Journal of Personality and Social Psychology
2006, Vol. 91, No. 2, 342–350

0022-3514/06/$12.00 DOI: 10.1037/0022-3514.91.2.342

Expect the Unexpected: Ability, Attitude, and Responsiveness to Hypnosis

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Participants' expectancies and hypnotic performance throughout the course of a standardized, individually administered hypnotic protocol were analyzed with a structural equation model that integrated underlying ability, expectancy, and hypnotic response. The model examined expectancies and ability as simultaneous predictors of hypnotic responses as well as hypnotic responses as an influence on subsequent expectancies. Results of the proposed model, which fit very well, supported each of the 4 major hypothesized effects: Expectancies showed significant stability across the course of the hypnosis protocol; expectancies influenced subsequent hypnotic responses, controlling for latent ability; hypnotic responses, in turn, affected subsequent expectancies; and a latent trait underlay hypnotic responses, controlling for expectancies. Although expectancies had a significant effect on hypnotic responsiveness, there was an abundance of variance in hypnotic performance unexplained by the direct or indirect influence of expectation and compatible with the presence of an underlying cognitive ability.

Keywords: hypnosis, hypnotic suggestibility, structural equation modeling, expectancy theory

As defined by the American Psychological Association, Division 30 (Green, Barabasz, Barrett, & Montgomery, 2005), and others (Kihlstrom, 2003; Killeen & Nash, 2003), a hypnotic procedure occurs when "one person (the subject) is guided by another person (the hypnotist) to respond to suggestions for changes in subjective experience, alterations in perception, sensation, emotion, thought or behavior" (Green et al., 2005, p. 262). Logistically, there are three components to a hypnotic procedure. First, the subject is told that he or she is going to be administered "some suggestions for imaginative experiences." Second, the subject is administered the induction, which is no more or less than "an extended initial suggestion" (Green et al., 2005, p. 262). The nature and specific wording of this initial suggestion do not seem crucial; for example, most standard hypnotic inductions include suggestions to relax, but some do not. However, all current standard protocols include at least one explicit introductory suggestion—for example, eye closure in the Stanford Scale of Hypnotic Susceptibility, Form C (SHSS:C; Weitzenhoffer & Hilgard, 1962). Finally, after this introductory suggestion that constitutes the induction, a series of test suggestions (typically 12) are administered to determine the extent to which the subject behaviorally responds to the hypnosis procedure.[1]

It turns out that people differ markedly in the extent to which they respond to hypnosis. These individual differences are both very consistent, as seen in the strong positive correlations in responsiveness to the different hypnotic suggestions in a protocol, and very stable, as seen in the strong positive correlations in test performance across time (e.g., Piccione, Hilgard, & Zimbardo, 1989). Explaining the genesis of these striking individual differences in hypnotic responding is arguably the first and most fundamental challenge to any scientific explanation of hypnosis.

At issue here is explaining an aspect of human performance, in this case hypnotic performance. Not surprisingly, then, aptitude and attitude (and how they are configured causally) are central to explanatory models of hypnotic performance, just as they are to models of intellectual, athletic, and artistic performance. Indeed, generally speaking there are those theories of hypnosis that afford the central causal role to aptitude (i.e., ability) and those theories that grant center stage to attitude (e.g., expectation, motivation). Below, we broadly sketch the contours of these two types of theory, we propose a model that integrates the insights of both of them, and we describe a study that tested this model.

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This research was supported by an Operating Grant RGPGP 283352 from the Natural Sciences and Engineering Research Council of Canada to Erik Z. Woody.

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[1] The APA definition describes the same sequence of events for self-hypnosis: "Persons can learn self-hypnosis, which is the act of administering hypnotic procedures on one's own" (Green et al., 2005, p. 262). In addition, a hypnotic procedure can be administered via audiotape (Shor & Orne, 1962), interactive computer software (Grant & Nash, 1995), and videotape (American Sign Language; Repka & Nash, 1995).

Aptitude-Centered Theories of Hypnotic Responsiveness

Aptitude-centered theories posit that the highly consistent individual differences in hypnotic performance reflect the direct and substantial operation of a latent cognitive ability. Much as there are aptitudes that explain substantial variability in athletic, artistic, and intellectual performance, so there is a putative aptitude that substantially explains variability in hypnotic performance. These theorists have generally characterized this cognitive ability as a capacity to alter the experience of agency such that there are transient disconnects (dissociations) between intent–action, implicit–explicit memory, and implicit–explicit perception (Kihlstrom, 1998; Woody & Farvolden, 1998). They further have speculated that, whatever the nature of this capacity, it may be rooted in genetic (Morgan, 1973; Raz, 2005), cognitive (Tellegen & Atkinson, 1974), and neural substrates (Graffin, Ray, & Lundy, 1995; Horton, Crawford, Harrington, & Downs, 2004). However, the underlying nature of such an ability remains somewhat elusive.

Aptitude-centered theorists acknowledge the additional influence of attitude on hypnotic performance, according it a role in determining the extent of hypnotic response (e.g., Shor, 1971). For instance, when people who have had no personal experience with hypnosis estimate how responsive they will be, this expectation usually correlates with actual hypnotic performance in the $r =$ .25–.35 range (Barber & Calverley, 1969; Derman & London, 1965; Shor, 1971; Shor, Pistole, Easton, & Kihlstrom, 1984); similarly, when people estimate how hypnotically responsive other people in general are, this too correlates with their own actual hypnotic performance ($r = .22$; Shor, 1971). However, aptitude-centered theorists have pointed out that the relatively modest contribution of attitude leaves plenty of room for the operation of ability (Kihlstrom, 2003; see also Katsanis, Barnard, & Spanos, 1988; Spanos, Brett, Menary, & Cross, 1987).

Further, people have the capacity to reflect on their own performance and revise expectations according to their own response history (Bandura, 1977, 1997; Mischel, Cantor, & Feldman, 1996; Olson, Roese, & Zanna, 1996; Wilson, Lisle, Kraft, & Wetzel, 1989). Aptitude-centered theorists expect a person's prior performance on hypnotic tasks to inform his or her estimates (i.e., expectancies) of success on future hypnotic tasks; however, the primary determinant of performance on those future hypnotic tasks would be aptitude (a latent trait) acting directly on performance itself, not acting on performance through expectancies or attitudes per se.

Attitude-Centered Theories of Hypnotic Responsiveness

In contrast, attitude-centered theorists view hypnotic responsiveness as based primarily (and perhaps even exclusively) on the direct operation of social learning, or social–cognitive, variables (expectations, motivation, attitude, and role enactment; Spanos, 1991). For instance, Kirsch (1991) has argued that response to hypnotic suggestions proceeds directly from the individual's response expectancies about hypnosis:

> The effectiveness of a hypnotic induction appears to depend entirely on people's beliefs about its effectiveness . . . . In other words, response expectancy may be the sole determinant of the situations in which hypnotic responses occur, and also of the nature of the responses that occur in those situations. (pp. 460–461)

For such theorists, people's beliefs about their own hypnotic responsiveness exert a profound effect on the extent of hypnotic performance and may in fact constitute "the 'essence' of hypnosis" (Kirsch, 1991, p. 461).

If aptitude-centered theorists have failed to empirically identify the contours of the purported cognitive ability underlying hypnotizability, attitude theorists have not established whether experimentally instilling high expectations of success leads to the predicted enhanced hypnotic responsiveness. In two studies, Kirsch and his colleagues (Kirsch, Wickless, & Moffitt, 1999; Wickless & Kirsch, 1989) found that participants who were administered one type of *enhanced-expectation* manipulation tended to be more responsive to hypnosis than control participants. Critically, in neither study were participants' expectations actually measured (i.e., there was no manipulation check to confirm that expectations were in fact different between experimental and control groups). When this design flaw was corrected in a new study in a separate laboratory (Benham, Bowers, Nash, & Muenchen, 1998), a measurable increase in expectation due to manipulation was secured, but this did not lead to higher hypnotic responsiveness scores. Across each of two independent samples, hypnotic responsiveness of participants receiving the enhanced-expectations manipulation was no different than the hypnotic responsiveness of control participants who did not receive the manipulation.

Attitude-centered theorists explain the stability of hypnotic responsiveness not as a reflection of enduring individual differences in ability but as a function of expectancies that have been stabilized by repeated testing. With each test of hypnosis (presumably each administration of a suggestion), "The subjects reach a conclusion about the degree to which they are hypnotized, and this conclusion elicits altered and more confidently held expectations about their responses to subsequent suggestions" (Kirsch & Council, 1992, p. 287). These altered expectations then directly influence the extent of response to the subsequent suggestions, which in turn leads to further consolidation of expectancies and hence stability of responsiveness. Indeed, Council, Kirsch, and Hafner (1986) queried subjects twice about their expectations: before they were administered the initial suggestions of the hypnotic procedure (i.e., prior to the induction) and after having been administered the initial suggestions (i.e., after the induction). Once subjects had a chance to observe their own response to the initial suggestions, their expectations correlated .55 with final performance, up from a correlation of .21 between initial expectations and final performance. The effect of altered expectation on responsiveness is posited to be directly causal, of substantial magnitude, and not merely due to observation of one's own prior performance (Braffman & Kirsch, 1999; Council et al., 1986).

Attitude-centered theorists tend to be open to the possibility that there could be an aptitude component to hypnotic responsiveness. However, these theorists have expressed concern that any role of aptitude is readily confounded with the strong effects of expectancy: "Once expectancy effects are eliminated, there may be nothing left" (Kirsch, 1991, p. 461; see also Braffman & Kirsch, 1999). Further addressing whether ability variables are important, Kirsch states "The question that needs to be asked about these variables is whether they can be shown to produce effects that are independent of subjects' expectations . . . or whether their effects are entirely mediated by response expectancy" (Kirsch, 1991, p. 462).

A Structural Model Integrating Ability, Attitude, and Hypnotic Response

As indicated in the foregoing review, each of the two major types of hypnosis theory raises important questions about the main evidence for the alternative theory. To summarize, according to aptitude-centered theorists, the fact that expectancies predict responsiveness does not necessarily imply that they have a causal role. This is because expectancies may be based on accurate self-observation of ability: Through their experience of hypnosis, subjects may assess their level of ability and hence correctly predict their likelihood of responding to future suggestions. Although it is certainly possible that positive expectancies have some additional feed-forward effect, aptitude-centered theorists imply that this additional effect can be assessed accurately only if underlying ability is controlled for.

Likewise, according to attitude-centered theorists, the fact that hypnotic responsiveness tends to be highly consistent and stable does not necessarily imply an underlying aptitude. This is because expectancies are another major potential source of response consistency. Although it is certainly possible that an underlying aptitude may have some additional effect (beyond expectancy), attitude-centered theorists imply that this additional effect can be assessed accurately only if expectancies are controlled for.

These two positions are actually complementary, and their integration is straightforward. We need a model in which both expectancy and ability serve as simultaneous predictors of hypnotic responsiveness. In this way, we can assess the effect of expectancy controlling for ability, as the aptitude-centered theorists require, and we can assess the effect of ability controlling for expectancy, as the attitude-centered theorists require.

The two types of theorist appear to concur on the requirement for one additional feature of an appropriate model: Hypnotic performance, rather than simply being an outcome to be predicted, should also serve, in turn, as a cause. According to aptitude-centered theorists, an important determinant of subjects' expectancies might be their preceding performance because it provides them with information about their level of underlying ability. Similarly, attitude-centered theorists recognize the possibility that expectancies derive, at least in part, from subjects' preceding experience of hypnosis and hence may be fairly labile early in their experience of hypnosis (although eventually expectancies are theorized to stabilize with repeated testing). Thus, we need a model in which subjects' ongoing response during the hypnosis session is allowed to influence (or update) their expectancy for future responsiveness.

Evaluating such a model integrating ability, expectancy, and hypnotic response requires measuring and tracking expectations and performance throughout a hypnotic protocol, preferably with participants who have never before experienced hypnosis. In this article, we report such an analysis on the basis of data collected during the course of a broad-based programmatic effort that nonetheless shares a common structure and protocol. In all cases, hypnosis-naive participants were administered the SHSS:C, which consists of a hypnotic induction followed by a sequence of 12 suggestions. Further, at six points throughout the administration of the SHSS:C, the experimenter probed for participants' expectations regarding success with future hypnosis.

All the features of our proposed integrative model are readily encapsulated in a structural equation model, as depicted in Figure 1. Expect 1 through Expect 6 represent expectancies measured at six time points over the course of the SHSS:C, and SHSS 1–3 through SHSS 10–12 represent responsiveness to five subsets (or parcels) of hypnotic suggestions administered between successive expectancies. Except for Expect 1, which is the expectancy mea-

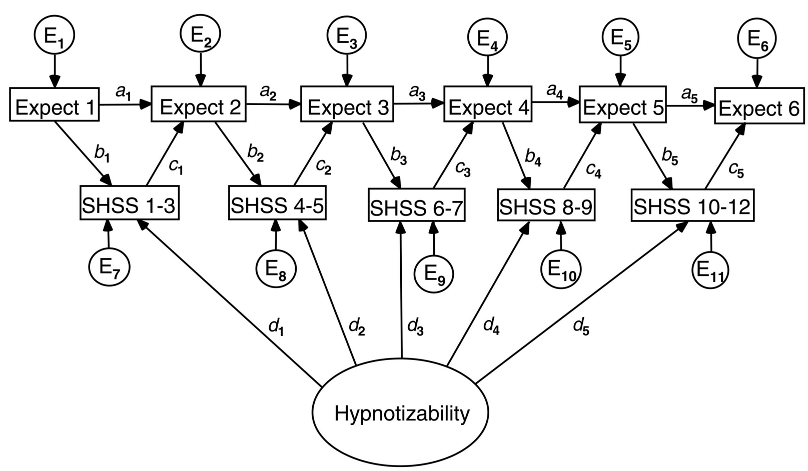

Figure 1. Model of response to hypnotic suggestions as a function of expectancies and hypnotic susceptibility. Expect 1 through Expect 6 represent expectancies measured at six time points over the course of the Stanford Scale of Hypnotic Susceptibility (SHSS), Form C (Weitzenhoffer & Hilgard, 1962); SHSS 1–3 through SHSS 10–12 represent responsiveness to five subsets (or parcels) of hypnotic suggestions administered between successive expectancies; the disturbance or residual variables E_1 through E_6 represent all other sources of variance in expectancies; the disturbance or residual variables E_7 through E_{11} represent all other sources of variance in hypnotic performance besides those specified by the model; *Hypnotizability* represents the aptitude-centered hypothesis that there is a stable ability underlying hypnotic responsiveness.

sured after the induction but before any of the test suggestions,[2] all expectancies have two determinants: the previous expectancy, the effect of which is represented by the paths labeled a, and the participant's immediately preceding hypnotic performance, the effect of which is represented by the paths labeled c. This is a lag-one structure, the essence of which is that participants continually update their expectancies on the basis of their recent experience. We believe such a structure faithfully represents Kirsch's (1991) arguments that "unlike personality traits, expectancies can be quite labile" (p. 457) and that they can be affected by the experience of hypnosis. Note that the relative sizes of paths a and c represent a range of possibilities: The larger the as relative to the cs, the more stable expectancies would be; in contrast, the larger the cs relative to the as, the more strongly participants' expectancies would be updated by their ongoing response to hypnosis. The disturbance or residual variables E_1 through E_6 represent all other sources of variance in expectancies.

Response to hypnotic suggestions, broken into five sets of items over the course of the SHSS:C, likewise has two determinants: the immediately preceding expectancy, the effect of which is represented by the paths labeled b, and an unchanging latent trait (or general factor), the effect of which is represented by the paths labeled d. The general factor, labeled *Hypnotizability* in the structural diagram, represents the aptitude-centered hypothesis that there is a stable ability underlying hypnotic responsiveness. It is defined in the model as a unitary latent variable underlying the residual covariation, controlling for expectancies, among the responses to subsets (or parcels) of hypnotic suggestions. As before, the relative sizes of paths b and d represent a range of possibilities: The larger the bs relative to the ds, the more strongly expectancies would determine hypnotic responsiveness; in contrast, the larger the ds relative to the bs, the more participants' responses would be due to a nonexpectancy-related latent trait. Of course, it is also possible that the contributions of the two determinants could be approximately equal. The disturbance or residual variables E_7 through E_{11} represent all other sources of variance in hypnotic performance besides those specified by the model.

To summarize, our structural equation model integrates four major questions:

1. How stable are expectancies across the course of the SHSS:C? (coefficients a_1 through a_5)

2. Do expectancies influence subsequent hypnotic responses, even when the effects of a latent ability are taken account of? (coefficients b_1 through b_5)

3. Do hypnotic responses, in turn, influence subsequent expectancies? (coefficients c_1 through c_5)

4. Does a latent trait underlie hypnotic responses, even when the effects of expectancies are taken account of? (coefficients d_1 through d_5)

Finally, it is important to note that we can evaluate a variety of other possible structural equation models that serve as plausible alternatives to our hypothesized model. For example, we can look at whether the relationships among expectancies are fit more convincingly by a latent-factor model than by a lag-one model and whether a lag-one model fits the relationships among successive hypnotic performances more convincingly than a latent-factor model. If we can successfully reject such alternatives, the case for the present model is strengthened.

Method

Participants

Participants were 90 undergraduate psychology students (69 females, 21 males) recruited with an offer of extra credit for participation in the initial phase of an ongoing research effort (Wilson, 2001). Only individuals reporting no previous hypnotic experience were recruited.

Measures and Procedure

All participants were administered the SHSS:C, as per Wickless and Kirsch (1989) and Benham et al. (1998). This standardized scale is widely recognized as the best available measure of hypnotic responsiveness.

The experimenter greeted the participant and escorted him or her to a comfortable, pleasantly lit, and quiet room. The experimenter explained the nature of the study and obtained the participant's informed consent. The participant was seated in a comfortable recliner chair with the experimenter seated slightly behind and to the left. Before commencing the SHSS:C, the experimenter introduced the idea of an expectancy probe by asking the question "If at some future time we were to give you 20 suggestions, at that time (knowing what you know now) how many of those 20 suggestions do you think you would respond to?" Half of the participants then received the induction portion of the SHSS:C unaltered. The other half received an extended induction (of 4 extra minutes) taken in detail from Wickless and Kirsch (1989) and previously used in our lab (Benham et al., 1998).

Periodically throughout the administration of the SHSS:C, participants were asked to estimate how much they expected to respond to hypnosis in the future. The expectancy measures were taken at six times during the course of the SHSS:C administration: (1) immediately following the hypnotic induction (i.e., immediately prior to administration of the 1st SHSS:C item); (2) immediately following the 3rd SHSS:C item, (3) immediately following the 5th SHSS:C item, (4) immediately following the 7th SHSS:C item, (5) immediately following the 9th SHSS:C item, and (6) immediately following the 12th SHSS:C item (following termination of hypnosis). The expectancy probe was the following question: "If we were to give you 20 suggestions at some future time, how many of those do you *now* think you would respond to?" For each expectation probe, a response ranging from 0 to 20 was recorded.

Results

Induction Type

Compared with the unaltered SHSS:C induction, the extended induction had very negligible effects in this study. In particular, the mean expectancy scores for the two conditions were not significantly different at any of the six times they were given during

[2] Although preinduction expectancies were also measured in the experimental procedure, we excluded them from our model in accordance with Kirsch's (1991) position that they are of questionable relevance. Kirsch noted that the failure to find strong relationships of expectancies to hypnotic performance in some previous research is due to the fact that the expectancies were measured prior to the induction rather than after it. Because the experience of an induction changes expectancies, Kirsch argued that it is postinduction expectancies that are the "major determinants of hypnotic responding" (Council, Kirsch, & Hafner, 1986, p. 188).

administration of the SHSS:C, nor were expectancies different when averaged over all six times: for the unaltered induction, $M = 14.98$; and for the extended induction, $M = 14.74$, $t(88) = 0.251$, *ns*. Likewise, type of induction had no significant effect on overall SHSS:C scores: for the unaltered induction, $M = 6.15$; and for the extended induction, $M = 6.43$, $F(1, 86) = 0.243$, *ns*.

The obvious implication is that we may collapse across type of induction. Nonetheless, as an additional check, we ascertained whether the network of associations, as represented in Figure 1, was basically the same regardless of whether the extended induction was used. This is a straightforward hypothesis to test with structural equation modeling: We analyzed the two groups simultaneously and compared two models. In one model, all the paths were allowed to be unequal across the two groups; in the other model, all pairs of respective paths were set to be equal across the two groups (a_1 in the extended group equal to a_1 in the standard group, etc.). If the latter model fits significantly worse than the former one, we have evidence to reject the hypothesis that the phenomena are the same in the two groups.

This structural equation model, as well as all others we report, was evaluated with Amos 4.0 (Arbuckle & Wothke, 1999). In the present case, constraining all paths to be equal across groups led to no loss of fit, $\Delta\chi^2(19, N = 90) = 20.69$, *ns*. Furthermore, the model constraining the two induction groups to the same solution fit extremely well, $\chi^2(89, N = 90) = 86.18$, *ns* (comparative fit index [CFI] = 1.00, root-mean-square error of approximations [RMSEA] = .00).[3] Hence, we felt justified to move ahead with the combined sample. Indeed, the foregoing analysis indicates that rather than being dependent on any particular induction protocol, the results we report below generalize across two rather different induction procedures. (The correlation matrix, means, and standard deviations of the variables for the combined sample appear in the Appendix.)

Equality Constraints

There are other equality constraints that are well worth examining. In particular, there is no a priori reason to believe that the effect of expectancy on performance would change across the administration of the scale; thus, a reasonable hypothesis is that all *b*s are equal. We can test this hypothesis by comparing a model in which the *b*s are allowed to be unequal with one in which they are all constrained to be equal ($b_1 = b_2 = \ldots = b_5$). Constraining these paths to be equal led to no significant loss of fit, $\Delta\chi^2(4, N = 90) = 1.97$, *ns*. Likewise, there is no a priori reason to believe that the effect of performance on expectancy would change across the administration of the scale; indeed, setting all *c*s to be equal led to no significant loss of fit, $\Delta\chi^2(4, N = 90) = 6.87$, *ns*. Thus, in the solution we present below, these empirically verified equality constraints have been set. They are highly advantageous because they give us much better power in estimating the respective effects.

We also examined whether equality constraints could be imposed on the remaining sets of paths in the model. That is, could the *a*s be set equal and the *d*s be set equal, in addition to the *b*s and *c*s? However, these additional constraints resulted in significant lack of fit, $\Delta\chi^2(8, N = 90) = 16.53$, $p < .05$, and were therefore rejected.

Estimated Parameters

Figure 2 presents the estimated parameters for the model, each of which is statistically significant at the $p < .05$ level. (The parameters are provided in standardized form. The equality constraints apply to the unstandardized coefficients; coefficients set equal become very slightly different from one another once they are standardized because the variables have slightly different standard deviations.) This model fit the data very well, $\chi^2(43, N = 90) = 48.93$, *ns* (CFI = .99, RMSEA = .04, *pclose* = .60).[4] Examining the path coefficients in this model, one can see that expectancies appear to have been highly stable; only the very last expectancy was somewhat less strongly predicted by the previous one. All these expectancies were rather weakly (but significantly) updated according to the previous hypnotic response. Likewise, although both expectancies and the latent trait appear consistently to have had significant effects on hypnotic responses, the effect of the latent trait was always considerably larger.

Evaluation of Alternative Models

As mentioned in the introduction, we examined some plausible alternative models. One interesting alternative was to model the relationships among expectancies not with a lag-one structure but instead with a latent factor. Such a model involved deleting all the paths labeled with *a*s in Figure 1 and adding an Expectancy general factor with paths pointing from it to each of the six specific expectancy measures. This alternative model clearly fit poorly, $\chi^2(42, N = 90) = 120.59$, $p < .001$ (CFI = .87, RMSEA = .14, *pclose* < .001). In addition, allowing the two factors Hypnotizability and Expectancy to be correlated did not improve this alternative model significantly, $\Delta\chi^2(1, N = 90) = 3.26$, *ns*. Thus, the relationships among expectancies were clearly fit better by a lag-one model than by a latent-factor model.

We also tested an alternative model in which the latent trait of Hypnotizability was omitted (there was no latent factor and none of the paths labeled with *d*s). Unsurprisingly (given the results shown in Figure 2), this model showed significant lack of fit, $\chi^2(48, N = 90) = 102.60$, $p < .001$ (CFI = .91, RMSEA = .11, *pclose* < .01). A more interesting alternative model is one in which the latent factor is again omitted, but a lag-one structure is added among the hypnotic responses: a path from SHSS 1–3 to SHSS 4–5, another path from SHSS 4–5 to SHSS 6–7, and so on. This model also tended to show significant lack of fit, $\chi^2(44, N = 90) = 71.92$, $p < .01$ (CFI = .95, RMSEA = .08, *pclose* = .06). In addition, we used the expected cross-validation index (ECVI; Browne & Cudeck, 1993) to compare this alternative lag-one model of hypnotic responses with the latent-trait model shown in Figure 2. The alternative model yielded a larger ECVI value (1.38)

[3] Widely acknowledged criteria for excellent model fit are a nonsignificant chi-square test, CFI greater than .95, and RMSEA less than .05 (Arbuckle & Wothke, 1999; Hu & Bentler, 1999).

[4] The parameter *pclose* evaluates the hypothesis that the fit of the model to the data is close enough that any lack of fit is attributable to sampling error (Browne & Cudeck, 1993). Hence, a relatively large probability (e.g., .50) suggests that any lack of fit might plausibly be attributed to chance, whereas a relatively small probability (e.g., .05 or smaller) indicates that the obtained lack of fit is not likely due to chance.

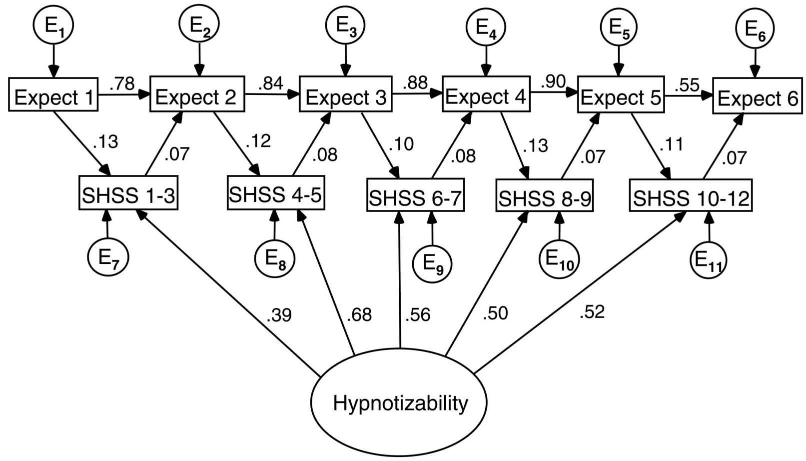

Figure 2. Standardized coefficients for the structural equation model. Expect 1 through Expect 6 represent expectancies measured at six time points over the course of the Stanford Scale of Hypnotic Susceptibility (SHSS), Form C (Weitzenhoffer & Hilgard, 1962); SHSS 1–3 through SHSS 10–12 represent responsiveness to five subsets (or parcels) of hypnotic suggestions administered between successive expectancies; the disturbance or residual variables E_1 through E_6 represent all other sources of variance in expectancies; the disturbance or residual variables E_7 through E_{11} represent all other sources of variance in hypnotic performance besides those specified by the model; *Hypnotizability* represents the aptitude-centered hypothesis that there is a stable ability underlying hypnotic responsiveness. All path coefficients are significant, $p < .05$.

than the ECVI obtained with the model in Figure 2 (1.02), supporting the superiority of the latent-factor model.[5]

In summary, these tests of alternative models lend support to our proposed structural model (shown in Figures 1 and 2). Specifically, the relationships among expectancies are fit better by a lag-one model than by a latent-factor model, whereas the relationships among successive hypnotic performances are fit better by a latent-factor model than by a lag-one model.

Discussion

An Integrative Perspective

Our results provide clear evidence in support of each of the four major effects integrated into our proposed structural equation model: (a) Expectancies showed significant stability across the course of the hypnosis protocol; (b) expectancies influenced subsequent hypnotic responses, even controlling for latent ability; (c) hypnotic responses, in turn, affected subsequent expectancies; and (d) a latent trait underlay hypnotic responses, even controlling for expectancies. As such, the results indicate a fairly complex but quite plausible web of effects interconnecting these important variables.

However, the data of the present study also suggest that the four types of linkage are of different strengths. Expectancies were a very strong predictor of later expectancies, whereas hypnotic responses were a fairly weak predictor. Thus, expectancies were less labile than one might have anticipated (Kirsch, 1991). Likewise, the underlying latent trait was a strong predictor of hypnotic responses (with coefficients of .39–.68), whereas expectancy was a more modest predictor (with coefficients around .12). In the present model, the latent trait was essentially defined by the internal consistency among parcels of the performance measures, controlling for the influences of expectancies. The strong role of this latent variable is consistent with the hypothesis that there is an important unitary ability underlying hypnotic performance. Because the latent variable is in a sense a default source of variation, it is possible that the results may overstate the role of ability somewhat; nonetheless, they clearly show that a large portion of the systematic variance in hypnotic performance operates independently of ongoing expectation. Hence, Kirsch's (1991) speculation about hypnotic response that "Once expectancy effects are eliminated, there may be nothing left" (p. 461) seems too extreme. Although in the present study there were genuine effects of expectancies on hypnotic responsiveness, they were of relatively modest importance.

The stability of expectancies dropped somewhat toward the end of the SHSS:C (from Expect 5 to Expect 6). Perhaps this suggests a somewhat state-dependent quality to expectancies, given that the last expectancy was taken after participants had been alerted from hypnosis. Because this last expectancy precedes no further responses, its significance is somewhat indeterminate. Otherwise, the coefficients obtained along the various stages of the administration of the SHSS:C paint a very consistent picture: Expectancies are neither irrelevant nor definitive. That is, whereas expectancies shift somewhat as hypnosis progresses, the ranking of individuals in responsiveness remains quite stable over time.

Strengths and Weaknesses of the Present Study

A major strength of the present approach using structural equation modeling is that it integrates multiple hypothesized underlying

[5] The smaller the ECVI, the better the obtained parameter estimates would generalize to new samples. Browne and Cudeck (1993) recommended, given alternative models, selecting the one with the smallest value.

mechanisms into one dynamic process unfolding across time. This approach avoids simply assuming that, on one hand, hypnotic response represents an ability-like maximum performance or that, on the other hand, it represents an attitude-like typical tendency consolidated through ongoing experience (cf. Dennis, Sternberg, & Beatty, 2000). Instead, our methodology allows different hypotheses, such as trait and expectancy theories of hypnotic response, to provide a context for each other. Such a multivariate approach seems to approach theoretical disputes with much greater verisimilitude, showing explicitly, for example, how more than one mechanism may be simultaneously involved. Another strength is that the relative importance of these mechanisms as predictors of performance can be compared. Accordingly, we like to believe that the present research may serve as a model for future work on hypnotic responsiveness, in which performance over time is predicted by multiple hypothesized mechanisms.

One aspect of our structural equation model that might strike some aptitude-centered hypnosis theorists as a possible weakness is the portrayal of the traitlike aspects of hypnotic response with a single-factor model. For example, Hilgard (1965) advanced a three-factor model of responses to the SHSS:C. Nonetheless, Balthazard and Woody (1985) raised the possibility that one or two of these factors might be artifacts of the factoring procedures that Hilgard and others have used. More recently, Sadler and Woody (2004) applied a sophisticated item response theory-based factoring method to the Waterloo–Stanford Group C Scale (Bowers, 1993, 1998), which was very closely modeled after the SHSS:C. They found that the items of the Waterloo–Stanford Group C Scale closely approximated unidimensionality. Woody, Barnier, and McConkey (2005) applied the same method to an extensive item pool that included the SHSS:C. Although they were able to isolate separable subcomponents of ability, there was a very strong second-order general factor. Given that in the present model hypnotic responsiveness was represented by parcels of items rather than by single items, such a general factor is likely the major common contributor to performance; indeed, there were no problems of model fit to suggest otherwise.

From the point of view of an advocate for the response-expectancy theory of hypnosis, the chief possible weakness of the present study might have to do with the measurement of expectancies. Although we believe our measurement of expectancies is reasonable and faithful to the theory (self-expectations of success), it is not the only way to measure them. One valuable strategy for future research would be to measure expectancies at each time point in two or three different ways and use these multiple measures in the structural equation model to correct for imperfect reliability. However, although it is possible that another measurement approach could yield stronger effects for expectancies, the effects would need considerable improvement to approach the magnitude of the role of the latent trait.

A final point about our model is that although expectation was measured directly, ability was measured only indirectly. It would be preferable, if possible, to index ability with pure indicators that are arguably unaffected by expectancies and any other nonability influences; however, there is not yet any consensus about what such indicators would be. For example, Balthazard and Woody (1992) proposed that the Tellegen Absorption Scale (Tellegen & Atkinson, 1974) might possibly serve as such a pure indicator of underlying ability, but it has been argued that even the relationship between absorption and hypnotizability may reflect shared expectancies (Kirsch & Council, 1992).

Conclusions

Citing Isaiah Berlin's essay "The Hedgehog and the Fox," Kihlstrom (2003) commented on the tension between monism and pluralism in hypnosis theory:

> There never was any necessary incompatibility between cognitive and social psychological approaches to hypnosis, and it is a mistake to believe there was or to act *as if* there was. There is plenty of hypnosis to go around for everyone, and everyone can make a positive contribution so long as nobody makes a claim that his or her theory is universal and sufficient. (p. 177)

We view the results of our structural equation modeling to be fully congruent with this sentiment. On one hand, decades of empirical work has documented that the individual's attitude, expectations, and motivation have an impact on hypnotic response. Indeed, in the present study there were tangible effects of expectancies on hypnotic responsiveness. On the other hand, the strength of the linkages we observed between expectation and performance did not support the more extreme position that expectations are the "sole determinants" or the "essence" of hypnosis (Kirsch, 1991, pp. 460–461). To the contrary, our analysis demonstrated that there is an abundance of residual variability in hypnotic performance that is unexplained by the direct or indirect influence of expectation. Further, our results are compatible with the notion that there is a latent trait or cognitive ability that underlies hypnotic response and that, along with prior attitudes, strongly codetermines the nature and extent of an individual's response to hypnotic suggestion.

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(*Appendix follows*)

Appendix

Correlation Matrix, Means, and Standard Deviations of the Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Expect 1	—										
2. SHSS 1–3	.271	—									
3. Expect 2	.794	.300	—								
4. SHSS 4–5	.106	.311	.184	—							
5. Expect 3	.747	.317	.855	.232	—						
6. SHSS 6–7	.158	.226	.144	.388	.209	—					
7. Expect 4	.656	.348	.766	.239	.894	.233	—				
8. SHSS 8–9	.146	.267	.033	.383	.041	.300	.055	—			
9. Expect 5	.617	.416	.699	.271	.813	.219	.913	.174	—		
10. SHSS 10–12	.062	.223	.112	.372	.137	.372	.128	.251	.154	—	
11. Expect 6	.471	.354	.467	−.022	.456	.058	.478	.028	.572	−.034	—
M	15.078	2.678	15.478	1.222	15.622	0.978	15.700	0.589	15.856	0.833	13.544
SD	5.016	0.647	5.091	0.742	4.936	0.789	5.587	0.713	5.523	0.860	6.877

Note. *Expect 1* through *Expect 6* represent expectancies measured at six time points over the course of the Stanford Scale, of Hypnotic Susceptibility (SHSS), Form C (Weitzenhoffer & Hilgard, 1962); *SHSS 1–3* through *SHSS 10–12* represent responsiveness to five subsets (or parcels) of hypnotic suggestions administered between successive expectancies.

Received August 15, 2005
Revision received February 15, 2006
Accepted February 27, 2006 ■