et al., 2003a, b; Ghorbani, Watson, Bing, Davison, & LeBreton, 2003c).

The Hospital Anxiety Scale (Zigmond & Snaith, 1983) measured general anxiety. This 7-item measure used a 4-point response format with options that were relevant to each item. An example item is, "I feel tense or 'wound up'," with response options ranging from *not at all* to *most of the time*.

The Hospital Depression Scale (Zigmond & Snaith, 1983) recorded depression. This 7-item measure also employed a 4-point format with response options that were again relevant to each item. One item, for example, is, "I look forward with enjoyment to things," with options ranging from *as much as I ever did* to *hardly at all*. Validity of the Persian versions of the Hospital Anxiety and Depression Scales has been demonstrated with a previous Iranian sample (Ghorbani & Watson, 2006).

Participants completed six measures that served as indicators of perceived control. Three scales measured variations in locus of control, and general self-efficacy, hardiness control, and desire for control constructs were assessed by one scale each.

The Levenson (1973) Locus of Control Scale had three subscales measuring perceptions that oneself, others, or chance have control over life events. The powerful others and chance subscales recorded variations in an external locus of control. The other subscale measured an internal locus of control. All three subscales contained 8 items that were completed using a 5-point format ranging from *strongly disagree* to *strongly agree*. These subscales have been used successfully with previous Iranian samples (Ghorbani & Watson, 2004; Ghorbani, Watson, Krauss, Davison, & Bing, 2004).

The Self-Efficacy Scale (Sherer et al., 1983) operationalized general self-efficacy, which is defined as beliefs that individuals have regarding their capabilities to exert control over life events (Bandura, 1989; Sherer et al., 1983). This 17-item measure was completed using a 5-point format ranging from *strongly agree* to *strongly disagree*.

The Desirability of Control Scale (Burger & Cooper, 1979) measured participants' desire to maintain control, to make their own choices, and to be in charge of life events. This 20-item instrument was completed using a 5-point format ranging from *this statement doesn't apply to me at all* to *this statement always applies to me*.

The Hardiness Control Scale came from the second version of the Personal Views Survey

(Maddi, 1997) and was used to record the degree to which participants work to have an influence over outcomes. This 17-item measure was completed using a 4-point format ranging from *not at all true* to *completely true*. Validity of the Persian version of this scale was confirmed in several previous Iranian studies (Ghorbani & Watson, 2005; Ghorbani, Watson, & Morris, 2000).

Procedure

In groups varying in size from approximately 10 to 75, participants responded to the questionnaire booklets in a classroom setting. No names or other identifying information were collected, so responding was completely anonymous. All participation was fully voluntary and in accordance with ethical standards for conducting research in both societies.

Analyses

The scoring of all scales was expressed in terms of the average response per item. Correlations among variables were examined first and followed by tests of the Mediational and Byproduct Models. Overall model fit was assessed using Hu and Bentler's (1999) recommendations. Specifically, in the frequent cases in which the χ^2 was significant, good model fit was indicated by values close to or above .95 for CFI, and by values close to or below .06 for RMSEA and .08 for SRMR.

For use in structural equations modelling, items from the Hospital Anxiety Scale were randomly divided into three indicators of anxiety (items 1 and 5 became A1; items 3 and 6 became A2; items 2, 4, and 7 became A3), as were items from the Hospital Depression Scale (items 1 and 4 became D1; items 2 and 7 became D2; items 3, 5, and 6 became D3). Items from the Perceived Stress Scale were randomly divided into four indicators of stress (items 1, 2, 9, and 10 became S1; items 3, 4, 7, and 10 became S2; items 6, 8, and 12 became S3; and items 5, 11, and 13 became S4). These indicators had roughly equal size and number of reverse-scored items.

Because perceived control is multidimensional (e.g., Levenson, 1973; Skinner, 1996), exploratory factor analysis helped indicate the most suitable way to conceptualize perceived control in this study. This structure was then examined using confirmatory factor analysis. A principal components analysis was conducted separately for each sample, using all six control-related constructs. The scree plot and eigenvalue-over-1 rule clearly

identified two factors in both the Iranian and American samples. In each sample, internal locus of control and desirability of control loaded on the first factor, which was termed internal control. The powerful others and chance locus of control subscales loaded on the second factor, which was termed external control. General Self-Efficacy and Hardiness Control Scales loaded positively on the internal factor and negatively on the external factor.

These exploratory analyses suggested two orthogonal perceived control factors, and a confirmatory factor analysis was conducted separately in each sample to determine the suitability of this structure for subsequent structural equation modelling procedures. This structure had good fit in both the Iranian, $\chi^2(7, n = 191) = 5.5$, *ns,* and the American samples, $\chi^2(7, n = 197) = 13.3$, *ns*, CFI $= .987$, RMSEA $= .068$, SRMR $= .065$.

RESULTS

Descriptive analyses

Descriptive statistics and internal reliabilities are shown in Table 1. Most instruments displayed adequate reliability for research purposes. In the Iranian sample, however, the internal locus of control subscale exhibited poor reliability, suggesting that Iranian data for this measure should be interpreted with caution.

Correlations among all measures are shown in Table 2. All but three relationships in each sample were significant and in a direction conforming to theoretical expectations. In both groups, the internal control subscale was unrelated to the chance and powerful others subscales. The powerful others subscale was also unrelated to the Desirability of Control Scale.

As hypothesized, perceived stress correlated more strongly with anxiety than with depression. In Iran, the correlation was .64 ($p < .001$) with anxiety and .49 ($p < .001$) with depression. These values were $r = .67$ ($p < .001$) and $r = .54$ ($p < .001$), respectively, in the American sample. A direct comparison of these relationships revealed a significant difference in both Iran ($z = 2.53$, $p < .05$) and the United States ($z = 2.57$, $p < .05$). Also as expected, internal control, desire for control, and the Hardiness Control Scale all displayed more robust negative relationships with depression than with anxiety in the American sample (see Table 2, $zs > 1.96$, $p < .05$). With Iranians, however, no differences were observed in correlations of perceived control with depression and anxiety.

Model testing

Structural equation models first compared the Mediational and Byproduct Models in each country separately. In the Mediational Model, (1) internal and external control mediated the perceived stress–depression and the perceived stress–anxiety relationships; (2) anxiety mediated the perceived stress–depression relationship; and (3) perceived stress had direct effects on depression and anxiety. In the Byproduct Model, (1) internal and external control predicted depression, anxiety, and perceived stress; (2) anxiety predicted depression and perceived stress; and (3) perceived stress had a direct effect on depression.

The Mediational and Byproduct Models fit the data equally well both in the American sample: Mediational model, $\chi^2(93, n = 197) = 151.9$, Byproduct model, $\chi^2(93, n = 197) = 154.1$; and in the Iranian sample: Mediational Model, $\chi^2(93, n = 191) = 134.3$, Byproduct Model, $\chi^2(93, n = 191) = 136.3$. The nonartifactual and thus meaningful

TABLE 1
Descriptive statistics and reliabilities for American and Iranian samples

	American sample			Iranian sample		
	M	*SD*	*Alpha*	*M*	*SD*	*Alpha*
Stress	1.81	0.64	.87	1.82	0.59	.79
Anxiety	1.28	0.54	.74	1.17	0.58	.78
Depression	0.78	0.53	.74	0.97	0.55	.73
Internal control	2.50	0.68	.77	2.66	0.57	.57
Chance control	1.59	0.57	.67	1.62	0.77	.78
Other control	1.65	0.58	.67	1.56	0.68	.71
Self-efficacy	2.58	0.63	.87	2.49	0.64	.83
Desire for control	2.54	0.53	.79	2.69	0.56	.80
Hardiness control	2.07	0.38	.75	2.06	0.44	.78

TABLE 2
Correlations between variables in the American and Iranian sample

	Stress	Anxiety	Depression	Internal control	Chance control	Other control	Self-efficacy	Desire for control	Hardiness control
Stress		.67	.54	−.37	.37	.26	−.61	−.25	−.47
Anxiety	.64		.54	−.33	.43	.36	−.53	−.28	−.49
Depression	.49	.43		−.35	.36	.34	−.50	−.32	−.48
Internal control	−.22	−.15	−.54		−.10	−.08	.40	.48	.45
Chance control	.40	.36	.33	−.11		.58	−.35	−.15	−.47
Other control	.35	.37	.23	.04	.60		−.28	−.07	−.35
Self-efficacy	−.55	−.40	−.57	.52	−.54	−.44		.44	.51
Desire for control	−.27	−.16	−.49	.63	−.22	−.08	.57		.47
Hardiness control	−.47	−.37	−.60	.43	−.47	−.38	.65	.50	

Correlations: below the diagonal = American sample; above the diagonal = Iranian sample; *in italic* = not significant.

implications of these outcomes were confirmed in both samples by demonstrating that the Mediational and Byproduct Models fit the data significantly better than three alternative models in which (1) stress, anxiety, and depression caused perceived control; (2) anxiety and depression caused stress and control with stress also causing control; and (3) stress caused anxiety, depression, and control with anxiety and depression also causing perceived control.

Mediational model hypotheses

The best-fitting version of the Mediational Model was identified by dropping pathways that were nonsignificant in either or both samples. The most noteworthy pathway to fit this criterion occurred between stress and depression. Specifically, stress within the context of this model did not directly predict depression in either the Iranian ($\beta = .10$, *ns*) or American ($\beta = .13$, *ns*) samples. Outside the context of this model, however, stress displayed the expected association with depression in both the Iranian ($\beta = .64$, $p<.01$) and the American ($\beta = .56$, $p<.01$) samples. In short, anxiety and perceived control completely mediated the stress–depression relationship in both samples. This model fit the data well in Iran, $\chi^2(94, n = 191) = 134.6$, CFI = .965, RMSEA = .048, SRMR = .054, and in the United States, $\chi^2(94, n = 197) = 153.0$, CFI = .959, RMSEA = .057, SRMR = .052.

With one exception, all casual relationships hypothesized in this final Mediational Model were invariant across the Iranian and American samples, $\Delta\chi^2(7, n = 388) = 10.0$, *ns*. The one exception occurred in the relationship between internal control and anxiety: Internal control was a better predictor of anxiety, $\Delta\chi^2(1, n = 388) = 8.1$, $p<.01$, in Iran ($\beta = −.22$, $p<.01$) than in the United States

($\beta = −.02$, *ns*). Figure 1 presents the standardized regression coefficients of this Mediational Model for the American sample. These data were largely invariant to those in the Iranian sample, except as noted, in the relationship of internal control with anxiety.

Byproduct Model hypotheses

To arrive at the best-fitting version of the Byproduct Model, pathways that were nonsignificant in either or both samples were again dropped. The only pathway to fit this criterion was between stress and depression. Specifically, stress did not directly predict depression in the Iranians ($\beta = .09$, *ns*) or in the Americans ($\beta = .13$, *ns*). This model fit the data well both in Iran: $\chi^2(94, n = 191) = 136.8$, CFI = .963, RMSEA = .049, SRMR = .057; and in the United States: $\chi^2(94, n = 197) = 155.1$, CFI = .958, RMSEA = .058, SRMR = .056.

As with the Mediational Model, all causal relationships hypothesized in the Byproduct Model were invariant across the two samples, $\Delta\chi^2(7, n = 388) = 8.7$, *ns*, except for the relationship between internal control and anxiety. Internal control once again was a better predictor of anxiety, $\Delta\chi^2(1, n = 388) = 9.0$, $p<.01$, in Iran ($\beta = −.48$, $p<.01$) than in the United States ($\beta = −.20$, $p<.20$). Standardized regression coefficients of the Byproduct Model are displayed in Figure 2 for the American sample; once again these were largely invariant to those in the Iranian sample, except as noted in the relationship of internal control with anxiety.

DISCUSSION

Structural equation modelling techniques demonstrated that the Mediational and Byproduct
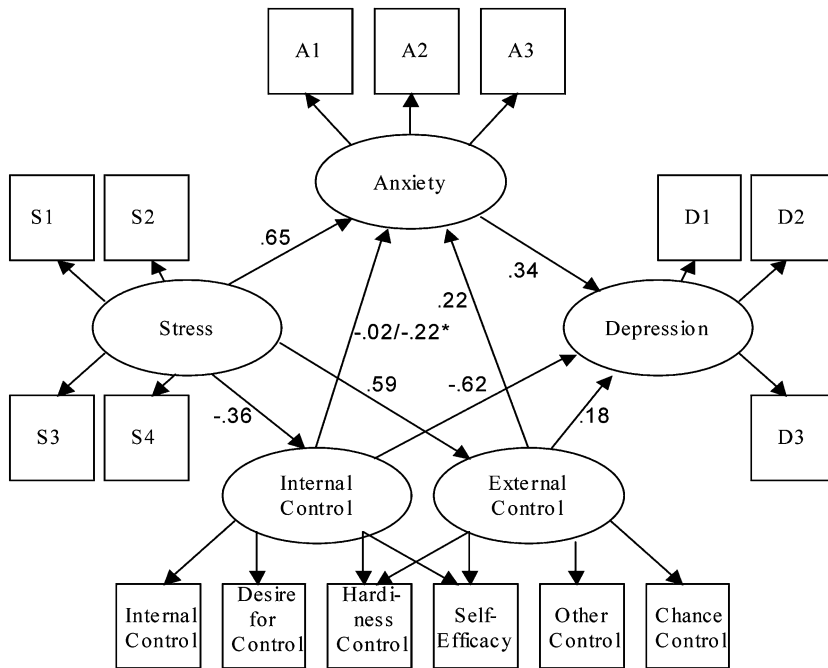
Figure 1. Best fitting version of the Mediational Model in the American sample. Numbers represent standardized regression coefficients. Numbers are invariant from the Iranian sample unless marked with an asterisk (*), in which case the US value appears first followed by the Iranian value.

Models provided equally good descriptions of the perceived stress–depression relationship. In the Mediational Model, perceived stress combined with perceived control and anxiety to serve as causal predictors of depression. In the Byproduct Model, only perceived control and anxiety operated as causes of not only depression, but also of perceived stress. Although both models provided adequate fit, the Mediational Model was associated with three causal factors whereas the
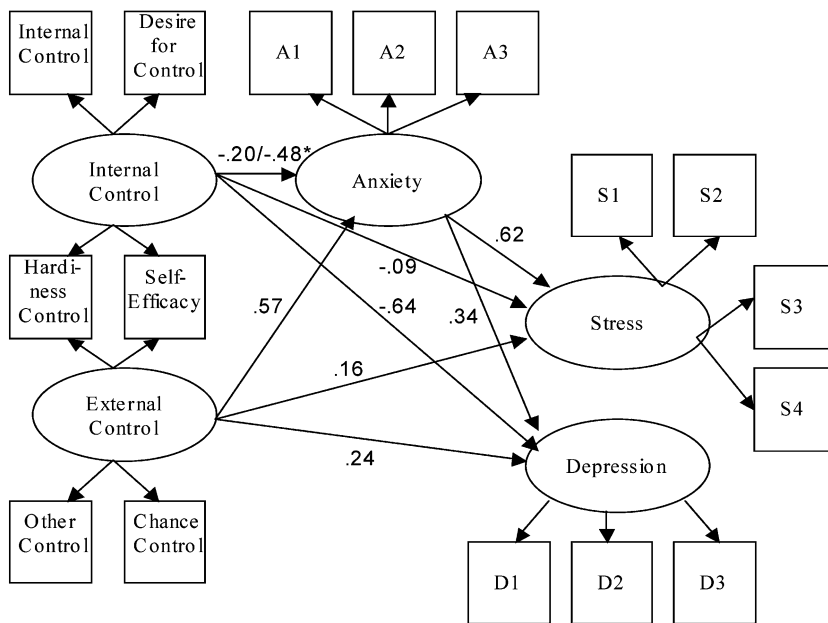
Figure 2. Best fitting version of the Byproduct Model in the American sample. Numbers represent standardized regression coefficients. Numbers are invariant from the Iranian sample unless marked with an asterisk (*), in which case the US value appears first followed by the Iranian value.

Byproduct Model identified only two. The Byproduct Model, therefore, seemed preferable on the grounds of parsimony alone.

These cross-cultural findings thus supported the argument that perceived control and anxiety play a central role in the stress–depression relationship (Abramson et al., 1978; Alloy et al., 1990; Chorpita & Barlow, 1998; Lazarus, 1966). Perceived stress did correlate with depression in both Iran and the United States. Once perceived control and anxiety were taken into account, however, stress no longer predicted depression in either culture.

A number of reasons may explain why the current study found a complete mediation of the stress–depression relationship instead of the more typical finding of partial mediation (e.g., Yarcheski & Mahon, 2000). First, previous studies have rarely included measures of both anxiety and perceived control (e.g., Yarcheski & Mahon, 2000). Second, researchers have tended to examine only facets of perceived control when studying the stress–depression relationship, and an examination of only one facet may be insufficient (Skinner, 1996). Third, this study used a cross-sectional design, and past studies have often used longitudinal designs (e.g., Schmeelk-Cone & Zimmerman, 2003). Additional research needs to determine if anxiety and perceived control completely mediate the relationship between stress and *later* depression. Finally, the current study used a measure of perceived stress, whereas many of the past studies have measured the frequency of stressful life events (e.g., Maciejewski et al., 2000). It is possible that perceived control and anxiety are more strongly involved in the generalized perceived stress–depression relationship than in the stressor-depression relationship. Future research also needs to examine that possibility.

The current study gave limited support to the possibility that perceived control mediated the stress–anxiety relationship (Chorpita & Barlow, 1998). Specifically, perceived external, but not internal, control partially mediated the stress–anxiety relationship. More research is needed to identify the mechanism through which stress causes anxiety (Chorpita & Barlow, 1998).

Implied in the Helplessness/Hopelessness Model of depression (Alloy et al., 1993) is the suggestion that stress would predict anxiety better than depression. Results supported this hypothesis in both Iran and the United States. Data from a broader range of societies would be useful in evaluating how general such processes might be.

The Helplessness/Hopelessness Model of depression also implies that perceptions of control

would predict depression better than anxiety. This hypothesis was supported only in the United States. Hence, the cross-cultural relevance of this suggestion appears suspect, and future investigations may need to identify when such relationships do and do not occur. At least some evidence suggests that Americans may be relatively more individualistic and Iranians more collectivistic in the dynamics, though not necessarily in the average levels, of their psychological functioning (Ghorbani et al., 2003b). Contrasts between individualism and collectivism, therefore, may deserve some consideration in additional cross-cultural examinations of this issue.

On the other hand, Iranians and Americans displayed numerous similarities in data related to the stress–depression relationship. The only contrast occurred in both models when internal control displayed significant negative associations with anxiety in Iran only. This result appeared to refute any possible suggestion that a supposedly individualistic process like internal control has no role within a presumably more collectivistic Muslim society like Iran. That this linkage was stronger in Iran might imply that variations in individualistic traits exert a more critical influence within a collectivistic context. It should be remembered, however, that associations of internal control with other constructs were essentially identical across the two societies. In addition, this one difference seemed equally attributable to other cross-cultural contrasts, with economic circumstances perhaps being only one noteworthy possibility. In general conformity with the hypothesis of this study, therefore, Iranians and Americans displayed wide-ranging commonalities in the psychological dynamics associated with the stress–depression relationship.

All conclusions must, of course, be conditioned by an awareness of the limitations of this project. Two potential caveats have already been mentioned: the use of a cross-sectional rather than a longitudinal design and the assessment of generalized perceptions of stress rather than stressor frequency. Many other caveats also deserve consideration. Student samples may not be fully representative of the societies from which they are selected. Iranians may also display contrasts with other Muslim samples, since Iran, more strongly than other Islamic societies, maintains a Shi'ite rather than a Sunni form of commitment. Finally, commonalities observed between American and Iranian samples may not extend to other societies. Contrasts might appear, for example, in societies that do not share such strong

cultural origins in monotheistic religious traditions.

In conclusion, this study most importantly suggested that the generalized perceived stress–depression relationship is completely dependent on changes in perceived control and anxiety. The more parsimonious and thus preferable Byproduct Model was as adequate as the Mediational Model in describing relationships among perceived stress, anxiety, perceived control, and depression. Whether the Byproduct Model deserves general acceptance will require additional studies that measure the frequency of stressful life events (e.g., Maciejewski et al., 2000) and that utilize a longitudinal design (e.g., Schmeelk-Cone & Zimmerman, 2003). The present data, nevertheless, suggest that future studies might usefully test the hypothesis that perceived stress fails to operate as an essential predictor of depression and that this understanding of the stress–depression relationships is valid cross-culturally.

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