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3	Robinson, Meier, & Vargas, in press-b. Any update?	
4	There were 73 (28 male and 45 female) participants in Study 1, 80 (29 male and 51 female) participants in Study 2, and 60 (15 male & 45 female) participants in Study 3. Should these not be labelled 2, 3 and 4 here?	
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Trait Self-report as a "fill in" Belief System: Categorization Speed Moderates the Extraversion/ Life Satisfaction Relation

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The present studies pursue the premise that self-reported traits such as extraversion can be viewed in terms of beliefs about the self that may be used as a default, particularly when encoding skills are poor. Encoding skills were measured by several choice reaction time tasks. Study 1 supported the hypothesis that individual differences in categorization speed predict abilities to assign self-relevant meaning to events as they occur. Studies 2–4, involving 213 undergraduates, sought to build on this foundation in the context of potential interactions between categorization speed and trait extraversion in the prediction of life satisfaction. As hypothesized, the trait of extraversion predicted reports of life satisfaction particularly among slow categorizers; among fast categorizers, such relations did not occur. The results in total suggest that individuals differ in their episodic encoding abilities and that trait/ outcome relations (at least as measured by self-report) might be somewhat particular to those who lack an ability to assign meaning to events as they occur.

Life can be represented in molecular or molar terms. From the molecular standpoint, life is a constant flux of new events. One wakes up refreshed or tired; one's hair cooperates or not; daily social interactions are pleasing or unsatisfying; etc. From such a perspective, life is defined by the particular events that comprise it. On the other hand, life can also be represented in relatively molar terms. One's occupation, social relationships, and habits can be characterized by certain continuities that tend to remain somewhat stable over time. One develops a representation of self that emphasizes these longer-term generalities (Klein, Loftus, & Kihlstrom, 1996). For example, the extravert develops beliefs about the self that are quite stable and quite different from those of the introvert (McCrae & Costa, 1994). From this more molar perspective, life does not change much (McCrae & Costa, 1994).

A premise of some of our prior work is that molecular and molar representations of life are relatively independent from each other (Robinson & Clore, 2002a, 2002b; Robinson, Vargas, & Crawford, 2003a). That is, the *episodic* (i.e., event-specific) self is a different creature to the *semantic* (i.e., event-independent) self (see also

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Klein et al.,1996). Because these forms of self-representation are independent, they can often diverge from each other (Robinson & Clore, 2002a, 2002b). Expressed in other terms, beliefs about the self, constituting a semantic source of self-knowledge, may or may not correspond to momentary experiences (Robinson & Clore, 2002a, 2002b; Robinson et al., 2003a).

Trait as Default

Most relevant to the present predictions are a series of accessibility principles governing the use of episodic and semantic knowledge (Robinson & Clore, 2002a, 2002b). Episodic knowledge, particular to time, place, and event, is far more specific than semantic knowledge is. Because episodic knowledge is more useful with respect to the particulars of life, individuals will tend to base their judgments on this source of knowledge to the extent that they can. However, there are factors that render episodic knowledge relatively inaccessible. For example, episodic knowledge decays rapidly with time (Tulving, 1984). Therefore, in making retrospective (relative to online) reports of emotion, it will be difficult to recall the particulars involved (Robinson & Clore, 2002a, 2002b). Other factors also render episodic knowledge relatively less accessible, as the present findings will show. The important point here is that when episodic knowledge is relatively inaccessible, people will "default" to a semantic or belief-based mode of judgment (Robinson & Clore, 2002a, 2002b). Some recent studies are consistent with this framework (e.g., Robinson, Solberg, Vargas, & Tamir, 2003b; Tamir, Robinson, & Clore, 2002).

Semantic sources of self-knowledge include a variety of inputs such as social stereotypes (e.g., gender stereotypes: Barrett, Robin, Pietromonaco, & Eyssell, 1998), cultural beliefs (e.g., beliefs about happiness: Oishi, 2002), and consensual ideas concerning particular events (e.g., vacations are good: Mitchell, Thompson, Peterson, & Cronk, 1997). More important for present purposes, however, is the contention that self-reported traits can also be viewed in terms of semantic sources of self-knowledge (Klein et al., 1996; Robinson & Clore, 2002a, 2002b; Robinson et al., 2003a). Indeed, Klein et al. (1996) found that an amnesic patient could make reliable and valid trait reports about herself despite a complete inability to recall any specific facts from the recent past. Such results converge with those from reaction time paradigms (Klein et al., 1996; Robinson & Clore, 2002b).

The present work examines a new direction for this (Robinson & Clore, 2002a, 2002b) episodic/semantic model. Specifically, it is reasonable to think that individuals differ in their capacity to attach meaning to current events. Some individuals will be skilled at making episodic distinctions. Among such individuals, beliefs about the self may be relatively inconsequential, inasmuch as such beliefs should be discarded when one has event-specific information with respect to the judgment at hand (Robinson & Clore, 2002a, 2002b). On the other hand, other individuals may be relatively incapable of categorizing life events at encoding. Among the latter group of individuals, beliefs about the self should be particularly consequential, inasmuch as such individuals receive relatively less information about life in a bottom-up manner. The present studies sought to support this theoretical framework within the context of the extraversion/life satisfaction (LS) relationship.

Extraversion and Life Satisfaction

Among the most important personality correlates of LS are extraversion and neuroticism (Diener, Suh, Lucas, & Smith, 1999). Of particular relevance here, extraverts

frequently report being more satisfied with their lives than introverts. Such an association could occur for a variety of reasons and indeed different authors have emphasized different reasons. A number of authors have suggested that extraverts are temperamentally (i.e., genetically) inclined to make positive evaluations of their lives (McCrae & Costa, 1994). Other authors have suggested that extraverts, relative to introverts, may seek more social interaction, which in turn may be associated with subjective well-being (Watson, Wiese, Vaidya, & Tellegen, 1999). Finally, some authors have suggested that extraverts seek and react to pleasure (Lucas & Diener, 2001), which accounts for their higher subjective well-being (SWB) relative to introverts.

Our point in focusing on the extraversion/LS relationship is not to invalidate these prior frameworks, particularly as we did not measure the proposed mediating variables (i.e., temperament, social interaction, or pleasure seeking). Rather, our point in focusing on this relationship is to suggest that a trait-as-belief perspective (Robinson & Clore, 2002a, 2002b) may have considerable explanatory value at least with reference to relations among self-reported variables. According to the trait-as-belief perspective, trait self-reports represent, among other things, beliefs about the self (e.g., Robinson et al., 2003b; Tamir et al., 2002). Within the context of extraversion, extraverts *believe* that they are particularly satisfied with life, whereas introverts believe that they are typically less satisfied with life (Robinson & Clore, 2002a; Robinson et al., 2003b).

Such extraversion-linked beliefs may or may not be accessed in reporting on levels of LS. To the extent that the person is relatively skilled at categorizing events as they occur, extraversion may be less consequential (i.e., bottom-up path). On the other hand, to the extent that the person is relatively unskilled in categorizing events, the trait-linked beliefs related to extraversion may be more consequential (i.e., top-down path). In other words, it may be that the extraversion/LS association is somewhat particular to those incapable of categorizing events during encoding.

We should be clear that this framework pertains to self-reported variables (e.g., self-reported extraversion & LS) in particular. Our framework has no obvious relevance to the wider correlates of the extraversion construct (e.g., levels of cortical arousal). With this caveat in mind, it is also important to note that many investigations concerning the correlates of extraversion make heavy use of self-report. Our framework is potentially relevant to such investigations. To examine our predictions, we needed a measure of episodic encoding skills. We reasoned that such skills could be assessed through choice reaction time performance.

Individual Differences in Choice Reaction Time

The choice reaction time task has a long and venerable history within cognitive psychology (Donders, 1868/ 1969; for a more recent review, see Sanders, 1998). The task appears to be quite valid in examining a diversity of cognitive processes such as those related to attention (Klein, 2000), priming (Neely, 1991), response compatibility (Kornblum, Hasbroucq, & Osman, 1990), and attitude accessibility (Fazio, 1995). We have also used choice tasks extensively within prior studies of individual differences in cognition (for reviews, see Robinson, 2004; Robinson et al., 2003a).

The choice reaction time task seemed suited to examining episodic encoding skills, here defined as those responsible for assigning meaning to events as they occur. Within the choice reaction time task, events are equivalent to stimuli. Prior to the appearance of each trial stimulus, the participant has no indication of the meaning of this event, specifically because stimuli are randomly selected and thus equally likely

to pertain to one category (e.g., pleasant meaning) or the other (e.g., unpleasant meaning). Subsequent to the appearance of the stimulus, the task measures the length of time necessary to determine the category-related meaning of the specific event. Performance in the choice task would therefore seem to relate to the ability to assign meaning to events in bottom-up, event-specific fashion (Posner, 1978; Sanders, 1998).

To this prior literature (e.g., Posner, 1978; Sanders, 1998), we add the speculation that individual differences in choice reaction time should assess individual differences in episodic encoding abilities. Specifically, we reasoned that fast categorizers are those who are more capable of assigning meaning to events in a bottom-up manner and that slow categorizers are less capable of doing so. Although there are few prior investigations along these specific lines, the basic idea is consistent with research showing that old-aged (Salthouse, 2000), low-IQ (Jensen, 1998), and brain-damaged (Baumeister, 1998) individuals are slower to assign meaning to stimuli within choice tasks. In other words, fast categorization speed taps abilities, often known as fluid intelligence, that vary across individuals and are responsible for assigning meaning to novel events (Jensen, 1998).

In evaluating our suggestion that episodic encoding abilities can be measured in terms of categorization speed, several caveats are useful. One, it should be clear that categorization performance relates to encoding operations and not to the qualities of consciousness associated with memory retrieval (Rajaram, 1993). Two, it is clear that episodic encoding abilities could be assessed in a number of ways. For example, such abilities could potentially be measured in terms of the extent to which one's judgments agree with experts (Wilson & Schooler, 1991) or the level of specificity in written protocols (Blagov & Singer, 2004). It is somewhat unclear whether the present measure of encoding abilities would correlate with alternative ways of assessing such abilities. This is an important issue for future research. Regardless, however, the present measure builds on our previous work related to individual differences in choice reaction time (Robinson, 2004; Robinson & Neighbors, in press), some of which has been supportive of predictions of the present type (e.g., Robinson et al., 2003a).

In relation to the predictions at hand, we follow the assumption that episodic and semantic sources of knowledge tend to trade off in their influence on self-report (Robinson & Clore, 2002a, 2002b). Therefore, if categorization speed taps abilities related to assigning meaning to events, then categorization speed might reasonably interact with extraversion in predicting self-reports of LS. This was the specific focus and rationale of the present studies.

Overview of Studies

Our primary hypotheses were based on the idea that categorization speed taps individual differences in the ability to assign meaning to events as they occur, whether self-relevant or not. To make a better case for this assumption, Study 1 examined relations between categorization speed and performance in a second task designed to measure self-relevant processing. We expected fast categorizers to perform better in the self-relevant processing task.

Armed with some, albeit not extensive, validity data, we then sought to examine our primary predictions. Participants in Studies 2–4 either completed heterogeneous choice tasks (Studies 2 & 3) or a Stroop task (Study 4) designed to measure encoding abilities. We then examined potential interactions between categorization speed and

the trait of extraversion in the prediction of LS judgments. This constant empirical focus allowed us to make stronger claims concerning the reliability of the phenomenon. In addition, this empirical focus seemed useful given suggestions that LS judgments often reflect a combination of bottom-up and top-down influences (e.g., Diener et al., 1999).

We predicted that bottom-up (i.e., event-to-judgment) influences would be more important among fast categorizers, who are more capable of assigning meaning to events as they occur. By contrast, we predicted that top-down (i.e., trait-to-judgment) influences would be more important among slow categorizers. Putting these two sets of predictions together, we hypothesized that extraversion and categorization speed would interact in the prediction of LS judgments, such that higher relations would be observed among slow categorizers.

Study 1

The idea that categorization speed reflects the speed of mental processes, such as the assignment of meaning, is beyond dispute within the cognitive literature (Posner, 1978; Sanders, 1998). However, individual differences in reaction time have been the focus of a smaller number of studies, especially in relation to variables such as LS (Robinson & Neighbors, in press). Accordingly, we viewed it worthwhile to conduct (1) an initial study examining possible relations between categorization speed and self-relevant processing abilities in another task.

Specifically, we examined relations between choice RT performance and a task designed to tap self-relevant processing (Robinson, Meier, & Solberg, in press-a; (2) Robinson, Meier, & Vargas, in press-b; Tamir et al., 2002). The latter task is a go/no (3) go task in which participants, within separate blocks, are asked to press the spacebar in response to *wanted* (e.g., love), *unwanted* (e.g., pain), and *neutral* (e.g., sound) objects. The divergent procedures related to go/no go and choice tasks should help rule against methodological factors in the interpretation of the results. We predicted that individual differences in categorization speed, in heterogeneous choice tasks, would correlate with self-relevant processing abilities in the go/no go task.

Method

Participants and Procedures

Participants were 56 (24 male and 32 female) undergraduates from the University of Illinois. Participant sex did not moderate the effects reported below, $ps > .15$. We did not collect ethnicity information in this sample, but undergraduates at this institution are over 90% Caucasian. Participants completed a first implicit task based on go/no go performance. Participants then completed a second implicit task based on choice reaction time performance. Both tasks were completed within a single assessment session.

Measures

Categorization speed. One task involved heterogeneous choice distinctions. Participants were asked to categorize relevant objects in terms of four distinctions: feminine (e.g., *gentle*) versus masculine (e.g., *competitive*), vegetable (e.g., *broccoli*) versus fruit (e.g., *banana*), me (e.g., *mine*) versus not me (e.g., *them*), and unpleasant

(e.g., *cancer*) versus pleasant (e.g., *kiss*). These tasks are quite heterogeneous, which is useful in measuring general (i.e., task-invariant) categorization speed abilities. Trials were blocked by task and there were 252 trials in all. General instructions encouraged both speed and accuracy in performance.

Participants were instructed to press the 1 or 9 keys at the top of the keyboard in order to categorize each stimulus. In order to aid the participant in his/her choices, category endpoints (e.g., vegetable versus fruit) were presented to the left (1 key response) and right (9 key response) during the course of the trials. Each trial began with the random selection of one stimulus word from the relevant block list, which was presented in the center of the computer screen. Timing began with the appearance of this central word. Although all tasks were designed to be fairly easy, we penalized errors as is common in the cognitive literature. Participants received a visual "Error!" message following incorrect responses. This error message was presented for 1500 ms. There was a 150 ms blank screen in between trials.

In scoring reaction time performance, we deleted inaccurate trials (M accuracy = 95.50%). Trial reaction times were then log-transformed to reduce the skew typical of reaction-time distributions. Subsequent to this, we sought to lessen the impact of outliers by replacing log latencies 2.5 *SD*s above and below the grand latency mean with these cutoff values (2.91% of trials). We then simply averaged across outlier-replaced log latencies to score individual differences in categorization speed. Lower scores reflect a faster speed of categorization.

There are large and robust individual differences in reaction time regardless of the task under consideration (Baumeister, 1998; Jensen, 1998). Accordingly, we expected categorization speed to be a very reliable individual difference. To assess the reliability of categorization speed, we computed log latency means for odd versus even trials, separately for each participant. We then correlated these split-half estimates of categorization speed. The odd–even correlation was $r = .96$, $p < .01$. Thus, categorization speed is a very reliable individual difference measure.

We sought to supplement such evidence for reliability with a second procedure for estimating reliability. Specifically, we obtained four log-latency means for each participant, one for each of the categorical distinctions. We then computed an alpha coefficient across the four scores. Alpha was .89, again suggesting that categorization speed is a very reliable individual difference variable, even when computed across different tasks.

Want/don't want task. Participants also completed a go/no go task designed to examine abilities to link personal goals to relevant stimuli. There were three blocks within the task. In the first block, participants were told to press the spacebar if a word was *desirable* or *wanted* by the self (relevant words: friendship, gifts, happiness, love, praise, reward, and success). In the second block, participants were told to press the spacebar if a word was *undesirable* or *not wanted* by the self (words: conflict, criticism, failure, insult, pain, punishment, and ridicule). In the third block, participants were told to press the spacebar in response to *neutral* words—that is, those that are neither desirable nor undesirable (words: afternoon, collection, definition, geology, situation, sound, and window). Within all blocks, participants were asked to refrain from pressing the spacebar in response to non-matching words for the task at hand (e.g., pain in the *want* block).

Within each of the three blocks, there were 126 trials. Every trial began with the random selection of one of the 21 words identified above. Because only seven of the 21 words were specifically relevant to the task at hand, participants, overall, should

tend to press the spacebar 33% of the time and refrain from pressing the spacebar 67% of the time. To allow for non-responses and also make the task somewhat difficult, we removed words within 600 ms if no response was registered. There was a 250 ms blank interval between trials to help prepare the participant for the next trial. In order to support the speeded nature of the procedures, we did not penalize errors within this task.

To score task performance, we sought to characterize both accuracy and speed. Accuracy rates were computed separately depending on the block in question and whether the trial involved a task-matching stimulus (e.g., pain in the *don't want* block) or a task-mismatching stimulus (e.g., love in the *don't want* block). To compute reaction time performance within the task, we retained only the task-matching trials, also referred to as "go" trials (i.e., trials on which the person should respond). Furthermore, we deleted non-responses on go trials, which were obviously not associated with reaction times. Because of the time-limited nature of this paradigm, outliers were non-existent. Therefore, we simply averaged across go response times, separately for each of the three blocks.

Results

Categorization speed (derived from the choice RT task) did not correlate with "no go" accuracy rates, ps $> .50$. We did not expect any such correlations, which relate to non-responses. However, categorization speed correlated significantly with "go" accuracy rates within the want block (M accuracy $= 81.46\%$), $r = -.39$, $p < .01$, and the don't want block (M accuracy $= 76.11\%$), $r = -.28$, $p < .05$, but not within the neutral block (M accuracy $= 56.01\%$), $r = -.23$, $p < .10$.

To more definitively determine if these findings are somewhat specific to the want and don't want blocks, we created two residual scores by removing shared variance with go accuracy rates in the neutral block. With this shared variance removed, categorization speed correlated significantly with the residual score pertaining to the want block, $r = -.34$, $p < .01$, but not with the residual score pertaining to the don't want block, $r = -.21$, $p < .15$. Overall, the findings indicate that fast (versus slow) categorizers were somewhat more skilled in linking their personal goals to events as they occur, here defined in terms of go accuracy rates.

We then examined go reaction times. categorization speed was positively correlated with go speed in the want block (M time $= 461$ ms), $r = .47$, $p < .01$, and the don't want block (M time $= 479$ ms), $r = .34$, $p < .05$, but not in the neutral block (M time $= 501$ ms), $r = .17$, $p > .21$. Therefore, categorization speed appeared to have some particular relevance to linking the self's desires—whether wanted or not wanted—to stimuli in a quick manner. To reinforce this conclusion, we created residual want and don't want scores by removing baseline speed, here defined in terms of speed within the neutral block. Categorization speed correlated significantly with both want, $r = .42$, $p < .01$, and don't want, $r = .31$, $p < .05$, residual scores.

Discussion

Categorization speed was a very reliable individual difference, whether examined in terms of split-half performance or performance across different tasks. This comports with other data in the literature (e.g., Baumeister, 1998; Jensen, 1998). We predicted that categorization speed would relate to abilities to assign self-relevant meaning to

events as they occur. To examine this prediction, we also administered a second task designed to tap self-relevant processing. The latter task (versus that assessing categorization speed) was different in nature. For example, it related to personal likes and dislikes, used go/no go procedures, and had a short (i.e., 600 ms) timeout window. Despite the different procedures, we were able to establish associations across the two different tasks. Fast, relative to slow, categorizers tended to be more accurate in recognizing self-relevant "go" stimuli and this was particularly the case for *desirable* or *wanted* objects.

Moreover, fast categorizers, as determined by their choice RT performance, were also faster to recognize go stimuli associated with *desirable* (e.g., love) and *undesirable* (e.g., pain) objects in the go/no go task. The latter effects were not exclusive to general speed per se, as fast categorizers displayed particular acuity in linking meaning to desired and undesired objects relative to neutral ones. In sum, the data from Study 1 help to support the premise that choice RT speed, computed across diverse tasks, has particular relevance to linking self-relevant meaning to stimuli. In making this statement, we recognize that a broader class of correlates would be desirable and we encourage such work in the future. However, for now, we note that our primarily purpose was to examine a more general theory related to the fill-in function of trait self-beliefs among poor (i.e., slow) categorizers.

Studies 2, 3, and 4

Although the specific categorization tasks and measures of LS varied across Studies 2–4, all studies made the same predictions. Specifically, we hypothesized that extraversion and categorization speed would interact with each other in predicting LS. Owing to the similar nature of these studies, we present them together rather than separately.

Method

Participants

The first two studies were conducted at the University of Illinois, whereas the third was conducted at North Dakota State University. All studies involved undergraduate student volunteers. There were 73 (28 male and 45 female) participants in Study 1, 80 (29 male and 51 female) participants in Study 2, and 60 (15 male and 45 female) participants in Study 3. Participant sex did not moderate the interaction effects reported below, all $ps > .10$. The ethnicity of all samples was approximately 95% Caucasian.

Procedure

Study 2 was conducted in a single assessment session. Participants completed the categorization task and then the LS and extraversion measures, in that order. In Studies 3 and 4, we sought to institute a temporal delay between the collection of the independent and dependent variables. In a first session within both studies, participants performed the categorization task and then self-reported on their levels of extraversion. In both studies, there was a two-week delay followed by a second laboratory session. In the second session, we measured life domain satisfaction.

Measures

Categorization tasks. Participants in Study 2 were asked to categorize relevant objects in terms of six distinctions: blameworthy (e.g., *malpractice*) versus not blameworthy (e.g., *baldness*), unpleasant (e.g., *cancer*) versus pleasant (e.g., *sunset*), threat (e.g., *gun*) versus non-threat (e.g., *mildew*), neutral (e.g., *string*) versus positive (e.g., *kiss*), animal (e.g., *mouse*) versus non-animal (e.g., *chalk*), and neutral (e.g., *couch*) versus negative (e.g., *dirt*). There were 44 trials within each block, for a total of 264 trials.

Study 3 also involved heterogeneous choice tasks. Participants were asked to categorize relevant objects in terms of seven distinctions: not animal (e.g., *chalk*) versus animal (e.g., *mouse*), unpleasant (e.g., *cancer*) versus pleasant (e.g., *sunset*), blameworthy (e.g., *malpractice*) versus not blameworthy (e.g., *baldness*), threat (e.g., *gun*) versus non-threat (e.g., *mildew*), neutral (e.g., *string*) versus positive (e.g., *kiss*), not intense (e.g., *whisper*) versus intense (e.g., *shout*), and neutral (e.g., *couch*) versus negative (e.g., *dirt*). There were 328 trials in this study.

In contrast to both of the prior studies, participants in Study 4 completed a Stroop-based categorization task. Specifically, they were asked to categorize letter strings as green or red in font color as quickly and accurately as possible. There were six stimuli in the task, created by crossing three letter strings (the word *green*, the word *red*, or the letter string *xxx*) with the two font colors. There were 252 trials.

Participants were instructed to be quick and accurate in all studies. As in Study 1, each block within each study involved the random selection of a stimulus, which was presented in the center of the computer screen. Participants were instructed to determine if the stimulus matched the left (1 key) or right (9 key) categories specific to that block. Category labels were presented to the left (e.g., green) and right (e.g., red) of the screen to aid in the response mapping process. Although all tasks were designed to be fairly easy, participants also received a visual "Error!" message following incorrect responses. This error message was presented for 1500 ms in Studies 2 and 3 and for 2000 ms in Study 4. There was a short blank delay in-between trials (150 ms in Studies 2 and 3, and 500 ms in Study 4).

Scoring categorization speed. All tasks were fairly easy as accuracy rates were 96.03%, 94.09%, and 97.80% in Studies 2, 3, and 4, respectively. For purposes of scoring reaction time, we followed the procedures reported in Study 1. Such procedures involved deleting incorrect responses, log-transforming millisecond values, and replacing 2.5 *SD* outliers (resulting in the replacement of 2–3% of the log latencies in Studies 2–4).

To score categorization speed, we simply averaged across trials. To compute the internal reliability of categorization speed, we repeated the above procedures separately for odd and even trials of the choice tasks. We then correlated these independent estimates of categorization speed and found correlations of .97, .97, and .98 in Studies 2, 3, and 4, respectively. As another way of examining the internal reliability of categorization speed, we computed an alpha across different block means, which was possible in Studies 2 and 3, but not in Study 4. Alphas were .93 and .94 in Studies 2 and 3, respectively. Overall, then, categorization speed is a very reliable individual difference, regardless of the specific tasks under consideration.

Extraversion. Extraversion was measured by Goldberg's (1999) 10-item extraversion scale. This scale was designed to tap the broad trait of extraversion and not its

specific facets (e.g., social dominance, positive affect, preference for stimulation, etc.). Participants in all studies were asked to decide the extent (1 = *very inaccurate*; 5 = *very accurate*) to which statements indicative of low (e.g., *have little to say*) and high (e.g., *am the life of the party*) levels of extraversion are generally true of the self. After reverse-scoring five of the 10 items, we averaged across items to quantify levels of introversion–extraversion (alphas = .88–.92 across studies).

Given that Goldberg's (1999) extraversion scale is a relatively recent addition to the literature, it is useful to say more about it. Goldberg's scale correlates highly with alternative measures of extraversion. For example, Goldberg's scale correlates at $r = .79$ with extraversion as measured by the NEO-PI (Costa & McCrae, 1992); the correlation rises to $r = .88$ when the two measures are corrected for unreliability (Goldberg, 1999). The scale is as reliable as any scale and more reliable than some (alpha = .87: Goldberg, 1999). The scale also has predictive validity (Goldberg, 1999), for example with reference to peer and teacher reports of extraversion among adolescents (Baker, Victor, Chambers, & Halverson, 2004), sexual behaviors (Heaven, Crocker, Edwards, Preston, Ward, & Woodbridge, 2003), and positive affect prior to and following mood inductions (Lucas & Baird, 2004).

Satisfaction with life. Participants in Study 2 reported on their satisfaction with life using the Satisfaction With Life Scale (SWLS: Diener, Emmons, Larsen, & Griffin, 1985). The scale involves disagreeing or agreeing (1 = *strongly agree*; 7 = *strongly agree*) with five statements indicative of high levels of LS (e.g., *I am satisfied with my life*). A good deal of prior research attests to the reliability and validity of the scale (e.g., Pavot & Diener, 1993). In the present study, alpha was .80.

We sought a more contextual measure of LS in Studies 3 and 4. To this end, we asked participants to report on their satisfaction (1 = *very dissatisfied*; 6 = *very satisfied*) with ten important life domains during the previous week (domains: appearance, classes, family, finances, friends, grades, health, love life, possessions, and self). LS is often assessed in this manner (Diener et al., 1999). We averaged across life domains to score generalized tendencies to be satisfied with life (alphas = .87 and .89 in Studies 2 and 3, respectively).

Traits are remarkably stable over time (McCrae & Costa, 1994), whereas this is less true of LS measures (Pavot & Diener, 1993). In addition, LS measures are sensitive to both bottom-up (i.e., event-related) and top-down (i.e., trait-related) sources of influence, whereas this is less true in relation to self-reported traits (Pavot & Diener, 1993). Finally, we note that the LS measure in Studies 3 and 4 was a relatively episodic one. For all of these reasons, our hypotheses relate to interactions between speed and extraversion rather than to interactions between speed and LS.

Results

Correlations Among Measures

We expected extraversion and categorization speed to interact in predicting LS ratings. Before examining this hypothesis, we sought to examine correlations among the three measures. In all studies, categorization speed was uncorrelated with extraversion, $|r|$s $< .20$, ps $> .20$, or LS, $|r|$s $< .20$, ps $> .10$. Extraversion was positively correlated with LS in all studies, but this correlation was only significant in Study 3 (Study 2: $r = .17$, $p = .15$; Study 3: $r = .24$, $p = .02$; Study 4: $r = .19$, $p = .11$).

The size of the latter correlations is consistent with previous research (DeNeve & Cooper, 1998).

Main Analyses

To examine our interactive hypothesis, we *z* scored extraversion and categorization speed and then computed an interaction term by multiplying these *z* scores. We then entered Extraversion, Speed, and the Extraversion × Speed interaction term simultaneously in predicting LS (Aiken & West, 1991). We performed one regression for each study.

In Study 2, there was no main effect for Extraversion, $t(1, 69) = 1.28$, $p > .20$, $\beta = .15$, or Speed, $t(1, 69) = -1.35$, $p > .15$, $\beta = -.16$, but there was an Extraversion × Speed interaction, $t(1, 69) = 2.01$, $p < .05$, $\beta = .23$. In Study 3, there was a main effect for Extraversion, $t(1, 76) = 2.91$, $p < .01$, $\beta = .28$, no main effect for Speed, $t(1, 76) = -0.55$, $p > 50$, $\beta = -.05$, but again a significant Extraversion × Speed interaction, $t(1, 76) = 2.70$, $p < .01$, $\beta = .27$. In Study 4, there were neither main effects for Extraversion, $t(1, 56) = 0.84$, $p > .40$, $\beta = .11$, nor Speed, $t(1, 56) = 1.30$, $p > .20$, $\beta = .17$, but there was an Extraversion × Speed interaction, $t(1, 56) = 2.20$, $p < .05$, $\beta = .28$. The Extraversion × Speed interaction was thus replicated within three separate studies.

To understand the nature of the Extraversion × Speed interactions, we used the regression equations to estimate means for those low (−1 *SD*) and high (+1 *SD*) in each of the components of the interaction (Aiken & West, 1991). As shown in Figures 1 (Study 2), 2 (Study 3), and 3 (Study 4), the interactions were parallel in the sense that the relation between extraversion and LS was pronounced among slow categorizers, but minimal among fast categorizers. This aspect of the interactions is consistent with our hypothesis of a "fill-in" role for extraversion in the absence of online appraisal skills.

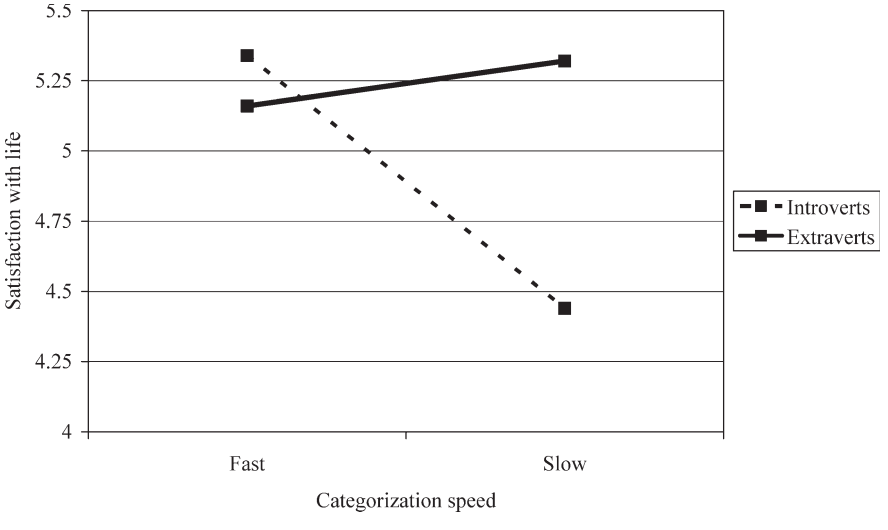

FIGURE 1 Satisfaction with life as a function of the extraversion by categorization speed interaction, Study 2.

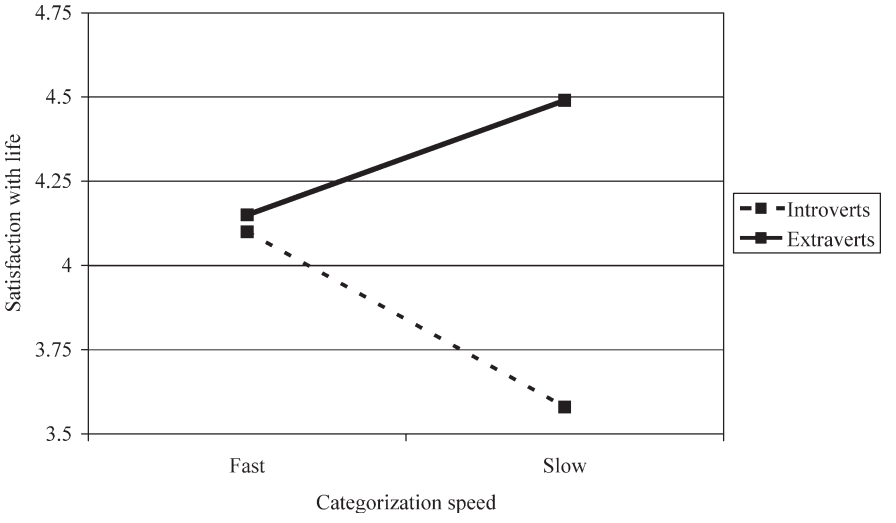

FIGURE 2 Satisfaction with life as a function of the extraversion by categorization speed interaction, Study 3.

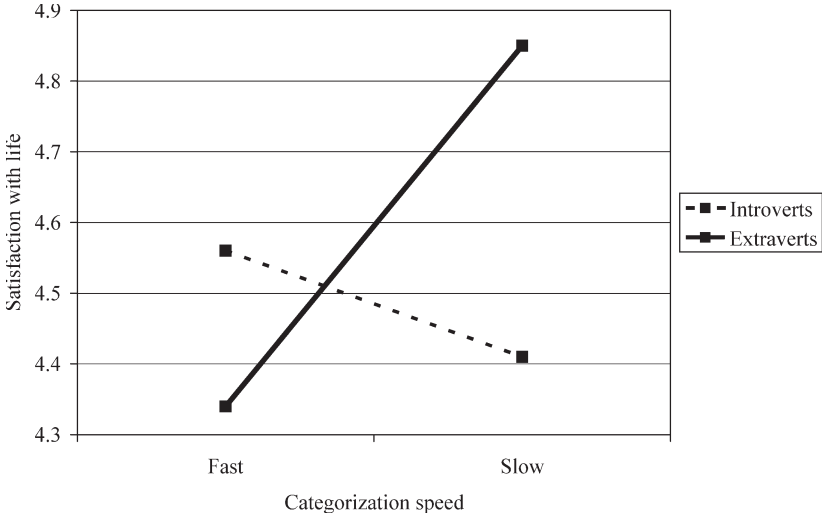

FIGURE 3 Satisfaction with life as a function of the extraversion by categorization speed interaction, Study 4.

To further probe the significant interactions, we conducted simple slopes analyses by examining the impact of extraversion at each level of categorization speed (-1 SD = fast; $+1$ SD = slow). There was no relation between extraversion and LS ratings among fast categorizers, $t(1, 69) = -0.45$, $p > .65$, $\beta = -.08$ in Study 2, $t(1, 76) = 0.24$, $p > .80$, $\beta = .03$ in Study 3, and $t(1, 56) = -1.11$, $p > .25$, $\beta = -.22$ in Study 4. By contrast, all studies found such a relation among slow categorizers, $t(1, 69) = 2.51$, $p < .05$, $\beta = .38$ in Study 2, $t(1, 76) = 3.60$, $p < .01$, $\beta = .54$ in Study 3, and $t(1, 56) = 2.22$, $p < .05$, $\beta = .43$ in Study 4. Such results support the "fill-in" predictions that guided the investigation.

Meta-Analysis

We sought to conduct a meta-analysis to examine three questions:

1. The precise nature of the interaction, in Studies 2–4, varied a bit from study to study. For example, the effects of categorization speed appeared stronger among introverts in Study 2 and extraverts in Study 4. We sought to determine, in a meta-analysis, whether such apparent differences from study to study were meaningful or not.
2. It was somewhat notable that extraversion did not predict LS ratings among fast categorizers. Although this was true in each study considered alone, it could be that such a relation would emerge given the larger sample size characteristic of a meta-analysis.
3. We sought to examine the simple slopes involving Speed at a given level of Extraversion. With the added power of a meta-analysis, we were hopeful that we could show that categorization speed had opposite implications (i.e., opposite simple slopes) among introverts versus extraverts.

Prior to merging data sets from the three studies, we first z scored each of the variables—extraversion, categorization speed, and LS—separately within each study. This is an important first step as the specific measures of categorization speed and LS varied somewhat from study to study. Subsequent to merging the files, we computed the Extraversion × Categorization speed interaction by multiplying these z scores. For the sake of establishing the generality of the findings, we finally added two dummy codes to represent the Study variable (i.e., which particular study the participant came from).

Within a first multiple regression, we sought to examine whether the nature of the Extraversion × Speed interaction varied by study. To this end, we performed a simultaneous multiple regression predicting LS levels. Within this regression, we entered main effects for Extraversion, Speed, the two Study dummy codes, as well as two- and three-way interactions among these variables. Within this regression, there was a significant main effect for Extraversion as well as an Extraversion × Speed interaction (see below). All other predictors, including those pertaining to the Study dummy codes, were not significant, ps $> .25$. Thus, results did not vary by study.

Within a second multiple regression, we dropped the Study dummy codes, specifically entering Extraversion, Speed, and the Extraversion × Speed interaction in the predicting of LS. Within this regression, there was a main effect for Extraversion, $t(1, 209) = 3.15$, $p < .01$, $\beta = .20$, no main effect for Speed, $t(1, 209) = -0.78$, $p > .40$, $\beta = -.05$, and a significant Extraversion × Speed interaction, $t(1, 209) = 3.75$, $p < .01$, $\beta = .24$.

We used the latter regression equation to predict z scored LS levels among those low (-1 *SD*) and high ($+1$ *SD*) in each of the interaction variables. Among fast categorizers, those low in extraversion (estimated $M = 0.08$) reported LS levels that were quite comparable to those high in extraversion (estimated $M = 0.01$). By contrast, among slow categorizers, individuals high in extraversion reported LS levels (estimated $M = 0.38$) that were quite a bit higher than those low in extraversion (estimated $M = -0.48$). These meta-analytic results thus replicate the prior interactions reported in the paper. Indeed, among fast categorizers, relations between extraversion and LS were minimal and non-significant, $t(1, 209) = -0.39$, $p > .65$. By contrast, among slow categorizers, the relationship between extraversion

and LS was quite robust, $t(1, 209) = 4.78$, $p < .01$. In sum, even with the added power of a meta-analysis, there was no hint of a relation between extraversion and LS among fast categorizers.

Perhaps more important, the added power of the meta-analysis allowed us to examine the effects of speed at a given level of extraversion. Our hypothesis might predict that extraverts would report *higher* LS levels if they were slow (versus fast) within the choice RT tasks. Indeed, this was the case within the meta-analysis, $t(1, 209) = 1.99$, $p < .05$. By contrast, our hypothesis might predict that introverts would report *lower* LS levels if they were slow (versus fast) within the choice RT tasks. This simple slope was also significant, $t(1, 209) = -3.31$, $p < .01$. In sum, the meta-analysis offers data in support of the idea that levels of extraversion "fill in" given slow categorization speed. Such a fill-in pattern is associated with opposite implications for LS among slow extraverts versus slow introverts.

Discussion

Studies 2–4 differed in a number of important ways. The categorization tasks varied across studies, thus insuring that the results reported here are not particular to any one categorization task or set of tasks. Given that categorization speed was very reliable, it appears that there are general abilities associated with fast or slow assignment of meaning regardless of the specific tasks. The LS measures also varied across studies. Regardless of whether LS was measured in a relatively global (Study 2) or domain-specific (Studies 3 and 4) fashion, similar results were found. Finally, it is useful to point out that Extraversion × Speed interactions were obtained regardless of whether all measures were collected within one session (Study 2) or temporally separated by two weeks (Studies 3 and 4).

General Discussion

Summary of Findings

Robinson and Clore (2002a, 2002b) suggested that most subjective well-being judgments can be made in either a bottom-up (i.e., event-to-judgment) or top-down (i.e., trait-to-judgment) manner. This framework has been productive in a number of studies (e.g., Robinson et al., 2003b; Tamir et al., 2002). However, no study to date has evaluated the central premise that guided the present studies, namely that individuals differ in their reliance on bottom-up versus top-down routes to judgment. There is evidence that individuals appear to use event-specific or episodic information when it is available and generalized or semantic information when it is not (Robinson & Clore, 2002a, 2002b). Thus, we predicted that individuals less capable of assigning meaning to specific events would exhibit a stronger reliance on trait-related sources of self-knowledge.

To evaluate this theory, we needed a measure of individual differences in encoding abilities. We reasoned that various choice reaction time tasks should tap such abilities in that such tasks assess the speed of attributing meaning to events as they occur. We speculated that such individual differences in speed would predict similar abilities to derive self-relevant meaning from everyday life. Study 1 provided some, albeit preliminary, support for this assumption in that faster categorizers were

better able to determine the personal desirability or undesirability of events in a second (go/no go) task that has been linked to the accessibility of goals and attitudes in previous research (e.g., Tamir et al., 2002).

Studies 2–4 then tested the central prediction of the studies, namely that trait extraversion should be more predictive of LS judgments among slow categorizers. As hypothesized, relations between extraversion and LS were strong among slow categorizers, consistent with the idea of a top-down route to judgment. By contrast, relations between extraversion and LS were non-existent among fast categorizers, consistent with the idea of a bottom-up route to judgment. A meta-analysis of these studies reinforced and extended such conclusions. The findings have implications for our understanding of the manner in which self-reported extraversion predicts outcomes.

A Trait-as-Belief Theory of Extraversion

We recently proposed a theory of extraversion (and neuroticism) that is cognitive in nature (e.g., Robinson & Clore, 2002a), therefore departing somewhat from the biological theories that tend to dominate this area (e.g., Eysenck, 1967; Gray, 1987). Specifically, we suggested that extraversion, *at least measured in terms of self-report*, calls for generalizations about the self's experiences of positive emotion. If so, extraversion, as typically measured, may be tapping beliefs about the self's positive emotions.

This extraversion = belief perspective has been generative in recent studies of affective processing and judgment. For example, viewing self-reports of extraversion in terms of beliefs helps to explain some prior data indicating that extraverts (relative to introverts) sometimes overestimate their prior experiences of positive emotion, relative to their actual (online) experiences (reviewed in Robinson & Clore, 2002a). Such a perspective also allows us to understand recent data showing that extraversion predicts the degree to which making one positive emotion judgment speeds making another positive emotion judgment (Robinson & Neighbors, in press). Such priming-related results suggest that that extraversion correlates with the organization and structure of positive emotional knowledge concerning the self (Robinson & Clore, 2002a). (1)

Furthermore, the extraversion = belief theory allows for generalized beliefs about the self to mismatch momentary emotional experiences, which in turn should have consequences for affective processing. Specifically, when semantic beliefs about the self mismatch current mood states (i.e., an unhappy extravert or a happy introvert), we should expect some degree of affective knowledge conflict, which should result in delayed evaluations concerning personal preferences. Recent studies, built on the logic of the trait = belief perspective, have confirmed such predictions (Tamir & Robinson, 2004; Tamir et al., 2002).

Finally, the extraversion = belief perspective specifically predicts the interactions reported in Studies 2–4. That is, we were able to predict semantic infusion effects related to extraversion on the basis of the tradeoff between episodic and semantic sources of self-knowledge. Self-reports of extraversion predicted LS ratings specifically among individuals with poor episodic encoding abilities, which seems quite consistent with the extraversion = belief perspective that motivated the investigation (Robinson & Clore, 2002a). We therefore offer the trait-as-belief perspective as one that can complement, but not replace, other perspectives on extraversion/outcome relations.

Other Trait–Outcome Relations

It is worth considering the broader potential moderating role of categorization speed with respect to other trait/outcome relations. Fortunately, we found a similar interactive pattern in a recent investigation of relations between neuroticism and somatic symptom complaints (Robinson & Clore, 2005). Consistent with the present model and data, we found that the neuroticism/somatic complaint relationship was exaggerated among slow categorizers (Robinson & Clore, 2005). Indeed, there was no such relation among fast categorizers. Such additional results point to the wider generality of the present model. However, clearly more work along these lines would be useful.

Indeed, the present work included only one trait and one self-reported dependent measure. Although other work indicates that the present interactive framework may have a wider degree of applicability (Robinson & Clore, 2005), it is also true that all studies of this type have focused on self-reported dependent measures. We suggest that it may be of interest to extend this framework to the prediction of trait-related behaviors. For example, it is feasible, although totally unproven, that extraversion and categorization speed may interact in the prediction of extraverted behaviors (e.g., tendencies to socialize, smile, and laugh). Similarly, it might be that categorization speed moderates other trait/behavior relations such as those related to agreeableness and aggression or conscientiousness and excellence in work performance. Broadly speaking, it seems plausible that categorization speed taps a focus on the present, specific events of one's life and may, for this reason, render generalized beliefs concerning the self (i.e., self-reported traits) less influential (Robinson & Clore, 2002a).

Limitations and Future Directions

The present contribution, both in terms of theory and results, pertains somewhat exclusively to self-report. Therefore, our data can neither support nor contradict the possibility that extraversion is a wider construct associated with other outcome measures such as cortical arousal, social behavior, or informant reports of happiness. Our exclusive reliance on self-reports of extraversion and LS simply renders us somewhat incapable of making wider conclusions concerning the correlates of extraversion that are not self-reported in nature.

Even within the context of self-report, however, there are also some unanswered questions. We have not shown, for example, that categorization speed and extraversion interact in the prediction of momentary experiences of positive emotion. Somewhat speculatively, we would suggest that the present interactive framework has implications for momentary experiences and behavior (for some initial evidence along these lines, see Robinson et al., 2003b). However, we have not shown this here. Research on belief-based contributions to momentary experience and behavior can be specifically recommended on the basis of some prior data suggesting that momentary emotion *can be* susceptible to belief-consistent influences (e.g., Wilson, Lisle, Kraft, & Wetzel, 1989).

With respect to measuring episodic encoding abilities, we adopted only one assessment strategy, namely one based on choice RT speed. The use of the task was based on the premise that individuals might differ in their abilities to quickly link meaning to stimuli and that such individual differences might have relevance to episodic processing in everyday life. However, there are quite a few other methods

that could have been used to examine episodic encoding abilities, such as agreement with expert opinion (Wilson & Schooler, 1991) or level of specificity in written protocols (Blagov & Singer, 2004). It is unknown whether categorization speed would correlate with such alternative measures.

Broadening this scope somewhat, episodic abilities have been linked to subjective experiences of remembering rather than knowing (Rajaram, 1993) and to decreased vulnerability to false memory intrusions (Baddeley, Aggleton, & Conway, 2002). It is currently unknown whether individual differences in categorization speed predict these other sorts of measures related to episodic encoding and retrieval abilities (although some aging data are supportive of such a relation: e.g., Hertzog, Dixon, Hultsch, & MacDonald, 2003). We therefore see the need for more systematic correlational work along these lines.

In principle, furthermore, it seems that multiple measures of episodic encoding or retrieval skills could moderate trait/state relations in a manner similar to the present studies. For example, individual differences in intelligence have been broadly interpreted in terms of flexibility with respect to stimuli at hand (Baumeister, 1998). Similarly, aging effects have often been interpreted in terms of flexibility in information processing operations in relation to present stimuli (Salthouse, 2000). Interestingly, both intelligence (Baumeister, 1998) and age (Salthouse, 2000) also correlate with categorization speed. Such results suggest that intelligence, age, and categorization speed may all tap a similar construct related to the speed and flexibility of one's encoding operations (Jensen, 1998). Following this general sort of framework, it is plausible to think that intelligence and age, like categorization speed, might moderate trait/state relations in a manner similar to the current studies. Indeed, work of this sort is underway.

Conclusions

Within the literature on individual differences, top-down influences are often ascribed to traits, whereas bottom-up influences are often ascribed to situations (e.g., Mischel, 2004). Although such views of personality are often seen as incompatible with each other, it seemed possible to us that individuals may differ in the strength of these top-down versus bottom-up paths to judgment. We investigated this interactive framework within the context of individual differences in categorization speed, which we proposed might be associated with individual differences in the bottom-up path to judgment (i.e., fast = bottom-up; slow = top-down). We found support for the interactive predictions, specifically as related to robust Extraversion × Speed interactions predicting LS ratings. In total, the results reaffirm the usefulness of the trait = belief perspective and do so with respect to novel interactive predictions.

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