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Retrieval contexts and the concreteness effect: Dissociations in memory for concrete and abstract words

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Decades of research on the concreteness effect, namely better memory for concrete as compared with abstract words, suggest it is a fairly robust phenomenon. Nevertheless, little attention has been given to limiting retrieval contexts. Two experiments evaluated intentional memory for concrete and abstract word lists in three retrieval contexts: free recall, explicit word-stem completion, and implicit word-stem completion. Concreteness effects were observed in free recall and in explicit word-stem completion, but not in implicit word-stem completion. These findings are consistent with both a bidirectional version of the relational-distinctiveness processing framework (Ruiz-Vargas, Cuevas, & Marschark, 1996) and a second framework combining insights from dual coding theory (Paivio, 1971, 1986) and the transfer appropriate processing framework (Roediger, Weldon, & Challis, 1989). Also, consistent with the relational-distinctiveness framework, the second experiment suggested that concreteness effects might depend on relational processing at encoding: Concreteness effects were observed in explicit memory for related word lists but not for unrelated word lists.

Concrete words like *bicycle*, *tiger*, or *kick* are better remembered than abstract words like *justice*, *humour*, or *obey*. Four decades of research on this concreteness effect in verbal memory have shown it to be a robust phenomenon generalising over different orienting tasks (e.g., semantic, imagery, and memory instructions), stimulus types (e.g., word lists, word pairs, sentences), languages (e.g., English, Indian, Chinese), and memory tests (e.g., free recall, cued recall, recognition memory; see reviews by Marschark & Cornoldi, 1991; Paivio, 1986, 1991, 1995). Moreover, concreteness effects cannot be fully explained by

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structural word properties that may be naturally confounded with concreteness, such as distinctiveness, meaningfulness, frequency, or associative set size (e.g., Gee, Nelson, & Krawczyk, 1999; Marschark & Cornoldi, 1991; Nelson & Schreiber, 1992; Paivio, 1995).

Despite the robustness of the concreteness effect, theory and empirical evidence suggest it may be limited to certain encoding and retrieval contexts. Most recent studies in this domain have tested the predictions of prominent process theories about the effects of the encoding context on concreteness effects. In contrast, relatively little attention has been given to retrieval contexts, or to the congruence between encoding and retrieval contexts as emphasised for instance in the transfer appropriate processing framework (Roediger, Weldon, & Challis, 1989).

Prior research on the concreteness effect has instead focused almost exclusively on one type of retrieval context, namely explicit conceptual memory tests. An explicit memory test is one that ''requires conscious recollection of previous experiences'', whereas an implicit memory test ''does not require conscious or intentional recollection'' (Schacter, 1987, p. 501). Conceptual tests are those in which retrieval—whether explicit or implicit—is ''meaning-driven'', whereas perceptual tests are those in which retrieval is driven by perceptual (e.g., visual or auditory) word characteristics (e.g., Weldon & Roediger, 1987).

The present study considers whether the concreteness effect arises in retrieval contexts other than purely conceptual explicit memory tests, building on recent research by Hamilton and Rajaram (2001). Before introducing in detail the rationale for the present research, we first consider limiting encoding and retrieval contexts as suggested by two of the most influential process theories of the concreteness effect, namely dual coding theory (Paivio, 1971, 1986, 1991) and the relational-distinctiveness processing framework (Marschark & Hunt, 1989; Marschark & Surian, 1992).

Dual coding theory proposes that concreteness effects should arise only in certain encoding contexts, yet places no explicit limits on retrieval contexts. The theory postulates two representational systems, one verbal and one imaginal (e.g., visual; Paivio, 1971, 1986). The verbal system is said to be equally suited to encoding concrete and abstract words, whereas the imaginal system can more easily encode concrete words. An additive contribution of these two independent modalities to memory for concrete words is presumed to form the basis for concreteness effects. Because this dual activation of verbal and imaginal codes entails referential (i.e., cross-system) processing, which is assumed to be conceptual in nature, dual coding theory predicts concreteness effects only on semantic or conceptual orienting tasks (i.e., tasks that elicit processing based on word meanings, as opposed to perceptual or other superficial word characteristics; D'Agostino, O'Neill, & Paivio, 1977; Paivio, 1986, 1991). Empirically, concreteness effects in memory are well established over a variety of conceptual orienting tasks (see reviews by Marschark & Cornoldi, 1991; Paivio, 1986, 1991). Nevertheless, concreteness effects have also been observed following nonsemantic perceptual orienting tasks (e.g., Ruiz-Vargas, Cuevas, & Marschark, 1996, Exps. 3 and 4).

The relational-distinctiveness processing framework proposed by Marschark and colleagues (Marschark & Hunt, 1989; Marschark & Surian, 1992; Marschark, Richman, Yuille, & Hunt, 1987; Ruiz-Vargas et al., 1996) attributes concreteness effects to the way in which a stimulus word is processed rather than the number of encoding modalities; more specifically, memory is said to depend on the encoding of relational information (i.e., ‘‘intra-list’’ information linking a stimulus word to other information in the presentation context), together with the encoding of distinctive features of the stimulus word itself. When relational information has been encoded and the retrieval context facilitates access to this relational information, the presumed ‘‘naturally’’ greater distinctiveness of concrete words leads to concreteness effects in memory.

Accordingly, the relational-distinctiveness framework predicts attenuated or eliminated concreteness effects when the encoding context discourages relational processing (e.g., with incidental or item-specific orienting tasks, or single learning trials), or when the retrieval context discourages access to relational information (as in free recall or ‘‘extra-list’’ cued recall, the latter referring to recall cued by information unrelated to the presentation context; Ruiz-Vargas et al., 1996). Although there is empirical support for some of these predictions (Marschark & Hunt, 1989; Marschark & Surian, 1992), other studies appear to contradict the relational-distinctiveness framework (e.g., Gee et al., 1999; Paivio, Khan, & Begg, 2000; Paivio, Walsh, & Bons, 1994; Richardson, 2003; Ruiz-Vargas et al., 1996). Most notably, concreteness effects have been observed on memory tests that presumably discourage access to relational information, such as free recall (e.g., Paivio et al., 1994, 2000; Ruiz-Vargas et al., 1996; see also reviews by Marschark & Cornoldi, 1991; Paivio, 1986, 1991) and extra-list cued recall (Gee et al., 1999; Ruiz-Vargas et al., 1996).

The latter findings led Ruiz-Vargas et al. (1996) to propose a modified ‘‘bidirectional’’ version of the relational-distinctiveness framework, wherein concreteness effects still require relational processing at encoding, yet do not require a retrieval context that cues or otherwise encourages access to relational information. Instead, the modified framework proposes that more distinctively encoded items—for instance, high-imagery words—can encourage access to other distinctive items in consciously guided retrieval by virtue of their shared relational information. This bidirectional version of the relational-distinctiveness framework implies that relational processing during encoding forms the key condition for concreteness effects; as long as the retrieval context does not fully block access to relational information, which could presumably be the case with any form of consciously guided retrieval, concreteness effects may arise.

In summary, research inspired by the two most influential process theories has not demonstrated reliable limits to retrieval contexts for the concreteness effect. On the one hand, dual coding theory does not explicitly postulate such limitations; on the other hand, the original relational-distinctiveness framework postulated limiting retrieval conditions that empirical studies do not consistently support. Although Ruiz-Vargas et al.'s (1996) bidirectional relational-distinctiveness framework implies that consciously guided retrieval may form the key limiting retrieval condition for concreteness effects, it is difficult to evaluate this possibility because prior research on concreteness effects has focused almost exclusively on explicit memory tests.

To date, only Hamilton and Rajaram (2001) have systematically considered the concreteness effect in retrieval contexts other than explicit conceptual memory tests. Their second experiment is of particular interest because it compared a broad range of retrieval contexts: free recall, implicit and explicit versions of a (conceptual) general knowledge test, and explicit and implicit versions of a (perceptual) word-fragment completion test. Hamilton and Rajaram tested predictions derived from the dual coding assumption that concreteness effects require conceptual processing at encoding (D'Agostino et al., 1977; Paivio, 1986, 1991), together with the transfer appropriate processing principle that memory performance depends on a correspondence between the types of processing elicited at encoding and retrieval (Roediger et al., 1989). Their overall prediction was that concreteness effects should be evident on conceptual memory tests but not on perceptual memory tests. However, this overall prediction was qualified in the case of the explicit perceptual test: Because prior research suggests that explicit perceptual tests such as word-fragment and word-stem completion tap both perceptually and conceptually encoded information (e.g., Roediger, Weldon, Stadler, & Riegler, 1992; Weldon, Roediger, Beitel, & Johnston, 1995), Hamilton and Rajaram predicted a small concreteness effect on their explicit ''perceptual'' test.

As predicted, Hamilton and Rajaram (2001) observed concreteness effects on both conceptual explicit tests (free recall, explicit general knowledge) and no concreteness effect on their perceptual implicit test (implicit word-fragment completion). However, the predicted concreteness effects were not observed on the conceptual implicit test (implicit general knowledge) or on the perceptual explicit test (explicit word-fragment completion).

Hamilton and Rajaram's (2001) finding of concreteness effects on two conceptual explicit tests, but not on a perceptual implicit test, corroborates not only their predictions derived from dual coding theory and the transfer appropriate processing framework, but also some prior research. Numerous prior studies have demonstrated concreteness effects on conceptual explicit tests such as free recall and cued recall (e.g., Marschark & Cornoldi, 1991; Paivio, 1986, 1991; Paivio et al., 1994, 2000; Ruiz-Vargas et al., 1996). One prior study corroborates Hamilton and Rajaram's finding of no concreteness effect on an implicit perceptual memory test: Comparing the speed at which participants could spell old and new words, Wippich, Mecklenbräuker, Wachtl, and Schumacher (1989) found no reliable difference in priming effects for concrete versus abstract words.

Concerning the two retrieval contexts where Hamilton and Rajaram (2001) predicted but did not observe a concreteness effect, namely a conceptual implicit test and a perceptual explicit test, their results are more difficult to interpret. Results from prior research using conceptual implicit tests are mixed, in that Blaxton (1989) predicted and found an imagery effect in this retrieval context, whereas Weldon and Coyote (1996) predicted but did not find picture-superiority effects. In two subsequent experiments, Hamilton and Rajaram tested memory in circumstances thought to be more conducive to the emergence of concreteness effects, but consistently found no evidence of better implicit conceptual memory for concrete as compared with abstract words.

Regarding the second retrieval context where Hamilton and Rajaram (2001) predicted but did not observe a concreteness effect, namely the explicit perceptual test, they noted that they had no ‘‘ready explanation’’. A levels-of-processing effect was observed on this measure, so dual coding theory and the transfer appropriate processing framework would together suggest that there should have been a concreteness effect. Moreover, because the word-fragment retrieval cues used in Hamilton and Rajaram's explicit perceptual test can be characterised as extra-list recall cues, their results appear inconsistent with prior research where concreteness effects have been observed in explicit recall guided by extra-list perceptual cues (e.g., Ruiz-Vargas et al., 1996).

The absence of a concreteness effect on Hamilton and Rajaram's (2001) explicit perceptual test could be attributable to specific methodological features of their experiment. The design included a within-participants levels-of-processing manipulation: Half of the stimuli were presented in a graphemic (perceptual) encoding condition (‘‘Does this word contain the letter *c*?’’); the other half were presented in a semantic (conceptual) encoding condition (‘‘Can you buy this?’’). On the one hand, processing some concrete and abstract words with a perceptual instruction may have inhibited conceptual processing, considered a precondition for concreteness effects in both dual coding theory and the relational-distinctiveness framework. On the other hand, as Hamilton and Rajaram pointed out, processing some concrete and abstract words with a conceptual instruction ‘‘may have reduced the default differences in the conceptual encoding of these items’’(p. 108). Moreover, their processing manipulation was confounded with concreteness, as different sets of questions were posed for the concrete and abstract words, respectively.

In view of these methodological features of Hamilton and Rajaram's (2001) second experiment, the generalisability of two of their more noteworthy findings is uncertain. Namely, because they did not reinvestigate explicit and implicit perceptual tests in their subsequent experiments, it is unclear whether the concreteness effect might arise in these retrieval contexts under encoding conditions more favourable to its emergence. These two perceptually based retrieval contexts were reconsidered in the present research.

Another reason to reconsider concreteness effects on explicit and implicit perceptual memory tests is that the pattern of effects observed by Hamilton and Rajaram (2001)—namely no concreteness effect on either type of perceptual test—contrasts with the predictions of the three theoretical frameworks we have discussed so far. As mentioned above, dual coding theory by itself does not set explicit limits on retrieval contexts for concreteness effects. Hence, the theory would presumably predict concreteness effects in any retrieval context as long as the necessary encoding conditions for concreteness effects exist.

As pointed out by Hamilton and Rajaram (2001), dual coding theory together with the transfer appropriate processing framework suggests different predictions for explicit and implicit perceptual tests: Given that concreteness effects are indeed conceptually driven as assumed by dual coding theory, and given that the orienting task in a specific instance does in fact elicit conceptual processing, the transfer appropriate processing framework would predict concreteness effects on conceptual memory tests, whether explicit or implicit. A smaller concreteness effect on perceptual explicit tests like word-fragment and word-stem completion would also be predicted, because these tests are assumed to engage a combination of perceptual and conceptual retrieval processes (e.g., Roediger et al., 1992; Weldon et al., 1995). On the other hand, the transfer appropriate processing framework would predict no concreteness effect on perceptual implicit tests that engage primarily perceptual retrieval processes.

Ruiz-Vargas et al.'s (1996) bidirectional version of the relational-distinctiveness framework suggests a slightly different set of predictions. When encoding conditions foster relational processing of stimulus words, the bidirectional relational-distinctiveness framework would predict the strongest concreteness effects in explicit recall guided by intra-list cues, because such cues encourage access to relational information. Nevertheless, concreteness effects should still be evident on other explicit tests such as free recall or extra-list cued recall, because such intentional memory tests would presumably not fully block access to relational information. Finally, no concreteness effects would be predicted on implicit memory tests, because access to relational information would presumably be fully blocked in the absence of intentionally guided retrieval processes.

These theoretically derived predictions concerning retrieval contexts and the concreteness effect were evaluated in two studies of intentional memory for concrete and abstract word lists. An intentional memory orienting task served to establish encoding conditions necessary for the emergence of concreteness effects as articulated in both dual coding theory (i.e., conceptual processing; e.g., Paivio, 1986, 1991) and the relational-distinctiveness framework (i.e., relational processing; e.g., Marschark & Surian, 1992). Presentation of stimulus words in lists is also likely to encourage relational processing in intentional learning, because lists offer a context for forming relational links between individual words (Marschark & Surian, 1992).

Memory for the concrete and abstract word lists was evaluated in three retrieval contexts: free recall, explicit word-stem completion, and implicit word-stem completion. Word-stem completion was selected for the present study instead of word-fragment completion in an effort to limit baseline retrieval proportions for nonstudied words: Word stems consisting of three letters typically have more possible completions than word fragments (Roediger et al., 1992). Like the word-fragment completion test, the word-stem completion test meets Schacter, Bowers, and Booker's (1989) retrieval intentionality criterion in that ''levels of processing of words have a powerful effect on explicit versions of the tests but no effect on implicit versions'' (Roediger et al., 1992, p. 1251).

EXPERIMENT 1

Method

Participants. The participants were 73 paid volunteers (21% male, 79% female) recruited at a Dutch university, aged 18–33 years (average: 20.7 years). Participants received the equivalent of about $2.00 for taking part in the experiment, which lasted approximately 20 min and was conducted in the Dutch language. The experiment was the first in a series completed by these participants during a single visit to the experimental laboratory.

Design. A 2 (item concreteness: concrete, abstract) $\times$ 3 (memory test: free recall, explicit word-stem completion, implicit word-stem completion) mixed design was used, with concreteness as a within-subjects variable and memory test as a between-subjects variable.

Procedure. The experiment comprised three successive phases: study, distraction, and memory test. Participants reported to the experimental laboratory for scheduled sessions including up to 15 participants. Upon arrival each participant was randomly assigned by the experimenter to a memory test condition and led to a separate cubicle containing a personal computer. The computer randomly assigned the participant to receive the first or second stimulus version. Instructions displayed on the computer informed participants that the experiment consisted of a series of distinct tasks. Participants were told that their first task would be to study a series of word lists, and that their memory for the words would be tested at a later stage in the experiment.

During the study phase, each participant viewed four word lists: one list of 12 concrete verbs, one list of 12 abstract verbs, and two 12-item filler word lists. The filler lists contained no verbs and were included to attenuate primacy, recency, and ceiling effects in memory for the concrete and abstract verbs. The word lists were presented in random order. Each list was introduced with text at the top of the screen (e.g., *List-1*, *List-2*); then each word comprising the list was presented individually, in large text, on a separate screen. The words within each list were presented in random order, at a rate of 5 s per word. Within each 5 s interval, the stimulus word was presented for 2 s, followed by a blank screen for 3 s. In this way, the duration of actual visual presentation of the stimuli was shortened so as to attenuate perceptual encoding and thereby encourage conceptual encoding; similarly, different letter types (serif vs. sans serif; capital vs. lower-case; larger vs. smaller font size) were used respectively for presentation of the stimulus words and for subsequent presentation of the three-letter word stems to attenuate perceptually driven retrieval processes.

During the distraction phase, participants were asked to generate and write down as many country/capital city pairs as they could think of, for a period of 3 min. After the 3 min had elapsed, a button appeared on the computer screen, enabling participants to proceed to the next phase.

During the memory test phase, each participant completed one of the three memory tests: free recall, explicit word-stem completion, or implicit word-stem completion. Participants in the free recall condition were told that they would be completing a ''memory task''. They were instructed to type all of the stimulus words they could remember, one after the other, on a single computer screen. After 4 min a button appeared, which participants could use to proceed to the next experimental phase. If they had not yet exhausted their recall for the stimulus words, they could elect to continue working on the free recall task.

Participants in the explicit word-stem completion condition were also told that they would be completing a ''memory task''. They were told they would be shown three-letter word stems, which would in some cases correspond to the first three letters of one of the stimulus words viewed during the study phase. The word stems were presented individually, each on a separate computer screen, in fully randomised order. For each word the participants were asked whether they thought the word stem might correspond to one of the stimulus words, and if so, to type the complete stimulus word onto the computer screen before proceeding to the next word stem.

Participants in the implicit word-stem completion condition were told that they would be completing a ''free association task''. They were instructed that they would be shown a series of three-letter word stems, and that their task was to complete each stem as quickly as possible with the first word that came to mind. The word stems were presented individually, each on a separate computer screen, in fully randomised order. Participants provided their free-association responses by typing the complete word onto the computer screen.

Stimulus materials. The concrete and abstract target words consisted of verbs corresponding to two of the interpersonal predicate types specified in Semin and Fiedler's (1988, 1991) linguistic category model: Concrete words were operationalised as descriptive action verbs (e.g., *kick*, *wink*), and abstract words were operationalised as interpretive action verbs (e.g., *help*, *obey*). A key characteristic distinguishing descriptive action verbs from interpretive action verbs is the presence of a physical invariant in the case of the former (e.g., use of the foot in *kick*) but not in the case of the latter. Prior research has shown that research participants consistently rate descriptive action verbs as more concrete than interpretive action verbs (e.g., Semin & Fiedler, 1988).

Each participant viewed one of two stimulus versions. Two stimulus versions were used to expand the range of stimulus words under investigation, and to enable computation of baseline retrieval proportions of nonstudied words for the explicit and implicit word-stem completion tests. The 24 concrete verbs and 24 abstract verbs contained in the two stimulus versions were selected from a word corpus assembled by Semin and Marsman (1994). Selection of the stimulus words was subject to additional constraints in that a set of unique three-letter word stems (e.g., S T A ____) would be needed for the explicit and implicit word-stem completion memory tests. A single set of 40 three-letter word stems was constructed for use in both of these tests: 10 stems corresponding to concrete verbs from the first stimulus version, 10 stems for concrete verbs from the second stimulus version, 10 stems for abstract verbs from the first stimulus version, and 10 stems for abstract verbs from the second stimulus version. Each stem could be completed to form only one of the words presented during the study phase. Also, the word stems were screened using a pocket dictionary to ensure that each could be completed to form at least four commonly used Dutch words. The resulting stimulus word lists are displayed in Appendix 1. In both stimulus versions, the concrete and abstract words did not differ significantly in terms of either word length, defined as the number of syllables, or word frequency according to De Jong's (1979) norms.

Concreteness ratings of the 48 stimulus words were collected from 25 university students in a pilot study. For each word, participants indicated ''to what extent you consider this word to be abstract or concrete''. Based on Paivio, Yuille, and Madigan (1968), *concrete* was defined as something that ''can be clearly imagined visually, or with one of the other four senses'', and *abstract* was defined as something that ''*cannot* be clearly imagined visually, or with one of the other four senses''. Responses were given on a 7-point scale (anchors: 1 = *very abstract*; 7 = *very concrete*). Ratings of the 48 stimulus words were assessed in an analysis of variance (ANOVA) with concreteness (concrete verb, abstract verb) as a within-subjects variable. The concrete verbs ($M = 5.3$) were rated as significantly more concrete than the abstract verbs ($M = 4.4$; $p < .001$).

Results

Participants completed the memory tests by typing words into the computer. To assess retrieval on all three memory test conditions, a single coding protocol was used based on procedures in prior research (e.g., Schwanenflugel, Akin, & Luh, 1992). A stimulus word was coded as correctly retrieved only if the participant had typed the very same word, or an inflectional variant of the same word, as a test response: *diamonds* would be coded as correct retrieval of *diamond*; and *talented* as correct retrieval of *talent*. On the other hand, synonyms of a target word (e.g., *pay* instead of *wage*), and longer words formed from a target word (e.g., *stable* instead of *stab*), were not coded as correct retrieval.

Table 1 displays the mean proportion of studied and nonstudied words retrieved on the three memory tests, computed separately for concrete and abstract words. For free recall, a paired-sample *t*-test compared correct retrieval of concrete and abstract words. For the explicit and implicit word-stem completion tests, 2 × 2 within-subjects ANOVAs were carried out to assess retrieval, with study status (studied, nonstudied) and item concreteness (concrete, abstract) as independent variables.

On the free recall memory test, a concreteness effect was observed in that the mean proportion of correctly recalled words was significantly associated with concreteness, $t(24) = 3.71$, $SE = .04$, $p < .01$, $\eta^2 = .36$. As can be seen in Table 1, recall was better for concrete words ($M = 0.32$) as compared with abstract words ($M = 0.17$).

On the explicit word-stem completion test, there was a significant main effect of study status, $F(1, 23) = 43.15$, $MSE = 0.04$, $p < .001$, $\eta^2 = .65$, and no main effect of concreteness, $F(1, 23) = 2.74$, $MSE = 0.02$, $p = .11$, $\eta^2 = .11$. The interaction was significant, indicative of a concreteness effect, $F(1, 23) = 7.74$, $MSE = 0.01$, $p < .05$, $\eta^2 = .25$. Similarly, a follow-up *t*-test on the corrected retrieval or ''priming'' scores (i.e., [S–N] in Table 1) revealed a significant concreteness effect, $t(23) = 2.78$, $SE = .05$, $p < .05$, $\eta^2 = .25$, reflecting better retrieval of concrete words ($M = 0.33$) as compared with abstract words ($M = 0.20$).

TABLE 1
Mean proportion of studied and nonstudied items retrieved in three types of memory tests (Experiment 1)

	Concrete words			*Abstract words*		
Memory test	*Studied (S)*	*Nonstudied (N)*	*S–N*	*Studied (S)*	*Nonstudied (N)*	*S–N*
Free recall$_a$	.32	.00	.32	.17	.00	.17
Explicit WSC$_b$	.39	.06	.33	.28	.08	.20
Implicit WSC$_c$	.21	.11	.10	.18	.10	.08

WSC = word-stem completion. S = studied words. N = nonstudied words. Priming scores for both WSC tests were computed as S–N.

$_a n = 25$. $_b n = 24$. $_c n = 24$.

On the implicit word-stem completion test, there was a significant main effect of study status, $F(1, 23) = 7.15$, $MSE = 0.03$, $p < .05$, $\eta^2 = .24$, indicative of an overall priming effect on this implicit memory test. There was no main effect of concreteness, $F(1, 23) = 0.87$, $MSE = 0.01$, $p = .36$, $\eta^2 = .04$. The interaction was also nonsignificant, $F(1, 23) = 0.12$, $MSE = 0.01$, $p = .73$, $\eta^2 = .01$. A follow-up *t*-test similarly showed no concreteness effect, $t(23) = 0.35$, $SE = .04$, $p = .73$, $\eta^2 = .01$, as there was no difference between priming scores (i.e., [S–N] in Table 1) for concrete words ($M = 0.10$) and abstract words ($M = 0.08$).

Discussion

In Experiment-1 concreteness effects were found to depend on the retrieval context: Better memory for concrete as compared with abstract words was observed on two explicit memory tests, namely free recall and word-stem completion, but not on an implicit version of the same word-stem completion test. This overall pattern of results is consistent with predictions derived from both the relational-distinctiveness framework and a combined dual coding/transfer appropriate framework.

Concerning the relative magnitude of concreteness effects on the two explicit memory tests, the evidence is difficult to interpret. Visual inspection suggests—consistent with predictions from the combined dual coding/transfer appropriate framework—that the concreteness effect may have been somewhat larger and more reliable in free recall ($\eta^2 = .36$, $p < .01$) as compared with explicit word-stem completion ($\eta^2 = .25$, $p < .05$). Nevertheless, no direct comparison of retrieval performance on the free recall and word-stem completion tests was undertaken because the measurement scales may not be commensurate (e.g., Richardson, 2003; Weldon & Coyote, 1996).

A second experiment served two purposes: It offered a methodological replication, and provided a more critical test of the two frameworks supported in the first experiment. A key difference between the relational-distinctiveness framework and the dual coding/transfer appropriate framework is the central role given to relational processing in the former. It has been argued in the relational-distinctiveness literature that concreteness effects are particularly likely under encoding conditions that ‘‘explicitly or implicitly encourage interitem processing in list learning’’ (Marschark & Hunt, 1989, p. 718). As Paivio et al. (1994) pointed out, this suggests that concreteness effects should be stronger for related as compared with unrelated stimulus words according to the relational-distinctiveness framework; in contrast, dual coding theory predicts that concreteness effects should be independent of relatedness.

The lists of concrete and abstract verbs used in Experiment-1 were selected from two rather narrowly defined linguistic categories: Both types of verbs describe only interpersonal actions fulfilling specific semantic and linguistic criteria (Semin & Fiedler, 1988). In this sense, the concrete and abstract word lists used in Experiment-1 can be characterised as related. This raises the question of whether the same pattern of effects would be observed with less related word lists.

The question of whether concreteness effects are moderated by relatedness has been tested in several recent studies. In line with the predictions of dual coding theory, Paivio et al. (1994) observed largely independent main effects of concreteness and relatedness, and just one interaction effect, in two investigations of memory for related and unrelated noun pairs. Paivio et al. (2000) reported comparable results in two similar experiments on memory for noun–adjective pairs and for minimal sentences constructed from noun–adjective pairs. Finally, Richardson (2003) also found no evidence of interactions between concreteness and relatedness in either free recall or cued recall; in the latter study, ''related'' words were defined as those presented in a semantically coherent sentence frame, and ''unrelated'' words as those presented in a semantically anomalous sentence frame.

Considered together, the available evidence from investigations of concreteness and relatedness as orthogonally manipulated independent variables favours dual coding theory in that interactive effects have only very rarely been observed. Nevertheless, the methodologies used by Paivio and colleagues (1994, 2000) and by Richardson (2003) may not have created entirely favourable conditions for relational processing. All of these studies employed an incidental memory task; as Marschark and Surian (1992) have argued, relational processing is especially likely to arise with intentional memory orienting tasks because such tasks give rise to deliberate attempts to interrelate to-be-remembered items. It is also unclear whether the manipulations of relatedness used in these prior studies did indeed establish different levels of relational processing. The noun pairs used by Paivio et al. (1994) were so highly related that they sometimes formed nearly perfect synonyms or antonyms (e.g., stone–rock; instance–example; question–answer); similarly, many of the noun–adjective pairs used in Paivio and colleagues' (2000) later study consisted of very strong associates (e.g., rich–banker; essential–nutrient). Rather than encouraging active, relational processing, these ''related'' stimuli might have instead activated preexisting semantic structures in memory.

EXPERIMENT 2

Experiment-2 constituted a methodological replication of Experiment-1 with two noteworthy differences: The stimulus words represented a grammatical category more commonly used in research on concreteness effects (i.e., nouns instead of verbs); and relatedness of the word lists was introduced as an additional within-subjects independent variable. As in Experiment-1, the orienting task consisted of an intentional memory instruction. In this context, the dual coding/transfer appropriate framework would predict the same relationship between concreteness effects and retrieval context as in Experiment-1: Concreteness effects should be evident in free recall, as well as on the explicit word-stem completion test, but not on the implicit word-stem completion test. To the extent that the related word lists lead to deeper processing, the dual coding/transfer appropriate framework would also predict main effects of relatedness; however, it would predict no interaction between concreteness and relatedness (e.g., Paivio et al., 1994, 2000; Richardson, 2003).

According to the relational-distinctiveness framework, the pattern of results predicted in Experiment-1 should be stronger for related as compared with unrelated words in Experiment-2: Concreteness effects should be evident for related words in free recall, as well as on an explicit word-stem completion test, but not on an implicit word-stem completion test. In contrast, because participants may be less successful in relating the elements of unrelated word lists, the relational-distinctiveness framework would predict attenuated or perhaps eliminated concreteness effects in memory for unrelated words on both explicit memory tests.

Method

The methodology in Experiment-2 was identical to that in Experiment-1, except as noted below.

Participants. The research participants were 111 paid volunteers (24% male, 76% female) recruited at a Dutch university, aged 18–31 years (average: 21.3 years).

Design. A 2 (item concreteness: concrete, abstract) $\times$ 2 (relatedness of word list: related, unrelated) $\times$ 3 (memory test: free recall, explicit word-stem completion, implicit word-stem completion) mixed design was used, with concreteness and relatedness as a within-subjects variables and memory test as a between-subjects variable. The experiment also included a between-subjects cognitive load manipulation; because this manipulation showed no main or higher order effects on retrieval, it was assumed to be unsuccessful and is given no further attention.

Stimulus materials. Each participant viewed 32 stimulus words presented as four word lists: two lists of 8 concrete nouns and two lists of 8 abstract nouns (see Appendix 2). Nouns were used as stimulus words to provide a broader basis from which unrelated and related word lists could be constructed. As in Experiment-1, there were two different stimulus versions.

The unrelated word lists were derived from unrelated concrete and abstract stimulus words used in prior research (e.g., Paivio et al., 1994). Each related word list consisted of eight associates of a single theme word, according to published Dutch word association norms (de Groot & de Bil, 1987; van der Made-van Bekkum, 1973; van Loon-Vervoorn & van Bekkum, 1991); the theme word was not included in the list. The average strength of association with the theme word was constrained to be constant over the four related word lists: The eight words comprising each related list had been mentioned, on average, by 11% of respondents as the first associate of the corresponding theme word. In both stimulus versions, neither concreteness nor relatedness was significantly associated with word length, defined as the number of syllables, or with word frequency according to de Jong's (1979) norms.

The concreteness of the stimulus words was pretested using ratings collected from 73 research participants, with responses given on the same 7-point scale as in Experiment-1. Within-subjects ANOVAs indicated that the concrete/related words were rated as substantially more concrete (M = 6.0) than the abstract/related words (M = 2.8); and the concrete/unrelated words were as substantially more concrete (M = 6.7) than the abstract/unrelated words (M = 2.5; both p's < .001).

A single set of 32 three-letter word stems was presented to all participants in the explicit and implicit word-stem completion conditions, 16 stems from the first stimulus version and 16 from the second stimulus version. Within the word-stem set, concreteness (concrete vs. abstract words) and relatedness (related vs. unrelated words) were varied orthogonally.

Results

Table 2 displays the mean proportion of studied and nonstudied words retrieved on the three memory tests, separately for concrete and abstract words from related and unrelated lists. For free recall, a 2×2 within-subjects ANOVA was carried out to assess retrieval, with item concreteness (concrete, abstract) and item relatedness (from related vs. unrelated list) as independent variables. For the explicit and implicit word-stem completion tests, $2 \times 2 \times 2$ within-subjects ANOVAs were carried out to assess retrieval, with study status (studied, non-studied), item concreteness (concrete, abstract), and item relatedness (from related vs. unrelated list) as independent variables.

On the free recall memory test, the two-way ANOVA revealed a main effect of concreteness, indicative of an overall concreteness effect, $F(1, 35) = 20.08$, $SE = .05$, $p < .001$, $\eta^2 = .37$: Recall was significantly better for concrete words (M = 0.45) as compared with abstract words (M = 0.28). There was also a significant main effect of relatedness, $F(1, 35) = 6.98$, $SE = .03$, $p < .05$, $\eta^2 = .17$, with better recall for related words (M = 0.40) as compared with unrelated words (M = 0.33). Finally, the Concreteness $\times$ Relatedness interaction was significant, $F(1, 35) = 4.93$, $SE = .05$, $p < .05$, $\eta^2 = .12$. Consistent with the pattern of means in Table 2, follow-up t-tests revealed a significant concreteness effect for related words, $M_{CR} = 0.53$, $M_{AR} = 0.28$, $t(35) = 4.47$, $SE = .06$, $p <$

TABLE 2
Mean proportion of studied and nonstudied items retrieved in three types of memory tests (Experiment 2)

	Concrete words			*Abstract words*		
Memory test	*Studied (S)*	*Nonstudied (N)*	*S–N*	*Studied (S)*	*Nonstudied (N)*	*S–N*
Related words						
Free recall$_a$	.52	.00	.52	.28	.00	.28
Explicit WSC$_b$	.49	.04	.44	.31	.04	.27
Implicit WSC$_c$	.27	.18	.09	.24	.12	.11
Unrelated words						
Free recall$_a$	.37	.00	.37	.28	.00	.28
Explicit WSC$_b$	.49	.04	.46	.48	.09	.39
Implicit WSC$_c$	.37	.17	.20	.39	.22	.17

WSC = word-stem completion. S = studied words. N = nonstudied words. Priming scores for both WSC tests were computed as S–N.

$_a n = 36$. $_b n = 40$. $_c n = 35$.

.001, $\eta^2 = .36$, but only a nonsignificant trend for unrelated words, $M_{CU} = 0.37$, $M_{AU} = 0.29$, $t(35) = 1.77$, $SE = .05$, $p < .10$, $\eta^2 = .08$.

On the explicit word-stem completion test, the three-way ANOVA revealed a highly significant main effect of study status, $F(1, 39) = 170.46$, $MSE = 0.07$, $p < .001$, $\eta^2 = .81$, representing the priming effect. There was also a main effect of relatedness, $F(1, 39) = 5.05$, $MSE = 0.05$, $p < .05$, $\eta^2 = .12$, but no main effect of concreteness, $F(1, 39) = 1.53$, $MSE = 0.06$, $p = .22$. The latter two main effects represent overall differences, collapsed over studied and nonstudied words.

Of more interest is the significant interaction between study status and concreteness, representing a concreteness effect, $F(1, 39) = 5.87$, $MSE = 0.05$, $p < .05$, $\eta^2 = .13$. A follow-up *t*-test on the priming scores (i.e., [S–N] in Table 2) revealed better retrieval of concrete as compared with abstract stimulus words, $M_C = 0.45$, $M_A = 0.33$, $t(39) = 2.42$, $SE = .05$, $p < .05$, $\eta^2 = .13$. On the other hand, the Study Status $\times$ Relatedness interaction was nonsignificant, $F(1, 39) = 1.82$, $MSE = 0.05$, $p = .19$, $\eta^2 = .04$, indicating no effect of relatedness on retrieval of studied items. The Study Status $\times$ Concreteness $\times$ Relatedness interaction was also nonsignificant, $F(1, 39) = 1.68$, $MSE = 0.04$, $p = .20$, $\eta^2 = .04$, suggesting that the concreteness effect did not depend on item relatedness. In view of the theoretical importance of the relationship corresponding to this interaction, follow-up *t*-tests were applied to the priming scores ([S–N] in Table 2) to evaluate the concreteness effect separately for related and nonrelated words. In line with the pattern of means in Table 2, the concreteness effect was significant for related words, $M_{CR} = 0.44$, $M_{AR} = 0.27$, $t(39) = 2.27$, $SE = .07$, p

$< .05$, $\eta^2 = .13$, but not for unrelated words, $M_{CU} = 0.46$, $M_{AU} = 0.39$, $t(39) = 1.12$, $SE = .06$, $p = .27$, $\eta^2 = .03$.

Like explicit word-stem completion, implicit word-stem completion showed main effects of study status, $F(1, 34) = 17.73$, $MSE = 0.08$, $p < .001$, $\eta^2 = .34$, and relatedness, $F(1, 34) = 12.25$, $MSE = 0.04$, $p < .01$, $\eta^2 = .27$, but no main effect of concreteness, $F(1, 34) = 0.07$, $MSE = 0.03$, $p = .80$, $\eta^2 = .00$. None of the interactions were significant, indicating that neither concreteness nor relatedness (nor their interaction) was associated with retrieval.

GENERAL DISCUSSION

Using procedures intended to encourage conceptual and relational processing (i.e., an intentional memory orienting task and stimuli in the form of word lists), Experiments 1 and 2 established encoding conditions conducive to concreteness effects as articulated in dual coding theory (i.e., conceptual processing; e.g., Paivio, 1971) as well as the relational-distinctiveness framework (i.e., relational processing; e.g., Marschark & Surian, 1992). In both experiments, concreteness effects were observed on two explicit memory tests, namely free recall and explicit word-stem completion, but not on an implicit version of the word-stem completion test. This dissociation in the pattern of results fulfils what Schacter et al. (1989) have termed the retrieval intentionality criterion with respect to the word-stem completion test: Concreteness effects were observed on an explicit version of this test, but not on an implicit version, yielding additional evidence that word-stem completion is a ''truly'' implicit memory test (see also Roediger et al., 1992).

Only one prior study, namely Hamilton and Rajaram's (2001) second experiment, has systematically considered concreteness effects in a similar set of retrieval contexts. Our finding of concreteness effects in free recall corroborates similar results both in Hamilton and Rajaram's experiment and in many other prior studies (e.g., Paivio et al., 1994, 2000; Ruiz-Vargas et al., 1996); this finding in our first study is novel in that prior research has not considered concrete and abstract verb lists as experimental stimuli. A precedent for the absence of a concreteness effect in implicit word-stem completion in our experiments can be found in Hamilton and Rajaram's finding of no concreteness effect in implicit word-fragment completion, as well as in Wippich et al.'s (1989) finding of no reliable difference in priming effects in the speed at which participants could spell concrete and abstract words.

Our finding of a concreteness effect on an explicit perceptual memory test can be viewed against a background of mixed evidence in prior research. On the one hand, Hamilton and Rajaram (2001) found no concreteness effect in implicit word-fragment completion; on the other hand, Ruiz-Vargas et al. (1996) did observe a concreteness effect on an explicit perceptual memory test, namely recall cued by pseudowords that rhymed with target words. The discrepancy between our own findings and those of Hamilton and Rajaram could be attributable to methodological features of our experiments that may have encouraged conceptual processing (e.g., intention memory instructions, list learning) as well as discouraged purely perceptual processing (e.g., different font types for the display of stimulus words during study phase vs. word stems at retrieval). From this perspective, it is noteworthy that concreteness effects still failed to emerge on our implicit word-stem completion tests; under conditions that should have been highly conducive to concreteness effects, no such effects were observed on an implicit memory test.

Visual inspection of the mean differences, effect sizes, and significant levels in both experiments would appear to suggest somewhat larger and more reliable concreteness effects in free recall as compared with explicit word-stem completion, in line with predictions based on the combined dual coding/transfer appropriate framework. Nevertheless, inferential tests were not carried out to test these differences. As other authors have pointed out (e.g., Richardson, 2003; Weldon & Coyote, 1996), such comparison of effects obtained on non-commensurate measurement scales are likely to be misleading. Hence, Experiments 1 and 2 do not support firm conclusions about the relative magnitude of the concreteness effects in the two explicit memory conditions.

By itself, dual coding theory cannot explain the overall pattern of results in Experiments 1 and 2—namely, concreteness effects in free recall and explicit word stem completion, but no concreteness effects in implicit word-stem completion. Dual coding theory does not explicitly limit concreteness effects to particular retrieval contexts, and therefore offers no explanation of why no concreteness effect would be observed on an implicit word-stem completion task. At the same time, however, the present findings do not contradict central tenets of dual coding theory; instead, it appears that the theory as articulated to date simply does not consider retrieval contexts outside the domain of explicit conceptual memory tests.

The present results concerning retrieval contexts and the concreteness effect are however consistent with two other theoretical frameworks: a combined dual coding/transfer appropriate framework (see Hamilton & Rajaram, 2001) and the bidirectional relational-distinctiveness framework (Ruiz-Vargas et al., 1996). A limitation of the present research is that it does not provide a basis for determining which of these theoretical frameworks can better account for limiting retrieval conditions of the concreteness effect. The two frameworks give rise to different predictions in just one respect, namely the relative magnitude of concreteness effects in free recall as compared with explicit word-stem completion. As we have just noted, however, the present data do not offer a basis for unequivocal conclusions on this point.

Otherwise, both theoretical frameworks can account for the overall pattern of observed results. The key retrieval condition suggested by the bidirectional relational-distinctiveness framework is whether or not a memory test is intentionally guided: Concreteness effects were observed on two explicit memory tests but not on an implicit memory test. In contrast, the key retrieval condition identified in the dual coding/transfer appropriate framework is the conceptual versus perceptual nature of a memory test: Concreteness effects were observed on one primarily conceptual memory test (free recall) and one partially conceptual memory test (explicit word-stem completion), but not on a primarily perceptual memory test (implicit word-stem completion). Hence, the present findings by themselves do not offer a basis for determining whether retrieval contexts for the concreteness effect demonstrate a classic implicit–explicit dissociation as originally observed in research comparing normal and amnesic persons (e.g., Schacter, 1987), or whether the more parsimonious transfer appropriate processing framework (Roediger et al., 1989)—focusing instead on the conceptual or perceptual nature of encoding and retrieval processes—offers a better account.

A consistent but unexpected finding in Hamilton and Rajaram's (2001) research offers a broader context from which to consider limiting retrieval conditions for the concreteness effect. Their series of four experiments focused on the prediction—derived from the dual coding/transfer appropriate framework—that concreteness effects should be evident on implicit conceptual memory tests. Despite evidence of effects of levels of processing manipulations on memory assessed with an implicit conceptual test, no concreteness effects were observed (see also Weldon & Coyote, 1996; cf. Blaxton, 1989). These findings in Hamilton and Rajaram's experiments, considered together with the present results, suggest that the explicit or implicit nature of memory test instructions could form a key retrieval condition for concreteness effects: Concreteness effects may be limited to intentionally guided retrieval. Future research will be needed to investigate this issue more fully.

Besides investigating the concreteness effect in different retrieval contexts, our second experiment also offered a critical test of competing theoretical predictions concerning the encoding context and concreteness effects. The relational-distinctiveness framework would predict an attenuation or elimination of concreteness effects in memory for unrelated as compared with related word lists, because related word lists presumably offer a better basis for relational processing than unrelated word lists (Marschark & Hunt, 1989). In contrast, in dual coding theory concreteness effects are considered to be independent of relatedness (Paivio et al., 1994, 2000).

The results of Experiment-2 generally supported predictions from the relational-distinctiveness framework in that the concreteness effect depended on whether stimulus words had been presented in related or unrelated lists. In the free recall condition, a significant overall concreteness effect was qualified by a significant Concreteness $\times$ Relatedness interaction. Follow-up *t*-tests revealed a significant concreteness effect for related words ($p < .001$) but only a non-significant trend for unrelated words ($p < .10$). In the explicit word-stem completion condition, there was a significant concreteness effect but no Concreteness $\times$ Relatedness interaction. Nevertheless, follow-up t-tests revealed a significant concreteness effect for related words ($p < .05$), but not for unrelated words ($p = .27$).

These results in support of the relational-distinctiveness framework stand in stark contrast to findings reported in several recent studies. As predicted by dual coding theory, largely independent main effects of concreteness and relatedness have been reported by Paivio and colleagues (1994, 2000) and by Richardson (2003). This could be attributable to methodological differences between the latter studies and our second experiment (e.g., incidental vs. intentional orienting tasks; stimuli presented as word pairs vs. word lists), which could have served to produce more ''truly'' relational processing in our study.

Even though Experiment-2 supports encoding assumptions of the relational-distinctiveness framework in that concreteness effects were found to depend on relatedness, the literature as a whole suggests that this framework probably does not by itself provide a comprehensive account. As we have already mentioned, concreteness effects have been observed in encoding contexts that should have discouraged or blocked relational processing (for instance with item-specific orienting tasks, e.g., Ruiz-Vargas et al., 1996). Even in the present study, free recall for unrelated words showed a statistical trend suggestive of a concreteness effect. Nevertheless, according to Marschark and Hunt (1989), the relational-distinctiveness framework was not advanced as a comprehensive account: The framework proposes that relational processing enhances concreteness effects, yet does not rule out the possibility that they may also be attributable to other underlying processes.

In conclusion, despite the accumulation over the past decade of substantial evidence against the relational-distinctiveness framework, the present results do appear to breathe some new life into the framework. In two experiments, the bidirectional relational-distinctiveness framework (Ruiz-Vargas et al., 1996) successfully predicted whether concreteness effects would arise in a variety of encoding and retrieval contexts. A framework combining insights from dual coding theory and the transfer appropriate processing framework was also successful in predicting concreteness effects in different retrieval contexts, suggesting that dual coding theory can usefully be extended with insights from the transfer appropriate processing framework to predict limiting retrieval conditions for the concreteness effect. Nevertheless, only the relational-distinctiveness framework could account for the emergence of concreteness effects in explicit memory for related words but not for unrelated words. Hence, although relational processing as operationalised to date may not form a necessary condition for concreteness effects, the present findings suggest that it may nevertheless form a key mechanism contributing to concreteness effects, and that it therefore deserves consideration in any comprehensive account. More broadly, the present findings underscore the importance of both encoding and retrieval contexts to a full understanding of concreteness effects in verbal memory.

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APPENDIX 1
Word lists used in Experiment 1

	First stimulus version	*Second stimulus version*
Concrete word lists	to blindfold (*blinddoeken*)	to run into (*botsen*)
	to laugh (*glimlachen*)	to shout (*brullen*)
	to tickle (*kietelen*)	to whisper (*fluisteren*)
	to massage (*masseren*)	to wink (*knipogen*)
	to point at (*nawijzen*)	to kick (*natrappen*)
	to embrace (*omhelzen*)	to bow down (*neerbuigen*)
	to kick (*schoppen*)	to push over (*omduwen*)
	to stare (*staren*)	to stab (*steken*)
	to punch (*stompen*)	to caress(*strelen*)
	to telephone (*telefoneren*)	to nod at (*toeknikken*)
	to whistle at (*uitfluiten*)	to wrestle (*worstelen*)
	to cradle (*wiegen*)	to kiss (*zoenen*)
Abstract word lists	to praise (*aanprijzen*)	to distract (*afleiden*)
	to bluff (*afbluffen*)	to convert (*bekeren*)
	to threaten (*bedreigen*)	to stand by (*bijstaan*)
	to insult (*beledigen*)	to deport (*deporteren*)
	to demotivate (*demotiveren*)	to greet (*groeten*)
	to help (*helpen*)	to manipulate (*manipuleren*)
	to inform (*informeren*)	to communicate (*meedelen*)
	to observe (*observeren*)	to promote (*promoveren*)
	to persuade (*overtuigen*)	to pester (*treiteren*)
	to treat (*trakteren*)	to flatter (*vleien*)
	to care for (*zorgen*)	to warn (*waarschuwen*)
	to obey (*gehoorzamen*)	to put down, figuratively (*kleineren)*

English translations appear, with original Dutch words in parentheses.

APPENDIX 2
Word lists used in Experiment 2

	First stimulus version	*Second stimulus version*
Concrete/related word lists	couch (*bank*)	plant (*plant*)
	chair leg (*poot*)	bud (*knop*)
	divan (*divan*)	scent (*geur*)
	room (*kamer*)	bee (*bij*)
	antique (*antiek*)	garden (*tuin*)
	home (*thuis*)	wall (*muur*)
	swing (*schommel*)	colour (*kleur*)
	bar (*bar*)	window (*raam*)
Abstract/related word lists	success (*succes*)	diligence (*ijver*)
	wish (*wens*)	occupation (*beroep*)
	well-being (*welzijn*)	craft (*kunst*)
	hope (*hoop*)	wage (*loon*)
	gift (*gave*)	service (*dienst*)
	life (*leven*)	penalty (*straf*)
	advantage (*voordeel*)	effort (*moeite*)
	future (*toekomst*)	assignment (*opdracht*)
Concrete/unrelated word lists	castle (*kasteel*)	squirrel (*eekhoorn*)
	hurricane (*orkaan*)	diamond (*diamant*)
	tiger (*tijger*)	salad (*salade*)
	peach (*perzik*)	sea (*zee*)
	tree (*boom*)	pencil (*potlood*)
	needle (*naald*)	finger (*vinger*)
	pudding (*pudding*)	baby (*baby*)
	meat (*vlees*)	flag (*vlag*)
Abstract/unrelated word lists	fact (*feit*)	talent (*talent*)
	hint (*hint*)	moment (*moment*)
	place (*plaats*)	opinion (*mening*)
	idea (*idee*)	peace (*vrede*)
	respect (*eerbied*)	question (*vraag*)
	memory (*geheugen*)	spirit (*geest*)
	conclusion (*conclusie*)	hypothesis (*hypothese*)
	religion (*religie*)	government (*overheid*)

English translations appear, with original Dutch words in parentheses.