Double Dissociation Between Implicit and Explicit Personality Self-Concept: The Case of Shy Behavior

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Using the trait of shyness as an example, the authors showed that (a) it is possible to reliably assess individual differences in the implicitly measured self-concept of personality that (b) are not accessible through traditional explicit self-ratings and (c) increase significantly the prediction of spontaneous behavior in realistic social situations. A total of 139 participants were observed in a shyness-inducing laboratory situation, and they completed an Implicit Association Test (IAT) and explicit self-ratings of shyness. The IAT correlated moderately with the explicit self-ratings and uniquely predicted spontaneous (but not controlled) shy behavior, whereas the explicit ratings uniquely predicted controlled (but not spontaneous) shy behavior (double dissociation). The distinction between spontaneous and controlled behavior was validated in a 2nd study.

The aim of the present study is to apply recent conceptual and methodological advances in social cognition research to the assessment of the self-concept of personality and the prediction of behavior. Using the trait of shyness as an example, we attempt to show that (a) it is possible to reliably assess individual differences in the implicit self-concept of personality that (b) are partly independent from traditional explicit self-ratings and (c) increase significantly the prediction of spontaneous behavior in a realistic social situation. For this purpose, we make a conceptual distinction between the explicit and the implicit self-concept of personality, propose a general hypothesis on how these two aspects of the personality self-concept are linked with spontaneous and controlled behavior, and test this hypothesis in a behavioral observation study. In a follow-up study, we experimentally test and confirm the distinction between spontaneous and controlled shy behavior.

Two Threats to Explicit Self-Ratings of Personality

Empirical research on personality differences is dominated by the use of verbal self-reports of personality. Typically, participants are explicitly asked to judge their own personality traits—thus, aspects of their *self-concept of personality*. Numerous studies have shown substantial agreement between self-rated traits and ratings of these traits by others (particularly if the traits refer to observable behavior) and between self-rated traits and observed behavior in trait-relevant situations if these external criteria for the self-ratings are sufficiently aggregated over observers, time, or situations. Thus, explicit self-ratings of personality show substantial validity for observable personality traits (Funder, 1999).

However, there are two main limitations to the validity of explicit self-ratings of personality. First, a long-standing and still unresolved issue concerns differential self-presentation of one's personality, particularly differential social desirability biases (Edwards, 1957). Researchers have made progress by distinguishing self-deception tendencies from impression management tendencies, including deliberate faking of responses (Paulhus, 1984, 1998). But despite attempts over half a century to increase the validity of explicit self-ratings of personality by controlling for such tendencies, only limited progress has been made in this direction (Paulhus, 1998).

The second threat to the validity of explicit self-ratings, which is less frequently acknowledged by personality researchers, is the limited accessibility of the self through the self-rating method. In recent years, social cognition researchers have increasingly recognized that information about the self is processed in two different modes. Although the exact difference between these two modes is not yet fully understood and the use of terminology is not consistent, many distinguish between an *explicit mode* characterized by conscious, controlled, and reflective information processing and an *implicit mode* characterized by unconscious, automatic, and intuitive processes (Bargh, 1994; Bosson, Swann, & Pennebaker, 2000; Epstein, 1994; Greenwald & Banaji, 1995; Greenwald & Farnham, 2000; Kihlstrom & Cantor, 1984; Wilson, Lindsey, & Schooler, 2000). In addition, it is generally assumed that informa-

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tion processing in the explicit mode has only limited access to the self-concept and its affective evaluation (i.e., self-esteem). Intuitions about oneself, unfavorable or threatening evaluations of oneself, and self-related knowledge that was acquired a long time ago, particularly in early childhood, may be difficult to access in the explicit mode (Bowlby, 1969; Breakwell, 1986; Furman & Flanagan, 1997; George, Kaplan, & Main, 1985; Wilson et al., 2000). Explicit self-ratings of personality require information processing in the explicit mode and are therefore subject to this limitation.

Explicit Versus Implicit Personality Self-Concept

The present study is an attempt to tackle these two key problems of explicit personality self-ratings—namely, self-presentation biases and limited cognitive accessibility—at once through the assessment of the implicit self-concept of personality. To avoid some of the confusion that surrounds the use of the terms *implicit* and *explicit* in the social cognition literature, we propose to clearly distinguish between the self-concept of personality at the construct level and the measured self-concept of personality at the empirical level.

Recently, Greenwald et al. (2002) proposed that social knowledge can be represented in a general associative network (called the social knowledge structure) that contains a central *me* node, nodes representing other social objects, attributes of the *me* and the other social objects, and also nodes representing positive and negative valence. Greenwald et al. defined the self-concept as "the association of the concept of self with one or more (non-valence) attribute concepts " (p. 5) and self-esteem simply as the connection of the self node to a valence node. Consistent with this definition, we define the self-concept of personality at the construct level as an associative network containing all associations of the concept of self with attribute concepts describing one's personality—thus, attributes that describe individual, relatively stable, nonpathological characteristics of the person. Because some parts of the self-concept refer to cultural and even human universals (e.g., German, European, human being) or to pathological attributes (e.g., being spider phobic), the self-concept of personality is only part of one's self-concept.

Explicit measures of the self-concept of personality are based on information that is intentionally given to inform about the self. They contain valid information as far as they refer to parts of the self-concept of personality that are introspectively accessible. Additionally, they may contain invalid information about the person's personality that is motivated by self-presentation concerns and unrelated to the self-concept of personality or that is due to measurement error. In contrast, implicit measures of the self-concept of personality are based on information that is not intentionally given to inform about the self. They contain valid information as far as they refer to parts of the self-concept of personality that are accessible through the particular assessment methodology. Additionally, they may contain invalid information about the person's personality due to systematic biases of the assessment methodology and measurement error. Therefore, implicit measures are expected to be more robust against deliberate self- and other deception than are explicit measures.

Although there are presently only a few studies on the relation between implicit and explicit measures of the self-concept of personality, we expect to find relations similar to those observed for implicit and explicit attitudes, stereotypes, and self-esteem—namely, weak to moderate correlations (e.g., Greenwald & Nosek, 2001; Banse, Seise, & Zerbes, 2001; Bosson et al., 2000; Greenwald & Farnham, 2000; Cunningham, Preacher, & Banaji, 2001). Also, the definitions of explicit versus implicit self-concept measures imply that these implicit–explicit correlations increase if self-presentation tendencies are controlled for. This implication has been supported by numerous studies (Banse & Gawronski, 2001; Dunton & Fazio, 1997; Fazio, Jackson, Dunton, & Williams, 1995). Empirical zero correlations between implicit and explicit measures may often be due to the low reliability of implicit measures rather than to total independence of implicit and explicit constructs (e.g., Bosson et al., 2000).

Our usage of the terms *implicit* and *explicit* always refers to the empirical level, that is, to measures of the self-concept of personality. To simplify terminology, from now on we use the terms *implicit/explicit personality self-concept* when we refer to an individual's measured implicit/explicit self-concept of her or his personality.

Reliable Assessment of Implicit Traits

How can we assess the implicit self-concept of personality? Trait-oriented personality psychologists (Funder, 1991; McCrae & Costa, 1999) would like to have general procedures assessing people's implicit self-concept for particular personality traits. Fortunately, these procedures need not be invented anew, because a flourishing research on implicit attitudes and stereotypes provides candidate procedures. To simplify terminology, from now on we use the terms *implicit trait* and *explicit trait* when we refer to an individual's measured implicit/explicit self-concept regarding this trait. Thus, we talk about implicit shyness, explicit conscientiousness, and so on.

Two different types of procedures are prime candidates for the assessment of implicit traits because they have been used in numerous studies and are flexible enough to be easily adapted to the empirical study of implicit traits.[1] First, there is a vast literature on the use of semantic or evaluative priming methods for the assessment of attitudes (e.g., Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Fazio et al., 1995), stereotypes (e.g., Blair & Banaji, 1996; Wittenbrink, Judd, & Park, 1997), self-esteem (Bosson et al., 2000), and the self and significant others (e.g., Banse, 1999, 2001). Whereas priming has proved to be a useful procedure to study sample means and group differences, the effect sizes are typically small, and the reliability of individual differences is typically low (see, e.g., Banse, 1999, 2001; Bosson et al., 2000) to moderate (e.g., Cunningham et al., 2001; Kawakami & Dovidio, 2001). The low reliability of individual-differences measures that

[1] Beginning with the pioneering work of the "New Look" back in the 1940s, various experimental paradigms were used to measure perception thresholds (Bruner & Postman, 1947) or automatic attention allocation processes (McLeod, Mathews, & Tata, 1986; Williams, Mathews, & MacLeod, 1996). These were assumed to be directly related to personality traits such as coping styles or anxiety without necessarily being part of the self-concept of personality. All these methods are plagued by very low reliabilities of individual scores (Byrne & Holcomb, 1961; Greenwald & Banaji, 1995).

are based on priming is crucial for applications of this method to the assessment of implicit traits at the individual level (Greenwald & Banaji, 1995). A methodology is needed that routinely produces internal consistencies and retest reliabilities that fall into the same range as do the reliability coefficients of typical explicit self-ratings of personality traits (.70–.90). Available priming methods generally fail to meet this standard.

More recently, Greenwald, McGhee, and Schwartz (1998) proposed a different implicit assessment procedure, the Implicit Association Test (IAT). In this procedure, the automatic association between a bipolar target concept such as *self–others* and a bipolar attribute concept such as *good–bad* is assessed through a series of discrimination tasks that require 10–15 min to accomplish. The effects produced by the IAT are typically much larger than priming effects, and recent studies have shown that IAT procedures assess individual differences in implicit attitudes and self-esteem with internal consistencies that regularly approach .80 and above (Banse et al., 2001; Bosson et al., 2000; Cunningham et al., 2001; Greenwald & Farnham, 2000; Greenwald & Nosek, 2001). However, the test–retest correlations typically range between .60 and .70, which is not fully satisfactory but much higher than the retest correlations for priming measures.

A Double Dissociation Strategy for Validating Implicit Trait Assessments

The distinction between an implicit and an explicit mode of information processing is a general one that applies not only to cognition but also to behavior and action control. In the MODE model of attitude–behavior relations (Fazio, 1990; Fazio & Towles-Schwenn, 1999), it is postulated that implicitly measured attitudes predict spontaneous or highly automatized behavior better than controlled behavior, whereas explicitly measured attitudes predict controlled behavior better than spontaneous or highly automatized behavior, because the mediating information processes are consistent in both cases with regard to implicit versus explicit mode. Similar dual models have been proposed for relations between behavior and implicit versus explicit self-esteem (Greenwald & Farnham, 2000), implicit versus explicit person and relationship schemata (Baldwin, Carrel, & Lopez, 1990), and implicit versus explicit motives (McClelland, Koestner, & Weinberger, 1989; see also Wilson et al., 2000, for a general discussion).

Building on these dual model approaches, we propose the general hypothesis that the implicit personality self-concept predicts spontaneous or highly automatized behavior better than controlled behavior, whereas the explicit personality self-concept predicts controlled behavior better than spontaneous or highly automatized behavior. Consequently, we propose a *double dissociation strategy* for the empirical evaluation of the validity of assessments of implicit behavior-relevant traits. First, the reliability of the implicit, explicit, and behavioral measures has to be established, avoiding the problem that dissociations between measures of implicit and explicit constructs are simply due to a low reliability of the implicit measures (Buchner & Wippich, 2000). Second, the validity of the behavioral measures for the target trait has to be established (e.g., by correlations with external criteria or trait ratings of observers of the behavior), avoiding the problem that low predictive correlations with the behavioral measures are due to their irrelevance for the target trait.

Third and most important, a double dissociation between the implicit and explicit trait measures with regard to spontaneous/automatized and controlled behavior has to be confirmed. It has to be shown that the implicit trait predicts spontaneous/automatized behavior significantly and uniquely (i.e., even when the correlation between the explicit trait and behavior is controlled for). In our view, the significant and unique prediction from the implicit trait to spontaneous behavior is the key validity criterion for assessments of behavior-relevant implicit traits. Simple correlations are not sufficient because they can be spurious if the indirect path to behavior that is mediated by the explicit trait is strong. In other words, this part of the proposed validation procedure requires that we show a *simple dissociation* between the implicit and the explicit trait with regard to spontaneous and controlled behavior.

In addition, we propose that the same logic should also be applied to an explicit trait measure; that is, it has to be shown that the explicit trait significantly and uniquely predicts controlled behavior. Otherwise there is a risk that an implicit trait shows a unique prediction of behavior because the explicit measure is not valid, although the prediction would be spurious if a more valid explicit measure were chosen. Thus, Step 3 of our validation strategy requires that we show a full double dissociation for the implicit versus explicit traits. Readers may consider Figure 1 for a graphic illustration.

Because a double dissociation includes two dependent and two independent variables, structural equation modeling is required to test it. In a weak version of the double dissociation hypothesis, only significant paths from the implicit trait to spontaneous/automatized behavior and from the explicit trait to controlled behavior are required; the cross-paths from the implicit trait to controlled behavior and from the explicit trait to spontaneous/automatized behavior may also be significant. In a strong version, the cross-paths are zero; that is, the implicit trait adds nothing to the prediction of controlled behavior beyond the explicit trait, and vice versa. The higher the correlation between the implicit and the explicit trait is, the lower is the chance of confirming the strong version of the double dissociation hypothesis.

There is some evidence for the weak version of the double dissociation pattern in the domain of implicit attitudes (Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Dovidio, Kawakami, & Gaertner, 2002; Fazio et al., 1995; McConnel & Leibold, 2000) and self-esteem (Spalding & Hardin, 1999).[2] Across all studies, explicit but not implicit measures correlated significantly with more deliberate/controlled behavior and implicit but not explicit measures correlated with more spontaneous/automatic behavior. However, the evidence for the double dissociation pattern is not very strong. All studies used small sample sizes for correlational analysis (samples ranged from 33 to 64), the reliability of implicit measures was not reported, and correlations between implicit and explicit measures varied widely. In all studies, a low controllability of nonverbal behavior was assumed but not empirically tested.

[2] A conceptually similar dissociation was also found in the domain of latent (or implicit) and manifest (or explicit) motives (for an overview, see Spangler, 1992). Because motives can hardly be subsumed under the label of knowledge representations such as attitudes, stereotypes, and self-concept and because the methodological problems of projective tests are probably very different from those of implicit measures based on reaction times, we prefer not to consider implicit motives in the present article.

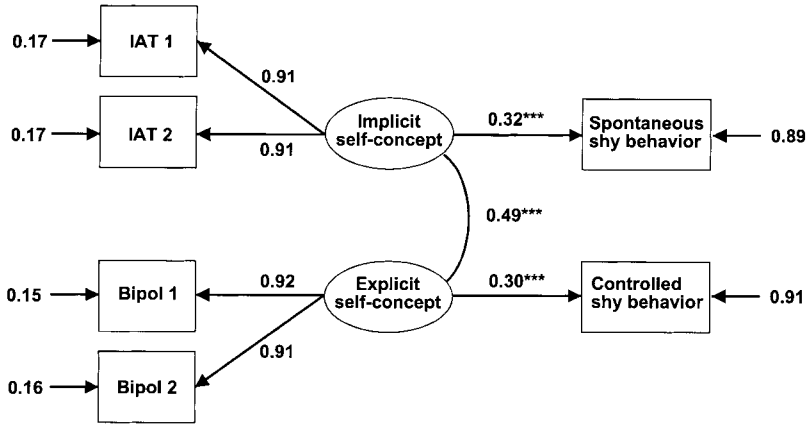

Figure 1. Double dissociation between the implicit and explicit self-concept of shyness. Presented is the result for the a priori defined structural equation model for the strong version of the double dissociation hypothesis (estimations of latent correlations, paths, and errors by LISREL). IAT 1 and IAT 2 refer to two parallel Implicit Association Test (IAT) subtests. Bipol 1 and Bipol 2 refer to two parallel subscales of the bipolar (Bipol) shyness self-rating scale. *** $p < .001$.

Moreover, controlled behavior was operationalized by some form of judgment or rating of either an out-group member or the self. Therefore, the prediction of controlled behavior by an explicit questionnaire measure may have been inflated by common method variance of both variables. Although the strong version of the double dissociation pattern has not been formally tested using multivariate analyses, the results of most studies show insignificant cross-correlations. Only Dovidio et al. (1997, Experiment 3) reported a path analysis, in which a cross-path between explicit attitudes (modern racism) and nonverbal behavior (less visual contact) was marginally significant. In the present study, we aim to investigate the double dissociation hypotheses in the domain of self-concept of personality, to formally test the strong version of the double dissociation pattern, and to assess both automatic and controlled behaviors by coding observable behavior in the same interaction situation.

The Present Studies: Shyness

For multiple reasons, we chose to study the personality trait of shyness. First, shyness is a personality trait that is well represented in common language and lay psychology, is observable by others in social interaction, shows moderate self–other agreement in explicit ratings, and can be studied in naturalistic situations in the laboratory (Asendorpf, 1987, 1989). Therefore, it is easy to select shyness-descriptive adjectives for both explicit self-ratings and an IAT for shyness, and observers agree on others' shyness without special training (Asendorpf, 1987, 1989). Second, shyness is socially evaluated moderately negatively in Western cultures and therefore is subject to differential impression management tendencies. Because of its observability and good representation in lay psychology, the self-concept of shyness seems to be relatively cognitively accessible; consequently, discrepancies between implicit and explicit shyness can be mainly attributed to impression management. Third, we can sharpen the discriminant validity of implicit and explicit shyness measures by contrasting assessments of shyness with assessments of unsociability, which is a correlated but not identical trait (Asendorpf & Meier, 1993; Cheek & Buss, 1981).

Building on prior research (Asendorpf, 1989, 1990) on the situational and personal antecedents of state shyness and its differential expression in behavior, we tried to maximize state shyness by having young, heterosexual adults who had not recently fallen in love interact with an (a) unfamiliar, (b) above-average physically attractive opposite-sex confederate who played the role of another participant. The situation was socially evaluative because (c) the conversation partners were instructed to get to know each other to evaluate each other's personality later on, and (d) the conversation was filmed by a visible video camera.

To minimize the problem of individual response hierarchies (Asendorpf, 1988), we coded numerous behaviors, particularly both body movements and body tension. We hypothesized that speech and movements illustrating speech are more under the participants' explicit control, whereas body tension and body self-stimulations are more spontaneous indicators of shyness. We were less sure about the status of gaze aversion because it is well documented that it is influenced by both the affective state and the more controlled processes of initiating and terminating speaker roles (Kleinke, 1986). We tested whether these behavioral indicators are shyness indicators at all by correlating them with shyness judgments of observers of the videotaped interactions.

Study 1

Method

Participants

Participants were 139 heterosexual young adults who were native speakers of German and had finished high school (69 male, 70 female; mean age = 22.6 years, range = 19–31 years; 87% university students; psychology students were not recruited for this study). Most participants were approached by two experimenters on the campus of Humboldt University, Berlin, and were asked to participate; other participants were acquaintances of the experimenters. The participants were not paid. Instead, we motivated

them for participation by informing them that the study was on social perception and that they could receive individual feedback on their results later on. Thus, the participants cooperated in the study mainly to get individual feedback on their personality.

Assessments and Measures

Overview. The participants (a) were videotaped in a shyness-inducing situation with a confederate of the experimenter, (b) judged themselves on bipolar personality-descriptive items, (c) completed a shyness IAT, (d) judged themselves on other personality items, and (e) completed a parallel shyness IAT (only the first 35 men and 35 women). The shyness items of the two IATs were explicitly self-rated in Step b. Finally, the participants were thanked, asked for permission for the videotapes to be analyzed (all gave permission), and promised individual feedback about their results. Four months after the study was finished, they received a letter explaining the procedures and general findings of the study and were invited for a feedback session at which they were informed about their individual results.

Shyness situation. On arrival at the lab, the participant was guided by the experimenter to the observation room, which was furnished as a living room. An above-average physically attractive, unfamiliar, opposite-sex peer sat at a low table. This confederate was trained to play the role of another participant and to respond in a friendly manner to initiatives of the participant but to be otherwise rather reserved. The experimenter introduced the participant to the confederate and asked him or her to sit down in a chair that was placed at a 90° angle to the confederate's chair.

Next, the experimenter read the following instructions:

> As you know, this experiment is on social perception, that is, how you perceive yourself and how you are perceived by others. You have now 5 minutes for getting to know each other. Subsequently, you will judge your conversation partner in a questionnaire, for example, how likable he or she is. Your answers in this questionnaire will be treated strictly confidentially; in particular, your conversation partner will not get to know your judgment. Thus, you should try not to gloss over the facts. There [experimenter points to the camera] is a video camera that records your conversation. This is part of our routine procedure. Later on, you will separately complete various computer tasks. Because people usually differ in their speed, you will probably not see your conversation partner again.

This procedure was designed to induce shyness by (a) the unfamiliarity, (b) the opposite sex, (c) the attractiveness, and (d) the evaluation of the confederate and by (e) the video recording.

Subsequently, the experimenter left the room. After the 5-min conversation, she returned and asked the participants to judge their conversation partner on various bipolar scales (not analyzed for the purpose of the present study). Finally, the experimenter asked the confederate to wait for another experimenter and guided the participant to another room.

The participant and the confederate were videotaped by a camera that was operated from another room using S-VHS video. Camera settings were constant for all participants. A time code was imprinted on the tapes, and it started when the experimenter had closed the door. If the participant stood up and/or walked away, the confederate was to get him or her back as quickly as possible; the time period until he or she sat down again was defined as missing. Secondary tapes were prepared that contained the first 3 min of nonmissing interaction of all participants. These tapes were used for the judgments and codings.

Global judgments of shyness. Three student judges who were unfamiliar with the participants independently judged the 3-min video recording of each participant on a 7-point scale for shyness (ranging from 1 = *not shy* to 7 = *shy*). We anchored the judgments by presenting beforehand two examples of extremely shy and extremely nonshy participants from the study by Asendorpf (1989). The six ratings of each judge were averaged.

Codings of shy behavior. The videotaped behavior of all participants in the first 3 min was coded by one coder; coding reliability was assessed by independent coding of 40 randomly selected participants by another coder. Codings were done on a personal computer that was synchronized with the time code of the videotape. For each behavioral code, coders marked the onset and the offset of the behavior by pressing an appropriate button on the keyboard. Coded in independent runs were (a) speech of the participant, (b) body movements of the participant, (c) tenseness of the body posture, and (d) gaze aversion. For each code, its duration (expressed as percentage of observation time) was analyzed.

Body movements were coded according to Ekman and Friesen's (1972) classification, which distinguishes illustrators (movements illustrating speech, including emblems, i.e., movements with culturally defined meaning), facial adaptors (self-stimulation of face or neck), and body adaptors (self-stimulation of other parts of the body). Facial adaptors were distinguished from body adaptors because some facial adaptors may be redirected spontaneous movements of covering the face and may therefore be more specifically related to shyness than are other self-stimulations that mainly serve arousal-regulating functions (see Asendorpf, 1990).

Gazing was coded in terms of the onset and offset of participants' gaze toward the face of the confederate; the video recording did not make it possible to distinguish between face-directed gazing and eye contact. Gaze aversion was defined as the duration of not gazing.

Tenseness of body posture was coded on a 3-point scale: *normal*, *slight*, and *strong tension*. Normal tension was defined by four standard body postures that require minimum muscle activity. Slight/strong tension was defined by slight/strong deviations of head, shoulders, arms, hands, or legs from the standard positions that were described to the coders by 2 (degree of deviation) × 4 (standard positions) = 8 additional prototypical body postures. We summed the durations of the three tension categories (in percentage of observed time) using the weights 0, 1, and 2 and then divided them by 2, which yielded scores that could range from 0% to 100%.

IAT. We took care to design the tests to be as similar to the original IATs by Greenwald et al. (1998) as possible. The target-concept discrimination was *me–others*, and attributes were *shy–nonshy*. In a first step, participants discriminated *me–others*, then *shy–nonshy*. In the initial combined task, they discriminated *me* and *shy* from *others* and *nonshy*. Subsequently, they discriminated *others–me* and, finally, *others* and *shy* from *me* and *nonshy* (see Tables 1 and 2). The difference between the mean reaction time in the reversed combined task and the mean reaction time in the initial combined task is the main dependent variable (IAT score); positive differences indicate faster associations between *me* and *shy* than between *others* and *shy*.

Participants used the letter *A* on the left side of the keyboard and the number *5* on the right-side numeric keypad for discrimination. The targets and/or attributes assigned to the response keys were presented in the left and right upper corners of the computer screen throughout each task. The stimuli were presented in the center of the screen until the participant responded. The stimuli for the two parallel IATs are presented in Table 2;

Table 1
Implicit Association Tests for Shyness: Task Sequence

Sequence	No. of trials	Task	Response key assignment: Left key	Response key assignment: Right key
1	40	Target discrimination	Me	Others
2	40	Attribute discrimination	Shy	Nonshy
3	80	Initial combined task	Me, shy	Others, nonshy
4	40	Reversed target discrimination	Others	Me
5	80	Reversed combined task	Others, shy	Me, nonshy

Table 2
Implicit Association Tests for Shyness: Stimuli

		Test		Parallel test	
Me	Others	Shy	Nonshy	Shy	Nonshy
I	they	inhibited	uninhibited	self-conscious	easy-going
self	them	insecure	secure	unassertive	assertive
my	your	timid	daring	hesitant	resolute
me	you	reticent	candid	reluctant	spontaneous
own	other	reserved	open	withdrawn	sociable

Note. The original German stimuli can be obtained from us.

the attribute stimuli were identical to the corresponding bipolar adjectives in the explicit self-ratings. In the two combined tasks, the stimuli alternated between target and attribute. Target and attribute stimuli were randomized in order within blocks of 20 trials. Thus, the internal consistency of the IAT could be evaluated across four subtests that included the same 20 trials in a different order. Interstimulus interval was 250 ms; after an incorrect response, the word *FEHLER* (German for *error*) immediately replaced the stimulus for 300 ms, resulting in a 550-ms interstimulus interval. Because this study focuses on interindividual differences, all participants received the stimuli in the same order to minimize interindividual variance due to order effects. Participants needed approximately 12 min to complete the IAT.

Participants were instructed to respond as quickly and accurately as possible. Their responses were recorded using Experimental Run Time System software (Beringer, 1994). In keeping with Greenwald et al. (1998), the first two responses in the combined tasks were not analyzed, response latencies below 300 ms were recoded as 300 ms, and latencies above 3,000 ms were recoded as 3,000 ms. These raw latencies were used only for reporting means and standard deviations. All other statistical analyses were based on log-transformed latencies to correct for the skewed latency distribution.

Explicit self-ratings. In a first block, participants responded to 40 bipolar adjective pairs that were presented one by one on a computer screen (e.g., shy 1—2—3—4—5—6—7 nonshy). They were instructed to indicate how well the two opposed adjectives described their personality by pressing the appropriate number on the keyboard. We selected 10 adjective pairs each for assessing shyness, agreeableness, conscientiousness, and intellect. The 20 shyness-descriptive adjectives were selected by high or low factor loadings on both introversion and neuroticism in a factor analysis of self-ratings of 830 unipolar personality-descriptive adjectives used by Asendorpf and Ostendorf (1998). The other adjectives were selected by high or low factor loadings on the agreeableness, conscientiousness, and intellect factors of these adjectives and served as distractors. The resulting 40 bipolar items were then randomly mixed.

After completion of the first IAT, the participants answered 27 personality-descriptive items that were again presented one by one on the computer screen on a 5-point scale (ratings ranged from 1= *not at all true for me* to 5 = *completely true for me*) by pressing the appropriate number. Five items referred to shyness, and another 5 referred to sociability. These two 5-item scales were used by Asendorpf and Wilpers (1998) and were included to validate the bipolar shyness adjectives. These items were randomly mixed with 17 distractor items.

Results

Description of the Main Variables

IATs. For both IATs, the individual incorrect response rates for the 156 analyzed responses in the two combined tasks were similar to those reported by Greenwald et al. (1998; for the first IAT, M = 5.0%, SD = 4.2%; for the second IAT, M = 3.6%, SD = 2.2%). Inspection of the error distributions indicated one clear outlier (a participant with 35% errors in the first IAT); all other error rates were below 17% (first IAT) or 9% (second IAT). Therefore, this participant was excluded from all analyses, and the following analyses refer to 138 participants (68 men, 70 women).

We evaluated the internal consistency of the two IATs by computing Cronbach's alpha for the IAT scores (which we determined by calculating difference scores between the two combined tasks split into four consecutive blocks based on log-transformed latencies). As Table 3 indicates, alpha was high for the first test and satisfactory for the parallel test.

Table 3 also indicates that the mean IAT scores were slightly below zero. Negative means might be due to (a) more nonshy than shy people in the sample or the population, (b) a positively biased implicit self-concept of shyness, or (c) learning or other order effects that facilitated the responses in the reversed combined task that assessed the *me–nonshy* association. This ambiguity of interpretation of the IAT mean effects is not crucial for the present

Table 3
Summary Statistics for the Main Variables of Study 1

Variable (range of scores)	M	SD	Range	Reliability[a]
First IAT[b]	−57.0	242.0	−663–534	.89
Second, parallel IAT[b]	−74.0	183.0	−690–315	.82
Bipolar shyness self-rating (1–7)	3.5	1.0	1.60–6.40	.90
Shyness scale (1–5)	2.6	0.7	1.00–4.60	.82
Sociability scale (1–5)	3.5	0.8	1.40–5.00	.81
Observer shyness judgment (1–7)	3.8	1.2	1.33–6.78	.92
Speech duration (%)	52.5	14.0	16–87	.94
Illustrator duration (%)	2.8	3.0	0–14	.93
Facial adaptor duration (%)	6.3	9.7	0–52	.91
Body adaptor duration (%)	13.4	21.5	0–98	.70
Gaze aversion (%)	32.3	16.2	1–74	.82
Tense body posture (%)[c]	38.7	27.0	0–100	.84

Note. N = 138 (n = 70 for the parallel IAT). M, SD, and range refer to raw scores; reliabilities refer to log-transformed scores in the case of the IAT latencies and the body movement codings. IAT = Implicit Association Test.
[a] Internal consistency alpha for IATs and self-ratings; agreement alpha of three observers for observer judgments; correlation between two independent codings for behavior codings. [b] In milliseconds except for reliability. [c] Weighted duration of normal, slight, and strong tension.

study, which focuses on interindividual differences. As Table 3 indicates, the standard deviations for the IAT scores were high; that is, the IATs discriminated well between the participants. Inspection of the distributions of the IAT scores based on log-transformed latencies showed no outliers, and Kolmogorov–Smirnov tests did not indicate even marginal deviations from the normal distribution (for both IATs, $Z < 1$).

Explicit self-ratings. As Table 3 indicates, all self-rating scales showed a satisfactory internal consistency. The shyness and sociability means were not even marginally different from those reported by Asendorpf and Wilpers (1998) for a similar-aged sample.

Behavioral observations. The interrater agreement for the global shyness judgments was high, and the intercoder agreement for the behavioral codings was sufficiently high (see Table 2). The distributions of the durations of the three types of body movement were strongly skewed to the left. Therefore, they were $\log(x + 1)$-transformed for further analysis (we used $x + 1$ instead of x because of zero durations). The mean of the observer judgments of shyness was marginally higher than in the similar unfamiliar-evaluative condition in Asendorpf's (1989) study with same-sex male students ($M = 3.80$ vs. $M = 3.48$), $t(160) = 1.67$, $p < .10$, and showed no sex difference ($t < 1$). Because the observers used a response scale that was anchored with extreme examples from Asendorpf's (1989) study, this difference can be attributed to a particularly successful induction of shyness in the present study with the use of an opposite-sex confederate. As expected, the intercorrelations of the behavioral indicators of shyness were low, ranging from .39 (speech-illustrators) to −.05 (facial adaptors–body adaptors). That facial adaptors served partially different functions from body adaptors was also supported by a correlation of .30 ($p < .001$) between facial adaptors and gaze aversion but only .10 ($p > .20$) between body adaptors and gaze aversion. This link between facial self-stimulation and gaze aversion supports earlier hypotheses that some facial adaptors may be redirected spontaneous movements of covering the face (a fragmentary avoidance response; see Asendorpf, 1990).

Sex Differences

Sex differences in the 12 variables presented in Table 3 were tested by t tests; because of the numerous tests, p was adjusted using stepwise Bonferroni correction. Only one difference was significant: Male participants talked more (57.3%) to the female confederate than female participants (47.7%) talked to the male confederate, $t(136) = 4.27$, $p < .001$, $d = 0.73$. This effect corresponds to gender roles in heterosexual encounters at this age (see, e.g., Burgoon, Butler, & Woodall, 1989).

Spontaneous and Controlled Shy Behavior

We assumed that facial adaptors, body adaptors, and tense body posture are indicators of primarily spontaneous expressions of shyness, whereas speech and illustrators are indicators of primarily controlled nonshy behavior; we were not sure about the status of gaze aversion except that it is an indicator of shyness in general. First, we tested whether these behaviors were correlated with the observer judgments of shyness (which would validate them as indicators of interindividual differences in shyness). Table 4 indicates that the hypothesis was confirmed in each instance.

Table 4
Validating Spontaneous and Controlled Shy Behavior in Study 1

	Correlation with shyness indicator		
Behavioral measure	Observer judgment	First IAT	Bipolar self-rating
Facial adaptor duration	.16*	.17*	.13
Body adaptor duration	.27***	.17*	.11
Gaze aversion	.40***	.18*	.18*
Tense body posture	.18*	.19*	.08
Spontaneous shy behavior[a]	.35***	.31***	.18*
Speech duration	−.66***	−.23***	−.31***
Illustrator duration	−.31***	−.11	−.15*
Controlled shy behavior[b]	.58***	.20**	.28***

Note. IAT = Implicit Association Test.
[a] Average of z-transformed duration of facial and body adaptors and tense body posture. [b] Average of reversed z-transformed duration of speech and illustrators.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Second, we explored whether the assumed spontaneous indicators tended to correlate more strongly with the IAT than with the explicit shyness self-ratings. Table 4 indicates that this assumption was confirmed for all indicators, although the differences between the correlations were not large. Gaze aversion showed equally high correlations with the IAT and the explicit self-ratings. Because gaze aversion did not discriminate between the implicit and explicit measures of shyness, it was not further analyzed.

In the next step, the three indicators of spontaneous shy behavior and the two indicators of controlled nonshy behavior were aggregated after z transformation. The sign of the aggregate of controlled behavior was reversed so that this index referred to controlled shy behavior. We tested whether both types of behavior independently contributed to the observer judgments by regressing the observer judgment on both spontaneous and controlled behavior. Together, these two predictors accounted for 40% of the variance in the observer judgments; 33.3% was predicted by controlled behavior, $F(1, 136) = 67.95$, $p < .001$, and 6.4% was independently predicted by spontaneous behavior, $\Delta F(1, 135) = 14.01$, $p < .001$.

Correlations Among the Main Variables

Numerous observations can be made from the correlations of the main variables (see Table 5). First, the correlation between the two parallel IATs was lower ($r = .66$) than their internal consistencies ($\alpha > .82$). Second, the second IAT tended to be less valid than the first one. This was also true if the analysis was restricted to those 70 participants who completed both IATs. Third, a correlation of .82 between the bipolar self-ratings of shyness and the shyness scale, along with lower correlations with the sociability scale, validated the bipolar adjectives for shyness. Fourth, the first IAT correlated significantly more highly with the five-item shyness scale than with the five-item unsociability scale, according to Steiger's (1980) test, $t(135) = 1.86$, $p < .05$, one-tailed, attesting to the specificity of the shyness IAT. Not shown in Table 5 are the correlations between the IATs and the three bipolar scales assessing agreeableness (internal consistency $\alpha = .84$), conscientious-

Table 5
Intercorrelations of the Main Indicators in Study 1

Indicator	1	2	3	4	5	6	7	8
1. First IAT	—	.66***	.44***	.40***	−.25**	.31***	.31***	.20*
2. Second IAT		—	.35***	.30**	−.34**	.24*	.08	.19
3. Bipolar shyness self-rating			—	.82***	−.51***	.48***	.18*	.28***
4. Shyness scale				—	−.48***	.40***	.19*	.21*
5. Sociability scale					—	−.32***	−.09	−.15
6. Behavioral shyness judgment						—	.35***	.58***
7. Spontaneous shy behavior							—	.18*
8. Controlled shy behavior								—

Note. $N = 138$. IAT = Implicit Association Test.
* $p < .05$. ** $p < .01$. *** $p < .001$.

ness ($\alpha = .88$), and intellect ($\alpha = .71$), because none of the six correlations was even marginally significant. Thus, the IAT was specifically related to shyness in participants' explicit self-ratings. Fifth, self-rated shyness tended to correlate more strongly with the three behavioral indicators of shyness than did sociability. Sixth, spontaneous shy behavior and controlled shy behavior were significantly correlated, but at a low level. Sex differences in the correlations in Table 5 were tested with Z tests; even without Bonferroni correction, all differences were nonsignificant.

Double Dissociation Between Implicit and Explicit Shyness

Finally, we tested the central hypothesis of a double dissociation (the IAT uniquely predicts spontaneous behavior, whereas the explicit self-ratings uniquely predict controlled behavior) with structural equation modeling (using LISREL 8.5; Jöreskog & Sörbom, 2001). The first IAT was split into two halves that were defined by the first and the last fourth of trials in the combined tasks and the second and third fourth of these trials, respectively. This split was preferable to an odd–even split and to a first-half versus second-half split because it minimized possible interactions between individual differences in the IAT and order effects in the IAT. The bipolar shyness scale was split into the five items used in the first IAT and the five items used in the parallel IAT. With these observed variables we defined two latent variables, implicit and explicit self-concept of shyness. These were related to the observed variables of spontaneous and controlled shy behavior. Latent variables could not be reasonably constructed in this case because, as expected, strong individual response hierarchies in behavior induced low correlations between the constituents of the aggregated observed variables.

We contrasted four models: the strong version of a double dissociation that lacked cross-paths between implicit shyness and controlled shy behavior and between explicit shyness and spontaneous behavior; a weak version of a double dissociation that included both cross-paths; and two intermediate models that included only one cross-path. The most parsimonious model for the strong version (see Figure 1) fit the data very well, $\chi^2(8, N = 139) = 8.21$, $\chi^2/df = 1.03$, $p = .41$, root-mean-square error of approximation (RMSEA) = .014, adjusted goodness-of-fit index = .95, Akaike information criterion (AIC) =34.21. The correlation between implicit and explicit self-concept was estimated as .49, and the paths between implicit self-concept and spontaneous behavior ($\beta = .32$) and between explicit self-concept and controlled behavior ($\beta = .30$) were both highly significant ($p < .001$; see Figure 1).

When cross-paths were permitted, all three models fit less well, although they were less restricted ($\chi^2/df > 1.07$, RMSEA $> .024$, AIC > 35.5); the cross-paths were far from being significant ($t < 1$) and were close to zero in each case ($\beta < .10$). Thus, the data confirm the strong version of the double dissociation hypothesis that implicit shyness contributed to controlled shy behavior only through its association with explicit shyness and explicit shyness contributed to spontaneous behavior only through its association with implicit shyness.

Discussion

This study successfully validates an IAT for the assessment of the implicit self-concept of shyness by following a double dissociation strategy. First, the internal consistency of the shyness IAT and the explicit self-ratings of shyness, the intercoder agreement for the behavioral indicators of shy behavior, and the interjudge agreement for the observer ratings of shyness were successfully established. Second, the validity of the adjectives that were used for both the shyness IAT and the explicit self-ratings of shyness was confirmed by a high convergent correlation between the bipolar adjective scale and an established shyness scale.

Third, the validity of the behavioral indicators of shy behavior was confirmed by significant correlations with the observer judgments of shyness. As expected, the intercorrelations between the behavioral indicators were low because of strong individual response hierarchies in the individual expression of shyness. Our solution to this long-standing problem in behavioral observation and psychophysiological research (see Lacey, 1950) was to aggregate multiple indicators of shy behavior. As the results show (see Table 4), this was a successful strategy because the correlations between the aggregate and each external variable were always clearly higher than the average correlations between a component of the aggregate and this external variable.

Fourth, we aggregated the behaviors separately for indicators that were assumed a priori to be more spontaneously activated or highly automatized (tense body posture, facial and body adaptors) or more under voluntary control (speech, illustrators). We had no a priori hypothesis about gaze aversion because gazing is linked to both affective states such as state shyness and the more voluntary control over speaker turns (Kleinke, 1986). As it turned out, gaze

aversion showed equally high correlations with the IAT and the explicit measure of shyness and thus was not considered in the formation of aggregated indices for spontaneous and controlled shy behavior.

Fifth, we confirmed with these behavioral measures of spontaneous and controlled shy behavior the strong version of the double dissociation hypothesis. That is, the shyness IAT significantly and uniquely predicted spontaneous shy behavior, and the explicit self-ratings of shyness significantly and uniquely predicted controlled shy behavior, without significant cross-paths between IAT and controlled behavior and between the explicit measure and spontaneous behavior. The fit of the structural equation model for the strong version of the double dissociation hypothesis was excellent, the cross-paths in the less parsimonious model for the weak version of the double dissociation hypothesis were nonsignificant and close to zero, and the relative fit of this alternative model was poorer than the fit of the more parsimonious model according to the AIC index of fit, which takes the different degrees of freedom for the two competing models into account.

Only two studies investigating the double dissociation pattern have actually used a detailed coding of nonverbal behavior (Dovidio et al., 1997; Spalding & Hardin, 1999). In Dovidio et al. (1997), racial prejudice was assessed explicitly by a questionnaire measure and implicitly by a priming procedure. The measures were uncorrelated ($r = .01$). The double dissociation was tested using multiple regression analyses. As expected, the explicit but not the implicit prejudice measure predicted the participants' deliberate evaluation of a Black as compared with a White experimenter. Also, the implicit but not the explicit measure predicted two presumed automatic nonverbal indicators of prejudice, higher eye blink rate and shorter visual contact with the Black as compared with the White experimenter. However, there was some evidence against the strong version of the double dissociation pattern. Unexpectedly, in a path analysis a marginally significant cross-path was found between the Modern Racism Scale (McConahay, Hardee, & Batts, 1981) and reduced eye contact with a Black as compared with a White confederate.

In a study by McConnel and Leibold (2000), the IAT was used as an implicit measure of racial attitudes. Unlike the study by Dovidio et al. (1997), the implicit measure showed a substantial correlation with a questionnaire measure of prejudice ($r = .42$), thus rendering substantial cross-paths more probable. This correlation notwithstanding, the implicit but not the explicit measure predicted biased participants' nonverbal behaviors while they interacted with a Black as compared with a White experimenter. Significant correlations were found for speaking time (.51), smiling (.39), speech errors (.42), and speech hesitations (.35). At first glance, these relations may appear inconsistent with the results of the present study because at least speaking time should be considered as controlled behavior and therefore correlate with explicit and not with implicit prejudice. However, for the participants, speaking time may be much more obviously related to shyness than to racial prejudice. In consequence, they may have missed controlling this controllable behavior. Because of this ambiguity and the lack of a deliberate open evaluation of the experimenters, the study by McConnel and Leibold (2000) seems less suitable to test the double dissociation hypothesis.

All in all, the findings of the present study confirm the strong version of the expected double dissociation. However, the double dissociation was not maximal because the IAT correlated significantly with controlled shy behavior and the explicit self-ratings correlated significantly with spontaneous shy behavior. Ideally, one might expect not only zero cross-paths but also zero cross-correlations. The main reason for the deviation of the present data from this ideal is the fairly high latent correlation of .49 between the IAT and the explicit self-ratings that induced indirect correlations between a predictor and behavior that were mediated through the other correlated predictor.

The relatively high correlation between the measures of implicit and explicit shyness may be attributed to the fact that social perception was the cover story and that the participants were not paid for participation and were promised individual feedback on their results. Thus, participation only made sense for them if they cooperated with the instructions and provided self-descriptions that were as accurate as possible. Dissociations between implicit and explicit shyness are minimized in such situations, restricted more or less to distortions of the self-concept that the participants are not aware of. Stronger dissociations are expected under conditions in which participants are highly motivated to present themselves as nonshy, for example in the context of personnel selection.

Low Effect Sizes

The correlations between the measures of self-concept and the predicted aggregated behavioral indices were small, ranging from .28 to .31. However, much higher correlations cannot be expected for two reasons. First, correlations between the self-concept of personality and observed behavior in one short situation are severely restricted because the self-concept of shyness is based on accumulated information about one's past behavior in many social situations, which reduces situation-specific variance (e.g., due to the particular interaction partner and the particular course of conversation). In contrast, the observer judgments and the behavioral indicators of shyness contain the full situation-specific variance, which reduces the correlation between self-concept and behavior.

Despite this well-known problem in the prediction of behavior from explicit self-perceptions of personality (Funder, 1999), the correlation between the explicit self-concept of shyness and the observer judgment of shyness was a respectable .48; much higher correlations cannot be expected for predictions of 3-min interactions. The correlation between the implicit self-concept of shyness and the observer judgment of shyness was lower (.31), which was mainly due to the fact that the observer judgment was strongly determined by participants' speech, which was controlled behavior that the IAT predicted less well. Because the observer judgments were more closely related to controlled than to spontaneous behavior, they were not a good external variable for validating measures of implicit shyness.

Position of the Self-Concept Measures

One limitation of the present study is that both self-concept measures were obtained after the conversation with the confederate. Thus, the correlations between self-concept and behavior were retrodictions rather than predictions. This seems not to be a problem for the explicit self-ratings because participants were explicitly asked to judge their personality, not their affective state, during the preceding conversation, and even judgments of state shyness

that were obtained before and after similar shyness-inducing situations correlated highly in the studies by Asendorpf (1987, 1989). However, it could be that the shyness IAT reflects the most recent state of shyness more strongly than the enduring self-concept of shyness as a personality trait. Future studies are needed to disentangle possible state components from trait components in measures of implicit self-concept by contrasting predictive and retrodictive correlations with one another.

Validity of the Distinction Between Spontaneous and Controlled Behavior

We based our a priori hypotheses for this distinction on common sense and theoretical approaches to nonverbal behavior in social interaction (Asendorpf, 1990; Ekman & Friesen, 1969, 1972; Hinde, 1970). The results support our hypothetical assignment of specific behavioral indicators. However, a direct empirical test of the assignment would be even more convincing. With this goal, we conducted Study 2.

Study 2

The validity of our distinction between spontaneous and controlled shy behavior can be empirically tested in a faking study in which the participants of an experimental condition are asked to present themselves as not shy. Relative to a control condition in which participants do not receive such an instruction, one would expect that controlled shy behavior (absence of speech and illustrators) is decreased but that spontaneous shy behavior (self-adaptors and tense body posture) remains unaffected by the experimental variation. Also, such a study could confirm the important prediction that self-reported shyness but not IAT-assessed shyness decreases under faking instructions.

In faking studies in which participants are asked not only to fake responses in questionnaires but to control their social-interactional behavior for an extended period of time, it is extremely important that the faking task makes sense to the participants. Therefore, we did not choose a faking version of Study 1 by simply instructing participants to present themselves as not shy in the presence of the confederate. Instead, we took care to set up a new social-interaction situation in which presenting themselves as not shy presented a real challenge to our student participants that they would be eager to meet. We invited the participants of the experimental condition to a simulated job application procedure including video feedback on their behavior and informed them that appearing nonshy (including their responses to computer tasks and their behavior in a role play situation typical for assessment centers) was crucial for getting the job. In the control condition, the role play was the same but the cover story was social perception (as in Study 1).

We expected that participants in the assessment center condition would score lower on the bipolar shyness adjectives but not the shyness IAT and that they would show less controlled shy behavior (duration of speech and speech-illustrating movements) but would not show less spontaneous shy behavior (facial and body self-stimulations and tense body position) compared with the participants in the social perception condition. Thus, we expected a dissociation between controlled and spontaneous shy behavior with regard to the experimental manipulation.

Because we expected the same direction of effects of the experimental variation for both men and women and because we expected women to show a somewhat stronger effect in relation to their well-documented higher social-interactional competence (Hall, 1984), we studied only women. In addition to allowing a smaller sample size, including only women meant that only one opposite-sex role play partner had to be trained for the role play and the video feedback, and this person was the same for all participants.

Method

Participants

Participants were 41 female nonpsychology university students (native speakers of German; mean age = 22.1 years, range = 19–30 years). The participants were invited either for a job application procedure (experimental condition, $n = 23$) or for a study on social perception (control condition, $n = 18$). In the first case, we motivated them for participation in the study by informing them that they would participate in a simulation of a job assessment center and would receive video feedback on their performance. In the second case, invitation was identical to Study 1.

Assessments

Experimental condition. On arrival at the lab, the participants in the experimental (assessment center) condition received the following instructions:

> The following assessment center assesses your ability to present yourself as successfully as possible for a position in a company that you are very interested in. An important part of your future job is to present the company as successfully as possible in interactions with new clients. Therefore, you must be able to warm up strangers quickly and to avoid insecure behavior because such insecurity could easily make an unprofessional impression.

After repeating the job criteria once more, the experimenter explained the different steps of the assessment center and stressed that to get the job, the participant should make a favorable impression in all parts of the assessment, including both the role play and the personality tests.

Control condition. The participants in the control condition received the alternative instructions: "The following experiment is on social perception, that is, how you perceive yourself and how others perceive you." After explaining the different steps of the experiment, the experimenter continued, "Please describe yourself in all personality tests as honestly and realistically as possible and act in the role play simply as you would do in real life." As in Study 1, these participants received no specific instructions before the implicit or explicit tasks.

Role play instructions. Subsequently, the participants were taken by the experimenter to the observation room that was also used in Study 1. Outside the room, participants in the assessment center condition were reminded that "it is very important for getting the job that you show in the role play that you can easily and openly approach strangers." In the control condition, the participants were informed that "the role play is informative about particular personality characteristics" and that they would be evaluated by their role play partner after the role play (this part of the instruction was identical to the instruction in Study 1).

Next, the participants were informed that the role play would be recorded by two cameras, and the role play situation was described for all participants as follows:

> You are an employee in a company. In your company, the boss will be replaced by a new one. This new boss, your future boss, was

supposed to be meeting the present boss now, but unfortunately the present boss is still in another meeting for about 10 minutes. You have been asked to fill in for these 10 minutes and to make the situation as comfortable for your future boss as possible.

In the assessment center condition, this instruction was continued, "You should present yourself as favorably as possible. Have in mind that your role play partner will be your future boss." In the control condition, the instruction was continued differently: "Act in the role play just as you would do in real life."

Role play. The participant was shown into the observation room. An older-looking, unfamiliar male advanced psychology student, dressed in a business suit, was already sitting at a low table. This confederate was not aware of the participant's assignment to the experimental condition. He was trained to play the role of the future boss described in the instruction. In particular, he was instructed to act slightly indignant at the delay of the meeting with the present boss and to slightly patronize the participant. As in Study 1, the participant was seated on a chair placed at a 90° angle to the confederate's chair.

This procedure was designed to induce shyness by (a) the unfamiliarity and (b) the status difference of the boss, (c) the assumed evaluation by the boss, (d) the opposite sex of the boss, and (e) the videotaping. Thus, we expected a similarly strong induction of shyness as in Study 1 for both experimental conditions. Both interactants were videotaped as in Study 1; again, the first 3 min were used for all behavioral codings and judgments.

Judgments and codings of shy behavior. We used procedures identical to those in Study 1, except that gazing was not coded because it did not differentiate between IAT and the explicit self-rating in Study 1. In particular, we computed indices of spontaneous and controlled shy behavior as in Study 1. Coding reliability was satisfactory in each case (for the observer judgments, $\alpha = .94$; for the intercoder agreement for 15 participants, $r > .80$ for each behavior).

IAT and explicit ratings. As in Study 1, the interaction situation was followed by explicit ratings of bipolar adjectives and the shyness IAT. The same bipolar adjectives and IAT procedures as in Study 1 were used in the control condition. In the experimental condition, the participants were reminded before the IAT and the explicit ratings that "You should present yourself in the following task in such a way that you will get the job". The Steps d–e of Study 1 were skipped.

Feedback. In the experimental condition, the role play partner watched the videotape of the role play with the participant, commented on her behavior, and suggested alternatives for less competent behavior. He was trained to stress participants' competencies and to provide constructive alternatives. In the control condition, participants were invited for an individual feedback after the full analysis of their data.

Results

For the IAT, the individual incorrect response rates for the 156 analyzed responses in the two combined tasks were highly similar to those in Study 1 ($M = 5.1\%$, $SD = 3.4\%$). Inspection of the error distributions indicated no extreme scorers (all error rates were below 15%). The distribution of the log-based IAT scores was not even marginally different from a normal distribution ($Z < 1$). The internal consistency of the IAT was evaluated as in Study 1; Cronbach's alpha was .84. The internal consistency of the shyness self-ratings was .86. Thus, the reliabilities were satisfactory for both the implicit and the explicit measures.

The means and standard deviations for all dependent variables are reported in Table 6 separately for the two experimental conditions. In a first step, differences between the control condition and the 70 female participants in Study 1 were explored by a MANOVA, followed by post hoc *t* tests. We found an overall effect, $F(8, 79) = 3.11$, $p < .01$, that was due to the expected difference in speech duration, $t(1, 86) = 3.08$, $p < .003$. The other seven dependent variables did not significantly differ between the control condition and Study 1. Thus, the control condition was highly similar to Study 1 except for a lower speech duration (38% as compared with 48% in Study 1), which most likely resulted from the different script of the confederate. In particular, there were no differences regarding the IAT, the shyness self-ratings, and the observer judgment of shyness.

Subsequently, the expected (non)differences between the experimental and the control conditions were tested by *t* tests for each dependent variable (see Table 6). As expected, the participants in the assessment center condition rated themselves as much less shy, talked much more, and illustrated their speech more with gestures than did the participants in the social perception condition. Therefore, as expected, the index for controlled shy behavior was much lower in the assessment center condition, $t(39) = 3.53$, $p < .001$, $d = 1.13$. Also as expected, the IAT scores were not even marginally different between the two experimental conditions.

Unexpectedly, the index of spontaneous shy behavior was even higher in the assessment center condition than in the control

Table 6
Summary Statistics and Instruction Effect for the Main Variables of Study 2

	Assessment center ($n = 23$)		Social perception ($n = 18$)		Instruction effect (*t* test)		
Variable (range of scores)	*M*	*SD*	*M*	*SD*	*t*(39)	*p*	*d*
IAT[a]	−65.0	232.0	13.0	218.0	1.22	*ns*	0.39
Bipolar shyness self-rating (1–7)	2.4	0.7	3.4	0.8	4.32	.001	1.38
Observer shyness judgment (1–7)	3.5	0.9	3.9	1.2	1.40	*ns*	0.45
Speech duration (%)	52.0	12.3	37.6	10.4	3.99	.001	1.28
Illustrator duration (%)	5.0	4.9	2.4	2.5	2.20	.05	0.71
Facial adaptor duration (%)	5.5	12.3	2.0	2.0	0.98	*ns*	−0.31
Body adaptor duration (%)	31.6	21.3	20.1	20.0	2.26	.05	−0.72
Tense body posture (%)[b]	44.1	26.0	36.1	21.6	1.05	*ns*	−0.34

Note. *M* and *SD* refer to raw scores; *t* tests refer to log-transformed scores in the case of the IAT and the body movement codings. The effect sizes (*d*) were defined such that positive scores indicate more shyness in the control condition. IAT = Implicit Association Test.
[a] *M* and *SD* for the IAT are in milliseconds. [b] Weighted duration of normal, slight, and strong tension.

condition, $t(39) = 2.78$, $p < .01$, $d = -0.89$, and the observer judgments of shyness were not significantly lower in the assessment center condition. As Table 6 indicates, the participants in the assessment center condition tended to show more shyness consistently across all three spontaneous shy behaviors (facial adaptors, body adaptors, and body tension), and this tendency reached significance for the body adaptors.

Discussion

Study 2 confirms our assignment of speech and illustrators to controlled behavior and of self-stimulations and tense body position to spontaneous behavior as even stronger than expected. The participants in the experimental condition followed the instruction to present themselves as not shy in their controlled behavior but failed to suppress spontaneous shy behavior; they even showed more body self-stimulations than did the participants in the control condition. Because such nervous movements are interpreted by observers as indications of shyness (see Table 4), they may have counteracted observers' tendency to attribute less shyness to the participants in the assessment center condition, resulting in only marginally lower observer judgments of shyness for this condition.

In addition, Study 2 also confirms the expectation that the faking instruction influenced participants' explicit shyness self-ratings (a decrease of more than one standard deviation, thus, a very large effect) but not their IAT scores, although the IAT was also assessed under a faking instruction. This last result is consistent with prior studies on the controllability of the IAT (e.g., Banse et al., 2001; Kim, 2001).

General Discussion

Mechanisms

Presently there is considerable debate about the cognitive processes underlying IAT procedures and the interpretation of IAT effects (Brendl, Markman, & Messner, 2001; De Houwer, 2001; Karpinski & Hilton, 2001; Mierke & Klauer, 2001; Rothermund & Wentura, 2001). It is important to note that results for IAT procedures that refer to personally meaningless materials such as geometric figures or nonsense syllables are not necessarily informative about their application to personally meaningful concepts such as implicit attitudes, stereotypes, and self-concept. Also, potential ambiguities concerning the interpretation of IAT mean effects (Brendl et al., 2001) are not crucial for the interpretation of interindividual differences in IAT effects. But there is no question that we need to know much more about the cognitive processes underlying IAT procedures to understand better what these procedures measure. We briefly discuss here three open questions in this respect that are relevant for the present study.

First, why is the parallel test reliability of IATs lower than the internal consistency? In the present study the internal consistency was above .80 for both parallel tests, but the correlation between them was only .66. Other authors have reported retest reliabilities around .50 (Banse et al., 2001) or even somewhat lower (Cunningham et al., 2001). Other assessment methods such as self-ratings or projective tests in motivation research (Winter & Stewart, 1977) do not show this discrepancy. In addition, the second IAT in our study was less valid with regard to virtually every correlate. Perhaps some participants but not all shifted to a different response strategy or even tried several response strategies during the second test. This differential change in the response strategy would decrease both the correlation between the two tests and the validity of the second test.

Second, to what extent do participants influence IAT results through conscious, deliberate behavior? Kim (2001) has shown that, when instructed to do so, respondents were not able to fake more pro-Black attitudes by accelerating responses in the difficult mixed blocks. They were only able to deliberately produce a positive implicit attitude toward Blacks by slowing down their responses in the easier White/good–Black/bad mixed task. However, these results are silent about what people really do when they do not receive specific instructions, particularly in studies such as the present one where there is no reason to fake results. Future studies should investigate in detail the strategies that participants spontaneously use for making testing easier for them or for influencing the test results.

Third, better knowledge of the cognitive processes underlying IAT procedures is needed for us to better understand the nature of implicit self-concept. This better understanding, in turn, is a necessary but not sufficient requirement for answering what we consider the most difficult question of all: Which mechanisms mediate between implicit traits and trait-relevant behavior? The only thing that seems sure is that implicit traits do not directly trigger behavior. People do not act shy because they feel that they are shy.

Instead, we assume, in line with Asendorpf's (1989) two-factor common pathway model, that individual differences in shy behavior are determined by both temperamental traits and relatively independent earlier experiences of being ignored or rejected by significant others. In a continuous process of self-validation, shy behavior is self-perceived both directly and indirectly through social feedback from others. These perceptions crystallize into an implicit self-concept of being shy. Through this developmental process, the implicit self-concept is linked with behavioral dispositions and, thus, also with actual behavior. Consequently, we assume that there are no direct mechanisms that link the implicit self-concept of shyness with shy behavior. Instead, the continuous influence of temperamental traits and the accumulation of social experiences over developmental time provide the key for our understanding of the link between self-concept and behavior. The mediating mechanisms are developmental.

Ethical and Practical Implications

Procedures such as the IAT are sometimes considered unethical because of a belief that these implicit procedures are not as much under voluntary control as are questionnaire responses. Others are enthusiastic about these procedures because they believe that the procedures promise a final solution to the problems of social desirability biases and cognitive inaccessibility not only in psychological research but also in psychological practice. Both beliefs may turn out to be erroneous. Concerning ethical issues, IATs can be faked if one knows how they work. Although it seems difficult to substantially accelerate one's responses in one of the mixed blocks, it is possible to slow down (Kim, 2001). For example, if one wants to fake being shy in the shyness IAT of the present studies, one must slow down responses in the second mixed block, which tests the *I–nonshy* association; if one wants to fake being nonshy, one must slow down responses in the first mixed block, which tests the *I–shy* association. Of course, to counteract this quite simple faking strategy,

assessment professionals will select only fast-responding participants with the searched-for IAT scores—at least as long as false negative decisions are less costly than false positive decisions. But with increasing use of the IAT, test crackers are very likely to develop more sophisticated faking strategies, such as focusing on specific aspects of the critical mixed task (e.g., Rothermund & Wentura, 2001). In case the IAT is used for personnel selection, it presently seems impossible to predict who will win the arms race between assessment professionals and test crackers.

Concerning practical use, IATs relating to the self-concept of personality may be useful in contexts such as counseling or psychotherapy, where people are motivated to access parts of their self-concept that are difficult to explore in explicit mode. Just as free associations in psychoanalytic settings provide a window to the unconscious, IATs provide another, probably more reliable window. But just as psychoanalytic interpretations of free associations are controversial for good reasons, interpretations of IAT results that are not backed up by a nomological network of empirical correlates are problematic as well.

Implications for Personality Research

Our studies have two important implications for future personality research. First, we have shown that it is possible to apply procedures such as the IAT to the assessment of implicit traits. Shyness is just one example; in principle, any trait that can be described by adjectives (and there are thousands of trait-describing adjectives; Allport & Odbert, 1936; John, Angleitner, & Ostendorf, 1988) can be studied by an IAT procedure. One has only to replace the shyness adjectives in our first IAT with a few adjectives that describe another trait. There is no guarantee that the resulting IAT will be as internally consistent as the parallel explicit self-ratings of the same adjectives, but the prospects are good.

Second, our double dissociation strategy for validating implicit traits can be applied to any behavior-related implicit construct, not only to implicit traits. This strategy poses strong constraints on the validity of implicit procedures that hopefully will prevent premature validity claims that are based on unreliable implicit measures (Buchner & Wippich, 2000) or spurious discriminant validities, because validity is fully mediated by the association with a valid explicit measure.

Besides exploring the usefulness of our approach for other domains of personality and unraveling the cognitive mechanisms that underlie the IAT procedure, a high-priority goal of future studies on implicit constructs should be the construction of different assessment procedures that access the same implicit constructs with different techniques in the implicit mode. If new procedures become available, psychologists can strengthen their empirical research on implicit constructs by replicating results with different methods and by reducing specific method variance through the aggregation across different implicit measures.

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