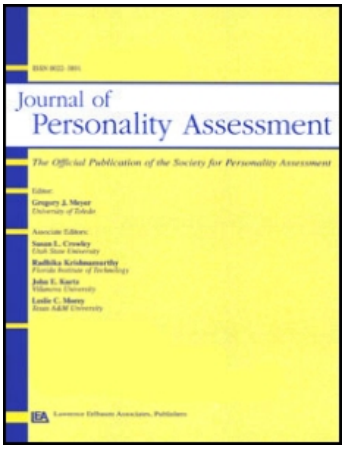

Journal of Personality Assessment
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t775653663

The FAD-Plus: Measuring Lay Beliefs Regarding Free Will and Related Constructs

Delroy L. Paulhus[a]; Jasmine M. Carey[a]
[a] Department of Psychology, University of British Columbia,

Online publication date: 22 December 2010

To cite this Article Paulhus, Delroy L. and Carey, Jasmine M.(2011) 'The FAD-Plus: Measuring Lay Beliefs Regarding Free Will and Related Constructs', Journal of Personality Assessment, 93: 1, 96 — 104
To link to this Article: DOI: 10.1080/00223891.2010.528483
URL: http://dx.doi.org/10.1080/00223891.2010.528483

Journal of Personality Assessment, *93*(1), 96–104, 2011

ISSN: 0022-3891 print / 1532-7752 online
DOI: 10.1080/00223891.2010.528483

Routledge
Taylor & Francis Group

The FAD–Plus: Measuring Lay Beliefs Regarding Free Will and Related Constructs

DELROY L. PAULHUS AND JASMINE M. CAREY

Department of Psychology, University of British Columbia

We describe the development of FAD–Plus, a 27-item measure of lay beliefs in free will and 3 closely related constructs: scientific determinism, fatalistic determinism, and unpredictability. Previously published measures included only a subset of these variables and tended to assume an a priori pattern of relations among these 4 beliefs. In Study 1, exploratory factor analyses suggested relatively independent factors. This independence was sustained in Study 2, using a confirmatory analysis. Each of the 4 subscales (Free Will, Scientific Determinism, Fatalistic Determinism, and Unpredictability) showed acceptable internal consistencies. Study 2 also mapped out associations with the Big Five personality traits and showed that believing in free will is not synonymous with having an internal locus of control. Study 3 replicated the instrument's structure and subscale reliabilities in a community sample. Preliminary applications are described.

The venerable debate over free will and determinism has inspired a new wave of theoretical commentary (e.g., Baer, Kaufman, & Baumeister, 2008) as well as empirical research (e.g., Baumeister, Masicampo, & DeWall, 2009; Nichols, 2006; Vohs & Schooler, 2008; Wegner, 2002). Interest in lay perceptions of these worldview issues has heightened the need for an effective measure of beliefs in free will and such related concepts as determinism and unpredictability. Unfortunately, the extant measures have (at least) one of two deficits: (a) they tap only a subset of the variables, or (b) they rely on a priori assumptions regarding relations among these beliefs—for example, that free will and determinism are incompatible.

In a seminal effort, Viney, Waldman, and Barchilon (1982) developed a scale based directly on the philosophical debate over free will versus determinism. Unfortunately, administration of the instrument required a preparatory lecture, implying that free will and determinism are mutually exclusive: Indeed, all seven items in the scale assumed bipolarity. Even with the preparatory lecture, typical college students had difficulty understanding the items. Such concerns led Nichols (2006) to discourage use of the Viney instrument.

To better capture the complexity of the association between free will and determinism, Stroessner and Green (1990) included multiple facets in their scale. Attitudes toward free will were measured separately from two forms of determinism: psychosocial and religious-philosophical. The subscales were derived from orthogonal factors and totaled separately. Because the correlations among the subscales were not provided, it is not clear what the final associations among the three scales were.

Two other measures have recently appeared in the literature. Rather than targeting free will directly, Keller (2005) developed an 18-item measure of genetic determinism. He found that high scores were associated with a variety of unsavory human qualities. Another questionnaire measure was developed by Rakos, Laurene, Skala, and Slane (2008). It returns to the earlier conception of free will and determinism as opposites, thereby reconfounding the concepts teased apart by Stroessner and Green (1990).

A PRELIMINARY VERSION

The combination of a burgeoning interest in the topic and the inadequacy of extant measures motivated us to develop a multi-factor instrument. A preliminary but unpublished version (the FAD–4) has been available for a number of years (Paulhus & Margesson, 1994). It included seven Likert-style items per subscale. Analyses on that instrument suggested that free will items cluster separately from two distinct types of determinism, namely, scientific and fatalistic. Also distinct were items tapping unpredictability. Separate measurement of those four constructs included confirmation of Stroessner and Green's (1990) finding that beliefs in free will and determinism are not incompatible.

Although never published, the FAD–4 proved useful in a number of published studies. Westlake and Paulhus (2007), for example, showed that Free Will scores were positively associated with punitiveness toward lawbreakers. Vohs and Schooler (2008) showed that the Free Will subscale was negatively associated with willingness to cheat for financial gain. Baumeister et al. (2009) demonstrated that Free Will scores were able to predict a behavioral indicator of altruism. More details about research on the FAD–4 are available at www.psych.ubc.ca/∼dpaulhus/FAD_info.

THE PRESENT RESEARCH

Despite some recent success, the FAD–4 had psychometric weaknesses. As a result, it was never published. Subscale reliabilities sometimes slipped below .60 and several items exhibited double loadings and even cross-loadings. Although the subscale intercorrelations were modest, we suspected that they were contaminated by the cross-loadings. Therefore, we remained uncertain about the true relations among our four constructs.

This article describes how we took a core set of those preliminary items and developed a new instrument labeled the

Received July 6, 2009; Revised June 21, 2010.
Address correspondence to Delroy L. Paulhus, Department of Psychology, University of British Columbia, Vancouver, BC, V6T 1Z4, Canada; Email: dpaulhus@psych.ubc.ca

FAD–Plus.[1] In creating the new instrument, we ran headlong into a long-standing psychometric dispute—whether or not to include reversals for each subscale. Although the inclusion of reversals (con-trait items) is traditionally recommended to control for acquiescence, many researchers have pointed out the drawbacks (Barnette, 2000; Holden, Fekken, & Jackson, 1985; Paulhus & Vazire, 2007; Schriesheim, Eisenbach, & Hill, 1991). The issue is especially critical in our case because the free will reversals inadvertently alluded to content relevant to the other subscales. To avoid this problem, we opted to include only positively-keyed (pro-trait) items in the new instrument. [2]

The following are three studies describing the development and preliminary validation of the FAD–Plus. Study 1 was an exploratory factor analysis of 23 pro-trait items. In Study 2, we expanded the item set to improve the subscale reliabilities. We then performed a confirmatory factor analysis (CFA) to verify the four-factor structure found in Study 1. To extend the generalizability of our measure beyond student populations, Study 3 confirmed the four-factor structure in a wide-ranging community sample.

In addition to testing the structure of the FAD–Plus, we began to investigate its construct validity. The greatest concern was that, in attempting to measure beliefs in free will and related constructs, we inadvertently captured locus of control (Rotter, 1966). The latter refers to the belief that control over human behavior resides within individuals rather than outside of them in forces such as powerful others and chance (Levenson, 1973). We tackled that concern with discriminant validity by correlating the FAD–Plus subscales with a standard measure of perceived control. Finally, we explored the broader nomological network of the subscales by examining their associations with the Big Five personality factors.

Study 1: Exploratory Factor Analysis of Pro-Trait Items

Method

Sample. Respondents were 295 undergraduate students who participated to receive extra credits in introductory psychology courses: 73% were female and the mean age was 20.6 years. To avoid the possibility of generating artifactual ethnic-difference factors, we did not include minority students in the sample.

Procedure. The data were collected as part of an online survey of subject pool students. The departmental subject pool system is designed to maximize confidentiality. Because participants are asked to invent their own identification code, their responses cannot be linked to their names or student ID numbers.

To avoid the problem of double loadings noted earlier, we began with the 23 pro-trait items from the FAD–4. These items were presented in 5-point Likert format with anchors of 1 (*strongly disagree*) to 5 (*strongly agree*). Age, gender, and ethnicity were also collected.

Analyses. We hesitated to predict the impact on the factor structure of using only pro-trait items: Therefore, we chose to begin with an exploratory factor analysis (EFA). The 23-item set was factored with a maximum likelihood extraction and oblimin rotation. Maximum likelihood was chosen because of its robustness to slight nonnormalities (Bollen, 1989). We also intended to follow up with a CFA in which maximum likelihood extraction is recommended: Following Bentler's (2004) advice, we chose to stay consistent in our extraction method. Oblimin (an oblique rotation) was chosen to allow for the possibility of correlated factors.

Results

Factors. The first seven eigenvalues were 3.3, 2.9, 2.2, 2.0, 1.2, 1.1, and 1.0. We used a parallel analysis procedure to determine the number of factors (e.g., Glorfeld, 1995; Zwick & Velicer, 1986). This method compares the eigenvalues of the data to the eigenvalues of randomly generated data. In our data, the point at which the eigenvalues of the actual data set dropped below the eigenvalues of the randomly generated data is after the fifth factor. However, the fifth factor was very close to the random eigenvalues and was likely an overestimation. The fifth factor had no loadings greater than .32 and was not interpretable.[3]

The factor loadings from the four-factor solution pattern matrix are presented in Table 1. This solution is clearly interpretable. With the exception of Item 15 ("I like the idea that people can't be predicted"), all items loaded highest on the appropriate factor. The combination of parallel analysis and interpretability supported our conclusion that only the first four factors were nontrivial. These four factors accounted for 45.25% of the total variance. Factor intercorrelations were small, ranging from $-.19$ to $+.11$

The first belief factor was interpreted as *Fatalistic Determinism:* The highest loading items are exemplified by "Fate already has a plan for each of us." This factor has proved to be the strongest in every factor analysis to date. The second belief factor was interpreted as *Free Will.* The highest loading is "People can overcome obstacles if they truly want to." Along with assumptions about autonomy, the factor includes declarations that people are responsible for their actions. Items on the third factor refer to randomness, luck, and unpredictability. Because the latter theme showed the strongest loadings, we applied the label *Unpredictability.* One example is "Life is hard to predict because it is almost totally random." Finally, the fourth factor was interpreted as *Scientific Determinism* because it included belief in biological forces (e.g., "People's biological makeup influences their talents and personality") as well as environmental forces (e.g., "Science has shown how your past environment created your current intelligence and personality").

Subscales. The faulty Item 15 was dropped and the retained items were aggregated into four subscales. As with the factor correlations, the subscale intercorrelations were small: The only

[1] The "FAD" portion of the label was retained to be consistent with its predecessor FAD–4: The "Plus" was added to signify that the instrument measures more than free will and determinism.

[2] Another alternative was to use the same content as the pro-trait items but negate them with qualifiers such as *not* and *never.* It is well known, however, that negations are less reliable and less valid because they are processed less effectively than affirmations (Holden et al., 1985; Paulhus & Vazire, 2007).

[3] As Lee and Ashton (2007) pointed out, interpretability is an essential criterion.

TABLE 1.—Pattern matrix from the exploratory factor analysis in Study 1.

Item	Fatalistic Determinism	Free Will	Unpredictability	Scientific Determinism
1. My future has already been determined by fate	**.85**	.07	−.11	.04
2. No matter how hard you try, you can't change your destiny	**.65**	−.13	.04	.15
3. Fate already has a plan for each of us	**.87**	.10	−.11	−.02
4. What will be, will be—there's not much you can do about it	**.53**	−.01	.24	.03
5. Whether we like it or not, mysterious forces seem to move our lives	**.57**	−.01	.03	−.10
6. I hate it when scientists take the mystery out of life	**.38**	.20	.07	−.23
7. People have complete control over the decisions they make	−.08	**.59**	−.01	−.09
8. People must take full responsibility for any bad choices they make	−.01	**.50**	.07	−.01
9. People can overcome obstacles if they truly want to	.03	**.65**	−.10	.16
10. Criminals are totally responsible for the bad things they do	.03	**.52**	.04	−.10
11. Strength of mind can always overcome the body's desires	.12	**.54**	−.07	.13
12. Chance events seem to be the major cause of human history	.11	−.17	**.55**	.13
13. No one can predict what will happen in this world	−.01	.23	**.45**	.03
14. Life seems unpredictable—just like throwing dice or flipping a coin	.05	.00	**.56**	−.06
15. I like the idea that people can't be predicted	−.05	.22	**.19**	−.24
16. There are random events going on—even at the level of atoms and molecules	−.07	−.15	**.43**	.03
17. Life is hard to predict because it is almost totally random	.05	.08	**.61**	.00
18. People's biological makeup influences their talents and personality	.12	−.11	−.10	**.39**
19. Bad behavior is caused by bad life circumstances	.01	−.21	.09	**.36**
20. Psychologists and psychiatrists will eventually figure out all human behavior	.02	.09	−.04	**.51**
21. Your genes determine your future	.09	−.14	.05	**.50**
22. Science has shown how your past environment created your current intelligence and personality	−.11	.13	.06	**.53**
23. As with other animals, human behavior always follows the laws of nature	−.10	.15	.08	**.54**

Note. $N = 257$. Maximum likelihood extraction with oblimin rotation. Bold loadings indicate that the item is part of that subscale.

significant value was the correlation of Fatalistic Determinism with Unpredictability ($r = .14$, $p < .05$, two-tailed).

The only significant gender difference was on scientific determinism with male participants ($M = 3.08$) scoring higher than female participants ($M = 2.83$), $t(293) = 3.48$, $p < .001$,[4] $d = .41$.

Summary

Overall, the results of Study 1 indicate the distinctiveness of four beliefs related to free will. Moreover, the content of those factors was coherent and consistent with previous research. Of special importance is the fact that the free will factor emerged as independent of both determinism subscales. Rather than rest our conclusions on exploratory analyses, we proceeded in Study 2 to apply a confirmatory procedure.

STUDY 2: CONFIRMATORY FACTOR ANALYSIS AND EXTERNAL CORRELATES

Study 2 included several goals. To improve the subscales, a number of alterations were made to the 23-item set from Study 1. Several items were reworded to improve clarity. The poorly performing Item 15 was dropped and three items were added to help improve the subscale reliabilities.

One active decision was to restrict our wording to third person ("they," "one") rather than second person ("you"), or first person ("I" or "me"). The rationale was that third-person allusions better maintain a detached philosophical flavor. We were especially concerned that first-person responses would implicate self-related issues.

To confirm that the four-factor structure was robust, a CFA was performed on the new 25-item set. Based on the EFA, we anticipated that the subscales would remain relatively independent. Recall that the lone exception to orthogonality was the association of Fatalistic Determinism with Unpredictability.

To support their construct validity, we also began elaborating the nomological network around the subscales. We felt that two goals were paramount: The first was to show that the subscales had coherent associations with the fundamental dimensions of personality; the second was to demonstrate that believing in free will was not redundant with having an internal locus of control.

Construct Validity

The Big Five. Because personality space as a whole is currently organized around the Big Five personality traits (e.g., John & Srivastava, 1999), we considered it important to investigate links with our new measure. Several hypotheses seemed to be justified. Because self-perceptions of autonomy are generally associated with good adjustment (e.g., Wilt & Revelle, 2009), we hypothesized that belief in Free Will would be positively correlated with Extraversion and Emotional Stability.

Links between prosocial behavior and free will beliefs (Stillman & Baumeister, in press) suggest a positive association between free will and Agreeableness. Fatalistic Determinism implies a sense of helplessness; hence we hypothesized a positive association with Neuroticism.

Locus of control. It is easy to confuse notions of free will and determinism with those of internal and external locus of control, respectively. Therefore it is important (in lay samples, especially) to establish that we are not tapping "old wine in new bottles."

[4] Unless otherwise indicated, all significance tests are two-tailed.

The conceptual contrast is clear enough. Free will beliefs are consistent with an internal locus of control but also include moral responsibility. Scientific determinism subsumes both internal forces (e.g., biology) and external forces (e.g., conditioning). Unpredictability does not specify locus of control one way or the other. Fatalistic determinism is the only concept that wrests control from the individual and attributes it to external forces; but it goes further to assume the inevitability of those external forces. In short, the constructs targeted by the FAD-Plus overlap with but do not correspond directly to the traditional distinction between internal and external locus of control.

Based on these arguments, free will was expected to correlate with internal control, whereas fatalistic determinism should correlate with aspects of external control (e.g., powerful others). Scientific determinism should correlate with both internal and external control.

Method

Sample. Participants were 177 undergraduate students who participated to receive extra credits in introductory psychology courses: 65% were female and the mean age was 20.2 years ($SD = 2.69$). To remain consistent with Study 1, we did not include minority participants.

Procedure. As in Study 1, the data were administered as part of an online survey. The subject pool system was organized to maximize confidentiality. Participants are assured that their responses cannot be linked to their name or student ID.

Measures.

The FAD–Plus: At this point, the instrument included 25 pro-trait items. Alpha reliabilities were Free Will, .69; Scientific Determinism, .69; Fatalistic Determinism, .82; and Unpredictability, .63.

Big Five Inventory: The Big Five traits have become widely recognized as the five most important factors of personality. One standard measure is the Big Five Inventory (BFI; John & Srivastava, 1999). It includes 44 items in 5-point Likert format. The BFI scale means in this sample were typical of student samples and the alpha reliabilities were all strong: Extraversion, .87, $M = 3.35$, $SD = .72$; Agreeableness, .84, $M = 3.60$, $SD = .64$; Conscientiousness, .81, $M = 3.50$, $SD = .58$; Neuroticism, .81, $M = 3.08$, $SD = .67$; and Openness, .83, $M = 3.65$, $SD = .59$.

This inventory was included to explore associations of the FAD–Plus subscales with personality space. It also served as an item source for an independent measure of individual differences in acquiescence (see Soto, John, Gosling, & Potter, 2008).

Locus of Control: To measure perceptions of internal versus external control we used the Multidimensional Locus of Control (MLOC) inventory (Levenson, 1973). A total of 24 items are rated for agreement on 6-point scales. The MLOC provides separate measures of internal control and two external forces: chance and powerful others. This instrument has a wealth of validation research and successful applications (Lefcourt, 1981).

Statistics from the sample were as follows: Internal Control, $\alpha = .67$, $M = 3.83$, $SD = .48$; Control by Chance, $\alpha = .77$, $M = 2.31$, $SD = .58$; and Control by Powerful Others, $\alpha = .83$, $M = 2.15$, $SD = .69$.

Structural analyses. To confirm the factor structure, our initial model allowed all factors to covary. Accordingly, the model required estimations of 21 loadings and errors, 6 factor covariances, and four factor variances. Error covariances were set to zero. Four loadings were fixed to set the metric for the four latent factors. The raw data covariance matrix was analyzed using maximum likelihood extraction, the default extraction method for CFA. Analyses were conducted with the well-recognized statistical software EQS (Bentler, 2004).

A total of 13 participants had missing data. After verifying that they were missing at random (a different pattern of missing data for each participant), we used maximum likelihood missing data handling to estimate the missing values (see Savalei & Bentler, 2005). As a result, we were able to include all 177 participants. The raw data showed a normalized kurtosis estimate of $Z = 5.84$. Accordingly, all fit statistics and standard errors reported here are the robust estimates as recommended to correct for nonnormal data (Bentler, 2004). To ensure adequate power, a series of Monte Carlo studies were conducted using methods detailed by Muthén and Muthén (2002). A full review of the analyses are available at www.psych.ubc.ca/∼dpaulhus/FAD_info.

Model 1 was rejected by the chi-squared index, $S\chi^2(269) = 376.20$, $p < .001$, and was weak according to the CFI (.84). Nonetheless, the initial model was acceptable according to the root mean square error of approximation (RMSEA) index (RMSEA = .05, 90% CI = [.04–.06]) with a 90% confidence interval of < .06. Of course, the χ^2 fit index depends on sample size (Bentler, 2004; Hoyle, 2007), and has an inflated Type I error rate in small samples (Bentler & Yuan, 1999). Furthermore, evidence is accumulating that all these standard fit indexes might be too stringent for personality data (Church & Burke, 1994; Hopwood & Donnelan, 2010; Raykov, 1998).

Nonetheless, we were curious about the sources of misfit. Lagrange-multiplier test results were used to empirically determine which parameter constraints contributed significantly to the misfit of the χ^2 (Bentler, 2004). Model 2 freed up the five within-factor error covariances that would lead to the greatest reduction in the χ^2. An examination of these item pairs confirmed that they had a common topic or common wording. Model 2 showed a significant improvement in fit: $S\chi^2(264) = 328.84$, $p < .005$, RMSEA = .04, 90% CI = [.02–.05], CFI = .90, χ^2 difference (5) = 47.36, $p < .001$. Note that this more relaxed model is no less valid than Model 1: After all, items within a subscale are aggregated in research applications.

Finally, we wanted to confirm the orthogonality of the free will and determinism factors. Model 3 constrained to zero all factor covariances except that between Fatalistic Determinism and Unpredictability. This more restrictive model did not significantly weaken the fit compared to Model 2, $S\chi^2(269) = 338.34$, $p < .005$, RMSEA = .04, 90% CI = [.03–.06], CFI = .90, χ^2difference (5) = 9.5, $p = .09$. In sum, Model 3 met standard fit criteria for both an absolute fit index (RMSEA) and a relative fit index (CFI). This model is presented in Figure 1.

Subscales. Table 2 contains the means and standard deviations broken down by gender. Only one significant gender difference emerged: Men scored higher on Scientific Determinism, $t(175) = 2.65$, $p < .01$, $d = .38$.

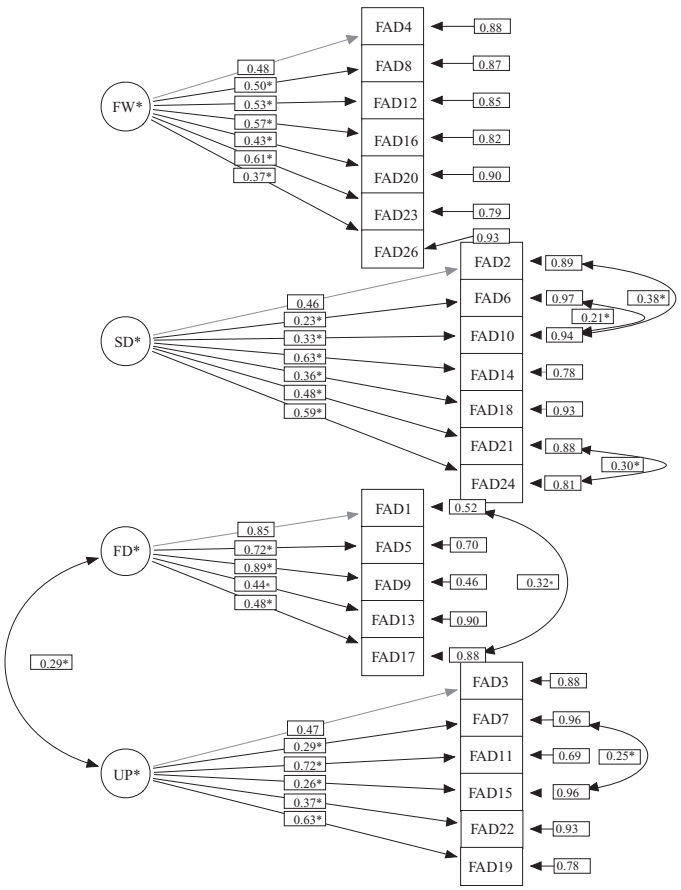

FIGURE 1.—Confirmatory factor analysis results from Study 2, Model 3. *Note.* $N = 177$. Confirmatory factor analysis Model 3 results with standardized parameter estimates; factors covariances, loadings, errors, and error covariances. FW = Free Will; SD = Scientific Determinism; FD = Fatalistic Determinism, UP = Unpredictability. Estimated parameters are marked with an asterisk.

In Table 3, the intercorrelations continue to be relatively small. Consistent with Study 1, the highest value is that between Fatalistic Determinism and Unpredictability ($r = .19$, $p < .05$).

Acquiescence. Given our choice to avoid reversals, however, we had to consider the possibility that the intercorrelations were inflated (made more positive) by individual differences in acquiescence. If so, some of the true construct correlations could actually be negative. This confounding with acquiescence should not be a problem in most analyses with the FAD subscales, because the appropriate analysis would involve pitting them against one another in a regression equation. Thus common acquiescent responding will be controlled.

Nonetheless, we were concerned that the intercorrelations might unduly influence our conceptual conclusions. Therefore, we developed an independent measure of acquiescence using a technique described by Soto et al. (2008). They selected 32 items forming 16 matched pairs of pro- and con-trait items on each Big Five trait. Each FAD–Plus item was ipsatized by the mean and standard deviation of these 16 pairs.

Although ipsatization is often conducted using the mean and standard deviations from the same items (e.g., McCrae, Herbst, & Costa, 2001; Ten Berge, 1999), recent research on the technique has found that it is actually more effective to use a separate set of items to create a measure of acquiescence (Weijters, Geuens, & Schillewaert, 2010). The BFI has previously been used in this context by Soto et al. (2008). The sum of the ipsatized pairs provides a global measure of the stylistic tendency to answer positively to any item. The correlations between the subscales computed from the ipsatized items are presented in Table 3. Along with the raw values, the partial correlations are included in parentheses. It is clear that the pattern of correlations shows little change when acquiescence was controlled, suggesting that the scores on the FAD–Plus are not being affected by acquiescence bias.

Construct validity. As an initial investigation into the construct validity of the FAD–Plus subscales, we computed their correlations with the Big Five personality traits (see Table 4). The Free Will subscale was positively correlated with both Extraversion ($r = .20$, $p < .01$) and Agreeableness ($r = .19$, $p < .05$). These findings were consistent with our hypotheses. Its correlation with Agreeableness is consistent with previous research showing that free will beliefs are associated with prosocial behavior (Baumeister et al., 2009). The correlation with Extraversion suggests that those who are more socially confident also believe more strongly in their own autonomy: This makes sense given our operationalization of free will as control over one's own actions.

Fatalistic Determinism correlated positively with Agreeableness ($r = .19$, $p < .05$) and negatively with Emotional Stability ($r = -.22$, $p < .01$). Although the correlation with Agreeableness was unexpected, it does make sense conceptually. Fatalistic Determinism is the belief that the future has already been determined and that one's actions have no effect on what happens. To cope with this helpless worldview, such individuals may have to take on the cooperative and complaint attitudes of agreeable people. Nonetheless, this coping strategy is unlikely to be completely successful. Individuals suffering from learned

TABLE 2.—Descriptive statistics from Study 2.

	Males		Females	
	M	*SD*	*M*	*SD*
Free Will	3.47	.61	3.31	.56
Scientific Determinism	3.17	.59	2.96	.54
Fatalistic Determinism	2.06	.62	2.41	.80
Unpredictability	3.19	.66	3.32	.53

Note. Data are from a sample of 177 undergraduates from the University of British Columbia. Item means have a possible range of 1.0 to 5.0.

TABLE 3.—Intercorrelations among FAD–plus subscales, with and without controlling for acquiescence.

	Free Will	Scientific Determinism	Fatalistic Determinism	Unpredictability
Free Will	—	.13 (.11)	.13 (.11)	.02 (.01)
Scientific Determinism		—	.09 (.08)	.01 (−.01)
Fatalistic Determinism			—	.19* (.18)
Unpredictability				—

Note. Values in parentheses are controlled for acquiescence. $N = 177$.
*$p < .05$, two-tailed.

TABLE 4.—Correlations of the FAD–Plus subscales with the Big Five factors.

	FAD Subscales			
	Free Will	Scientific Determinism	Fatalistic Determinism	Unpredictability
Extraversion	.20**	.09	−.09	.05
Agreeableness	.17*	−.01	.19*	.07
Conscientiousness	−.04	−.08	−.03	−.13
Neuroticism	−.07	−.04	.22**	.03
Openness	.03	.02	.04	.10

*$p < .05$. **$p < .01$, two-tailed.

helplessness are likely to suffer a lifetime of chronic anxiety. No wonder they are neurotic.

The correlations among the FAD–Plus subscales and the MLOC subscales are presented in Table 5. As predicted, free will beliefs correlated only with internal forces ($r = .35$, $p < .005$). Also as predicted, Fatalistic Determinism correlated positively with both external forces: chance ($r = .49$, $p < .001$) and powerful others ($r = .27$, $p < .005$), and negatively with internal forces ($r = -.19$, $p < .01$). Scientific Determinism was positively correlated with control by powerful others ($r = .28$, $p < .001$), as well as control by chance ($r = .16$, $p = .05$).

Although coherent, none of the correlations with locus of control were high enough to imply redundancy with that any of the FAD–Plus subscales. Only Free Will belief correlated significantly with internal control, providing further support for compatibility. Fatalistic Determinism appears to behave like the more traditional conception of determinism; it was positively related to all forms of external control and negatively related to internal control.

The correlation between scientific determinism and powerful others makes sense because social environments are controlled first by parents and then by society as a whole. However, scientific determinism was not negatively correlated with internal control, suggesting that the layperson does not see genetic and environmental causes of behavior as contradicting internal control (see Baumeister & Sommer, 1997).

Summary. The results of Study 2 provided support for the structure and construct validity of the FAD–Plus subscales. The CFA results were consistent with the level of fit typically found in well-established personality scales (Hopwood & Donnelan, 2010; Jackson, Gillaspy, & Purc-Stephenson, 2009), and support the characterization of free will beliefs as orthogonal to beliefs in scientific or fatalistic determinism.

Correlations with the Big Five factors and locus of control provided an initial foray into construct validity. The patterns of correlations were coherent, both in terms of our a priori hypotheses and the unexpected findings. The independence of the factors from locus of control also supports our orthogonal factor structure.

TABLE 5.—Correlations between the FAD–Plus and locus of control subscales.

	FAD Subscales			
	Free Will	Scientific Determinism	Fatalistic Determinism	Unpredictability
Internal	.35**	.14	−.19*	−.13
Chance	−.01	.16*	.49**	.20*
Powerful Others	−.07	.28**	.27**	.05

*$p < .05$. **$p < .01$, two-tailed.

TABLE 6.—Descriptive statistics from Study 3.

	Males		Females	
	M	*SD*	*M*	*SD*
Free Will	3.63	.63	3.82	.54
Scientific Determinism	3.13	.59	2.93	.63
Fatalistic Determinism	2.33	.93	2.29	.79
Unpredictability	3.21	.66	3.17	.55

Note. Data are from a community sample of $N = 188$. Item means have a possible range of 1.0 through 5.0.

STUDY 3

One limitation of our previous studies is the exclusive use of undergraduate college student samples. Although the FAD–Plus has a stable structure and reliability in student samples, it might not perform as well in a nonstudent sample. In our third study we tested the internal validity and reliability of the FAD–Plus on a community sample. In addition, we attempted to address the low reliability of the Unpredictability subscale by adding several new items.

Method

A sample of 203 participants was recruited from the Mechanical Turk research Web site. Participants sign up to volunteer for surveys for which they are paid according to the length and difficulty of the survey. Data from this source have been shown to be at least as valid as those from other sources (Buhrmester, Kwang, & Gosling, in press). No identifying information is provided. We included four validity-check questions designed to aid in removing those who responded randomly. The net sample of 188 was 42% male. The mean age was 34, $SD = 11.9$. Respondents were limited to residents of the United States with European heritage.

The 25 item FAD–Plus from Study 2 was administered along with two new items designed to fit the central theme in the Unpredictability subscale. They were: "People's futures cannot be predicted" and "Luck plays a big role in people's lives."

Results

The means and standard deviations are presented by gender in Table 6. As in student samples, men scored higher on Scientific Determinism, $t(186) = 2.30$, $p < .01$, $d = .33$. In addition, this community sample showed women scoring higher on belief in Free Will, $t(186) = -2.30$, $p < .01$, $d = -.33$. It is notable that none of the subscales correlated significantly with age (all rs $< .09$).

Reliabilities. Addition of the two new items improved the alpha reliability of the Unpredictability subscale to .72. Other subscale reliabilities were equal to or higher than in the student sample: Free Will $\alpha = .70$, Scientific Determinism $\alpha = .69$, and Fatalistic Determinism $\alpha = .82$. The final version now includes 27 items, in the order presented in the Appendix.

Confirmatory factor analysis. As in Study 2, we tested the factor structure using CFA. Again we used maximum likelihood extraction on the covariance matrix, but in this sample missing data correction was not necessary. The normalized kurtosis estimate was $Z = 7.99$: therefore all reported fit statistics are once again the robust estimates (Bentler, 2004).

The model was identical to Model 3 in Study 2 with allowances for the two additional item loadings on the Unpredictability factor. In addition, one more factor covariance was freed because, in the community sample, Scientific and Fatalistic Determinism were significantly correlated ($r = .38$, $p < .001$). Therefore we were estimating 23 loadings and errors, two factor covariances, and five error covariances. As before, we fixed four loadings to set the metric of the latent factors.

In this community sample, the model fit indexes were comparable to those in the student sample, $S\chi^2(317) = 506.17$, $p < .001$, RMSEA = .06, 90% CI = [.05–.07], CFI = .82. Again, the model does satisfy the RMSEA test of not-close-fit with the top of the 90% confidence interval being at or below .07 (Yuan, 2005).

General Discussion

We have provided details about key steps in the development of the FAD–Plus, a 27-item measure of lay beliefs in free will and three closely related constructs.[5] The instrument includes four subscales: Free Will, Scientific Determinism, Fatalistic Determinism, and Unpredictability. The final set of items is presented in the Appendix, in a format appropriate for administration.

Also provided in this article is preliminary support for the construct validity of the FAD–Plus subscales. We hope that future research in the area will take full advantage of this instrument. Tentatively, the Table 6 results from Study 3 can be considered adult norms.

Advantages

The FAD–Plus overcomes difficulties that handicap previous measures in this area of research. Those previous measures targeted only a subset of these variables or tended to assume specific theoretical relations among these four beliefs.

We believe that our scale construction procedures have helped avoid several pitfalls. First, the wide net cast in our preliminary work provided assurance that we had not overlooked a key construct. Second, we avoided philosophical jargon (e.g., words such as *determinism* or *libertarianism*). One major issue with the Viney et al. (1982) scale was that to achieve even moderate reliability, a lecture was required to explain the terms and concepts being measured. By contrast, the FAD–Plus items are suitable not only for college students without formal training on the free will debate, but also members of the broader community, who are even less likely to have been formally introduced to the topic.

Third, we wrote items that focused on one and only one of the target constructs. We also ensured that this univocal targeting applied to the subscales. Unfortunately that was not true of our earlier instrument, the FAD–4, which included con-trait along with pro-trait items in each subscale: The result was a confounding of free will with related beliefs. By including only pro-trait items in the FAD–Plus, we allowed the data to more freely reveal the relative independence of the four constructs. The only cross-loadings in our final item set were within subscale: This finding does not handicap use of the FAD–Plus because items within a subscale are only used as a sum.

As a result of our approach, an EFA in Study 1 yielded four relatively independent factors. CFAs in Study 2 and Study 3 sustained this relative independence. Although the final model did not satisfy all the standard fit indexes, its replicability across three studies provides assurance that our four-factor model is defensible: The distinctiveness of our four factors cannot be a matter of chance.

Clarifying the Four Constructs

Our conceptual development is linked most directly with the work by Stroessner and Green (1990). They showed that beliefs in free will and determinism could be measured separately: They are not opposites on a single bipolar dimension. All three of our studies support that claim for independence. One can believe in both, neither, or one and not the other. Consistent with our findings, recent experimental research supports the conclusion that lay judges see free will and determinism as quite compatible (e.g., Nahmias, Morris, Nadelhoffer, & Turner, 2006; cf. Knobe & Nichols, 2008). In short, intuitions about lay intuitions can be faulty.

Our instrument goes further to distinguish two forms of deterministic thinking, namely, scientific and fatalistic. Some previous measures of scientific determinism have been tainted by the implication of inevitability; ours maintains the narrower emphasis on scientific causality. For example, one can believe that environments can be manipulated to improve society with no implication of inevitability. We also made an effort to cancel out political biases by including both genetic and environmental arguments in our Scientific Determinism subscale. In that sense, our measure differs substantially from the Genetic Determinism scale developed by Keller (2005). His measure indicates a proclivity toward conservative political beliefs. However, as Rychlak and Rychlak (1990) pointed out, environmental and genetic versions are equally deterministic.

In all three studies, our Scientific Determinism subscale was independent of Fatalistic Determinism. This latter measure is not unlike Stroessner and Green's (1990) Philosophical Determinism subscale, but our items are not explicitly linked to religiosity. Both measures retain the flavor of inevitability. The linkage between fatalism and religion warrants further research.

We also broadened the scope of previous instruments by including the Unpredictability subscale in the FAD–Plus. This addition has conceptual benefits. Isolation of this belief helps address the commonly heard (but odd) argument that the existence of free will is evidenced by scientists' inability to perfectly predict human behavior. In fact, the empirical independence of beliefs in free will and unpredictability subscales suggests that believing in indeterminism is not a necessary or sufficient condition for believing in free will. In short, lay beliefs do not entail any implication of unpredictability for free will believers.

The curious link between unpredictability and fatalistic determinism, although modest in size, was replicated across all three studies. Apparently, those who believe in fate also believe that its action is unpredictable. We conjecture that these two beliefs have something in common, namely, they are external,

[5] A more detailed account of the evolution of the FAD–Plus from its unpublished predecessor, the FAD–4, can be found online at www.psych.ubc.ca/~dpaulhus/FAD_info/.

unpredictable, and unknowable. One possibility is that both beliefs are motivated by a need for mystery (see Carey & Paulhus, 2008). We hope to clarify that link in future research.

With some confidence, we now offer the FAD–Plus to researchers for use in studying lay beliefs regarding free will. The distinctions that we have confirmed among the four constructs should facilitate clearer conclusions about the significance and impact of such beliefs on the behavior of ordinary citizens. We believe that the ability of the FAD–Plus to simultaneously measure all four constructs provides a powerful tool for future research.

Limitations and Future Research

Further validation of the FAD–Plus subscales faces special challenges. The validity of most self-reports can be substantiated by demonstrating correlations with corresponding informant ratings and observable behaviors. Self-reports of extraversion, for example, are easily confirmed with concrete evidence. This is not so for beliefs in free will and its relatives. There is no expectation that individuals scoring higher on the Free Will subscale will actually possess greater free will and act more autonomously than low scorers (Baumeister, 2008).

Nonetheless, most commentators believe that free will beliefs are more than epiphenomena (Wegner, 2002) or some form of self-presentation (Johnson & Hogan, 2006). Such beliefs could insinuate themselves deeply into personal identities and worldviews (Rychlak & Rychlak, 1990). As a result, these beliefs should have a systematic, albeit indirect, impact on behavioral tendencies. The nature of those behaviors has only begun to be explored (e.g., Baumeister et al., 2009; Nichols, 2006; Vohs & Schooler, 2008). A variety of cogent hypotheses have been laid out in recent volumes by Baer and colleagues (2008) and Knobe and Nichols (2008).

In many of these papers, free will beliefs are viewed as state rather than trait indicators. For example, the strength of such beliefs has been shown to be sensitive to such manipulations as affective context (Nichols, 2006) and self-regulation depletion (Stillman & Baumeister, in press). Although the FAD subscales explicitly target trait beliefs (as corroborated by associations with trait measures such as the Big Five), there is some evidence for sensitivity to context (Vohs & Schooler, 2008). We suspect that behavioral indicators are more sensitive to state manipulations, whereas self-reports are superior for capturing trait-level individual differences.

Although we have investigated the relationship with locus of control, further research should investigate associations with intelligence, cognitive complexity, need for structure, and affective states. With respect to outcomes, the most important area for behavioral investigation involves moral judgments and allocations of punishment. We plan to explore this association in future studies.

Finally, our conclusions are constrained by the fact that we chose to limit our samples to participants of European heritage. It is likely, however, that the worldviews implicated in research on free will and related constructs will differ across cultures. For example, a growing body of research points to the likelihood of Western versus Asian differences in both mean levels and the very structure of such worldviews (Nisbett, 2003). Having established such differences, researchers could then track the transition to Western worldviews using measures of acculturation to the West and loss of Asian culture (e.g., Ryder, Alden, & Paulhus, 2000).

References

Baer, J., Kaufman, J. C., & Baumeister, R. F. (Eds.). (2008). *Are we free?: Psychology and free will.* New York, NY: Oxford University Press.

Barnette, J. J. (2000). Effects of stem and Likert response option reversals on survey internal consistency: If you feel the need, there is a better alternative to using those negatively worded stems. *Educational and Psychological Measurement, 60,* 361–370.

Baumeister, R. F. (2008). Free will, consciousness, and cultural animals. In J. Baer, J. C. Kaufman, & R. F. Baumeister (Eds.), *Are we free? Psychology and free will* (pp. 65–85). New York, NY: Oxford University Press.

Baumeister, R. F., Masicampo, E. J., & DeWall, N. D. (2009). Prosocial benefits of feeling free: Disbelief in free will increases aggression and reduces helpfulness. *Personality and Social Psychology Bulletin, 35,* 260–268.

Baumeister, R. F., & Sommer, K. L. (1997). Consciousness, free choice, and automaticity. In R.S. Wyer (Ed.), *Automaticity of everyday life* (pp. 75–82). Hillsdale, NJ: Lawrence Erlbaum Associates.

Bentler, P. M. (2004). *EQS structural equations program manual.* Encino, CA: Multivariate Software.

Bentler, P. M., & Yuan, H. K. (1999). Structural equation modeling with small samples: Test statistics. *Multivariate Behavioral Research, 34,* 181–197.

Bollen, K. A. (1989). *Structural equations with latent variables.* Oxford, UK: Wiley.

Buhrmester, M. D., Kwang, T., & Gosling, S. D. (in press). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality data. *Perspectives on Psychological Science.*

Carey, J., & Paulhus, D. L. (2008, January). *Need for mystery: Development and measurement of a new construct.* Poster presented at the 10th annual meeting of the Society for Personality and Social Psychology, Tampa, FL.

Church, A. T., & Burke, P. J. (1994). Exploratory and confirmatory tests of the Big Five and Tellegen's three- and four-dimensional models. *Journal of Personality and Social Psychology, 66,* 93–114.

Glorfeld, L. W. (1995). An improvement on Horn's parallel analysis methodology for selecting the correct number of factors to retain. *Educational and Psychological Measurement, 55*, 377–393.

Holden, R. R., Fekken, G. C., & Jackson, D. N. (1985). Structured personality test item characteristics and validity. *Journal of Research in Personality, 19,* 386–394.

Hopwood, C. J., & Donnelan, M. B. (2010). How should internal structure of personality inventories be evaluated? *Personality and Social Psychology Review, 14,* 244–254.

Hoyle, R. H. (2007). Structural equation modeling. In R. W. Robins, R. C. Fraley, & R. F. Krueger (Eds.), *Handbook of research methods in personality psychology* (pp. 444–460). New York, NY: Guilford.

Jackson, D. L., Gillaspy, J. A., & Purc-Stephenson, R. (2009). Reporting practices in confirmatory factor analysis: An overview and some recommendations. *Psychological Methods, 14,* 6–23.

John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 102–139). New York, NY: Guilford.

Johnson, J. A., & Hogan, R. (2006). A socioanalytic view of faking. In R. Griffith (Ed.), *A closer examination of applicant faking behavior* (pp. 209–231). Greenwich, CT: Information Age.

Keller, J. (2005). In genes we trust: The biological component of psychological essentialism and its relationship to mechanisms of motivated social cognition. *Journal of Personality and Social Psychology, 85,* 686–702.

Knobe, J., & Nichols, S. (2008). *Experimental philosophy.* New York, NY: Oxford University Press.

Lee, K., & Ashton, M. C. (2007). Factor analysis in personality research. In R. W. Robins, R. C. Fraley, & R. F. Krueger (Eds.), *Handbook of research methods in personality psychology* (pp. 424–443). New York, NY: Guilford.

Lefcourt, H. M. (Ed.). (1981). *Research with the locus of control construct.* New York, NY: Prentice-Hall.

Levenson, H. (1973). Multidimensional locus of control in psychiatric patients. *Journal of Consulting and Clinical Psychology, 41,* 397–404.

McCrae, R. R., Herbst, J. H., & Costa, P. T., Jr. (2001). Effects of acquiescence on personality factors structures. In R. Riemann, F. M. Spinath, & F. Ostendorf

(Eds.), *Personality and temperament: Genetics, evolution, and structure* (pp. 217–231). Berlin, Germany: Pabst Science.

Muthén, L. K., & Muthén, B. O. (2002). How to use a Monte Carlo study to decide on sample size and determine power. *Structural Equation Modeling, 9,* 599–620.

Nahmias, E., Morris, S. G., Nadelhoffer, T., & Turner, J. (2006). Is incompatibilism intuitive? *Philosophy and Phenomenological Research, 73,* 28–53.

Nichols, S. (2006). Folk intuitions on free will. *Journal of Culture and Cognition, 6,* 58–86.

Nisbett, R. E. (2003). *The geography of thought: How Asians and Westerners think differently . . . and why.* New York, NY: The Free Press.

Paulhus, D. L., & Margesson, A. (1994). *Free Will and Scientific Determinism (FAD-4) scale.* Unpublished instrument, University of British Columbia, Vancouver, BC, Canada.

Paulhus, D. L., & Vazire, S. (2007). The self-report method. In R. W. Robins, R. C. Fraley, & R. F. Krueger (Eds.), *Handbook of research methods in personality psychology* (pp. 224–239). New York, NY: Guilford.

Rakos, R. F., Laurene, K. R., Skala, S., & Slane, S. (2008). Belief in free will: Measurement and conceptualization innovations. *Behavior and Social Issues, 17,* 20–39.

Raykov, T. (1998). On the use of confirmatory factor analysis in personality research. *Personality and Individual Differences, 24,* 291–293.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs: General and Applied, 80*, 1–28.

Rychlak, J. F., & Rychlak, R. J. (1990). The insanity defense and the question of human agency. *New Ideas in Psychology, 8,* 3–24.

Ryder, A. G., Alden, L., & Paulhus, D. L. (2000). Is acculturation unidimensional or bidimensional?: A head-to-head comparison in the prediction of demographics, personality, self-identity, and adjustment. *Journal of Personality and Social Psychology, 79,* 49–65.

Savalei, V., & Bentler, P. M. (2005). A statistically justified pairwise ML method for incomplete nonnormal data: A comparison with direct ML and pairwise ADF. *Structural Equation Modeling, 12,* 183–214.

Schriesheim, C. A., Eisenbach, R. J., & Hill, K. D. (1991). The effect of negation and polar opposite items on questionnaire reliability and validity: An experimental investigation. *Educational and Psychological Measurement, 51,* 67–78.

Soto, C. J., John, O. P., Gosling, S. D., & Potter, J. (2008). The developmental psychometrics of Big Five self-reports: Acquiescence, factor structure, coherence, and differentiation from ages 10 to 20. *Journal of Personality and Social Psychology, 94,* 718–737.

Stillman, T. F., & Baumeister, R. F. (in press). Guilty, free, and wise: Determinism and psychopathy diminish learning from negative emotions. *Journal of Experimental Social Psychology.*

Stroessner, S. J., & Green, C. W. (1990). Effects of belief in free will or scientific determinism on attitudes toward punishment and locus of control. *Journal of Social Psychology, 130,* 789–799.

Ten Berge, J. M. F. (1999). A legitimate case of component analysis of ipsative measures, and partialling the mean as an alternative to ipsatization. *Multivariate Behavioral Research, 34,* 89–102.

Viney, W., Waldman, D., & Barchilon, J. (1982). Attitudes toward punishment in relation to beliefs in free will and scientific determinism. *Human Relations, 35,* 939–950.

Vohs, K. D., & Schooler, J. (2008). The value of believing in free will: Encouraging a belief in scientific determinism increases cheating. *Psychological Science, 19,* 49–54.

Wegner, D. M. (2002). *The illusion of conscious will.* Cambridge, MA: MIT Press.

Weijters, B., Geuens, M., & Schillewaert, N. (2010). The individual consistency of acquiescence and extreme response style in self-report questionnaires. *Applied Psychological Measurement, 34,* 105–121.

Westlake, B., & Paulhus, D. L. (2007, June). *Crime and punishment: Personality and mitigating factors.* Poster presented at the meeting of the Canadian Psychological Association, Ottawa, ON, Canada.

Wilt, J., & Revelle, W. (2009). Extraversion. In M. R. Leary & R. H. Hoyle (Eds.), *Handbook of individual differences in social behavior* (pp. 27–45). New York, NY: Guilford.

Yuan, K. H. (2005). Fit indices vs. test statistics. *Multivariate Behavioral Research, 40,* 115, 148.

Zwick, W. R., & Velicer, W. F. (1986). Comparison of five rules for determining the number of components to retain. *Psychological Bulletin, 99*, 432– 442.

APPENDIX

FAD–PLUS: FREE WILL AND DETERMINISM

For each statement below, choose a number from 1 to 5 to indicate how much you agree or disagree.

+1 +2 +3 +4 +5
Strongly disagree Strongly agree

1. I believe that the future has already been determined by fate.
2. People's biological makeup determines their talents and personality.
3. Chance events seem to be the major cause of human history.
4. People have complete control over the decisions they make.
5. No matter how hard you try, you can't change your destiny.
6. Psychologists and psychiatrists will eventually figure out all human behavior.
7. No one can predict what will happen in this world.
8. People must take full responsibility for any bad choices they make.
9. Fate already has a plan for everyone.
10. Your genes determine your future.
11. Life seems unpredictable—just like throwing dice or flipping a coin.
12. People can overcome any obstacles if they truly want to.
13. Whatever will be, will be—there's not much you can do about it.
14. Science has shown how your past environment created your current intelligence and personality.
15. People are unpredictable.
16. Criminals are totally responsible for the bad things they do.
17. Whether people like it or not, mysterious forces seem to move their lives.
18. As with other animals, human behavior always follows the laws of nature.
19. Life is hard to predict because it is almost totally random.
20. Luck plays a big role in people's lives.
21. People have complete free will.
22. Parents' character will determine the character of their children.
23. People are always at fault for their bad behavior.
24. Childhood environment will determine your success as an adult.
25. What happens to people is a matter of chance.
26. Strength of mind can always overcome the body's desires.
27. People's futures cannot be predicted.

Subscales

Free Will: 4, 8, 12, 16, 21, 23, 26
Scientific Determinism: 2, 6, 10, 14, 18, 22, 24
Fatalistic Determinism: 1, 5, 9, 13, 17
Unpredictability: 3, 7, 11, 15, 19, 20, 25, 27