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Referential competence is associated with motivational congruence

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ABSTRACT

Schultheiss (2001, 2008) hypothesized that referential competence (RC) – stable individual differences in the ability to quickly name nonverbally represented information – should predict congruence between implicit and explicit motives. We tested this hypothesis using a color-naming task to assess RC, picture-story measures of implicit motives, and self-report measures of participants' motivational values and goals. Study 1 showed that the RC measure captures a stable individual difference by test–retest and internal consistency criteria. Studies 2 and 3 provided correlational evidence for the hypothesized association between RC and measures of between- and within-individual motivational congruence. Study 4 showed that in the absence of situationally induced referential processing, RC predicts preferences for motive-congruent goals.

1. Introduction

Research in recent years has found replicable evidence for the existence of conscious (i.e., explicit) and nonconscious (i.e., implicit) motivational systems that operate independently, influence behavior in distinct ways, and, when in conflict, lead to impaired emotional and physical well-being (e.g., Baumann, Kaschel, & Kuhl, 2005; Brunstein, Schultheiss, & Grässmann, 1998; Hofer & Chasiotis, 2003; for reviews, see Berridge & Robinson, 2003; Brunstein, 2010; McClelland, Koestner, & Weinberger, 1989; Rolls, 1999). Between-systems independence entails that some people explicitly strive for goals that are congruent with their enduring implicit motives, whereas others pursue goals that are at odds with their motives. An emerging key question in this field therefore concerns the factors that are associated with more or less congruence between implicit and explicit motivational systems (see, for instance, Baumann et al., 2005; Hofer, Busch, Chasiotis, & Kiessling, 2006; Schattke, Koestner, & Kehr, in press; Thrash, Cassidy, Maruskin, & Elliot, 2010). In the present paper, we will argue that the degree of congruence between motivational systems is due in part to stable differences in referential processing, that is, the speed with which information is exchanged between the nonverbal implicit system and the language-based explicit system.

2. Information-processing differences between implicit and explicit motivation

Extending on earlier work by McClelland et al. (1989; Weinberger & McClelland, 1990) and others (Cantor & Blanton, 1996; LeDoux, 1996, 2002; Rolls, 1999), Schultheiss (2001, 2008; see Fig. 1) has described the properties of the implicit and explicit motivation systems as follows: The implicit system is comprised of a limited number of biologically-based motives, of which the needs for power, affiliation and achievement (often abbreviated as *n* Power, *n* Affiliation, etc.) have been most thoroughly studied in humans over the past 50 years. Each implicit motive represents a relatively stable capacity to experience a particular class of incentives as pleasurable. Thus, individuals high in *n* Power get a kick out of having impact on other people, individuals high in *n* Affiliation cherish close, friendly contact with others, and individuals high in *n* Achievement experience pleasure when they master a challenging task. Implicit motives preferentially respond to nonverbal stimuli, such as facial expressions, gestures, etc. (e.g., Klinger, 1967; Schultheiss & Hale, 2007) and influence nondeclarative (i.e., procedural or autonomic) measures of motivation, such as hormone changes, cardiovascular responses, response speed on performance tasks, implicit learning, nonverbal communication, and other forms of automatic, intuitive behavior (e.g., Brunstein & Maier, 2005; McClelland, 1979; Schultheiss & Brunstein, 2002; Schultheiss et al., 2005; Stanton & Schultheiss, 2009). Thus, the implicit system is geared towards processing nonverbal information and generating automatic, incentive-driven behavior.

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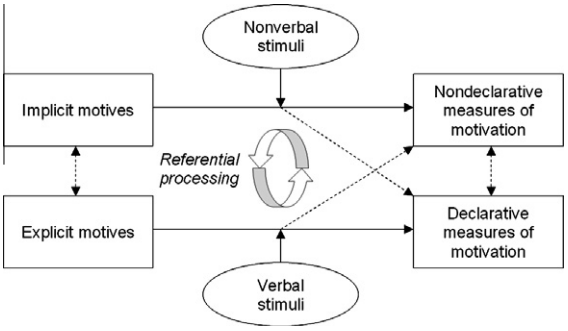

Fig. 1. Information-processing model of implicit and explicit motivation (solid lines: significant correlation/influence; dashed lines: no significant correlation/influence). Adapted with permission from Schultheiss (2008).

The explicit system, in contrast, contains individuals' stable language-based beliefs about themselves, that is, the motivational needs and values that people endorse and ascribe to themselves on questionnaire scales related to power, affiliation, or achievement. It also houses the long- and short-term goals people pursue in their daily lives, that are represented as verbal codes (e.g., "I want to get a PhD", "I want to exercise daily", "I want to spend more time with my children"), and whose content and importance partially reflects the structure of their explicit motivational values (Weinberger & McClelland, 1990). The number of different values and goals present in the explicit system can be quite large and is not inherently limited. The explicit system responds most readily to verbal incentives (such as demands, requests, suggestions) and influences declarative measures of motivation, such as people's decisions, judgments, and executive control of behavior. In summary, the explicit system is geared towards representing and processing verbal information in the service of effortful behavioral regulation.

Corroborating the validity of this two-systems model of motivation, research has consistently documented that implicit and explicit motive measures are statistically distinct and predict different kinds of outcomes in response to different kinds of incentives (e.g., Biernat, 1989; Brunstein & Hoyer, 2002; Brunstein & Maier, 2005; Brunstein & Schmitt, 2004; Craig, Koestner, & Zuroff, 1994). A meta-analysis on achievement motivation by Spangler (1992) pinpoints the core findings of these and many other studies: (1) Implicit and explicit motive measures have little variance overlap (correlations typically settle in the low positive range of $r \sim .10$; this estimate was recently replicated and extended to the domains of affiliation and power by Köllner & Schultheiss, in preparation); (2) implicit motive measures are good predictors of spontaneous, intuition-guided forms of behavior (such as making inventions or showing leadership behavior), particularly in the presence of so-called task-intrinsic incentives (a concept that has overlap with, but is less specific than, Schultheiss's, 2008, concept of nonverbal incentives); (3) explicit motive measures are good predictors of controlled and declarative forms of behavior (such as judgments, attitudes, grades), particularly in the presence of social incentives (a concept that is similar to, but less specific than, Schultheiss's, 2008, concept of verbal incentives).

3. Cross-talk between motivational systems: Referential processing

So if the implicit and the explicit motivation systems are set up to operate independently, is there any mechanism through which they can be brought into alignment? The information-processing model proposed by Schultheiss (2001, 2008) suggests that *referential processing* between the implicit and the explicit system might be such a mechanism (see Fig. 1; see also Weinberger & McClelland, 1990). Referential processing is a descriptive term for the translation of nonverbal representations into verbal ones through verbal labeling and verbal representations into nonverbal ones through mental imagery (see Marconi (1996), for a discussion of the importance of referential processing in semantic competence). It was introduced by cognitive psychologist Allan Paivio (1986), an early proponent of the now widely shared view that information is processed and stored in different codes and multiple memory systems (e.g., Poldrack et al., 2001; Squire, 2004). Paivio (1986) argued that referential processing allows information exchange between verbal and nonverbal processing systems, but that it always requires additional processing time and effort relative to processing within verbal and nonverbal systems in which the representational format remains constant. Stroop's (1935) famous color-naming task provides a good example of the cost of this between-systems cross-talk: Participants took 41 s to read 100 color names printed in black, but 63 s to name the colors of 100 rectangular patches. The 22 s difference represents the time participants needed to find the correct verbal label (e.g., "red") for the nonverbal color percept before they could recruit the same processes they needed to pronounce the word as they did in the word-reading task. Paivio, Clark, Digdon, and Bons (1989) found that the cost incurred by referential processing from words to images on color-naming and related tasks is highly correlated ($r = .71$) with the cost incurred by processing from images to words, suggesting that similar processes are involved in the translation of information in both directions.

In three experiments, Schultheiss and Brunstein (1999, 2002) tested the hypothesis that referential processing can increase congruence between implicit and explicit motivational systems by having one half of participants in each study vividly imagine the pursuit and attainment of an experimenter-assigned verbal goal and attending to their affective response to the experience, whereas the other half was engaged in control tasks that did not require translation of the same goal into mental imagery. Across all studies, goal-imagery participants' commitment to the assigned goal and their behavioral efforts aimed at attaining it were significantly predicted by their implicit motives. In contrast, among control-group participants goal commitment and implementation were not predicted by their implicit motives. These findings, which have recently been replicated by Job and Brandstätter (2009), suggest that situationally induced referential processing can transiently increase between-systems congruence and tie the commitment to and execution of explicit goals to implicit motives.

But what about the relationship between implicit and explicit levels of motivation when there is no situational context or instruction that actively promotes goal imagery to induce referential processing? Could dispositional differences in referential processing play a role in between-systems congruence, helping some people endorse motivational values and commit to goals that fit their implicit motive dispositions more reliably than others? In the present research, we were guided by the hypothesis that referential competence (RC; Bucci & Freedman, 1978), that is, stable individual differences in people's referential processing ability, facilitates the choice of goals and the self-ascription of motivational values that match individuals' implicit motives. *To be more specific, we expected individuals who are habitually quick at naming nonverbal stimuli, relative to their word-reading speed, to have better congruence between their implicit motives and their explicit values and goal commitments. Moreover, because we view referential processing as a general mechanism of between-system information exchange, we expected this effect to hold equally across different motivational domains (i.e., power, achievement, affiliation).*

4. Overview of the present research

We conducted four studies to test our hypotheses. In all studies, we assessed RC with a variant of the Stroop task in which participants read color words (written in black) and named color patches. The proper naming of colors is learned early in life (Anyan & Quillian, 1971) and represents a highly overlearned skill in adults. We therefore expected individual differences on this task to be particularly robust and diagnostically relevant for determining the efficiency of referential processing. The normalized latency difference between color-patch naming and color-word reading served as our measure of participants' RC, with smaller differences indicating higher RC. This version of the Stroop task was originally adapted by Bucci (1984; Bucci & Freedman, 1978) for the assessment of RC. Bucci (1984) found that individuals who were about as quick at naming color patches as they were at reading words used more specific, concrete, and immediate language when describing an interesting personal experience. In contrast, individuals who took a longer time to name color patches than to read color words used more general, abstract, and distanced language to describe such experiences. Bucci (1995, 1997) later demonstrated that these tell-tale signs of referential processing in language use are related to progress in psychotherapy sessions, with episodes characterized by concrete, visceral language (=high referential processing) leading to greater emotional insight and problem-solving than episodes characterized by abstract language (=low referential processing).

Study 1 was conducted to estimate the reliability of the RC. Studies 2 and 3 examined the association between RC and congruence between implicit and explicit levels of motivation cross-sectionally. Study 4 used an experimental design to test whether individual differences in RC would predict motive-congruent goal choices in the presence or absence of instructions facilitating referential processing.

5. Study 1: reliability and stability of the RC measure

In Study 1, we evaluated a computer-based adaptation of Bucci's RC measure with regard to its suitability for assessing stable individual differences in RC. To do so, we administered the RC task to US students twice, with a 2-week interval, and estimated test reliability of latency differences between color-naming and word-reading through retest correlation coefficients and internal consistency coefficients.

5.1. Method

5.1.1. Participants

One-hundred-and-six students enrolled at the University of Michigan, Ann Arbor participated for payment of $25 in a study consisting of two data collection sessions. Participants signed up in response to fliers advertising the research as a study on "attention and performance" posted on campus. Findings from this study regarding the stability of implicit motive measures were reported by Schultheiss, Liening, and Schad (2008) and findings regarding the stability of salivary hormone measures were reported by Liening, Stanton, Saini, and Schultheiss (2010). Neither set of findings has any overlap with the data reported here. Of the initial pool of participants, 19 were dropped from the analyses because they either failed to confirm that they had normal color vision ($n = 3$) or had high error rates on one or both RC assessments ($n = 16$; see below). The final data set that we used for analyses was based on 87 participants (63 women, 24 men) with a mean age of 20 years. Sixty percent of participants in the final sample self-identified as Caucasian, 28% as Asian, 6% as African–American, 3% as Pacific Islander; the remainder belonged to other or mixed ethnic groups.

5.1.2. Design and procedure

The study had a test–retest design. Testing sessions (T1 and T2) were spaced 14 days apart and for each participant time of day of the testing session was matched on both occasions. At both sessions, participants completed a test battery starting with various personality measures, followed by the assessment of RC and other cognitive tasks and the collection of saliva samples for later hormone analyses.

5.1.3. RC

RC was assessed with a computer-based version of Bucci's (1984) color-naming task programmed with DirectRT (Empirisoft Corporation, New York, USA). The task consisted of 192 trials, organized into 8 blocks. Each block featured 24 trials, resulting from a 4 (colors: red, green, blue, yellow) × 2 (stimulus type: word, color patch) × 3 (repetitions) factorial. Trial order within blocks was randomized. Stimuli were presented on a light gray background. Words were printed in 90-point Arial with black color. Color patches were sized at 5 cm × 5 cm, with pure color hues. Participants wore headsets with microphones during RC assessment and were instructed to read the words or name the colors presented on the screen as quickly and accurately as possible. On each trial, response latency was determined by measuring the time lag between stimulus onset and onset of the voice response. Stimuli remained on the screen until a voice response was made. Between trials a blank gray screen was shown for 500 ms. Examination of latency histograms for T1 and T2 indicated that latencies >1500 ms represented outliers and latencies <250 ms represented premature responses or noise artifacts, both presumably due to equipment malfunction, participant inattention, or improper microphone placement. These latency data were classified as error data (7.44% at T1 and 4.98% at T2) and dropped from the data file before further analyses. The median error rate was 7 at T1 and 5 at T2, with scores ranging from 0 to 97 (T1) and 64 (T2). Inspection of histograms of individuals' error rates suggested that the majority of participants produced less than 30 errors on the RC task. The remaining participants produced disproportionally higher error rates (>30) at either T1 or T2 and were therefore dropped from the sample.

5.2. Results and discussion

Replicating the robust difference between word-reading and color-naming latencies reported by Bucci (1984), we found participants' average latency differences for the two types of stimuli to be substantial and highly significant, $ts(86) > 27.24$, $ps < .0000005$. As shown in Table 1, average color-naming latencies were more than 100 ms slower than average words reading latencies, and no participant had average color-naming latencies that

Table 1
Descriptive statistics for the RC task (Study 1). Word reading and color-naming latencies are given in ms.

	Min.	Max.	*M*	SD	Cronbach's alpha
Time 1					
Word reading	347	655	502	59	–
Color naming	400	811	632	76	–
RC	0.0206	0.2534	0.1144	0.0345	.82
Time 2					
Word reading	362	619	491	51	–
Color naming	410	844	614	73	–
RC	0.0576	0.2305	0.1104	0.0309	.76

were shorter than her or his word-reading latencies. These findings support the notion that naming things, relative to merely reading their verbal labels, requires referential processing, that is, the retrieval of an appropriate verbal label for the perceived object (Bucci, 1984; Paivio, 1986).

What about stable individual differences in the efficiency of this process (i.e., RC)? To address this question, we calculated normalized difference scores for color-naming and word-reading latencies both for individual blocks and for the overall task according to the following formula: (color-naming latency – word-reading latency)/(color-naming latency + word-reading latency). Thus, *lower* scores on this measure reflect *higher* RC. We then calculated internal consistency coefficients across 8 blocks for each assessment and found them to be good (T1) or satisfactory (T2; see Table 1). Test–retest stability, assessed as the Pearson correlation between normalized overall difference scores at T1 and T2, was also good (see Fig. 2) and comparable in magnitude to the stability of standard tests of intelligence (see Parker, Hanson, & Hunsley, 1988). RC scores did not change significantly from T1 to T2, $t(86) = 1.73$, $p > .05$, suggesting that practice had a negligible effect on the RC measure. In summary, these findings indicate that the RC measure taps into stable and robust individual differences in the ability to quickly verbalize nonverbal stimuli.

6. Study 2: RC and motivational congruence in U.S. students

In Study 2, we put our hypothesis that high RC is associated with better motivational congruence to a first test. Motivation research in the McClelland tradition has frequently distinguished two types of constructs at the explicit level of motivation: the *goals* that people choose and pursue in their daily lives and the motivational *values* that they endorse (e.g., Hofer, Busch, Bond, Li, & Law, 2010; McClelland, 1985; McClelland et al., 1989). In this context, motivational values represent enduring, abstract, and trait-like motivational orientations that people ascribe to themselves and that guide the choice and pursuit of concrete, realizable, time-limited goals. Goals are thus closer to actual decision-making and behavior and change more frequently than values (for related arguments, see Hofer et al., 2010). To test whether RC is associated with motivational congruence, we therefore examined two types of congruence in Studies 2 and 3: *motive-goal congruence* and *motive-value congruence*. We expected congruence between individuals' implicit motives and the explicit goals they commit to and pursue in their daily lives to provide more frequent opportunities for RC to affect motivational congruence, and thus be more likely to show an association with RC, than congruence between implicit motives and abstract motivational values, although we did not rule out an effect of RC on the latter.

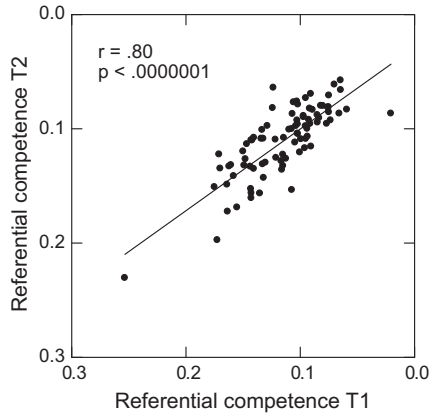

Fig. 2. Plot of the test–retest correlation between normalized RC scores at T1 and at T2 (Study 1). RC values on the *x*-axis have been reversed in this and all subsequent figures, consistent with the fact that greater color-naming-speed values (relative to word-reading speed) reflect lower RC. The correlation coefficient is attenuated to $r = .75$ if the outlier with an RC value >0.2 at T1 and T2 is removed from the dataset.

We assessed participants' implicit motives with a Picture Story Exercise (PSE; Schultheiss & Pang, 2007), their personal goal commitments with a personal goal inventory (Brunstein et al., 1998), and their motivational values with the Personality Research Form (PRF; Jackson, 1984). To determine each participant's degree of motivational congruence, we followed the lead of studies in organizational and personality psychology (e.g., Baumann et al., 2005; Kristof, 1996; Schattke et al., in press) and calculated absolute discrepancy scores between participants' implicit motives and their goal commitments (motive-goal congruence) and motivational values (motive-value congruence) separately for the domains of power, achievement, and affiliation. We then tested these scores and their average for variance overlap with the RC measure. To further examine the validity of the RC measure, we tested its overlap with a self-report measure of alexithymia, that is, the inability to recognize or verbalize one's emotions (Taylor & Bagby, 2004), and verbal fluency on the PSE.

6.1. Method

6.1.1. Participants, design, and procedure

One-hundred-and-forty-six students at the University of Michigan, Ann Arbor, USA, participated in a cross-sectional study on "attention and performance" for course credit. Of these, 103 participants were administered the RC measure, the PSE, and the personal goal inventory. One participant was dropped from the sample due to self-reported color-blindness and another 8 were dropped due to high error rates on the RC measure (see below). The final data set was based on 94 participants (51 women, 42 men, 1 person did not indicate her or his gender) with a mean age of 19 years. Sixty-eight percent of participants in the final sample self-identified as Caucasian, 23% as Asian, 4% as African–American, 3% as Pacific Islander; the remainder belonged to other or mixed ethnic groups.

6.1.2. RC

RC was measured with the same task and data cleaning was performed following the same criteria as in Study 1. 5.01% of the latency data were classified as error responses and dropped from all further analyses. The median error rate was 6. Eight participants were dropped because of high error rates (>30 errors). Cronbach's alpha for the RC measure in the final sample was .74.

6.1.3. Implicit motives

Participants worked on the 8-picture PSE used by Schultheiss, Liening et al. (2008), following standard instructions for computer administration described in Schultheiss and Pang (2007). The PSE was programmed in Inquisit 2.0 (Millisecond Software, Seattle, WA). Picture order was randomized for each participant. Each picture was shown for 10 s and then replaced by a screen with writing instructions. Participants were instructed to type their stories directly into a window on the screen. After 4 min had elapsed, a text appeared in the lower half of the screen instructing participants to finish the story and move onto the next picture, along with instructions to hit "CTRL + Enter" when they were ready to proceed. Protocol length of typed stories was determined through a utility programmed in Matlab 7.0 (MathWorks, Natick, MA).

Stories were later coded for motivational imagery by a trained scorer using Winter's (1994) *Manual for Scoring Motive Imagery in Running Text*. According to the manual, power imagery is scored when a story character shows a concern with having impact on others through strong, forceful actions, controlling, influencing,

helping, impressing or eliciting strong emotions in others. Achievement imagery is scored when a character shows a concern with a standard of excellence, as indicated by positive evaluations of goals and performances, winning or competing with others, disappointment about failure, or unique accomplishments. Affiliation-intimacy imagery is scored when a story character shows a concern with establishing, maintaining or restoring friendly relations, as expressed by positive feelings toward others, sadness about separation, affiliative activities, or friendly, nurturing acts.

The scorer had previously exceeded 85% inter-scorer agreement on calibration materials prescored by an expert that are contained in the manual. PSE protocol length ($M = 892$, $SD = 274$) was significantly correlated with participants' overall motive scores for *n* Power ($M = 5.01$, $SD = 3.02$), $r = .38$, *n* Achievement ($M = 6.59$, $SD = 3.01$), $r = .57$, and *n* Affiliation ($M = 7.10$, $SD = 3.18$), $r = .28$, all $ps < .001$. Following Winter's (1994) recommendation, we corrected for the influence of protocol length by multiplying total motive raw scores with 1000 and dividing the product by the total word count.

6.1.4. Personal goals

Participants' personal goals within the domains of affiliation, achievement, and power were assessed with Schultheiss, Jones, Davies, and Kley's (2008) adaptation of Brunstein et al's (1998) personal goal inventory. Participants were asked to generate a list of three personal goals according to the guidelines specified in the instructions. They were first told that "personal goals refer to the objectives, plans, and projects that you have pursued lately and that you intend to work on in the near future." They were then asked to list one goal for each of three striving areas: (a) "striving for affiliation and friendly social contacts" (affiliation), (b) "striving for achievement and mastery experiences" (achievement) and (c) "striving for independence, social influence, and self-reliance" (power). Each striving area was illustrated by a number of examples adopted from pilot work. All participants listed and assigned one goal to each of the three striving areas. Subsequently, they rated each goal on a 4-item scale assessing their goal commitment (e.g., "I fully identify myself with this goal"). The response scale ranged from 1 (*disagree strongly*) to 5 (*agree strongly*). To obtain goal commitment scores for each goal domain, we averaged the 4 item scores within each domain. Participants' mean (*SD*) commitment scores were 3.49 (0.85) for the affiliation goal, 4.17 (0.70) for the achievement goal, and 3.57 (0.86) for the power goal. Coefficient alphas for the 4-item commitments scales were .73 (affiliation), .74 (achievement) and .77 (power).

6.1.5. Motivational values

To assess participants' motivational values, we administered the scales for dominance (Cronbach's alpha = .77), achievement (Cronbach's alpha = .67), and affiliation (Cronbach's alpha = .73) of the PRF (Jackson, 1984). These scales capture, at the level of self-attributed motivational needs, similar motivational themes as Winter's (1994) system. Each PRF scale included 16 True/False (1/0) statements that described values, habits, and preferences consistent or inconsistent with each motive domain. Participants were asked to decide how representative each statement was as a self-description. An example of an item measuring dominance is "I feel confident when directing the activities of others", a typical achievement item is "I don't mind working while others are having fun," and a typical affiliation item is "I go out of my way to meet people". Participants' mean (*SD*) scores on the PRF were 11.57 (3.16) for affiliation, 10.39 (3.25) for achievement, and 9.77 (3.33) for dominance. Because 2 participants failed to complete the PRF, $n = 92$ for all analyses involving PRF measures.

6.1.6. Alexithymia

To assess participants' alexithymia levels, we administered the 20-item Toronto Alexiythmia Scale (TAS; Bagby, Parker, & Taylor, 1994). The scale items capture the degree to which individuals are unable to attend to, identify, or describe their emotions and feelings (e.g., "It is difficult for me to find the right words for my feelings"). Response scales ranged from 1 (*disagree strongly*) to 5 (*agree strongly*). Coefficient alpha of the TAS was .80.

6.2. Results and discussion

To create indices of motivational congruence, we first transformed PSE, goal commitment, and PRF scale scores to *z* scores. Next, we created – separately for the domains of power, achievement, and affiliation – absolute motive-goal congruence scores according to the formula: log (0.5 + |motive *z* score − goal commitment *z* score|). The purpose of the log transformation was to bring the resulting scores into closer alignment with a normal distribution and thereby avoid outlier problems in our analyses. In the same fashion, we created motive-value congruence scores. Higher scores thus indicate *lower* congruence between implicit motives on the one hand and personal goal commitments or motivational values on the other, regardless of whether low congruence is the result of implicit motives exceeding or falling short of levels on the self-report motivation measures. Conversely, lower scores indicate *higher* congruence, regardless of whether congruence results from implicit motives levels matching explicit motivation measures at low, medium, or high levels.[1] None of the six congruence measures was significantly correlated with its constituent PSE, goal commitment, or PRF measures, $rs < |.17|$, $ps > .05$.

As shown in Table 2, motive-goal congruence scores were not substantially correlated across the 3 motivational domains, but each was positively associated with RC. (Note that, because both higher congruence scores and higher RC scores indicate *less* congruence and *less* RC, respectively, positive correlations can be directly interpreted as reflecting higher RC being associated with higher congruence.) Likewise motive-value congruence scores had little overlap with each other, but correlated positively with higher RC. Repeated-measures analyses with motive-goal congruence scores for the three motivational domains as a within-subjects factor and RC scores as a between-subjects factor revealed a main effect of RC, $F(1, 92) = 9.42$, $r = .31$, $p = .003$, that was not significantly moderated by the within-subjects factor.[2] A similar analysis with motive-value congruence scores indicated that the main effect of RC approached significance, $F(1, 90) = 2.90$, $r = .18$,

[1] We also tested the suitability of multiplicative interaction terms between implicit and explicit motivation measures (e.g., implicit power motive × explicit power goal commitment) as indicators of motivational congruence. However, after they had been residualized for their constituent main effects (e.g., implicit power motive, explicit power goal commitment) and converted to log-transformed absolute values, scores derived in this way failed to reflect the degree of motivational congruence in a linear, straightforward way, as revealed by examination of distance-weighted least-squares regression surfaces in SYSTAT. We therefore decided against their use. Likewise, we decided against using moderated regression to test for RC effects of motivational congruence (e.g., by testing effects of RC x implicit power motivation on explicit power goal commitment), because the number of terms in such analyses would increase substantially (3 implicit motive variables plus RC and RC × motive interaction terms = 7 variables) and interaction terms would test for *directional* effects of implicit/explicit alignment (i.e., whether someone is low in implicit, but high in explicit motivation, as compared to someone how is high in implicit, but low in explicit motivation), whereas we were interested in the *absolute degree* to which both measures converge, not in the direction.

[2] We ascertained that RC effects on average motivational discrepancy scores remain significant even if the constituting three implicit motive variables and the three corresponding goal commitment variables are held constant; this was the case in all studies. Thus, the results we report reflect the specific effect of RC on motivational congruence, regardless of participants' basal implicit and explicit motivation measures.

Table 2
Descriptive statistics and correlations for motivational congruence scores, RC, and related constructs in Study 2.

	M	SD	1	2	3	4	5	6	7	8
Motive-goal congruence										
1. Power	0.413	0.509	–							
2. Achievement	0.358	0.547	.16	–						
3. Affiliation	0.360	0.474	.06	−.01	–					
Motive-value congruence										
4. Power	0.322	0.546	.18	−.04	.01	–				
5. Achievement	0.310	0.486	−.03	.27**	.12	−.01	–			
6. Affiliation	0.336	0.513	.03	−.06	.39***	−.05	.00	–		
7. RC	0.110	0.035	.17	.16	.24*	.11	.02	.17	–	
8. Alexithymia	51.06	12.64	.01	.01	−.01	−.02	−.09	−.03	.04	–
9. Verbal fluency	892	274	−.05	−.15	−.07	.01	−.02	.08	−.22*	−.05

Motive-goal congruence: log-transformed absolute differences scores between implicit motive scores (PSE) and goal commitment scores (personal goal inventory); motive-value congruence: log-transformed absolute differences scores between implicit motive scores (PSE) and PRF scale scores.
* $p < .05$.
** $p < .01$.
*** $p < .005$.

$p = .09$, again without significant moderation by the within-subjects factor. Thus, higher RC was associated with higher overall motive-goal congruence and, to a lesser extent, with higher overall motive-value congruence. Fig. 3 illustrates the association between the RC measure and motive-goal congruence scores. After controlling for motive-value congruence, the association between RC and motive-goal congruence remained robust, partial $r = .28$, $p = .007$. Conversely, the association between RC and motive-value congruence did not survive controlling for motive-goal congruence, partial $r = .10$, $p = .33$.

Men and women did not significantly differ in their RC scores or in their averaged congruence scores. However, the correlation between RC and motive-goal congruence scores was higher in women, $r = .48$, $p = .0004$, than in men, $r = .10$, $p = .52$ (for the gender × RC interaction, $B = -3.92$, $SE = 1.76$, $t(89) = -2.22$, $p = .03$).

These findings suggest that RC is indeed associated with higher motivational congruence, and that this is particularly the case for the fit between the personal goals that people commit to and their implicit motives. RC also appears to be associated with the match between people's implicit motives their motivational values, although this effect is weaker and vanishes once motive-goal congruence is taken into account. While this observation corroborates our assumption that motive-goal congruence may be more sensitive to variations in RC than motive-value congruence, we cannot rule out that the PRF scales we used to assess motivational values may not represent a commensurable counterpart of implicit motive measures and their suitability for the creation of congruence scores may thus be questionable (see Schultheiss, Yankova, Dirlikov, and Schad (2009), for related arguments).

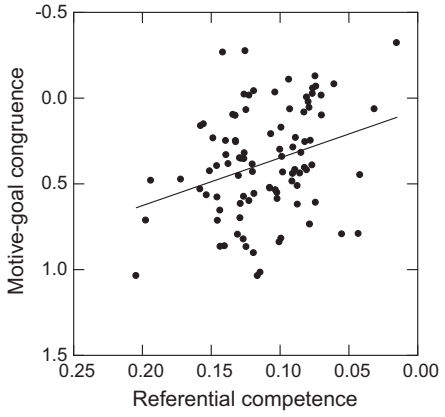

Fig. 3. Plot of the association between normalized RC and motive-goal congruence scores (Study 2). Lower scores on either scale signify better referential competence and better congruence, respectively.

Higher RC was associated with higher verbal fluency on the PSE but not with higher scores on the TAS measure of alexithymia. TAS and verbal fluency scores were not significantly correlated. We speculate that verbal fluency and RC were correlated because both represent procedural measures of the capacity to efficiently verbalize internal events (i.e., nonverbal percepts or fantasies). In contrast, the TAS represents a declarative measure of this capacity and thus taps more into people's beliefs about themselves (see Schultheiss, 2008). Neither verbal fluency nor alexithymia accounted for significant portions of variance in averaged motivational congruence measures.

7. Study 3: RC and between-individual and ipsative motivational congruence in german students

Study 3 served as a cross-cultural replication of the link between RC and between-individual variations of congruence between implicit motives and personal goal pursuits in a German sample. To examine the role of RC in the congruence between people's implicit motives and explicit motivational values, we replaced the PRF with the Picture-Story-Exercise Questionnaire (PSE-Q; Schultheiss et al., 2009) in this study. The PSE-Q is a self-report measure of motives that closely matches the PSE, and is thus commensurable with it, because it uses the same picture cues as the PSE and features items that are phrased to capture each of the content-coding categories of Winter's (1994) motive coding system (Schultheiss et al., 2009).

Using the PSE-Q allowed us to differentiate between two kinds of motive-value congruence: congruence as assessed *between individuals*, that is, by comparing individuals' normative standing on an implicit motive vis-a-vis their corresponding normative standing on a self-report motivation measure, and congruence assessed *within individuals* (i.e., ipsative congruence), that is, by examining whether a given individual's story-writing responses to different PSE pictures covary with her or his item endorsements in response to the same pictures on the PSE-Q. We hypothesized that variations in RC may not only account for the degree of normative (i.e., between-individual) motivational congruence, but also for how well individuals are able to reflect in their conscious responses to different picture cues their implicit responses to these cues. In addition, we also further explored the convergent and discriminant validity

of the RC measure by examining its variance overlap with verbal-intelligence measures.

7.1. Method

7.1.1. Participants, design, and procedure

One-hundred-and-six students at Friedrich-Alexander University, Erlangen, Germany, participated in a cross-sectional study on "attention and performance" for payment of €15. Of the initial sample, 100 participants were administered the RC task, the full PSE, PSE-Q, and the personal goal inventory. One participant was dropped from this sample due to a high error rate on the RC task (see below). The final data set that we used for analyses was based on 99 participants (49 women, 50 men) with a mean age of 23 years.

7.1.2. RC

RC was measured with the same computer-based task and data cleaning was performed following the same criteria as in Study 1. 1.3% of the latency data were classified as error responses and dropped from all further analyses. The median error rate was 3. One participant was dropped because of a high error rate (>30 errors). Cronbach's alpha for the RC task in the final sample was .90.

7.1.3. Implicit motives

The same method of assessing implicit motives was used as in Study 2, except that we used Pang and Schultheiss's (2005) 6-picture PSE. Two trained scorers coded all PSE stories blindly and independently. Interrater reliability (Pearson correlations of each participant's raw motive score) was good, with .79 for *n* Power, .74 for *n* Achievement, and .86 for *n* Affiliation. PSE protocol length ($M = 610$, $SD = 147$) was significantly correlated with participants' overall motive scores (averaged across coders) for *n* Power ($M = 4.58$, $SD = 2.34$), $r = .45$, *n* Achievement ($M = 5.17$, $SD = 2.52$), $r = .40$, and *n* Affiliation ($M = 6.63$, $SD = 2.75$), $r = .37$, all $ps < .0005$. The influence of protocol length on averaged motive scores was removed in the same way as in Study 2.

7.1.4. Personal goals

Participants' personal goals within the domains affiliation, achievement, and power were assessed with the same method as in Study 2. Participants' mean (*SD*) commitment scores were 3.86 (0.79) for affiliation goals, 4.03 (0.75) for achievement goals, and 3.77 (0.81) for power goals. Coefficient alphas for the commitment scales were .75 (affiliation), .76 (achievement) and .86 (power).

7.1.5. Motivational values

To assess participants' motivational values, we administered the PSE-Q (Schultheiss et al., 2009), using the same six picture cues as on the PSE. For each picture, 15 items, corresponding to the 15 coding categories of Winter's (1994) coding system, were presented in random order and could be endorsed on a True/False (1/0) scale. Sample items are "In this situation, I would try to persuade or convince the other person(s)" (power), "In this situation, I would try to achieve something extraordinary" (achievement), and "In this situation, I would try to share companionate activities with the other person" (affiliation). We added one item, "In this situation I would try to mentor and support the other person", to capture the power category "unsolicited help, support, and advice" in Winter's (1994) system; this was not included in Schultheiss et al's (2009) original item list. Scores for each of the 15 items were summed across the 6 pictures. Coefficient alphas for these aggregated items were .61 for the power scale (6 items), .83 for the achievement scale (5 items), and .64 for the affiliation scale (4 items). For between-subjects analyses, item scores were summed to create overall scale scores for each motive domain. Sample mean (SD) scores were 16.18 (4.74) for power, 19.83 (5.04) for achievement, and 9.82 (3.36) for affiliation. For within-individual (i.e., ipsative) analyses, power, achievement, and affiliation scores for each motive were calculated by summing up the corresponding scale items per picture.

7.1.6. Verbal intelligence

Verbal intelligence was measured with two tests, the Verbal Creativity Test (VCT; Verbaler Kreativitätstest, Schoppe, 1975) and the Word-Picture Test (WPT; Wort-Bild-Test WBT 10+, Anger, Mertesdorf, Wegner, & Wülfing, 1971). We used two subtasks from the VCT to assess verbal fluency under timed conditions by instructing participants to write down different words starting with the German prefixes "Ver.." and "De.." or ending with the German suffixes "...los" and "...ing". Participants had 90 s to come up with words for each pre- and suffix. To arrive at a total score, we summed up the number of valid words participants had generated across subtasks. Schoppe (1975) reports test–retest reliability coefficients of .72 and .52 for the prefix and suffix tasks, respectively.

We assessed participants' picture-naming ability with the WPT (form A), a 45-item test that requires participants to assign each of 45 words to one of four pictures according to its fit with the contents of the depicted scene. The four pictures showed (1) a train compartment with passengers, (2) a movie theater, (3) a soccer game, and (4) two men at a table. The correct assignment for a word like "frenetic", for instance, was the picture with the soccer game. We summed participants' correct responses to all 45 items to arrive at an overall score. The authors report a split-half reliability of .92 for this test.

7.2. Results and discussion

We created indices of motivational congruence following the same procedures as in Study 2. None of the resulting six between-individual congruence measures (3 motive-goal, 3 motive-value) was significantly correlated with its constituent PSE, goal commitment, or PSE-Q measures, $rs < |.18|$, $ps > .05$. An RC × Domain (power, achievement, affiliation) analysis revealed a significant main effect of RC on motive-goal congruence, $F(1, 97) = 5.14$, $r = .22$, $p = .03$, that was not significantly moderated by domain. (After dropping a participant with an atypical RC value indicating faster color naming than word reading, the effect became stronger, $F(1, 96) = 6.07$, $r = .24$, $p = .02$.) As depicted in Fig. 4, better RC was associated with overall better between-individual congruence in the full sample. This effect was not moderated by gender.

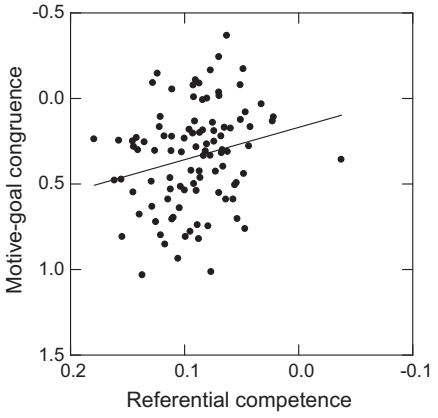

Fig. 4. Plot of the association between normalized RC and motive-goal congruence scores (Study 3). Lower scores on either scale signify better referential competence and better congruence, respectively.

A similar analysis for motive-value congruence showed no significant effect of RC, $F(1, 97) = 0.52$, $p = .47$, $r = .07$, despite the fact that average motive-goal and average motive-value congruence scores were significantly and positively correlated, $r = .22$, $p = .03$. Including gender as a moderator had no significant effect on these findings.

To obtain within-individual (i.e., ipsative) motive-value congruence scores, we first created for each PSE picture motive scores from which the effect of story length for the picture was removed by regression and the residuals were transformed to *z* scores. We also created *z* scores for each motive-scale score per picture on the PSE-Q. In this manner, the sample-level effect of each picture on implicit (PSE) and explicit (PSE-Q) motive scores was removed and participants' scores represented individual variations in responses to picture cues *above and beyond the sample's average response to the picture* (and, in the case of PSE motive scores, story length). Next, we computed for each participant and each motive domain ipsative Pearson correlations between PSE and PSE-Q scores based on six pictures. This procedure captures the degree of ipsative profile similarity between PSE and PSE-Q (Furr, 2010). Ipsative correlation coefficients were subjected to an *r*-to-*z*′ transformation for all further analyses. Within each domain, none of the resulting three ipsative correlation measures was significantly correlated with participants' overall PSE or PSE-Q motive scores, $rs < |.17|$, $ps > .05$.

As shown in Table 3, ipsative motive-value congruence was positive and significantly different from 0 for power and affiliation, but not for achievement. When we averaged all three ipsative congruence coefficients, the resulting mean *z*′ was .121 ($r = .120$), $t(98) = 3.33$, $p = .001$, suggesting a reliable but low degree of convergence between participants' story-writing and item-endorsement responses to picture cues. Higher ipsative achievement motive congruence (as indexed by *higher* z'ed correlation coefficients) was significantly associated with higher RC (as indexed by a *lower* difference between color naming and word reading). After removing a participant with an atypical RC value indicating faster color naming than word reading (see Fig. 4), average ipsative congruence was not directly associated with RC scores, $r = -.13$, $p = .20$, or gender, $t(96) = -0.49$, $p = .60$, but was significantly affected by the interaction of these variables, $B = -5.05$, $SE = 2.20$, $t(94) = -2.29$, $p = .02$. In women, better RC was associated with higher ipsative congruence, $r = -.38$, $p = .007$; this was not the case in men, $r = .08$, $p = .60$ (see Fig. 5).

Average ipsative correlations (*z*′) were not significantly associated with between-subjects motive-goal congruence scores, $r = -.04$, $p = .72$, or motive-value congruence scores, $r = .04$, $p = .69$. This finding indicates that whether someone's normative standing on implicit motive measures matches her or his normative standing on goal or value measures or not says little about whether this person shows similar profiles of responding to picture cues at the implicit and explicit level and vice versa (for related findings and arguments, see Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005; Thrash et al., 2010). In other words, people can be high in one, both, or neither of normative and ipsative motivational congruence with equal likelihood, which suggests that the two types of congruence represent different kinds of between-systems alignment that deserve careful exploration in future research (see also Thrash et al., 2010). But for this reason, we also think it is remarkable that the RC measure predicts both types of congruence, suggesting that high RC helps individuals both gauge their overall level of implicit motivation accurately (as reflected in motive-congruent goal commitments) and having insight into their idiosyncratic motivational responses to various situations (as reflected in ipsative motive-value congruence).

None of the verbal-intelligence measures accounted for reliable portions of variance in RC scores (see Table 3) or in our averaged normative or ipsative measures of motivational congruence, all $rs < |.17|$, $ps > .05$. These findings suggest that the RC measure captures individual differences in a fundamental translation process between nonverbal and verbal representations that is uniquely involved in the alignment between the implicit and the explicit motivation system, distinct from verbal fluency (PSE, VCT), and considerably broader and more basic than the ability to find the best fit between a word and an array of complex nonverbal context cues (WPT).

Table 3
Descriptive statistics and correlations for between-individual and within-individual motivational congruence scores, RC, and related constructs in Study 3.

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
Between-individual motive-goal congruence															
1. Power	0.424	0.569	–												
2. Achievement	0.305	0.548	−.01	–											
3. Affiliation	0.294	0.521	−.05	−.12	–										
Between-individual motive-value congruence															
4. Power	0.223	0.504	.26**	.18	−.03	–									
5. Achievement	0.369	0.494	.14	.11	−.06	.34***	–								
6. Affiliation	0.335	0.500	.09	.05	−.04	.09	.15	–							
Within-individual motive-value correlations															
7. Power	0.150†	0.597	−.03	−.19	.12	−.13	−.02	.05	–						
8. Achievement	0.082	0.644	−.02	.18	−.26*	.11	.18	−.02	−.08	–					
9. Affiliation	0.134†	0.617	.04	−.03	.08	−.00	−.03	−.01	.12	.01	–				
10. RC	0.091	0.035	.13	.12	.12	.10	−.09	.14	.05	−.21*	.02	–			
11. Verbal fluency (PSE)	610	147	−.07	−.03	−.02	.03	−.09	−.20*	−.09	.02	−.04	.06	–		
12. Verbal fluency (VCT)	34.45	13.33	.00	−.05	−.02	−.19	−.11	−.05	.03	.07	−.03	−.02	.10	–	
13. Picture naming (WPT)	35.86	4.01	.07	−.10	−.14	−.09	.10	−.11	.04	−.06	−.10	−.17	.11	.42***	–

One-sample *t*-test of *r*-to-*z*′ transformed within-individual correlations against population mean of zero. Between-individual motive-goal congruence: log-transformed absolute differences scores between implicit motive scores (PSE) and goal commitment scores (personal goal inventory); between-individual motive-value congruence: log-transformed absolute differences scores between implicit motive scores (PSE) and PSE-Q scale scores; within-individual motive-value congruence: *r*-to-*z*′ transformed ipsative Pearson correlations between profiles of PSE story-writing responses and PSE-Q item endorsements across picture cues.

* $p < .05$.

** $p < .01$.

*** $p < .005$.

† $p < .05$.

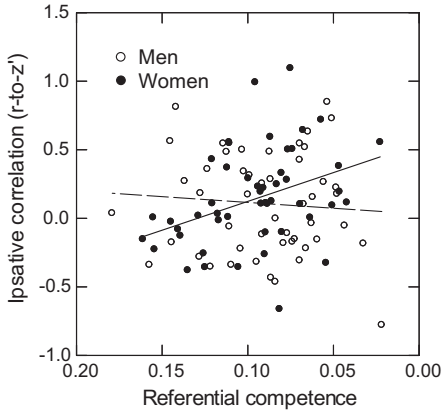

Fig. 5. Plot of the association between normalized RC, gender, and within-individual (i.e., ipsative) motive-value correlation scores (Study 3). Lower scores on the RC scale signifies better referential competence and higher ipsative correlations reflect better within-individual congruence. An outlier with an RC value <0 has been removed from the dataset.

8. Study 4: effects of RC and goal imagery on motive-congruent goal preferences

Although Studies 2 and 3 provided evidence for a replicable association between RC and motive-goal congruence, findings were correlational and thereby allow for other interpretations besides that of a causal influence of RC on motivational congruence. In Study 4, we therefore aimed at demonstrating that high RC is a precursor rather than a consequence of motive-congruent goal preferences. We also compared the effects of dispositionally high or low referential processing (i.e., RC) with situationally induced referential processing by experimentally manipulating whether participants imagined the pursuit of a potential goal with a focus on how they responded affectively to it (affect-focus condition, based on Schultheiss & Brunstein, 1999, and Job & Brandstätter, 2009), whether they pondered how well it would fit their view of their own self (self-focus condition), or decided without further reflecting about the goal (control condition). We expected affect-focused goal imagery, due to its general stimulating effect on referential processing, to enable everyone to choose goals in accordance with their implicit motives, regardless of variations in RC. For self-focus and control-group participants, on the other hand, we expected motive-congruent goal preferences to depend on individual differences in referential processing, with high-RC individuals being more likely to prefer goals congruent with their motives than low-RC individuals.

8.1. Method

8.1.1. Participants

Sixty-seven students recruited at Friedrich-Alexander University, Erlangen, Germany, participated voluntarily in a study on "goal striving". Two participants had to be dropped from the sample due to high error rates on the RC task (see below), leaving 65 students (32 women) with a mean age of 24 years in the final sample.

8.1.2. Design and procedure

The study had an aptitude-treatment-interaction design, with RC as the measured between-subjects aptitude factor and a treatment factor with three levels to which participants were randomly assigned (affect focus, $n = 24$; self focus, $n = 22$; control group, $n = 19$). Dependent variables were motive-congruent preferences for achievement and affiliation goals.

Participants first completed the PSE and the RC task, then a goal preference task and a biographical questionnaire. Then they were thanked and debriefed.

8.1.3. Implicit motives

The same method of assessing implicit motives was used as in Study 3. Two trained scorers coded all PSE stories blindly and independently. Interrater reliability (Pearson correlations of each participant's raw motive scores) was excellent, with .91 for achievement and .93 for affiliation motive scores. Scores averaged across coders were used in all further analyses. PSE protocol length ($M = 534$, $SD = 164$) was significantly correlated with participants' overall motive scores for the domains of achievement ($M = 4.33$, $SD = 2.39$), $r = .28$, and affiliation ($M = 5.35$, $SD = 2.99$), $r = .41$, $ps < .05$. The influence of protocol length on motive scores was removed in the same way as in Study 2.

8.1.4. RC

RC was measured with the same computer-based task and data cleaning was performed following the same criteria as in Study 1. 8.43% of the latency data were classified as error responses and dropped from all further analyses. The median error rate was 11. One participant was dropped because of a high error rate (>40 errors). Cronbach's alpha for the RC task in the final sample was .75, the mean (SD) of RC scores was 0.103 (0.037).

8.1.5. Goal preference task

The goal preference task was presented to participants as an opportunity to help volunteer organizations with a focus on environmental and social issues to gauge the attractiveness of typical goals within their organizations for potential new members. Participants were instructed to look at each goal in turn and judge how much they would like to commit to and pursue it using a 4-point scale ranging from "definitely not" (1) to "definitely" (4). The four achievement goals were: "I would like to optimize the organization's homepage," "I would like to take care of finances and whip them into shape," "I would like to contribute to scientific projects that aim at reducing pollution," and "I would like to acquire new skills and optimize existing skills by becoming an organization member." The four affiliation goals were: "I would like to volunteer in a home for elderly people and spend time with people who have no family," "I would like to make sure that organization members get to know and support each other personally," "I would like to share activities with other members (e.g., excursions)," and "I would like to help new members become integrated in the organization quickly."

In the affect-focus condition, participants were instructed to vividly imagine pursuing each goal and paying attention to their affective responses to this self-generated goal imagery. They were asked to write down in two to three sentences their thoughts and feelings when imagining the pursuit of the goal before entering their rating. This was done to ensure that they actually processed the goal in the required manner before indicating their preference. In the self-focus condition, they were asked to think about to what extent the goal would fit the kind of person they would ideally like to be. Here too they were asked to write down their thoughts about each goal in two to three sentences before rating the goal. In the control condition, participants simply rated each goal immediately after it appeared on the screen.

8.2. Results and discussion

Goal preference ratings were first averaged and converted to z scores within the domains of achievement and affiliation. We then created motive-goal congruence scores following the same procedures as in the previous two studies. Congruence score means

(SDs) were 0.328 (0.529) for achievement and 0.385 (0.461) for affiliation. Congruence scores were not significantly correlated with their constituent PSE or goal preference measures, $rs < |.09|$, $ps > .05$. Because we had specifically hypothesized that self-focus and control conditions would be equivalent with regard to the effect of RC on motive-goal congruence, we ran a regression in which we dichotomized experimental condition into a combined control condition (self-focus + control group) and an affect-focus condition. The RC × Condition interaction was significant, $B = -5.48$, $SE = 2.51$, $t(61) = -2.18$, $p = .03$, indicating that the effect of RC on congruence scores in the control conditions differed reliably from that in the affect-focus condition. The within-subjects factor did not significantly moderate this finding, $p > .10$. As predicted, RC did not significantly influence motive-goal congruence in the affect-focus condition, $r(24) = -.26$, $p = .23$, which was aimed at facilitating referential processing in all participants through the explicit instruction to imagine the pursuit of the goal and attend to affective responses to this scenario. In contrast, in the combined control conditions, higher RC significantly predicted higher congruence, $r(41) = .32$, $p = .04$. To illustrate these findings, we averaged achievement and affiliation congruence scores and plotted them as a function of experimental condition and RC (see Fig. 6). Although, as predicted, participants in the affect-focus condition had better motivational congruence ($M = 0.29$, $SD = 0.29$) than participants in the combined control conditions ($M = 0.40$, $SD = 0.39$), the effect did not become significant by itself, $t(63) = -1.22$, $p = .23$, or after holding RC constant, $t(62) = -1.48$, $p = .14$. None of these results were moderated by gender.

The results of this study thus support our hypotheses by showing that (a) variations in the RC measure are a precursor of motive-congruent goal choices, rather than a concomitant or consequence, and (b) dispositional RC effects emerge in the absence of situationally induced referential processing, but not when such processing is actively promoted through the strategic use of goal imagery instructions.

9. General discussion

The present research tested the hypothesis that RC, that is, the degree to which a person can efficiently translate information from nonverbal to verbal representation formats and vice versa, predicts the degree of congruence between implicit and explicit motivation systems, which process information in nonverbal and verbal formats, respectively (Schultheiss, 2001, 2008). Our findings support the validity of this hypothesis. Study 1 provided evidence that individual differences in and overall levels of RC, as assessed by the difference between color-naming and word-reading speed, remain robustly similar over time, establishing that the RC task represents a stable measure of dispositional differences in efficient referential processing. All studies moreover showed that the RC task has good internal consistency, which is remarkable given the procedural nature of this measure. Studies 2 through 4 provided replicable evidence for a role of RC in motivational congruence. Studies 2 and 3 established for US and German samples, respectively, that higher RC is associated with better motive-goal congruence regardless of motivational domain. Study 4 moreover demonstrated that RC predicts motivational congruence of de novo goal preferences in situations that do not actively promote referential processing, thereby establishing that high RC is a precursor, not a consequence of motive-congruent goals.

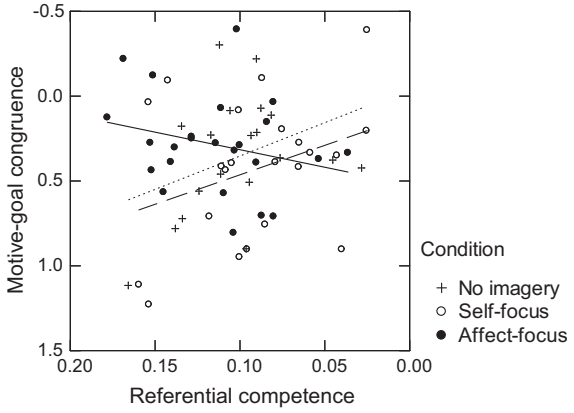

Fig. 6. Plot of the effect of goal imagery on the association between normalized RC and motive-goal congruence scores (Study 4). Lower scores on either scale signify better referential competence and better congruence, respectively. Affect-focus: solid line; self-focus: striped line; no imagery: dotted line.

To gauge the overall size of the effect of RC on motive-goal congruence, we *r*-to-*z*′-transformed the correlation coefficients reported for RC scores and averaged motive-goal discrepancy scores in Studies 2 through 4 (considering only participants in the two control groups in Study 4). The sample-size-weighted average Pearson correlation between RC and motive-goal congruence was .275 ($N = 234$), which suggests that the effect we observed was of medium size (see Cohen, 1992).

We also explored the association between RC and motive-value congruence in Studies 2 and 3. Although better RC was correlated with more motivational congruence in both studies, the effect was only marginally significant in Study 2 and nonsignificant at the between-individual in Study 3. As we have pointed out above, the choice of motive-congruent goals may be more susceptible to effects of RC than the degree to which motivational values reflect a person's implicit motives, because the motivational values people ascribe to themselves represent deeply engrained, enduring beliefs about themselves, whereas goals are frequently formed and pursued, thus providing more opportunities for individual differences in referential processing to influence the goal-formation process and hence motivational congruence.

Another possible explanation for weaker RC effects on the congruence between implicit and explicit motives may be a variant of the forest-for-the-trees problem. Perhaps people have difficulties making explicit judgments about the overall strength of their motivational needs vis-à-vis those of other people, but can accurately track *relative changes* in their needs from one situation to the next, regardless of their perceived absolute strength (for related arguments, see Mauss et al., 2005; Thrash et al., 2010) Evidence for the validity of this latter proposition comes from Study 3's finding that individuals' judgments about the likelihood of motivated behavior from one situation to the next as assessed on the PSE-Q indeed shows a slight but significant degree of convergence with variations in story-writing responses to the same situational cues on the PSE, which is the basis for the assessment of implicit motives. Even more importantly, higher RC was associated with higher within-individual motive-value congruence (as reflected in higher ipsative correlations between the PSE and the PSE-Q) in the domain of achievement and, after averaging ipsative correlations across domains, RC was associated with higher overall motive-value congruence among women. Thus, these findings demonstrated that RC is not only associated with better congruence between the relative strength of individuals' goal commitments and implicit motives vis-à-vis other members of their sample, but also with better conscious insight into which situational contexts are motivationally more appealing for the individual and which are less so.

Unexpectedly, we identified gender as a possible moderator of the role of RC in motivational congruence. In Study 2, the association between RC and motive-goal congruence was stronger in women than in men; in Study 3, the association between RC and

ipsative congruence between motives and values was stronger in women, too. However, we did not observe main effects of gender on either RC or motivational congruence measures in any study. Thus, although women do not have higher RC or better motivational congruence than men, RC may be related more strongly to motivational congruence in women than in men. Further research is needed to examine the robustness of this gender difference and the factors that give rise to it (e.g., differences in information processing styles and their relation to motivational processes).

Like in earlier research by Bucci and Freedman (1978), the RC measure turned out to be distinct from measures of verbal intelligence and verbal fluency (Studies 2 and 3). This is not surprising if one keeps in mind that being "good with words" in Western cultures and many others is synonymous with verbosity, using sophisticated words, understanding word types, etc. It does *not* usually mean the efficiency and accuracy with which words are used to represent and describe tangible perceptual, visceral, emotional experiences. As Paivio (1986) and Bucci (1997) have pointed out, the verbal system is capable of relatively self-contained and complex symbolic processing without necessarily having to relate to nonverbal representations at all. The exception to this is, of course, fictional and poetic literature, in which words are frequently used with great art and precision to conjure up in the reader's mind another person's feelings and perceptions. Ironically, this narrative, referential quality of language is both one of its oldest functions and the one most frequently omitted in standard measures of verbal ability and intelligence (see Bucci & Freedman, 1978, for related arguments).

RC also did not have substantial overlap with a self-report measure of alexithymia, which may be due to the limited validity of measures that attempt to use introspection to identify the limits of introspection. As research by Bucci (1995, 1997) documents, however, fluctuations in referential processing are associated with emotional insight and progress in psychotherapy, which suggests that RC may still be related to the *construct* of alexithymia as originally described by psychotherapists (Sifneos, 1973). Also, because RC encompasses symbolization of other kinds of nonverbal representations besides emotions, RC is a broader concept than alexithymia, and this may also limit the degree to which it should overlap with measures of alexithymia.

10. Limitations and future directions

Our approach to RC assessment in the present research was based on the notion that simple naming tasks provide direct measures of individual variations in the efficiency of referential processing (Bucci, 1997, p. 192) and on earlier research that has established the color-naming/word-reading task as a valid measure of RC (Bucci, 1984; Bucci & Freedman, 1978). Still, our reliance on only one measure of RC limits the generalizability of our findings. Future studies could therefore add content-coding (Bucci & Kabasakalian-McKay, 1992) or computer-based analysis (Mergenthaler & Bucci, 1999) of spoken or written narratives as additional measures of RC. Moreover, latency-based naming tasks for other types of material (e.g., geometric shapes, facial expressions) could be developed and their convergent validity with our present measure of RC examined. Finally, efficient referential processing may not only be manifested in greater speed of between-system translations, but also in their superior accuracy and specificity. This suggests that RC could also be assessed with tasks that gauge participants' ability to find the most apt and exact verbal labels for complex objects quickly.

Furthermore, although Study 4 showed that RC represents a precondition for motive-congruent goal choices to occur, RC itself was not manipulated and more work is therefore needed to bolster the status of RC as a causal force in motivational congruence. We think that it would be a very fruitful line of inquiry to identify the factors that increase or decrease RC. Does creative or expressive writing lead to transient or lasting increases in RC (see Pennebaker, 1997)? Does reading fiction and poetry help train RC? And which conditions lead to impaired RC? Could stress have a general deleterious effect on RC (see Gilbertson et al., 2006) or is RC particularly compromised under conditions of social evaluation and the imposition of contingencies of worth on a person (Rogers, 1961)? We believe that answering these and related questions empirically could turn out to be helpful for a better understanding of the forces that lead to salubrious coherence or pathogenic fragmentation of the elements of personality.

Finally, motivational congruence is influenced by other factors besides RC, such as action orientation, self-determination, or the successful mastery of developmental challenges (see Thrash et al. (2010), for a review). RC differs from these moderators of motivational congruence in that it is assessed procedurally and does not rely on introspective self-access. We have not examined RC's convergence with other moderators of motivational congruence in the present research, and it therefore remains to be seen to what extent RC overlaps with these moderators or is distinct from them.

11. Conclusion

To conclude, the present research provides evidence for a role of RC, stable individual variations of the fundamental human ability of verbalizing nonverbal experience, in the degree to which individuals' explicit goal commitments and motivational values reflect the strength of their implicit motives. Our hypotheses and findings are based on well-established multiple-system models of information processing in cognitive science (e.g., Paivio, 1986; Squire, 2004) and their extension to motivation research (Schultheiss, 2001, 2008; Weinberger & McClelland, 1990). They complement earlier research that has established beneficial effects of situationally induced referential processing on motive-congruent goal commitment and pursuit (Schultheiss & Brunstein, 1999, 2002). Together with these earlier studies, the results of the present research validate the distinction between nonverbal and verbal information processing in implicit and explicit motivation, respectively, and underscore the critical role of referential processing in bringing both levels of motivation into alignment.

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