The Learning of Foreign Language Vocabulary

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Abstract

This chapter reviews experimental research into learning foreign language (FL) vocabulary, focusing on direct methods of teaching such as keyword mnemonics, paired-association learning (including rote rehearsal), and picture-association learning. We discuss the relative effectiveness of these methods, the constraints in using them, and the way they interact with other factors, most notably the amount of experience a learner has had with learning foreign languages. We review research that shows that some types of words are easier to learn than others and discuss the reasons why this might be so. We also discuss the important role that good phonological skills play in successful FL vocabulary learning and review preliminary research that suggests that background music may be beneficial for some FL learners but detrimental for others. Finally, acknowledging the fact that FL learning via one of the direct methods discussed only provides the starting point for FL word learning, we discuss more advanced stages of the full-fledged learning process.

The Learning of Foreign Language Vocabulary

Learning a language, native or foreign/second[1], involves the learning of a number

of language subsystems including the language's grammar, phonology, and vocabulary.

Although vocabulary is obviously of crucial importance to the language learner, foreign

language (henceforth: FL) teachers as well as FL researchers have until recently treated

vocabulary as less central to FL learning than grammar and phonology. (See Boyd

Zimmerman, 1997, who provides a historical overview of instruction methods for FL

teaching, starting at the end of the 18th century, and explains why vocabulary was often

neglected in these methods.) Yet, it has been claimed "that native speakers can better

understand ungrammatical utterances with accurate vocabulary than those with accurate

grammar and inaccurate vocabulary" (Widdowson, 1978, in Boyd Zimmerman, 1997). A

corollary of this claim is that the chances of getting one's basic needs fulfilled in an FL

environment are substantially larger if the FL learner possesses some well-chosen basic

vocabulary in that language than when he or she masters the language's grammar

flawlessly, a fact that presumably all FL learners who have tried to make themselves

understood in an FL environment are willing to accept (and that is acknowledged by

publishers of travel guides, that almost without exception include a carefully selected

vocabulary of the language spoken in the country to be visited).

The pivotal role of vocabulary in FL use is also demonstrated in studies that have

looked at the relation between FL reading comprehension and FL vocabulary knowledge

(e.g., Laufer, 1992, 1997; Nation, 1993). These studies have shown FL vocabulary

knowledge to be a good predictor of success in reading in the FL, a finding that echoes

the strong relation that has long been known to exist between native-language vocabulary

knowledge and vocabulary skills (including fast, automatic access of word knowledge in

memory) on the one hand and reading in one's native language on the other hand. This

relationship has formed the basis of a number of influential models of reading and reading disability (e.g., Perfetti & Roth, 1981; Stanovich, 1980). The core assumption of these models, supported by a wealth of data, is that fast and automatic access to the words stored in the reader's mental lexicon is a prerequisite of fluent reading. If word recognition fails (because the word encountered is unknown to the reader or because it is known but cannot be accessed rapidly and/or automatically), reading comprehension breaks down. The reason is that in the case of laborious, non-automatic word recognition precious-attentional capacity (precious because only a limited amount of attentional capacity is available at any moment in time) has to be allocated to figuring out the word and its meaning, leaving too little of the remaining attentional capacity to be allocated to higher-level processes such as finding the antecedent for a pronoun.

Upon acknowledging the importance of vocabulary knowledge and fast access to and retrieval of this knowledge for fluent FL use, teachers and FL-learners appear to face an immense and daunting task. A language contains many tens of thousands of words, far too many to teach and learn via a method of direct teaching. Moreover, for each word ultimately seven types of information has to be learned: phonological and orthographic, syntactic, morphological, pragmatic, articulatory, idiomatic, and semantic information (Schreuder, 1987). The majority of these words have multiple meanings. It has been suggested that the number of meanings per word amounts to 15 to 20, none of which – contrary to what is often thought - can be singled out as being the word's "basic" or "real" meaning (Fries, 1945, in Boyd Zimmerman, 1997). Add to this the fact that word meanings are not stable but instead, just as a language's phonology, develop gradually over time (see Pavlenko, this volume), and one can easily imagine that the teaching and learning of a full-fledged FL-vocabulary is an impossible task that may discourage both

teachers and learners of FL and direct their efforts to more manageable components of

FL-knowledge instead.

However, several studies indicate that familiarity with a relatively small, carefully

selected, number of words suffices for adult language comprehension (Laufer, 1992;

Nation, 1993; see Hazenberg & Hulstijn, 1996, for a review). Nation argues that a

vocabulary of the 3,000 most frequent word families (about 5,000 lexical items; but see

Bogaards, 2001) provides around 95% of coverage of written texts in English, which

should enable an adequate level of comprehension of these texts (but see Hazenberg &

Hulstijn, 1996). This point of view has clear implications for FL-learning: If the FL-

learner needs to attain an initial vocabulary of 'only' a few thousand words, direct

(explicit) vocabulary instruction becomes a feasible means of instruction. The remaining

vocabulary can subsequently be learned implicitly, similar to the way native speakers and

early bilinguals acquire vocabulary from an early age onwards (e.g., Ellis, 1995) and

through extensive reading in the FL.

This chapter focuses on research that has employed direct methods of FL

vocabulary teaching (or, from the learner's viewpoint, on direct methods of FL

vocabulary learning) in (primarily) experimental settings. The first section discusses the

various methods that have been used and their effectiveness and constraints. The next two

sections focus on the differential learning effects that have been obtained with different

types of words. A description of these word-type effects precedes a discussion of

plausible theoretical explanations of their occurrence. A considerable amount of recent

research points at the importance of good phonological skills in vocabulary learning. This

work constitutes the topic to be discussed in the next part of this chapter. It is followed by

a section that intends to show that much more is involved in FL vocabulary learning than

just storing the FL word's name in memory. The final two sections discuss, first, a topic

of obvious pedagogical importance, namely, the beneficial and/or detrimental effects that background music may have on FL vocabulary learning and, second, a number of the causes of the large differences in FL vocabulary learning outcomes and learning ability that exist across studies and between groups of FL learners and individual FL learners.

Direct methods of learning foreign language vocabulary

Keyword mnemonics

A well-known imagery based instruction method for the learning of novel vocabulary, including FL vocabulary, is the keyword method. The keyword method is a mnemonic technique in which learning is divided in two steps. In the first step one learns to associate the novel word (e.g., 'mariposa') to a keyword (e.g., 'marinade'). A keyword is a word in the native language that looks and/or sounds like the novel word that must be learned. In the second step, the learner creates a mental image in which both the keyword and the L1 translation (here: 'butterfly') of the novel word interact (e.g., 'a butterfly swimming in the marinade'). The keyword mnemonic thus establishes both a form and a semantic connection (by means of the interactive image) between the novel word and its L1 translation. After learning, presentation of the novel FL word will elicit the keyword, which in turn will evoke the interactive image between the keyword and the novel word, after which the learner can produce the L1 translation.

The keyword method may seem a rather laborious procedure for learning FL vocabulary. Many studies have found, however, that the keyword method facilitates foreign vocabulary learning and enhances recall in comparison to rote rehearsal (in which the novel word and its L1 translation are subvocally repeated) and unstructured learning (in which learners may choose their own strategy; for reviews, see Cohen, 1987; Hulstijn, 1997; Pressley, Levin, & Delaney, 1982). Beneficial effects of the keyword method on learning and immediate recall of FL vocabulary have been obtained in a wide variety of

languages, including Chinese (Wang & Thomas, 1992), English (Elhelou, 1994; Rodríguez & Sadoski, 2000), German (e.g., Desrochers, Wieland, & Coté, 1991), Russian (Atkinson & Raugh, 1975), and Tagalog (e.g., Wang, Thomas, & Ouellette, 1992).

The keyword method has been found to be successful in a wide variety of settings, including laboratory experiments (as in Atkinson & Raugh, 1975) and studies in more natural settings, often a classroom (Levin, Pressley, McCormick, Miller, & Shriberg, 1979; Rodríguez & Sadoski, 2000). The method benefited FL vocabulary learning and recall of learners of various ages, ranging from children (e.g., Elhelou, 1994; Pressley, Levin, & Miller, 1981) to elderly learners (Gruneberg & Pascoe, 1996).

The keyword method's success can be illustrated by the classical study of Atkinson and Raugh (1975), which instigated a wealth of studies on keyword mnemonics. These authors had university students learn 120 Russian words on three consecutive days (40 words a day). The learners, all native speakers of English with no prior knowledge of Russian, received instructions to follow the keyword method or were instructed to use any learning method they wished. Atkinson and Raugh found that keyword learners outperformed the own-strategy learners on all recall tests. A second striking example concerns a study by Beaton, Gruneberg, and Ellis (1995), who studied the ten-year retention of a FL-vocabulary of 350 words learned by a 47-year old university lecturer via the Linkword Italian course. Linkword is a commercially available course in which the keyword method of vocabulary learning is integrated with basic grammar. After ten years, without any use of Italian, this person remembered 35% of the previously learned FL vocabulary, and after 10 minutes of re-learning added an additional 93 words to the list of recalled words. Although the learner's performance in acquiring Italian could have been facilitated by his knowledge of other languages, including French, Spanish, German, and Greek, and long-term retention with other

instruction methods has not been evaluated, the amount of vocabulary retained after so long is still remarkable.

Theoretical explanations of the benefits of the keyword method point towards an important role of imagery. According to the "dual coding" theory of Paivio and his colleagues (e.g., Paivio, 1986; Paivio & Desrochers, 1981), the keyword method enhances learning and recall because the method uses both the verbal system and the image system in human memory. During learning, both a verbal and an image code are encoded in memory. Assuming that these codes have additive effects, retrieval of the FL word is facilitated because there are two memory codes for the learning event, either of which can support recall. An alternative explanation is proposed by Marschark and his colleagues, who suggest that imaginal processing facilitates recall by increasing the relative relational value and distinctiveness of the information generated during learning (Marschark, Richman, Yuille, & Hunt, 1987; Marschark & Surian, 1989).

Though many studies report positive effects on the use of keyword mnemonics in FL vocabulary learning, the findings of other studies suggest that the method may not be effective under all conditions. Questions that have been raised pertain to the long-term benefits of the keyword method and intentional vs. incidental learning conditions, its usefulness for certain word types, the effects on retrieval speed, the benefits for experienced learners, and its usefulness for receptive and productive learning and recall. These findings potentially constrain and qualify the general applicability of this method. We will discuss each of these topics below.

Durability of memory traces. In the majority of studies reporting long-term benefits of the keyword method the delay interval between learning and testing is typically manipulated within-subjects: Each subject is tested both on the immediate test and on subsequent delayed tests. In a series of studies, Wang and Thomas questioned the

viability of this approach for measuring long-term effects of the keyword method, as the immediate test potentially provides an additional learning trial or allows testing the adequacy of retrieval paths (Wang & Thomas, 1992; 1995; Wang, Thomas, & Ouellette, 1992). They examined the long-term effectiveness of the keyword method by treating the delay interval as a between-subjects variable, testing some learners immediately after study and others only after a delay of several days. Their manipulation also changed the learning set from intentional learning instructions (in which the learners know in advance that their newly acquired knowledge will be tested after learning) to incidental learning instructions. Wang and Thomas convincingly showed that under these conditions, long-term forgetting is greater for keyword learners than for rote learners (Wang & Thomas, 1992; 1995; Wang et al., 1992; but see Gruneberg, 1998). The poorer retention for keyword learners observed by Wang and Thomas may have surfaced because of the between-subjects manipulation, which prevented additional learning or retrieval rehearsal on the immediate test.

The role of word type. A second potential constraint on the applicability of the keyword method concerns the diversity of the words presented in these studies. In most keyword studies, the FL vocabulary items are concrete words, referring to easily imaginable concepts. This sample of words does not represent adult vocabulary knowledge and language usage faithfully. Moreover, the exclusive use of concrete words may have overestimated the merits of the keyword method: Creating an interactive image between the keyword and the L1 equivalent of the novel FL word, a crucial step in the keyword method, is likely to be easier for concrete words (e.g., 'butterfly') than for abstract words (e.g., 'duty'). Ellis (1995) even conjectured that the keyword method would be of little use in learning abstract vocabulary. However, the few studies that explicitly tested the applicability of the keyword method to words that varied in

imageability or concreteness do not seem to substantiate this idea (Delaney, 1978; Pressley, Levin, & Miller, 1981; Van Hell & Candia Mahn, 1997; cf. Ellis & Beaton, 1993a). For example, Van Hell and Candia Mahn (1997) presented abstract and concrete FL words to keyword learners and rote learners. They found that concrete words were learned and remembered better than abstract words under rote rehearsal instructions (as is commonly found, see the word-type effects discussed below). However, the advantage of concrete words over abstract words was not notably larger under keyword instructions.

Another type of FL words that may be less suitable for learning via the keyword method are cognates. Remember that the keyword is an L1 word that looks and/or sounds like the to-be-learned FL word. In learning cognates, for instance, the Spanish word 'rosa', the most obvious keyword would be its translation, here 'rose'. The keyword method thus seems an unnecessarily laborious and ineffective method for learning cognates, particularly considering the large advantage that cognates have over noncognates in the more straightforward learning methods of word-association and picture-association learning (see below, also for a detailed discussion of the role of word type in FL vocabulary learning).

Retrieval speed. In the keyword literature, the benefits of learning are typically expressed in terms of the percentage or proportion of correctly recalled words, often measured in a cued recall task. In the cued recall task one of the elements in the pair (the 'cue') is presented during test and the participant is asked to come up with the other element of the pair. In the cross-language variant of the cued recall task, as frequently applied in FL vocabulary learning studies, the cue is a word in one language and the element to come up with is its translation in the other language; the cross-language version of the cued recall task is thus essentially a word translation task. The cued recall retrieval measure expressed as percentage of correctly recalled words is assumed to

reflect the items successfully encoded in long-term memory during learning. However, as discussed above, fluent language use is determined not only by retrieval accuracy but also by the speed with which a word can be retrieved from memory. Nearly three decades ago, Atkinson (1975) raised a similar point. He assumed that FL learning via the keyword method would not slow down subsequent retrieval of the learned FL words as compared to methods in which word retrieval is less complex, like rote rehearsal.

Remarkably few studies, however, have examined the effect of keyword instruction on FL word retrieval speed (see Van Hell & Candia Mahn, 1997, and Wang & Thomas, 1999, for exceptions). In two experiments, Van Hell and Candia Mahn examined retrieval speed by comparing retrieval times of keyword and rote learners for newly learned FL words in a timed cued recall task. Performance was assessed in three tests: immediately after the learning phase, after a one-week delay, and after a two-weeks delay. In all tests they observed considerably shorter retrieval times for rote learners than for keyword learners (with the differences ranging between 452 ms and 966 ms). The faster retrieval times for rote learners were not compromised by poor recall performance. Rather, the proportion of correctly recalled words of rote learners was higher than (Experiment 1) or equal to (Experiment 2) that of the keyword learners. Wang and Thomas (1999) corroborated these results by measuring response times via a timed recognition task (and treating delay interval as a between-subjects factor).

Together these findings show that keyword learners need more time to retrieve the newly learned words from memory than rote learners do, suggesting that the retrieval of newly learned words may be slowed down by the use of keyword mnemonics. Moreover, it appears that the keyword does not become superfluous but is still used as a retrieval cue well after learning (cf. Atkinson, 1975). This may impede an important goal of FL learning, namely, the attainment of verbal fluency.

The role of experience in FL learning. A fourth factor that may constrain the applicability and suitability of the keyword method concerns the learner's amount of FL learning experience. In the majority of keyword studies, the participants were inexperienced FL learners. Studies using more advanced learners suggest that these learners may benefit less from keyword mnemonics than inexperienced learners do. Levin, Pressley, McCormick, Miller, and Shriberg (1979), Moore and Surber (1992), and Hogben and Lawson (1994) used learners who had followed FL classes for at least a year and observed that the typical beneficial effects of keyword mnemonics are less robust with more advanced learners of the target language. These findings were extended by Van Hell and Candia Mahn (1997) to another group of experienced learners, namely multilingual language users with a considerable amount of experience in learning FL vocabulary (i.e., in English, French, and German), but who had no prior knowledge of the target language, Spanish. In these learners, keyword instructions were less effective than rote rehearsal instructions, both in immediate and delayed recall. These studies suggest that keyword mnemonics are relatively ineffective in experienced FL learners, both advanced learners of the target language and inexperienced learners of the target language who are in command of a number of other foreign languages. Apparently, there is no single most effective way of FL vocabulary learning, but a particular type of learner benefits most from a particular learning method. (Below another experimental result that substantiates this claim will be presented.)

Direction of testing. Another factor that may qualify the benefits of the keyword method concerns the direction of recall. Most keyword studies have used a "receptive" cued recall task, in which the newly learned FL word is presented and the L1 translation must be produced; this task corresponds to "backward" word translation (see e.g., De Groot, Dannenburg, & Van Hell, 1994). The reverse task, "productive" cued recall (or

"forward" translation), is used less frequently. Ellis and Beaton (1993a) found that keyword mnemonics are effective for receptive recall, but less so than rote rehearsal instructions for productive recall.

In conclusion, numerous studies reported beneficial effect of using keyword mnemonics in FL vocabulary learning. Yet, a drawback of the method is that it seems to impede word retrieval after learning, and that its success is constrained by a number of factors, including the learners' experience with FL learning and the type of words to be learned. One of the learning methods to be discussed in the next section, the word-association method, does not suffer from these constraints.

Paired-associate learning

Two other common methods used in FL vocabulary learning studies are versions of a general learning method that has been used in verbal learning and memory research for decades, namely, the so called paired-associate paradigm. In studies employing this method pairs of stimuli are presented during learning. At test, the cued recall task, discussed before, is often employed, in which one of the elements in a pair (the "cue") is presented and the participant is asked to come up with the second element of the pair. Alternatively, whole pairs are presented at test that were or were not presented as such during learning and the participants are asked to indicate whether or not the presented stimulus pair is "old" (presented during learning) or "new" (not presented during learning; "recognition"). The stimuli as complete pairs, but also the separate elements within a pair, may vary on many dimensions, such as the modality of presentation (e.g., auditory or visual) and the nature of the stimuli. Line drawings of common objects or the objects themselves, nonsense shapes, words of various grammatical categories, nonsense combinations of letters, single letters, numerals, and indeed, foreign words, have been

used as stimulus materials in paired-associate studies (see Runquist, 1966, for an early description of the essentials of the method).

The two versions of this general paradigm that have often been used in FL vocabulary learning research are the "word-association" and "picture-association" methods. In the word-association method, the paired associates presented during learning are two words, one a native-language word and the second its translation in the target foreign language. The FL words to be learned may be actual words in a natural language or invented, artificial words that do not occur as such in any natural language. In the latter case the FL word to be learned may be a letter sequence that is formed according to the orthographic and phonological systems of the learner's native language but that carries no meaning (a "pseudoword") or an orthographically and/or phonologically "illegal" letter string, that does not follow the orthographic and/or phonological rule systems of the learner's native language (a "nonword"). In the picture-association method, one of the elements in the study pairs is the targeted FL word and the second is a picture (or a line drawing) depicting the referent of this word. Typically, in both these methods the words are presented visually, but in word association (and for the FL words in the picture-association condition) auditory presentation is a feasible alternative as well, and may indeed sometimes be the only option (in the case of illiteracy of the learners).

The term "word-association method" is used here to stress the fact that in this method on each learning trial two words are paired. The term is neutral with respect to the exact learning strategy the participants have actually used. Often no specific instructions as to what strategy to adopt is given to the participants, a learning setting that is also referred to as "unstructured" learning. Under these circumstances learners report the use of various learning strategies (e.g., associating the two words in the pair; rehearsing them silently; detecting similarities between the words in a pair; forming

mental images of them; constructing sentences containing the words in the pair; inventing memory aids; De Groot & Van den Brink, in preparation); different participants within one and the same experiment may use different strategies, but individual participants may also replace a strategy employed early on in the learning episode by a new strategy later on. In other studies the instructions are somewhat more specific. For instance, in studies employing the "rote learning" technique the participants are instructed to silently rehearse and memorize the presented materials (this is how the term has been employed above).[2]

Of the two paired-associate learning methods, the word-association technique can be applied more widely than the picture-word association method. As pointed out above, the success and applicability of the keyword method, though effective under many circumstances, is constrained by a number of factors. One of these is the fact that the method is not optimally suited for the learning of abstract words and unsuitable for learning cognates. The picture-association technique suffers from one of these constraints as well, and to an even larger extent than the keyword-method: Whereas, with some effort, it is possible to employ the keyword method in learning abstract words (Van Hell & Candia Mahn, 1997), it is virtually impossible to depict abstract words, that, by definition, can not be experienced by the senses, including the eye. (Unlike the keyword method, there is no restriction to limit the picture-association method to noncognates.) The word-association method does not suffer from any of these constraints; it can be used and, indeed, has been used to study the learning of concrete and abstract words, and cognates and noncognates (and frequent and infrequent words, but this variable does not constitute a constraint for the picture-association and keyword methods either). The pertinent studies and the effects found will be discussed below (see the section on word-type effects).

Why then, if its applicability is restricted to the study of only a subset of a language's words, is the picture-association method used at all? An important reason presumably is that it lends itself rather naturally to study vocabulary learning in young children because the method closely resembles a common form of L1 vocabulary acquisition in these children, namely, the association of a word with the corresponding object in the child's environment. Experimental data collected by Wimer and Lambert (1959) suggest that this association of the to-be-learned FL word with environmental objects and events is a relatively effective FL vocabulary learning method for adult learners as well, but a more recent study (Lotto & De Groot, 1998) refutes this claim (see below for details).

When the picture-word association method is used with very young children, it can only be exploited in an auditory form (presenting a picture with the spoken form of its FL name), this because of the fact that these children will typically still be illiterate. Whereas visual presentation of the FL word is an option for young children who have just passed the very initial stages of learning to read, it is not a recommended mode of presentation for this learner group either. The reason is that for these children word reading has not been automatized yet and that, therefore, coming up with the correct sound structure of the visually presented words (via the written forms) often constitutes a real challenge to them. This cognitive limitation cannot be ignored in studies on vocabulary acquisition because it is a well-established fact that generating the phonological forms of visually presented words by means of overt or subvocal speech is an essential component of successful vocabulary acquisition (see below).

Learning words in context

In the FL vocabulary learning methods discussed above, i.e., keyword learning, rote rehearsal, word-association learning, and picture-association learning, the newly

learned words are presented in highly impoverished contexts. Language users, including

FL learners, typically perform in contextually richer situations. This evokes the idea that

an FL word may be better learned in a larger, more meaningful linguistic context like a

sentence. In the field of FL vocabulary learning studies using direct instruction methods,

the question as to whether such learning is more effective using restrictive contexts, as in

the studies discussed above, or using a larger linguistic context has received relatively

little empirical attention (but see, e.g., Moore & Surber, 1992; Prince, 1996). One

prerequisite of learning FL vocabulary in an FL sentence context is that the FL-learners

have a basic level knowledge of the FL language that should be at least sufficient to

understand the sentence context. Prince (1996) examined more advanced FL-learners

who had studied the FL (English) for 5 to 8 years, and instructed them to learn new FL

words in either a sentence context condition or in a word-association condition. He found

that more words were recalled with word-association than with sentence context

instructions. It should be noted, however, that recall of the relatively weak learners (but

not of the more advanced learners) in the word-association condition was notably poorer

when measured via a sentence completion task than via a cued recall task. This finding

suggests that FL learners may differ in the extent to which they can successfully transfer

new vocabulary learned via contextually restricted methods (here via word association) to

more meaningful and contextually richer foreign language situations.

<center>Word-type effects</center>

Words vary on a number of dimensions, two of which, concreteness and cognate

status, have already been touched upon above. For instance, words may refer to concrete

objects or to abstract entities (the variable concreteness); they may share (a large part of

their) visual and/or auditory form with their translation in another language (cognate

status); they may be used often or rather sparsely in speech and writing (frequency); they

may be morphologically simple or complex (morphological complexity) or may differ in structural complexity for other reasons (e.g., they may contain more or less complex consonant clusters). The effect of some of these variables, most notably concreteness, cognate status, and word frequency, have been studied frequently in "bilingual-representation" studies, that focus on the way translation pairs are represented in bilingual memory (e.g., as "compound", "coordinate", or" subordinate" structures in the wordings of Weinreich, 1953, or as "word-association" or "concept-mediation" structures in the terminology of Potter, So, Von Eckardt, and Feldman, 1984; see De Groot, 1993, Kroll, 1993, and Kroll & Tokowicz, this volume, for reviews). The tasks most commonly employed in these studies are word translation (e.g., De Groot et al., 1994), word association (e.g., Kolers, 1963; Van Hell & De Groot, 1998a), and semantic priming across languages (e.g., De Groot & Nas, 1991; Keatley, Spinks, & De Gelder, 1994).

In contrast to the bilingual-representation studies, relatively few FL vocabulary-learning studies have manipulated word-type variables, even though doing so is likely to provide relevant information on the learning process and the ensuing memory representations. Furthermore, results of such studies may inform FL curricula, especially the sequencing of the vocabulary to be learned by the students (e.g., Meara, 1993). A plausible reason why only few of these learning studies varied word type is that typically the word set presented for learning in these studies consists of rather few words, too few to contain a sufficiently large number of each type (e.g., concrete noncognates) to obtain reliable effects of the variables concerned. For instance, studies by Cheung (1996), Papagno, Valentine, and Baddeley (1991) and Wimer and Lambert (1959) presented only three, eight, and nine words, respectively, to be learned an FL word for.

As the representation studies, the few FL vocabulary learning studies that have manipulated word type have shown reliable effects of two of the above variables, namely,

word concreteness (De Groot & Keijzer, 2000; De Groot & Van den Brink, in preparation; Ellis & Beaton, 1993b; Service & Craik, 1993; Van Hell & Candia Mahn, 1997) and cognate status (De Groot & Keijzer, 2000; Ellis & Beaton, 1993b; Lotto & De Groot, 1998; Kroll, Michael, & Sankaranarayanan, 1998). For some of these studies, namely, those that have employed an orthogonal (not a correlational) design, it is possible to determine the actual size of the effects. These analyses show that the effects are substantial: Across the relevant studies, the magnitude of the concreteness effects varies been 11% and 27%, meaning that the recall scores are from 11% to 27% higher for concrete words than for abstract words (De Groot & Keijzer, 2000; De Groot & Van den Brink, in preparation; Van Hell & Candia Mahn, 1997). Similarly, the magnitude of the effect of cognate status varies between 15% and 19% when highly experienced FL learners are the participants in the vocabulary learning studies (De Groot & Keijzer, 2000; Lotto & De Groot, 1998). When less experienced FL learners serve as participants, the cognate effect even appears to be substantially larger (about 25% in a receptive-testing condition and about 50% in a productive testing condition; Kroll et al., 1998; p. 383).

Acknowledging the fact that fluent use of a foreign language not only requires that FL knowledge (here, the knowledge of FL vocabulary) is stored in memory, but also that this knowledge is accessed and retrieved rapidly (see also the section on keyword mnemonics), these five studies that employed an orthogonal design measured retrieval times as well. The results of these analyses generally converged with the analyses on the recall scores, although fewer of the effects were statistically significant. But whenever a significant effect occurred, its direction strengthened the conclusions drawn from the analyses of the recall scores. That is, responses to concrete words and cognates were generally faster than those to abstract words and noncognates, respectively.

A third variable that has been manipulated in some of the above studies is word frequency. As compared to the effects of word concreteness and cognate status, the effect of this variable is not robust. If it occurs at all in a particular study, it is rather small (effects of 3% to 7% in De Groot & Van den Brink, in preparation, De Groot & Keijzer, 2000, and Lotto & De Groot, 1998), and in two of these studies (De Groot & Van den Brink, in preparation; De Groot & Keijzer, 2000) this small effect (with better performance for high-frequency words than for low-frequency words) was attributable to a subset of the items only.

The FL vocabulary learning studies discussed in this section have employed different methods of FL learning. As mentioned earlier, Van Hell and Candia Mahn (1997) contrasted the keyword method and rote rehearsal; De Groot and Keijzer (2000) and De Groot and Van den Brink (in preparation) used the word-association technique; and Kroll et al. (1998) and Lotto and De Groot (1998) contrasted the word-association and picture-association methods. Maybe the most noteworthy word-type effect reported in these studies combined is the finding by Kroll et al. and Lotto and De Groot that an effect of cognate status not only materialized in the word-association condition, but also in the picture-association condition. What is more, the cognate effect was equally large in these two conditions. The reason to qualify this finding as noteworthy is that it is generally assumed that the form relation between translation equivalent terms underlies the effects of cognate status in both representation and learning studies. But of course, a word and a picture representing this word do not share any form similarity. The effect of cognate status in the picture-learning condition thus suggests that the presentation of a picture activates the corresponding L1 word form (Lotto & De Groot, 1998, pp. 58-59), and that the learner then recognizes the similarity between the generated L1 word form and the to-be-learned FL word form accompanying the picture. This awareness then

somehow (see below for more detail) facilitates the learning of the new form. In theory, the form concerned could be phonological, orthographic, or both, because the two elements within the cognate pairs used in these studies are typically similar both in spelling and in phonology, and the learner's recognition of either type of relationship might facilitate learning. Lotto and De Groot, however, argue that the forms involved presumably are the phonological forms (see there for details). Furthermore, they note that such a conclusion fits in nicely with the results of a number of related studies that all suggest an important role for phonology in learning FL vocabulary, even when the learning materials are presented visually (e.g., Baddeley, Papagno, & Vallar, 1988; Papagno, Valentine, & Baddeley, 1991; Van Hell & Candia Mahn, 1997; see below for a more detailed discussion).

<u>Word-type dependent forgetting</u>

The goal of FL vocabulary learning is to install durable, not transient, representations in memory. At least two studies suggest that this goal is not met equally often for all types of words but that, instead, more forgetting occurs for the types of words that are the most difficult to learn (De Groot & Keijzer, 2000; De Groot & Van den Brink, in preparation). When the participants of these studies where retested about a week after initial learning (without further learning), it turned out that more forgetting had occurred for abstract words than for concrete words and that more forgetting had occurred for noncognates than for cognates. These results converge with the findings of Bahrick and Phelps (1987), who showed (at a global level, without examining the performance for different types of words), that eight years after learning retention was best for words that had required the fewest learning trials to obtain criterion performance during learning.

Note that this does not imply that manipulations that increase the difficulty of a learning task lead to more forgetting. In a FL vocabulary learning study using the word-association method, Schneider, Healy, and Bourne (2002) found that increasing the difficulty of learning during the initial phase (i.e., through learning procedures involving the more difficult L1-FL direction rather than the reverse direction, mixing rather than blocking semantic categories, or no pre-training of FL words) leads to poorer learning and immediate retention but not to inferior delayed retention, transfer and relearning. Importantly, in Schneider et al.'s study the difficulty of the learning conditions pertains to the difficulty of learning procedures rather than of the FL materials to be learned, as in De Groot and Keijzer (2000) and De Groot and Van den Brink (in preparation). In other words, concrete words and cognates may be better retained than abstract words and noncognates, respectively, but FL words learned under difficult learning procedures may be better retained than those same words when learned under easy learning conditions.

<div align="center">Explaining the word-type effects</div>

<u>Concreteness</u>

Effects of concreteness are ubiquitous in studies on first and second/foreign language learning and language processing. For instance, the concreteness effect observed in the FL vocabulary learning studies discussed above has a parallel in first language acquisition, where concrete words are acquired earlier than abstract words (e.g., Brown, 1957; Schwanenflugel, 1991). The question remains what causes these effects, and whether or not all effects of this variable, both in L1 acquisition and in FL learning, both in language acquisition/learning and in language processing, can be parsimoniously attributed to one and the same source or whether different causes underlie the various manifestations of the effect. For instance, a likely cause of the concreteness effect in L1 acquisition is that acquiring concrete words is often supported by the tangible, visible,

audible, and/or palpable presence of the corresponding objects in the child's surroundings whereas this sensory information is, by definition, missing for abstract words. If this explanation holds, a different explanation of the concreteness effect in FL vocabulary learning has to be provided, since in none of the pertinent studies discussed above the entities the to-be-learned concrete words refer to were present in the learning environment (although these objects may have been imagined by the participants, a process that may have caused or contributed to the effect).

De Groot and Keijzer (2000) suggested two possible causes of the concreteness effect in FL vocabulary learning, that both attribute the effect to differences between the memory representations of concrete and abstract words. Both explanations assign a critical role to the amount of information concerning the L1 word that is stored in memory: The more information is stored, the more opportunity the learner has to anchor the to-be-learned FL word form onto it and, therefore, the more successful learning is. One of these explanations is in terms of dual coding theory (see also the section on keyword mnemonics), which assumes two memory representations for concrete words, one in the verbal system and one in the image system, whereas only one, stored in the verbal system, is assumed for abstract words. Note that this state of affairs implies that dual-coding theory assumes qualitatively different memory representations for concrete and abstract words.

The second explanation is in terms of the differential informational density of memory representations for concrete and abstract words within an amodal, monolithic memory system (De Groot, 1989; Kieras, 1978; Van Hell & De Groot, 1998b; Van Hell & Sjarbaini, in preparation): Within this framework, the memory representations of concrete and abstract words are only assumed to differ quantitatively, not qualitatively: Those of concrete words are assumed to contain more information elements than those of

abstract words (see De Groot, 1989, for experimental support). Again, this allows more anchoring opportunities in the case of learning and FL word form for concrete L1 words. Lotto and De Groot (1998) propose this same explanation for the (relatively small) frequency effect in FL vocabulary learning that has sometimes (but not reliably) been obtained.

This explanation of the concreteness effects in FL vocabulary learning cannot account for the analogous effects in L1 vocabulary acquisition by toddlers. The reason is that the former effects result from differences in memory structures for concrete and abstract words that presumably reflect the outcome, not the beginning, of the L1 acquisition process. At the onset of L1 vocabulary acquisition neither for concrete words nor for abstract words representations are likely to exist in memory; in other words, at that stage concrete and abstract words do not differ with respect to their memory representations; the build-up of memory information for both types of words presumably starts from scratch. A plausible explanation for the concreteness effect in L1 vocabulary acquisition was already provided above: Only the acquisition of concrete words, not that of abstract words, is supported by the perceptual presence of these words' referents in the child's environment.

Cognate status

Lotto and De Groot (1998) and De Groot and Keijzer (2000) suggested three possible sources for the superior FL vocabulary learning performance for cognates, considering both the learning stage (storage) and the testing stage (retrieval) as possible loci of the effect. The first explanation extends a view of bilingual memory representation that assumes shared representations for cognates but language-specific representations for noncognates (Kirsner, Lalor, & Hird, 1993; Sánchez-Casas, Davis, & García-Albea, 1992; see also Sánchez-Casas & García-Albea, this volume). In fact, a cognate relation

between two words is considered a special case of a morphological relation that may exist between words within one and the same language and that is reflected in the joint storage of morphologically related words in memory. According to this view, bilingual memory is, just as monolingual memory, organized by morphology, not by language. For instance, a French-English bilingual has one memory representation containing both the English words "marry", "marriage", and "married" as well as the French words "marier" and "mariage" (Kirsner et al., 1993). If true, the learning of a foreign-language word that shares a noncognate relation with the corresponding L1 word involves creating a new entry in memory, whereas learning a cognate word may only involve adding new information to, or adapting, a representation that was already stored there prior to the learning episode. The latter process may be less demanding than the former, causing the learning advantage of cognates over noncognates.

A second possible cause for the cognate advantage is that in the case of learning an FL cognate, which shares form with its translation, <u>less</u> has to be learned than when a noncognate FL word has to be learned. Finally, due to the form overlap between cognate translations and the absence of such overlap in the case of noncognates, when a cognate is presented as the testing stimulus it will constitute a strong cue for the retrieval of its translation equivalent in the target language. These three suggested causes of the effects of cognate status do not have to be mutually exclusive but may all contribute to the effect.

Word-type dependent effects on forgetting

The differential forgetting of concrete words and cognates on the one hand and abstract words and noncognates on the other suggest that, in terms of Atkinson (1972), immediately after training abstract words and noncognates are in a "T" state ("T" for "temporally") relatively often. This means that the newly learned word is only known

temporarily and that subsequent learning of other words will cause interference, causing forgetting of the previously known word. The second state Atkinson distinguishes is a "P" state ("P" for "permanent"), for newly learned words that have gained a permanent status in memory immediately after training. The data suggest that concrete words and cognates have reached a P state relatively often at the conclusion of the training phase. A third possible state that words presented for learning can be in, and that abstract words and noncognates are in relatively often immediately after training, is the "U" state ("U" for "unknown"). Of course, distinguishing between these three retention states only concerns a re-phrasal of the effects obtained, not an explanation. A true explanation may ultimately be provided in terms of, once again, differential memory representations for different types of words (e.g., being embedded in a denser representation and, as such, being linked to a relatively large number of information elements in memory, might render a newly learned FL word relatively immune to forgetting).

The role of phonology in FL vocabulary learning

The cognate effect observed in the picture-association learning condition in Lotto and De Groot (1998) and in Kroll et al. (1998) suggests that participants generated the names of the presented pictures during learning (see above). This was regarded support for the view that phonology plays an important role in FL vocabulary learning. Gathercole and Thorn (1998) review the relevant literature and provide overwhelming support from various sources for it. For instance, Papagno, Valentine, and Baddeley (1991) showed that an experimental technique called "articulatory suppression" disrupts the learning of FL vocabulary (although suppression had little effect on meaningful paired-associate learning in L1). The articulatory suppression technique involves the repeated uttering of a sound (e.g., "bla") while learning the paired associates consisting of, say, an L1 word and its FL translation. Suppression interferes with the phonological

recoding of visually presented items, thus preventing their short-term phonological storage. Furthermore, suppression interferes with "subvocal" rehearsal, a process that is deemed necessary for transfer from short-term memory into long-term memory.

Service (1992), in a three-year longitudinal study of Finnish children learning English as an FL, showed a close relationship between the children's ability, at the start of the program, to repeat presented pseudowords and their grades in English at the end of the program. Subsequent work (Service & Kohonen, 1995) suggested that this relationship was mediated by English vocabulary knowledge. Pseudoword repetition is assumed to involve phonological memory, and the level of accuracy at which the task is performed is thought to reflect phonological-memory skills and capacity. Therefore, also these data suggest a relation between phonological memory and FL vocabulary learning. This conclusion is strengthened further by neuropsychological evidence: Baddeley et al. (1988) showed that their patient PV, who had a reduced phonological store capacity, was unable to repeat back pseudowords longer than three syllables and to learn auditorily presented pseudowords paired with real words.

The important role of phonology in FL vocabulary learning is further supported by studies using experienced FL learners. Papagno and Vallar (1995) observed that polyglots performed better than non-polyglots in phonological memory tasks and in FL paired-associate learning, suggesting a relation between phonological-memory capacity and FL vocabulary learning. Van Hell and Candia Mahn (1997) observed that experienced FL language learners benefited more from rote rehearsal learning than from keyword learning. They proposed that subvocal rehearsal of the FL word and its translation activates phonological codes, and that experienced learners in particular benefit from using phonological information in learning novel FL words. Specifically, experienced FL learners may not only have better phonological memory skills (as

suggested by Papagno and Vallar's study), they may also possess more refined long-term knowledge of phonological structures. For example, the experienced FL learners in Van Hell and Candia Mahn's study had all learned the subtle, yet important, differences in the pronunciation of the cognate 'hotel' across the Dutch, English, French, and German languages. This fine-grained and broad repertoire of phonological knowledge, along with better phonological memory skills, may make experienced FL learners more receptive to the phonological information novel FL vocabulary contains, and may thus guide and facilitate the learning of novel FL words.

Finally, the "typicality" of the FL words to be learned affect their learning; that is, if the sound structure of the to-be-learned words confirms to the phonotactic rules of the learner's native language, learning is more successful than when phonotactically alien FL words are presented for learning. Gathercole, Martin, and Hitch (in Gathercole & Thorn, 1998) varied the nonwords in word-nonword pairs on "wordlikeness" (in terms of sound structure) and demonstrated that more wordlike nonwords than non-wordlike nonwords were learned. Similarly, immediately after learning De Groot and Van den Brink (in preparation) obtained recall scores that were 14% higher for phonotactically typical nonwords than for phonotactically atypical nonwords. Furthermore, a week after learning more forgetting had occurred for the latter. (This is yet another demonstration of the earlier finding of De Groot and Keijzer, 2000, that words hard to learn are more easily forgotten than words relatively easy to learn.) All these findings converge on the conclusion that during the learning of FL vocabulary phonological codes are generated and used to support the learning process: The typicality effect is likely to arise from the fact that the generation of phonological codes is easier for phonotactically typical words than for atypical such words.

Baddeley, Gathercole, and Papagno (1998) proposed a model of the phonological loop that accommodates the findings of the studies discussed above (and those of many other studies, see Baddeley et al., 1998; Gathercole and Thorn, 1998). The phonological loop, a component of the multi-component model of working memory, is specialized in the retention of verbal information over short periods of time. The phonological loop includes a phonological store (which holds information in phonological form) and a rehearsal process (which serves to preserve decaying representations in the phonological store). The primary function of the phonological loop is to mediate language learning by providing a temporary storage of unfamiliar phonological forms (novel words) while more permanent memory representations are being constructed. It is proposed that the phonological loop and long-term knowledge of the language operate in an interactive manner. Relevant for FL vocabulary learning is the assumption that the phonological loop function in FL learning is enhanced by instructions emphasizing subvocal rehearsal, as in rote rehearsal (e.g., Ellis & Beaton, 1993a; Van Hell & Candia Mahn, 1997) and is disrupted by articulatory suppression (e.g., Ellis & Sinclair, 1996; Papagno et al., 1991). Baddeley et al. (1998) proposed that the phonological loop function may vary across individuals. Specifically, the natural talent of polyglots, or gifted language learners in general, for learning language may arise from an excellent phonological loop function. (See also Michael and Gollan, this volume, who discuss other aspects of working memory, such as working-memory capacity, that may play pivotal roles in becoming proficient FL users.)

Freeing and fine-tuning the newly learned FL words

The storage of durable representations for the newly learned FL word forms in memory by means of either of the learning methods discussed above – keyword mnemonics, rote rehearsal, word-association learning, or picture-association learning – is

only a first step towards establishing an FL word representation that resembles a native speaker's representation of this same word and that enables the access (in comprehension) and retrieval (in production) of this representation in a way that resembles these processes in a native speaker. So far, the new representation consists of little more than an extra element – the FL word label – attached to (or embedded in) the representation for the corresponding native-language word. At this learning stage, when this new word form is encountered by the FL learner in actual FL speech or writing, he or she can only come to grips with it by assigning it the meaning of the corresponding L1 word. There is evidence to suggest that during the very initial stages of learning, this process of L1 meaning assignment proceeds indirectly, via the L1 word form (Chen & Leung, 1989; Kroll & Curley, 1988; Kroll & Sholl, 1992; Kroll & Stewart, 1994; Sholl, Sankaranarayanan, & Kroll, 1995; cf. Weinreich's, 1953, subordinate type of bilingualism; see also Kroll & Tokowicz, this volume). Similarly, during FL language production the retrieval of the FL word form is assumed to start out with the activation of the meaning representation of its translation in L1 and then to "pass through" the L1 form representation before the FL form is retrieved and produced. Soon afterwards, with increasing FL experience, the FL word form starts to become functionally detached from the corresponding L1 word-form representation and to access meaning as directly as the corresponding L1 word does. A number of studies have suggested that such "freeing" of the FL word form from the L1 word form starts very early on in the FL learning process for this word (Altarriba & Mathis, 1997; De Groot & Poot, 1997; Potter et al., 1984). Ultimately, retrieval of this word form in FL will no longer exploit the L1 word-form representations at all (cf. Weinreich's, 1953, "coordinate" bilingualism).

Assigning FL words the meaning of the corresponding L1 words, either indirectly via the L1 word forms or, later, directly, would imply the use of a strong "semantic

accent", the reason being that translation "equivalents" seldom share all aspects of their

meaning: The meaning aspects specific to the word in L1 would be implied when using

its L2 "equivalent" (see MacWhinney, this volume, for other types of L1 transfer in FL

learning). Highly technical words possibly constitute the only exception to the apparent

rule that the meanings of a word and its closest translation do not overlap perfectly (Fries,

1945, in Boyd Zimmerman, 1997, p. 11), although for particular classes of words

(concrete words) the overlap in meaning between the two languages is larger than for

other classes (abstract words; emotion words). For this reason, De Groot (1992; see also

Van Hell & De Groot, 1998a) proposed the "distributed feature" model of bilingual

lexical representation as an alternative to the more common "localist" models. In this

model word meaning is represented in memory as a set of semantic features, some of

which are shared between a pair of translations whereas others are unique to either the L1

word or to the FL word. Translations of concrete words share more of these semantic

features than translations of abstract words (see Kroll & Tokowicz, this volume, for

further details).

Furthermore, assigning FL words the meaning of "its" translation equivalent

entails the flawed assumption that a word has only one meaning, whereas the truth of the

matter is that words typically have many different meanings (some claim from fifteen to

twenty in English; Fries, 1945, in Boyd Zimmerman, 1997, p 11), some of which related,

but others apparently unique. Which one of a word's many meanings should be assigned

to it when it is encountered in speech or reading depends on the context in which it is

used. This plethora of meanings and shades of meaning words may have and the context-

dependence of word meaning have frustrated the attempts by many to obtain exact

definitions of words and have led others to accept the view that "word meanings cannot

be pinned down, as if they were dead insects. Instead, they flutter around elusively like

live butterflies. Or perhaps they should be likened to fish which slither out of one's grasp" (Aitchison, 1987, p. 40). Or, in the words of Labov (1973; in Aitchison, 1987, p. 40): "Words have often been called slippery customers, and many scholars have been distressed by their tendency to shift their meanings and slide out from under any single definition". In keyword mnemonics, word-association learning, and picture-association learning, only one of this plethora of meanings is singled out (either by the stimulus itself, e.g., the picture of a mug, or by the learner), leaving all remaining meanings of the FL word yet to be learned through other means.

Insight into learning the meaning of words in more advanced FL vocabulary learning is provided by Bogaards (2001). He studied the learning of new meanings for known words and for combinations of known words in learners of French, all native Dutch speakers, who were in their fourth year of learning this FL in high school. The results of Bogaards' study (see there for details) suggest that both previously learned word forms and word meanings may benefit the learning of new meanings for familiar forms and expressions comprised of familiar forms.

In sum, to ultimately use an FL word in a native-like way, the FL word form must provide access to meaning and be retrieved from conceptual representations directly, bypassing the form representation of its L1 translation. The meaning that is initially associated with the FL word (the meaning of its L1 translation) must gradually be narrowed down (to get rid of the unique L1 meaning parts), extended (to also cover the unique L2 meaning parts or be used in multiword expressions), and refined such that it covers all of its FL meanings and captures the specific connotations of each of them. Needless to say, gaining such a detailed level of FL vocabulary knowledge requires extensive practice of the FL words in contexts varied enough to acquaint the learner with all the finesses of their meanings. Apart from extended immersion in an environment

where the FL is the dominant language, only extensive reading in that language is likely to provide that outcome. The initial, flimsy, representations set up via the direct instruction methods discussed above provide no more than the means to bootstrap into this time-consuming learning process, but, as such, are extremely valuable.

The effect of background music on learning FL vocabulary

When performing cognitively demanding tasks some people prefer a quiet environment, claiming to be hindered by noise, including music, whereas others seem not to be bothered by a certain noise level or even prefer (a particular type of) background music while performing the task, claiming to perform better under those circumstances. This observation, if confirmed and understood in rigorous research, has obvious pedagogical implications as it might, for instance, inform teachers about how to create the optimal learning environment in the classroom and advise students with respect to the most effective circumstances to do their homework. Of course, the potential impact of well-controlled studies into this topic reaches far beyond the classroom, since cognition is involved in the far majority (if not all) tasks to be performed by humans, even in tasks that are performed automatically most of the time.

Acknowledging its potential importance, the effect of background music (and other types of noise, that will be ignored in the present discussion) on task performance has been a topic of study by several groups of researchers, most notably applied psychologists, cognitive psychologists, and personality psychologists. The applied psychologists among these researchers primarily tried to find out whether music affects workers' satisfaction and moral and/or their productivity at work; the cognitive psychologists' goal was to look at ways in which music affects attention and processing in various tasks; the personality psychologists' focus was on the way music and different

musical styles interact with individual differences in personality (see Furnham & Allass, 1999, and Furnham & Bradley, 1997, for a historical overview of this work).

The role of background music in learning has also received the attention of teachers and educators with an interest in a field of study carrying the esoteric name of "Suggestopedia", a name based on a teaching method thus dubbed and introduced in Bulgaria by Lozanov (1978, in Felix, 1993). The innovative element this learning method introduced in the classroom was the systematic use of music in the instruction process. Especially classical baroque music was thought to support the learning process. Felix (1993) reviews the pertinent studies and concludes that positive effects of music played during learning have been reported for vocabulary learning and reading performance; that effects of music played during testing do not consistently occur; and that playing the same music during both learning and testing leads to the best achievement. The latter finding exemplifies the well-known phenomenon of "context-dependent" memory, that is, that test performance is better the more similar the circumstances under which testing occurs are to the circumstances present while learning (e.g., Godden & Baddeley, 1975)

De Groot and Van den Brink (in preparation) looked at the effect of background music on learning "FL words" (that, in fact, were pronounceable and non-pronounceable nonwords) for a set of Dutch words. The participants were all drawn from the same population of relatively experienced FL learners. Half of them learned the FL words in silence, whereas the other half learned them while part of the Brandenburg Concerto by J. S. Bach was played in the background. During testing no music was played to either group of participants. The results were promising but not in all respects conclusive: The recall scores were higher (by 8.7%) in the music condition than in the silent condition, but this effect only generalized over items, not over participants. This finding suggests that only a subset of the participants in the music condition benefited from the presence

of background music. It also suggests that the remaining participants in this condition were not hindered by it either, because otherwise an overall null-effect of the music manipulation might have been expected.

Studies by Furnham and Bradley (1997) and Furnham and Allass (1999) hint at an exciting explanation of why the effect of the music manipulation did not generalize over participants. Inspired by Eysenck's (1967) theory that introverts and extraverts differ in their levels of cortical arousal, they predicted that background music might have a detrimental effect on cognitive task performance in introverts but a beneficial effect on such performance in extraverts. Manipulating this personality trait, Furnham and Allass observed that introverts performed substantially better in the silent condition than in the (pop)music condition in a reading comprehension task and a recall task (few details about the tasks are provided), whereas for extraverts exactly the opposite pattern of results was obtained. The detrimental effect of music for the introverts was larger in a condition where the music played was complex than in a condition where it was simpler. Again, this pattern reversed for the extraverts. Furnham and Bradley also demonstrated an interaction between the introvert/extravert variable and the music variable on two cognitive tests, one a reading comprehension test and the second a memory test, and Daoussis and McKelvie (1986) showed a similar interaction in a study looking at reading comprehension. The results of the latter two studies differed from those of Furnham and Allass in that music had a detrimental effect on the cognitive performance of introverts whereas extraverts appeared immune to the effects of the music manipulation. But all three studies converge on one and the same conclusion, namely, that the introvert/extravert personality trait plays an important role in the effects of background music on cognitive performance.

The authors of the three studies just discussed all turn to Eysenck (1967) to account for this intriguing interaction between the introvert/extravert personality trait and the presentation of music during learning. Eysenck posits that introverts have a lower neurological threshold of arousal and, therefore, experience greater arousal in response to lower-intensity stimulation than extraverts; this results in introverts' satisfaction at relatively low levels of stimulation. It is posited that in introverts optimum performance is reached at moderate levels of arousal. In contrast, extraverts require relatively high levels of arousal for optimal performance (Furnham & Allass, 1999, pp. 28-29). Presumably without being aware of this alleged underlying physiological cause, introverts and extraverts are apparently aware of the effect of background music on their study success, because extraverts claim to play background music more often while studying than introverts (Daoussis & McKelvie, 1968; Furnham & Bradley, 1997).

This account of music effects on learning provides a plausible explanation of the above finding by De Groot and Van den Brink (in preparation) that the effect of the music manipulation did not generalize over all participants. In that study the introvert/extravert personality trait was not taken into account and the participant sample most likely included both introverts and extraverts. The extraverts may have benefited from background music, causing the overall higher recall scores in this condition. The fact that a net positive effect of background music was obtained suggests that the introverts were not hindered by background music either.

The role of a number of other factors that may affect music's effect on learning success, such as music preference (see Etauch and Michals, 1975, who studied the effect of this variable on reading comprehension), vocal vs. non-vocal music (Belsham & Harman, 1977), and musical styles (e.g., classical, jazz, and popular, Sogin, 1988), is still largely unknown. The evident pedagogical implications of filling this knowledge gap on

creating optimal learning environments warrant an increase of research efforts devoted to unraveling the relevant variables and their interactions.

Individual differences in learning FL vocabulary

At various points in the preceding sections the existence of individual differences in the learning of FL vocabulary was alluded to, both differences between learner groups and differences within groups of learners. For instance, it was pointed out that advanced (experienced) learners of a particular target language benefit less from keyword mnemonics than less advanced (inexperienced) learners of that language do (e.g., Moore & Surber, 1992), and that for multilingual language users, who have a considerable experience with learning foreign languages, rote rehearsal is a more effective learning method than keyword mnemonics are (Van Hell & Candia Mahn, 1997). Lotto and De Groot (1998) obtained a similar result: They showed that multilingual language users, sampled from the same population as the participants in Van Hell and Candia Mahn's study, learned more FL vocabulary when a word-association method was used than when the picture-association method was employed.

In contrast, Wimer and Lambert (1959), comparing word-association learning with object-association learning (where the word to be learned is paired with an object rather than a picture of that object), obtained better recall performance with object association than with word association and concluded that "environmental events are more effective stimuli for the acquisition of foreign-language responses than are native-language equivalents for the new words, at least for the learning of a simple, basic vocabulary" (Wimer & Lambert, 1959, p. 35). The results of De Groot and Lotto (1997) and (if imaging objects plays the same role in learning as actual objects or pictures of actual objects do) also those of Moore and Surber (1992) and Van Hell and Candia Mahn (1997), suggest that this conclusion does not hold for all groups of learners. Possibly, the

participants in Wimer and Lambert's study were relatively inexperienced foreign language learners. If so, this combined set of studies would suggest that learner group and learning method interact such that for experienced FL learners the word-association technique (or rote rehearsal, as one particular implementation of this technique) is more effective than learning techniques that employ the visual (imagined or actual) analogues of the FL words to be learned and that for less experienced learners the opposite holds.

The results of Kroll et al. (1998; Experiment 1), that just as Lotto and De Groot (1998) contrasted word-association and picture-association learning, provides some direct support for this suggestion: Whereas Lotto and De Groot, testing experienced FL learners, obtained better results overall with word-association learning than with picture-association learning (82% correct for word-association learning vs. 77% correct for picture-association learning; only productive testing was employed), Kroll et al., testing less experienced language learners, obtained the opposite pattern of results (78.5% and 39.5% correct for word-association learning in a receptive- and productive testing condition, respectively, vs. 82% and 42% for these testing conditions following picture-association learning; all data collapsed across a test condition that tested with picture stimuli and one that tested with word stimuli). That the participants in Kroll et al. were less experienced learners than those of Lotto and De Groot is strongly suggested by the far lower learning scores in the productive-testing condition in Kroll et al. than in De Groot and Lotto. Furthermore, to achieve an overall recognition accuracy of 70% in the (relatively easy) receptive-testing condition, the data of only half of the participants (45 out of 99) could be included in the analyses (see Kroll et al., 1998, pp. 379 and 381). In De Groot and Lotto, to achieve at least 60% accuracy in the (relatively hard) productive-testing condition (the only condition that they tested), only eight of the 64 participants tested had to be removed from the analyses (De Groot & Lotto, 1998, p. 43).

The amount of FL learning experience is unlikely to be the only variable that interacts with the specifics of the learning environment. That other factors may be relevant as well was implicit in our discussion of the effect of background music on learning FL words. As shown there, the relevant literature suggests that the personality trait introversion/extraversion interacts with a role of background music. We hypothesized that the pattern of results obtained by De Groot and Van den Brink (in preparation), testing experienced FL learners exclusively, emerged from an interaction between this personality trait and the music manipulation. If that analysis is correct, the results of that study indicate that FL learning experience is only one of the factors that determine what the optimal learning circumstances are. In other words, the effects of FL learning experience and background music both suggest that there is no single optimal procedure of learning FL vocabulary but that, instead, the optimal procedure depends on learner characteristics. Different learners may benefit most from different circumstances, and one and the same learner may benefit most from different circumstances at different stages of learning.

Differences in phonological knowledge and processes and others aspects of working memory, such as working-memory capacity, were mentioned as yet another source of individual differences in FL vocabulary learning (Baddeley et al., 1998; Papagno & Vallar, 1995; see also Michael & Gollan, this volume). As we have seen, phonological coding appears to play an important role in transferring newly learned words from transient memory stores into permanent memory, and the presence of fine-grained phonological knowledge in long-term memory may increase the learner's receptiveness to subtle phonological differences in the learning material. Baddeley et al. (1998) suggested that the phonological-loop function differs between individuals and that gifted language learners are characterized by an excellent such function. The amount and

subtlety of phonological information in memory is obviously a function of the amount of language experience, native and foreign, a learner has so that, ultimately, language-learning experience may underlie (a substantial part of) the effects of phonological skills on FL language learning. It remains to be seen whether, all other things (such as language learning experience) being equal, a thing such as "talent" for learning foreign languages can still be identified.

Conclusion

This review of studies on FL vocabulary learning has highlighted some of the factors that need to be taken into account if one is to gain a complete understanding of successful learning performance while it has only briefly touched upon, or even completely ignored, other factors. For instance, much attention was devoted to contrasting the various direct FL vocabulary learning methods that are around and pointing out their limitations and the ways they interact with learner characteristics such as FL learning experience and phonological skills. Similarly, the fact that various word characteristics determine the success of learning FL equivalents for L1 words and the way these effects can be explained was discussed at length. We also reviewed at some level of detail the research that tries to resolve the dispute regarding the role that background music may play in FL vocabulary learning. Finally, some discussion was devoted to the later stages of FL vocabulary acquisition, in which the newly learned FL words get functionally detached from their L1 counterparts and their meaning representations gradually develop towards those of L1 users of the FL concerned.

Other aspects of FL vocabulary learning received little or no attention, for instance, the role of proximity of the to be learned FL to the learner's L1. This issue was only briefly touched upon when discussing the effect of word-typicality on learning performance. The larger the distance between L1 and the FL to be learned, the more of

the FL word <u>forms</u> to be learned will be atypical for the learner; but also, the more alien the FL words' <u>meanings</u> will be to the learner and the more mapping problems between elements in the L1 and the FL the FL learner will encounter. FL vocabulary learning studies that test an FL similar to the learner's L1 (or that test the learning of pseudowords, that by definition have phonological forms akin to the learner's L1) may overestimate learning performance as compared to testing more distant foreign languages. Such effects of language proximity/distance warrant a more thorough discussion than received above. A further neglected topic concerns the large difference in performance that is typically obtained between productive- and receptive testing conditions, with receptive testing producing the better results. Here and there mention was made of these two ways of testing newly learned FL vocabulary, but without providing theoretical accounts of this effect (see De Groot & Keijzer, 2000, pp. 43-45, for a discussion). Finally, hardly anything has been said on the crucial differences between late FL vocabulary learning, that, albeit implicitly, was the topic of the present discussion, and early bilingual vocabulary acquisition (see De Houwer, this volume). These learning processes differ crucially because in early bilingual vocabulary acquisition, as in L1 vocabulary acquisition, the acquisition of word form and word meaning proceed in parallel, whereas in late FL vocabulary learning a meaning for the new word to be learned is already in place (although it requires adjustment; see above). Future reviews of studies on FL vocabulary learning might shift the focus to these and other issues neglected here.

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<u>57</u>, 31-36.

Footnotes

1. A foreign language is a language that is not a native language in a country. In North America "foreign language" and "second language" are often used interchangeably in this sense. In British usage a distinction between the two is often made such that a "foreign language" is a language which is taught in school but is not used as a medium of instruction in school nor is it a language of communication within a country (e.g., English in France). In contrast, a "second language" is a language which is not a native language in the country but which is widely used as a medium of communication (e.g., in education and government) and which is used alongside another language or languages (e.g., English in Nigeria). In both Britain and North America the term "second language" describes the native language in a country as learned by immigrants who have another first language (Longman Dictionary of Language Teaching and Applied Linguistics). In this chapter we will consistently use the term "foreign language" to cover all these usages, although most of the studies described concern the learning of a foreign language in experimental settings by learners whose native language is the dominant (and only official) language in the country they live in.

2. Note that the term" word-association learning" should not be confused with the word-association technique often employed in semantic memory research, where the structure of semantic memory is revealed by presenting participants with words they know and they are asked to come up with the first word a stimulus word makes them think of.