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Assessing individual differences in achievement motivation with the Implicit Association Test☆

Joachim C. Brunstein* and Clemens H. Schmitt

Department of Psychology, University of Potsdam, Potsdam, Germany

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Abstract

The authors examined the validity of an Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998) for assessing individual differences in achievement tendencies. Eighty-eight students completed an IAT and explicit self-ratings of achievement orientation, and were then administered a mental concentration test that they performed either in the presence or in the absence of achievement-related feedback. Implicit and explicit measures of achievement orientation were uncorrelated. Under feedback, the IAT uniquely predicted students' test performance but failed to predict their self-reported task enjoyment. Conversely, explicit self-ratings were unrelated to test performance but uniquely related to subjective accounts of task enjoyment. Without feedback, individual differences in both performance and enjoyment were independent of differences in either of the two achievement orientation measures.

Keywords: Achievement motivation; Implicit Association Test; Implicit and explicit motives

1. Introduction

In a review of research on human motives, McClelland, Koestner, and Weinberger (1989) drew an important distinction between implicit and explicit modes of motivational functioning. According to these theorists, implicit motives refer to

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* Corresponding author.
E-mail address: brunstei@rz.uni-potsdam.de (J.C. Brunstein).

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enduring preferences or needs (e.g., the need to achieve) for the attainment of certain classes of desired goal states (e.g., doing something better). These motives are triggered automatically by incentives (e.g., mastering a challenging task) intrinsic to performing an activity and influence a person's behavior (e.g., how much effort a person puts into a given task) without a great deal of deliberative thought. In contrast, explicit (or self-attributed) motives are built upon a person's self-image. They refer to the values and desires people can articulate and acknowledge as being characteristic of their day-to-day activities. Explicit motives are reflected in self-conscious choices and associated appraisals of tasks and behaviors. They are most directly expressed when people are asked to indicate (e.g., by endorsing items on a questionnaire) how much they would prefer to engage in a certain type of activity (e.g., an achievement-oriented activity).

Because implicit motives are assumed to operate on a person's behavior outside of his or her awareness, McClelland (1980) recommended to assess them indirectly from picture-story tests akin to the Thematic Apperception Test (TAT). In contrast, due to their explicit nature, self-attributed motives can directly be assessed with self-report inventories. Notably, TAT and self-report measures of nominally similar motives have almost never been found to significantly correlate with each other (cf. Schultheiss & Brunstein, 2001; Spangler, 1992), a finding that led McClelland (1980) to suggest that the two measures assess different aspects of personality. Yet, from a psychometrical perspective, this lack of convergence could also be due to a reliability problem inherent in the TAT when one considers the low internal consistency among stories from which a person's motive scores are obtained (for a discussion of this issue, see Atkinson, 1981; Tuerlinckx, De Boeck, & Lens, 2002). Moreover, self-report tests and the TAT involve different stimuli (structured questions vs. ambiguous pictures) and use different response formats (selected vs. constructed responses) to assess the strength of a certain motive. Thus, method variance might be another, more obvious reason why the two measures often fail to agree.

For many years, the TAT was the only method for assessing individual differences in implicit motivational preferences. Recently, however, several theorists have begun to explore implicit personality processes by using a different tool, the Implicit Association Test (IAT) developed by Greenwald, McGhee, and Schwartz (1998) as a procedure to assess automatic evaluative distinctions. In a number of studies (for a review, see Greenwald et al., 2002), the IAT was adapted to measuring individual differences in self-esteem (Bosson, Swann, & Pennebaker, 2000; Greenwald & Farnham, 2000) and self-concepts of personality, such as shyness (Asendorpf, Banse, & Mücke, 2002) and anxiety (Egloff & Schmukle, 2002). Roughly sketched, the IAT examines automatic associations between a bipolar target concept and a bipolar attribute concept. Its basic principle is that it should be easier for people to categorize two concepts using the same response key if the concepts are evaluatively congruent than if they are incongruent. For instance, to measure self-esteem, Greenwald and Farnham (2000) devised an IAT that assesses automatic associations of self- vs. other-related words (target categories) with pleasant vs. unpleasant words (attribute categories). Participants are asked to make responses in two critical blocks of trials: in one block they are asked to sort together (by pressing one of two response keys)

self-related and pleasant words and to do the same with other-related and unpleasant words (by pressing the second key). In a further block of trials, key assignment of attribute categories is reversed, such that self-related and unpleasant words share one key and other-related and pleasant words the second key. The difference in response speed between the two blocks represents the IAT effect. To the extent that respondents more strongly associate the self with pleasant words, relative to the reverse pairings, they are manifesting high self-esteem.

The IAT assesses individual differences in (implicit) self variables with high internal reliability (Greenwald & Nosek, 2001). Although nominally similar IAT and self-report measures are mostly positively correlated (Banse, Seise, & Zerbes, 2001), they often share only little common variance (Karpinski & Hilton, 2001). A number of studies has shown that parallel IAT and self-report measures are dissociable in the sense that they are linked to different classes of behavioral variables. For instance, Asendorpf et al. (2002) reported that a shyness IAT uniquely predicted spontaneous behavioral expressions of shyness whereas explicit self-ratings of shyness best predicted controlled shy behavior.

Hence, available evidence suggests that IATs and self-report tests of nominally similar person variables (a) tap unique sources of variance and (b) predict different classes of behavior. This pattern of findings struck us as bearing strong resemblance to that evident in the motivation literature reviewed by McClelland et al. (1989). We therefore speculated that the IAT methodology might be suitable to tap motivational preferences that exist outside of a person's awareness but are expressed in her or his behavior in the presence of appropriate incentives. Given the prominence that the human need for achievement has assumed in the analysis of motivational processes, in our inquiry of this idea we chose to focus on the domain of achievement-oriented behavior.

To examine if the IAT qualifies as a procedure for assessing individual differences in the strength of achievement tendencies, we investigated if indirect (IAT) and direct (self-report) measures of achievement orientation would selectively predict different aspects of achievement behavior (effortful task performance vs. self-reflective task appraisals). Within the context of our present research, we use the term of achievement orientation to denote general representations of the self as being successful (e.g., ambitious and efficient) in the pursuit of achievement-relevant goals (i.e., goals that involve a sense of mastery and self-improvement relative to some standard of excellence). In doing so, we comply with previous theorists (Covington & Omelich, 1979; Kukla, 1978; Martin, Marsh, & Debus, 2001; Meyer, 1987; Nicholls, 1984) who viewed differential self-perceptions of competence as the primary ingredient in achievement (or success) motivation. In an influential article, Atkinson (1957) assumed that the tendency to seek success is a joint function of the motive to achieve, the incentive value of success, and the expectancy or probability of success, where incentive value and success probability are defined as situational variables reflecting the level of difficulty associated with a given task. Accordingly, the motive to achieve may alter the tendency to succeed in two different ways (cf. Heckhausen, 1977; Kukla, 1978): it may influence the value a person places on successful task performances, or it may influence the extent to which a person feels confident of being

able to master a challenging task. Although Atkinson preferred the former interpretation (individuals high in achievement motivation anticipate greater satisfaction from success than individuals low in achievement motivation), there exists considerable evidence in favor of the latter explanation (individuals high in achievement motivation have more optimistic expectations than individuals low in achievement motivation), as Kukla (1978) and Meyer (1987) stated. For instance, several researchers found that individuals with a strong motive to achieve generally see themselves as highly capable individuals (Covington & Omelich, 1979; Meyer, 1984) and therefore feel more optimistic with respect to their chances of success than individuals low in achievement motivation (Atkinson, Bastian, Earl, & Litwin, 1960; Shrable & Moulton, 1968). These findings already led Moulton (1974) to assume that achievement motives are closely interrelated with judgments of competence, and other researchers further advanced this argument by suggesting that individual differences in achievement motivation primarily reflect, and may therefore be equated with, differential amounts of self-perceived ability (Kukla, 1978; for a discussion of how achievement motivation relates to different psychological aspects of competence, see Koestner & McClelland, 1990; Schultheiss & Brunstein, in press).[1]

Although the distinction between value-based (or affective) and expectancy-based (or cognitive) conceptualizations of individual differences in achievement motivation has been an issue of much debate for quite some time (cf. Heckhausen, Schmalt, & Schneider, 1985), we found it most plausible to assume that individuals who are strongly motivated to achieve differ from low achievement individuals with respect to both the degree to which they strive for the attainment of achievement-related goals and the degree to which they feel capable of accomplishing such goals. This idea is consistent with the view (cf. Brunstein, Schultheiss, & Grässmann, 1998; Heckhausen, 1977) that psychological motives operate as weighting dispositions that augment (or attenuate) the valence (or product of incentive value and success probability) of desired outcomes. Yet, in keeping with McClelland's (1980) view, we furthermore supposed that a good deal of the associative links connecting the self with attributes of achievement-related competence may reside outside of a person's conscious awareness and may therefore not permit accurate assessment by self-report instruments. Accordingly, in our present investigation we assessed both implicit and explicit associations of the self with competence-related attributes (i.e., motivationally significant person characteristics that connote a sense of ambition *and* efficiency in the pursuit of achievement-relevant goals) supposedly differentiating high from low achieving individuals. In this way, we sought to maximize the similarity of the stimulus material presented in direct and indirect achievement tests.

[1] As Moulton (1974) stated, a concern with competent performances is also evident in the TAT assessment of achievement-related needs. Besides the expression of a desire to excel, success expectancies, goal-related instrumental activities, unique accomplishments, and effective task performances are all coded as indications of achievement orientation as described in conventional scoring manuals for assessing achievement-related goal imagery from picture-story tests. Accordingly, as Heckhausen (1977) stated, the TAT motive to achieve (or "Hope of Success") comprises both incentive- *and* expectancy-related thoughts about the successful pursuit of achievement-oriented goals.

To provide an initial test of the predictive (and discriminant) validity of the two achievement-orientation variables, student participants were presented with a mental concentration test that was organized in a number of consecutive blocks. After each block, half of the students received feedback indicating how their current level of achievement compared with that of their own previous accomplishments. This procedure was inspired by the view (cf. Breckler & Greenwald, 1986; Koestner & McClelland, 1990) that achievement-motivated behavior is guided by personal (or self-referenced) standards of excellence and that achievement-oriented individuals are strongly interested in receiving feedback in relation to such standards. The other half of the participants received no feedback as to their performance on the mental concentration test.

In achievement studies, the dependent variable motivation is often equated with the expenditure of mental effort and is accordingly measured with performance indices reflecting speed on a task (Thomas, 1983). As McClelland (1980, 1985) stated, effortful performance qualifies as an indicator of "operant" or spontaneous achievement behavior, provided that the amount of energy a person invests in a given task is left to his or her own initiative. Accordingly, implicit needs to achieve have been suggested and found to predict energetic persistence in effort-sensitive tasks (Biernat, 1989). In keeping with this view, in our present study we considered participants' processing speed in the mental concentration test as a measure reflecting the intensity of spontaneous (or self-initiated) effort. Yet, because individuals may differ greatly with respect to their general response speed (Fazio, 1990), we controlled in our statistical analyses of this criterion measure (*test performance*) individual differences in baseline latencies. Moreover, after they had completed the experimental tasks, participants were asked to indicate on a number of self-report items how much they had enjoyed performing these tasks. In this way, we obtained one further dependent variable (*task enjoyment*) reflecting participants' conscious appraisals of how much they had liked (or disliked) working on the test tasks. According to McClelland (1980, 1985), such judgments qualify as indicators of "respondent" or deliberate achievement behavior and should therefore be predicted by measures of self-attributed achievement motivation.

Our general expectation was that the IAT would assess with an adequate degree of reliability an important aspect of achievement motivation not accounted for by a self-report measure of achievement orientation. More specifically, we expected the IAT to reliably predict spontaneous achievement behavior, whereas subjective accounts of achievement orientation should better predict self-reflected expressions of task engagement. Proceeding on these ideas, for students exposed to feedback we formulated the following predictions: first, IAT-assessed achievement orientation should uniquely predict students' test performance, but should be less likely to account for their self-reported task enjoyment. Second, self-reported achievement orientation should uniquely predict students' self-ratings of task enjoyment, but should be less effective in predicting their effort-related performance. For students receiving no feedback, we assumed that achievement orientation, be it implicit or explicit, would be irrelevant to the prediction of either

of the two dependent variables. This proposition is in line with McClelland's (1985) idea that in the absence of performance standards (or any other kind of achievement arousing incentive), achievement-oriented individuals do not behave any differently than individuals who are relatively low in achievement motivation.

2. Method

2.1. Participants and procedure

Participants were 88 students (44 women and 44 men) enrolled in different faculties at Potsdam University (Potsdam, Germany). Their average age was 22 years.

All participants were run individually. They first completed the IAT and were then administered an achievement orientation questionnaire consisting of the same set of achievement-related items as those presented in the IAT. The experimental task consisted of a mental concentration test that required participants to discriminate between various visual stimuli. Both the IAT and the mental concentration test were programmed with Experimental Run Time System (Beringer, 1994) and presented to participants on a PC with a 17-inch monitor. Responses were made on a 2-key response panel. Students completed the mental concentration test either in the absence (control condition) or in the presence (feedback condition) of feedback. Forty-four students, 22 women and 22 men, were randomly assigned to each condition. Upon completion of the experimental tasks, participants reported how much they had enjoyed performing these tasks. Finally, they were fully debriefed, thanked, and dismissed.

2.2. Measures of implicit and explicit achievement orientation

2.2.1. Implicit achievement orientation

In presenting the IAT to the participants, we closely followed the procedure described in Greenwald et al. (1998). The target discrimination was *Me* vs. *Others*, and the attribute discrimination was *successful* vs. *not successful*. We used successful vs. not successful as attribute labels because these categories are strongly associated with competent performance within achievement-related contexts. The stimulus material consisted of four self-related (e.g., "I") and four other-related items (e.g., "They") as well as eight successful (e.g., "competent") and eight not-successful items (e.g., "inefficient"). Self and other items were adopted from Nosek, Banaji, and Greenwald (2002). Attribute items were inspired by standard questionnaire measures of achievement motivation as well as by content coding categories listed in manuals for the scoring of achievement-related imagery in picture-story tests (Heckhausen, 1963). We selected the respective adjectives (see Appendix A) according to the criterion that they should capture a sense of both performance efficiency and goal directedness in the enactment of achievement-oriented activities.

In a pilot study with 77 students, self-ratings of the 16 adjectives we selected for the IAT displayed satisfactory internal consistency ($\alpha = .84$; all items were scored on a 5-point scale, ranging from 0 = "not at all true for me" to 4 = "completely true for me"). Composite scores of these self-ratings (not-successful items were recoded) were significantly ($p < .001$) correlated with both success ($r = .54$) and failure (avoidance) motives ($r = -.53$) as assessed with Nygard and Gjesme's (1973) Achievement Motives Scale (AMS). The correlation between the adjective scale and the resultant achievement-motive score obtained from the AMS (difference between success- and failure-related items) was $r = .60$, indicating that self-descriptiveness judgments of the chosen adjectives shared a substantial portion of common variance with a standard self-report inventory of achievement motivation (please note that correlations among different achievement motivation questionnaires seldom exceed the value of .60; cf. Halisch, 1986).

The IAT consisted of five blocks (see Appendix B). The experimenter explained to participants that they would have to make a number of category judgments by pressing the right and left keys on the response panel. Block 1 (24 trials) required participants to categorize self- and other-related items into *Me* (right key) and *Other* categories (left key). Block 2 (48 trials) required them to distinguish successful (right key) and not-successful-meaning items (left key). In Block 3, participants sorted items into two combined categories: items related to *Me* and *successful* required a response of the right key, items related to *Others* and *not successful* a response of the left key. As compared with Block 2, assignments of successful and not-successful items to the right and left answer keys were reversed in Block 4 (48 trials). Similar to Block 3, both categorization tasks were again combined in Block 5, but this time required participants to respond to *Me* and *not successful* items by pressing the right key and to *Other* and *successful* items by pressing the left key, respectively. In Blocks 1, 2, and 4, each item was presented three times. Blocks 3 and 5 consisted of 32 practice trials and 128 critical trials. In the critical trials, each target-concept item was presented eight times and each attribute item four times, respectively.

Stimuli were displayed at the center of the screen. Target concepts (*Me* and *Others*) and attribute labels (*successful* and *not successful*) were presented on the upper right and left corner of the screen. In the two combined tasks, target- and attribute-related stimuli alternated from trial to trial. In these tasks, the program randomly presented the stimuli within blocks of 32 trials. The interstimulus interval was 250 ms. Incorrect responses were followed by an error message ("Wrong") that appeared on the screen for 300 ms.

Before we computed the IAT-score, we recoded latencies less than 300 ms as 300 ms, and latencies above 3000 ms as 3000 ms. None of the participants displayed an error rate above 20%, so, no participant was dropped from the sample. To reduce the influence of response outliers, we followed Nosek et al.'s (2002; see also Fazio, 1990; Ratcliff, 1993) recommendation and transformed latencies by a reciprocal transformation (1000 ÷ latency) into speed before we carried out the inferential analyses. The IAT-score was computed by subtracting the mean of the reciprocal latencies in Block 5 from the mean of the reciprocal latencies in Block 3. The higher a

participant's IAT-score, the stronger he or she associated *Me + successful* relative to *Others + successful*.[2] To assess the reliability of the (reciprocal) IAT-score, we split the two combined tasks into four consecutive blocks each consisting of 32 trials. The internal consistency of the four resultant difference scores was satisfactorily high ($\alpha = .82$).[3]

2.2.2. Explicit achievement orientation

Students were asked to indicate the extent to which the same adjectives as those displayed as attribute items in the IAT were true of them, using the 5-point response scale described above. The internal reliability of the resulting 16-item Achievement Orientation Scale (AOS; $M = 41.85$, $SD = 7.24$) was $\alpha = .86$ (negative items were recoded). Students were also administered the AMS. Similar to the pilot study, resultant achievement-motive scores obtained from the AMS were significantly related to students' scores on the AOS ($r = .54$, $p < .001$). Statistical results obtained from the AMS were equivalent to those obtained from the AOS, so they will not be reported.

2.3. Experimental task

The experimental task was adapted from Brickenkamp and Zillmer's (1998) d2 Test of Attention, a diagnostic tool that is used to assess individuals' capacity of concentrating their attention on a given task. Effective performance on the d2 Test requires a great deal of mental effort, making this test a suitable instrument to assess the effects of motivational variables (Brunstein & Gollwitzer, 1996; Brunstein & Hoyer, 2002; Gendolla & Krüsken, 2001). In our study, the letters *d* and *p* were displayed at the center of the computer monitor. The letters were accompanied by one, two or three vertical dashes placed above or below the letter. Respondents were instructed to press one key if a *d*2 (i.e., a *d* having two dashes) appeared on the screen

[2] Reciprocal IAT scores were statistically independent of average response speed across the five IAT blocks ($r = -.06$). In contrast, difference scores computed between the arithmetic means of the latencies obtained from Blocks 3 and 5 were significantly correlated with average response latency across the IAT blocks ($r = .36$, $p < .01$). Similarly, a new scoring algorithm (*D* measure) Greenwald, Nosek, and Banaji (2003) proposed for determining the IAT effect turned out to be contaminated by response speed ($r = -.21$, $p < .05$). The reciprocal transformation yielded the only IAT measure that annulled this undesired artifactual correlation with response speed, and this was one further reason why we used this measure as the predicting variable in our statistical analyses. It should be noted, however, that statistical results obtained from the *D* measure were quite similar to those obtained from the reciprocal measure. Neither of the three IAT measures (mean, reciprocal, and *D*) was significantly correlated with students' self-ratings of IAT adjectives (*ps* > .10; for further details, see Section 3).

[3] In a pilot study with $N = 41$ students, the one-week test–retest correlation for the achievement-IAT effect turned out to be .56, a value quite comparable with stability coefficients reported in the IAT literature (cf. Banse et al., 2001; Greenwald & Nosek, 2001). In the same pilot study, we also administered a German version of a self-esteem IAT developed by Greenwald and Farnham (2000) to assess automatic associations of self-related (vs. other-related) items with pleasant vs. unpleasant affective categories. The correlation between the achievement-orientation IAT and the (affective) self-esteem IAT was .26 ($p = .09$), suggesting that implicit achievement orientation should not be equated with a generalized sense of self-positivity.

and to press the other key if a non-*d*2 (i.e., a *d* having more or fewer than two dashes or a *p* no matter how many dashes it had) appeared on the screen. To familiarize the participants with the stimuli, they first completed a sample exercise. We organized the presentation of the mental concentration test in 18 consecutive blocks of trials. Each block consisted of 40 stimuli, 20 *d*2s and 20 non-*d*2s, presented in a random order. A block started with a fixation cross (600 ms), followed by the first stimulus that remained on the screen until the participant responded. After the participant had pressed one of the two keys, the next stimulus appeared on the screen. Before presenting a new block the program paused for 5 s.

Blocks 1 and 2 served to assess students' initial response speed. Blocks 3–18 were used to assess the effects of person variables and feedback on students' task performance. Upon completion of Block 2, the experimenter interrupted the participants to inform them that the d2 Test had been designed to explore how well people could sustain an attentional activity over a period of time. Control students did not receive any further information. In contrast, feedback participants were told that after each block, they would receive feedback indicating whether they had (or had not) achieved a top performance. The experimenter explained that the label "top performance" would be used to signify "that you have surpassed at a given test block the best performance you have reached on any of the previous blocks." Both accuracy and speed would be calculated by the computer program to determine a participant's performance score. Moreover, feedback participants were informed that whenever they would reach a top performance, a plus sign would appear on the screen immediately after completion of the respective block. Otherwise, a minus sign would appear on the monitor. Independent of their actual achievements, feedback participants were presented with eight plus and eight minus signs. Pilot work indicated that an equal number of positive and negative feedback messages guaranteed strong involvement in the test tasks. Plus and minus signs were presented in random order. Each sign appeared on the screen for 2 s. The first feedback was provided immediately before students started working on Block 3. They were led to believe this message would indicate whether they had (or had not) improved in their performance from Block 1 to Block 2. As noted, control students did not receive any feedback as to their test performance.

Before we computed the reaction times, we recoded latencies greater than 3000 ms as 3000 ms and latencies below 300 ms as 300 ms. The latency distribution was slightly skewed, but data transformations did not affect in any substantive way the results reported below. The error rate was relatively low (approximately 3%) and did not qualify the reported results (nor was it significantly accounted for by any of the predicting variables).

2.4. Dependent variables

We measured two dependent variables: first, for each student, we computed the mean of the latencies in Blocks 3–18 (*test performance*). For each student, we also computed the mean of the latencies recorded in Blocks 1 and 2 (*baseline performance*). We used this latter variable as a covariate in the statistical analyses reported

below. In doing so, we sought to control for individual differences in general response speed and thereby reduce what would otherwise be error variance in latency data (Fazio, 1990). Second, after completion of the test tasks, we assessed students' *task enjoyment* with four self-report items: "I enjoyed working on this test," "This test was quite challenging," "Performing this test was boring," and "Working on this test was a waste of time." Response scales ranged from 0 (*disagree strongly*) to 4 (*agree strongly*). The internal reliability of the four-item scale was $\alpha = .88$ (negative items were recoded). Similar items have been used in previous achievement studies (e.g., Tauer & Harackiewicz, 1999).

3. Results

3.1. Preliminary analyses

For the IAT, mean response latencies were 764 ms ($SD = 127$ ms) in Block 3 and 938 ms ($SD = 180$ ms) in Block 5, indicating that students generally responded much faster in the *Me + successful* condition than in the *Me + not successful* condition. Neither the means nor the variances (see Table 1) of the two personality predictors (i.e., the reciprocal IAT measure and composite AOS scores) significantly differed across the two experimental conditions ($ps > .20$). IAT- and AOS-scores were uncorrelated ($r = -.07$). Neither of the two achievement orientation measures was significantly correlated with response speed in the baseline and test phase ($ps > .10$). Task enjoyment was statistically independent of both baseline and test performance ($ps > .10$). Enjoyment also failed to correlate with performance changes from baseline to test trials ($p > .10$). Participant gender had no impact on the results reported below.

3.2. Test performance

We analyzed test performance with the following regression approach: experimental condition was coded 0 for no feedback and 1 for feedback. Measures of implicit

Table 1
Descriptive statistics of study variables in the two experimental conditions

	Feedback		No feedback	
	M	*SD*	*M*	*SD*
IAT mean (ms)	185.71	132.68	163.23	101.36
IAT reciprocal	.22	.13	.21	.12
AOS	57.40	7.30	58.29	7.24
RT baseline (ms)	698.02	86.50	704.39	110.97
RT test phase (ms)	577.07	76.71	652.85	93.23
Task enjoyment	11.59	3.29	9.97	2.62

Note. $n = 44$, for each of the two experimental conditions. IAT, Implicit Association Test. AOS, Achievement Orientation Scale. The mean IAT measure was obtained by subtracting the mean of the untransformed latencies of Block 3 from the mean of the untransformed latencies from Block 5. In all statistical analyses, the reciprocal IAT measure was used as the predicting variable.

Table 2
Regression of test performance (mean reaction time in the test phase) and post-experimental ratings of task enjoyment on feedback condition and achievement orientation measures

Predicting variables	Test performance		Task enjoyment	
	b	*SE*	*b*	*SE*
Baseline performance	75.90***	4.24	—	—
Feedback condition	−69.54***	8.30	1.72**	.60
IAT	2.62	6.56	−.09	.47
AOS	3.70	6.02	−.01	.43
Condition × IAT	−24.28**	8.97	−.12	.64
Condition × AOS	−.56	8.96	1.48*	.65
IAT × AOS	4.03	4.43	.16	.32

Note. $N = 88$. *b*, Regression coefficient obtained from the final standardized regression equation. IAT, Implicit Association Test. AOS, Achievement Orientation Scale.

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

and explicit achievement orientation were treated as continuous variables. We simultaneously regressed test performance onto baseline performance, experimental condition, IAT scores, AOS scores, and the two-way multiplicative interaction terms computed for the latter three first-order predictors (see Table 2). To facilitate the interpretation of regression coefficients, we converted all continuous predictors to *z* scores before we computed the interactions. The Condition × IAT × AOS interaction was not significant ($p > .10$), so we dropped it from the equation.

With baseline performance covaried out, the total set of predictors accounted for 17% of the variance in test performance, $F(6, 80) = 14.92$, $p < .001$. The effect of the experimental condition was significant (see *b* coefficients in Table 2). Feedback students displayed shorter latencies in the test blocks than no-feedback students (see Table 1). This main effect was qualified by a significant Condition × IAT interaction. Follow-up analyses revealed, that for students receiving feedback, the IAT-effect was a reliable predictor of test performance with variations in baseline performance statistically removed (partial $r = -.49$, $p < .01$; see Fig. 1). Under feedback (and relative to their baseline latencies), students high in implicit achievement orientation responded much faster than students low in implicit achievement orientation. No such effect emerged for no-feedback participants (partial $r = .01$). Neither explicit achievement orientation nor its interaction with the experimental condition contributed to the predictive power of the regression equation (*ps* > .10).

3.3. Task enjoyment

We analyzed task enjoyment with the same regression approach as that described above (see Table 2). The triple interaction was not significant ($p > .10$), so we excluded it from the equation. The remaining predictors accounted for 20% of the variance, $F(6, 81) = 3.54$, $p < .01$. The main effect of experimental condition was significant. Feedback participants reported greater enjoyment than no-feedback par-

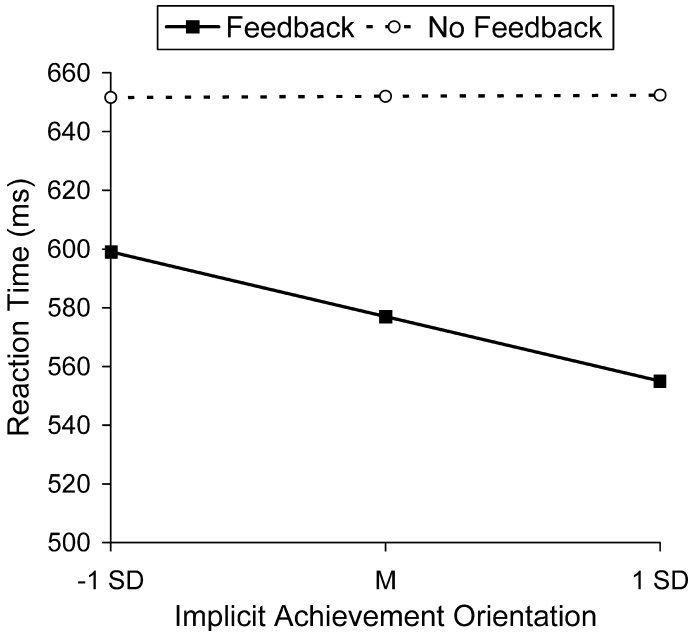

Fig. 1. Predicted test performance (mean reaction time in the test phase) as a function of experimental condition and implicit achievement orientation (Implicit Association Test).

ticipants (see Table 1). The Condition × AOS interaction was also significant. Subsidiary analyses revealed (see Fig. 2) that for students receiving feedback, explicit achievement orientation was positively associated with enjoyment ($r = .48$, $p < .01$). In contrast, in the absence of feedback, AOS scores failed to predict task enjoyment ($r = -.01$). Neither the IAT-effect nor its interaction with experimental condition reached significance ($ps > .10$) in the total regression analysis.

4. Discussion

The reported findings suggest that the IAT procedure described by Greenwald et al. (1998) can be adapted and used to assess, with an adequate degree of reliability and validity, individual differences in implicit achievement tendencies. Two main results emerged from this study:

First, IAT-assessed and self-reported achievement orientation were statistically independent of each other. This lack of any correlation between the IAT and explicit self-ratings can be attributed neither to a lack of reliability of one or both instruments nor to a lack of similarity of the stimuli included in the two assessment tools (identical self-descriptive attributes were used in the two tests). Strikingly, in our investigation a significant relationship between the IAT and explicit self-ratings failed to emerge under nearly ideal conditions.

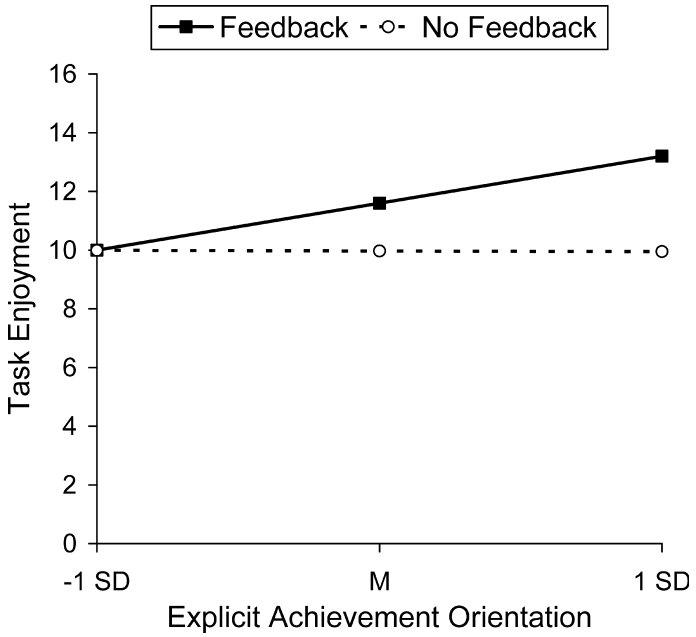

Fig. 2. Predicted task enjoyment as a function of feedback condition and explicit achievement orientation (Achievement Orientation Scale).

Second, both measures of achievement orientation were highly responsive to the presence (vs. absence) of achievement-related feedback, but each of them selectively predicted a specific criterion reflecting participants' involvement in the mental concentration test. For participants exposed to feedback, performance changes from the baseline to the test phase were reliably accounted for by the IAT but not by the AOS. Conversely, for the same group of (feedback) participants, the direct (AOS) but not the indirect (IAT) measure of achievement orientation was positively related to post-experimental ratings of task enjoyment. Hence, the IAT uniquely predicted how hard students tried to improve their task performance, whereas the AOS better predicted students' retrospective evaluation of how much they had enjoyed performing the test tasks. No comparable effects emerged for students assigned to the no-feedback condition.

Three additional findings deserve comment: (a) Although the AOS has not been used to assess achievement orientation in previous investigations, we successfully established evidence of its convergent validity before we administered it in our present investigation. Pilot work indicated that explicit ratings of achievement-related personality attributes were substantially correlated with a standard questionnaire measure of achievement motives. (b) Our findings add further evidence to the notion that personality variables (e.g., implicit and explicit achievement orientations) moderate individuals' reactions to feedback. Yet it should be noted that giving participants the opportunity to evaluate their task performance in relation to a personal standard of

achievement generally increased their test performance and intrinsic task enjoyment. These findings are in keeping with the view that feedback interventions involving a self-referenced (or temporal) standard of comparison are quite effective in stimulating people's task motivation (cf. Kluger & deNisi, 1996). (c) Individual differences in task enjoyment did not correlate with individual differences in test performance. This lack of correlation between self-reflective judgments and real task achievements enabled us to carry out a conclusive test of the notion that implicit and explicit measures of achievement orientation are linked to different types of behaviors (i.e., effort-related performance vs. self-conscious evaluations).

Which conclusions can be drawn from these results? According to McClelland (1980), a motive energizes, orients, and selects behavior, and any presumed measure of a certain motive should meet these criteria to be considered a valid indicator of differences in motive strength. Our data suggest that the IAT measure of achievement orientation satisfies at least the first (energizing) criterion listed by McClelland: the higher participants scored on the IAT, the harder they tried to succeed in competing with a personal standard of achievement. Moreover, McClelland (1985) proposed that to differentiate implicit from explicit levels of motivation, simultaneous assessment of both types of motivation within one and the same investigation is imperative, a requirement that has too seldom been met in previous achievement studies (for an exception, see Biernat, 1989). Complying with this argument, in our experiment, we were able to show that the IAT and a self-report measure of achievement orientation represented two clearly distinguishable constructs in the sense that they shared virtually no common variance and selectively predicted different output variables. From these findings, it is tempting to conclude that the IAT procedure constitutes a promising tool to assess individual differences in implicit sources of achievement-motivated behavior. Yet, before any definitive conclusion can be drawn as to whether the achievement orientation IAT taps the same (or at least a similar) type of motivational construct as that described by McClelland et al. (1989), much more research is needed to elucidate if this newly developed measure relates in a theoretically meaningful and empirically significant way to individual differences in behavioral, cognitive, and affective expressions of achievement tendencies.

Several qualifications of our findings should be noted. First, although the IAT displayed high internal reliability, its test–retest stability was lower than anticipated (see footnote 3). We therefore cannot say with certainty that IAT-assessed achievement orientation represents an enduring characteristic of an individual's personality.

Second, because we were primarily interested in individual differences in IAT scores, we did not vary between individuals the order of the two combined tasks nor did we counterbalance the order of the IAT and the AOS. Notably, however, Greenwald and Farnham (2000) reported evidence suggesting that independent of counterbalancing variables, students generally tend to respond much quicker in associating self with positive items than with negative items, and this is exactly what we observed in our experiment with respect to achievement-related items.

Third, the focus of our research was on the IAT and not on the projective assessment of achievement strivings. Thus, the relationship between IAT and TAT measures of achievement motivation needs to be explored in future studies. Another

point worthy of further inquiry is to investigate the discriminant and incremental validity of the achievement orientation IAT relative to IAT-based assessments of self-esteem (Greenwald & Farnham, 2000). Although the motive to achieve has often been described in terms of an esteem-related need (Maslow, 1954), cognitive competence and personal accomplishments provide only one of several important ways of establishing a sense of self-worth (cf. Harter, 1998). Notably, and in keeping with this view, preliminary evidence (see footnote 3) indicated that IAT-assessed achievement orientation was only weakly related to IAT-assessed self-esteem. Yet our pilot work was limited by the small sample size and the absence of multiple assessments of implicit self-attitudes (cf. Bosson et al., 2000). Thus, the issue of how implicit achievement orientation is related to indirect measures of self-esteem awaits further examination in future research.

Fourth, in our present investigation we proceeded on the idea that individual differences in achievement orientation are centered upon a person's self-concept of competence. In contrast, McClelland (1985) emphasized the affective nature of implicit motives and associated anticipatory goal states. From this perspective, psychological needs are thought to be connected with an extended network of "implicit representations of action alternatives and their emotional consequences" (p. 681), as Kuhl (2003) stated. We therefore believe it would be quite instructive to employ the IAT methodology to examine in greater detail associative links of achievement-related activities with pleasant vs. unpleasant affective categories. Different from the social-comparative nature of the target-concept discrimination task (me relative to others) we used in our present investigation, this procedure would employ an internal frame of reference to determine a person's affective preference for achievement-related activities relative to her or his liking for activities unrelated to achievement. Moreover, to measure failure-avoidance tendencies, future researchers may also want to include in their investigations IAT-based assessments of achievement-related fears (cf. Egloff & Schmukle, 2002). Proceeding in this direction would enable us to comply with Heckhausen's (1977) claim that a multivariate assessment strategy might be most promising to portray the multifaceted nature of the achievement-motive construct.

Fifth, except for feedback, we did not vary (further) context factors that may combine with person variables to predict performance outcomes. Based on previous evidence (Patten & White, 1977), one might speculate, for instance, that in the presence of ego-arousing cues (e.g., an explicitly stated demand for performing well), self-reported achievement orientation is more effective in accounting for performance differences than it was found to be in our present research. Moreover, as we (Schmitt & Brunstein, 2003) reported elsewhere, explicit achievement orientation may have an *indirect* effect on performance efficiency, through its influence on self-regulatory strategies (e.g., goal setting) that augment the effects of feedback and stimulate the investment of mental energy (cf. Locke & Latham, 1990; for a related argument, see Bandura, 1989). In contrast, implicit achievement tendencies, as assessed with the IAT, should be less likely to be reflected in willful, self-regulatory activities. This hypothesis merits further scrutiny in future achievement studies.

Finally, although our study adds further evidence to the published literature suggesting that implicit and explicit achievement concerns are (statistically) independent

of each other, the potential reasons for this divergence are not as clear as one might wish them to be (see Fazio & Olson, 2003). Introspective limits and self-presentational concerns associated with self-report tests may be among them (Asendorpf et al., 2002; Greenwald et al., 2002), but a growing number of researchers suggests that implicit and explicit motivational preferences do in fact represent two orthogonal motive systems (Brunstein & Hoyer, 2002; Brunstein et al., 1998; McClelland et al., 1989; Schultheiss & Brunstein, 1999; Wilson, Lindsey, & Schooler, 2000). Here, it would be fruitful to identify variables that moderate the extent to which implicit and explicit motive dispositions converge within individuals (cf. Thrash & Elliot, 2002).

In conclusion, the aim of our research was to establish evidence of the utility of an IAT-based measure of achievement-oriented motivational tendencies in the hope that this procedure will contribute to the development of a new generation of techniques capable of assessing latent motivational needs with high accuracy and validity (and with taking as little time as possible). Although the quest for such measures has begun only recently, we feel optimistic that the IAT might open up an avenue for research that will bring us closer to this objective.

Appendix A

Category labels and stimuli for the Implicit Association Test

Me	Others	Successful	Not successful
I	They	Ambitious	Idle
Me	Them	Curious	Uninterested
Myself	Their	Persistent	Sluggish
Mine	Theirs	Diligent	Distractable
		Inventive	Unimaginative
		Efficient	Inefficient
		Successful	Unsuccessful
		Competent	Incompetent

Note. The original German stimuli can be obtained from the authors by request.

Appendix B

Implicit Association Test (IAT) for the assessment of individual differences in achievement orientation

Block	1	2	3	4	5
Task description	Target discrimination	Attribute discrimination	Initial combined task	Reversed attribute discrimination	Reversed combined task
Category labels	• Me • Others	• Successful • Not successful	• Me • Successful • Others • Not successful	• Not successful • Successful	• Me • Not successful • Others • Successful
Sample stimuli	○ I ○ Me ○ They ○ Them	○ Ambitious ○ Competent ○ Idle ○ Inefficient	○ I ○ Ambitious ○ They ○ Inefficient	○ Inefficient ○ Idle ○ Competent ○ Ambitious	○ I ○ Inefficient ○ They ○ Ambitious
Trials	24	48	32 + 128	48	32 + 128

Note. Black circles indicate assignment of category labels to left and right answer keys. Open circles indicate correct responses. The schematic description of the IAT is adapted from "Measuring individual differences in implicit cognition: the Implicit Association Test," by Greenwald et al. (1998).

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