

**Lexical-Semantic Development in a Second Language:
Investigating the adjective *different* in English and Japanese**

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Declaration

I declare that this thesis was composed by myself and that the work contained herein is my own except where explicitly stated otherwise in the text. This work has not been submitted for any other degree or qualification except as specified.

(Ruth Churchill)

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Abstract

The current study examined the second language (L2) acquisition of a specific case of one-to-many mapping, the adjective *different* and its two partially synonymous Japanese translations, *betubetu* and *tigau*. This particular example was recognised by Duffield, Matsuo and Wood (2005) who reported findings from Japanese native-speakers indicating that the word *betubetu* is more restricted in meaning than both *different* and *tigau*, and that English L2 learners were likely to overextend its use. Duffield et al.'s results had broad scope for interpretation and the present study investigated their significance within a framework of first language (L1) to L2 semantic transfer. Two experiments were conducted to explain English L2 learners' performance at a lexically-specific level as well as to inform on the processes generally underlying L2 semantic development. A novel-word learning task and a magnitude estimation study of semantic acceptability used cross-linguistic comparisons of English and German learners to identify L1 dependencies in L2 behaviour. Methodological difficulties limited the explanatory potential of the novel-word task but magnitude estimation showed significant differences between native-speaker and L2 learner acceptability judgements consistent with the involvement of L1 semantic preferences in L2 lexical processing. As numbers in the study were small and learners varied in their L2 experience, the extent to which these deviations directly reflected L1 semantic influences could not be firmly concluded. However, their implications for current approaches to semantic development are discussed.

1 Introduction

1.1 L2 Lexical Acquisition

Researchers in developmental linguistics fervently contest the extent to which childhood L1 and adult L2 acquisition involve ‘fundamentally different’ processes (see, for example, Bley-Vroman, 1988; Epstein, Flynn, & Marthohardjono 1996; Towell, 2004). However, in vocabulary acquisition, it is an intuitive assumption that these learners differ in their initial state. Whilst infants are pioneering the use of their first words to discover how concepts are encoded in their L1, adults approach an L2 with preconceptions of how languages organise form and meaning based on the structure of their existing L1 lexical-semantic systems.

In the field of lexical acquisition, studies report transfer shapes L2 development as learners appear to assign L1 meanings to close L2 translations (Ard & Homburg, 1983; Odlin 1989; Ringbom, 1983; however see Pavlenko & Jarvis, 2002, for bidirectional influences, and Dewaele, 1998, for L2 to L3 effects). A consequence of this interaction is that L2 learners may have apparent native-like competence, without actually having achieved L2 semantic autonomy. When L1 and L2 words map onto identical concepts, this relationship can result in *positive* transfer and facilitate a native-like state. However, when there are subtle distinctions in reference between the L1 and L2 vocabulary, *negative* transfer is revealed in learners’ deviant semantic representations.

L2 learners’ linguistic deficits may go largely unnoticed unless the mapping conditions between languages are sufficiently irregular to conflict with native behaviour. The present study examines one such case of L2 lexical acquisition where native-like performance necessitates overcoming cross-linguistic differences in form-meaning mapping. Lexical systems encode aspects of meaning in different ways so that ‘polysemy in one language is often lexical plurality (i.e., many distinct words) in another and vice versa’ (Kecskes & Papp, 2000: 70). Duffield et al. (2005) observed this as the relationship between the adjective *different* in English and the words *betubetu* and *tigau* in Japanese.

1.2 The Semantics of *Different*, *Betubetu* and *Tigau*

Duffield et al.’s (2005) work was formulated on the premise that the English adjective *different* licenses two interpretations when modifying a plural nominal head; those which Carlson (1987) described as ‘internal’ and ‘external readings’. These readings are dependent

on the relative positions of the exemplars of the head noun compared by the adjective: internal readings contrast exemplars within the adjective's immediate sentential environment, whilst external readings contrast the most recent exemplars with those in the wider discourse. Scenarios A and B, devised by Duffield et al., illustrate this dichotomy.

Scenario A: Alice, Kirsty and Emma are thirsty and go to buy drinks. Alice buys a Coke and Kirsty decides to buy Coke too. Emma doesn't like Coke, so she buys Sprite instead.

Scenario B: Alice, Kirsty and Emma are thirsty and go to buy drinks. Alice buys a Coke but Kirsty decides to buy Sprite instead. Sprite is also Emma's favourite drink, so she buys that too.

Statement 1: 'Alice bought Coke. Kirsty and Emma bought *different* drinks.'

(Scenarios A and B and Statement 1 from Duffield et al., 2005: 154)

Scenario A satisfies the internal reading of *different* in Statement 1. This within-sentence interpretation of the adjective encodes the dissimilarity between Emma and Kirsty's chosen drinks, Coke and Sprite. Scenario B represents the external reading of *different*. In this context, the internal reading of Statement 1 is false as Emma and Kirsty's choices are identical. However, *different* can be interpreted by comparing their matching drinks with Alice's drink, mentioned in the previous sentence, the external reading. These scenarios demonstrate that achieving the intended interpretation of *different* depends entirely on the context of the utterance, the adjective sometimes restricted to within-sentence interpretation (Scenario A) and sometimes extended to discourse level construal (Scenario B). Further, Duffield et al. (2005) conceived a third scenario which could be described by *different*, the context in which all three drinks differ. Accessing this 'maximal contrast reading' of the adjective involves comparisons at a sentence and a discourse level. These scenarios demonstrate that the semantics of *different* are remarkably 'vague', legitimising mutually exclusive internal and external readings as well as a maximal contrast reading intersecting the two (Duffield et al., 2005: 154).

Duffield et al. (2005) noted that the Japanese word *tigau* licenses a 'broadly equivalent' range of meanings to English *different* (Duffield et al., 2005: 155). The authors also observed the potential for Japanese to explicitly refer to internal readings, drawing on Takano's (2004)

account of the lexical distinction between *tigau* and *betubetu* and the assertion that external readings are prohibited by the latter. This subtle cross-linguistic difference in mapping indicates that *betubetu* is an appropriate translation of *different* only in Scenario A.

The asymmetry between the English and Japanese mappings compelled Duffield et al. (2005) to address the possibility that *different* is properly ambiguous. The primary focus of their investigation was the potential for English children to acknowledge *different*'s full semantic range. Nevertheless, their research also reported preliminary findings for adult English L2 learners of Japanese and their behaviour with *betubetu*. English L2 learners were compared with Japanese native-speakers performing truth-value judgements (TVJs) of Japanese sentences featuring *betubetu* and choosing pictures to coincide with these sentences. The study showed that English L2 learners more frequently consented to an external reading of *betubetu* than Japanese native-speakers, who principally, though not absolutely, rejected this use. This overextension effect was foreseen by the researchers on the basis of 'standard assumptions about learners' capacities for overgeneralisation' (Duffield et al., 2005: 155). However, as the L2 sample in the original study was small, thirteen L2 learners participated in the TVJ task and nine made picture-choices, Duffield et al. opted to concentrate on explaining infant L1 behaviours rather than L2 development. The current study is dedicated to pursuing L2 issues.

1.3 Research Questions

The parallels between the preliminary findings for the L2 acquisition of *betubetu* and the process of negative transfer are clear; if English L2 learners of Japanese interpret *betubetu* according to the same semantic criteria as English *different*, overextension to an external reading will result for the L2 term. Investigating this possible interaction between the L1 and L2 lexicon generates three research questions for the present study. The first two are presented below

1. Do English L2 learners of Japanese discriminate between the internal and external readings of *betubetu* and *tigau* like Japanese native-speakers?
2. Are English L2 learners' representations of *betubetu* and *tigau* influenced by semantic transfer from the L1 translation *different*?

Research Question 1 explores the overextension of *betubetu* observed by Duffield et al. (2005) to establish whether the behaviour of their small sample of English L2 learners represents a valid and reliable deviation from Japanese native-speaker performance. Research Question 2 examines whether English L2 learners' *betubetu* overextensions were a product of negative semantic transfer from the English adjective *different* or a realisation some alternative effect. The responses to these questions will expand on the behaviour originally reported.

The present study also examines a third research question

3. Are English L2 learners' representations of *betubetu* and *tigau* a product of explicitly taught translation equivalents?

It is possible that Duffield et al. (2005) obtained an effect of *betubetu* overextension amongst English L2 learners because they had been explicitly taught that the word meant *different*. Jiang (2004) commented that the use of inter-lingual strategies in foreign language teaching may contribute to learners' erroneous L1-based representations for L2 words as it may lead to the assumption that partially equivalent translations are identical in meaning. Research Question 3 examines whether transfer can occur as an independent, learner-driven process. Therefore, this investigation has the potential to inform on a lexically-specific level as well as contributing insights into the general processes underlying L2 semantic development.

1.4 Structure of the Dissertation

Two experiments were used to investigate these questions. The study is reported as follows: Section 2 reviews the previous relevant research. Section 3 introduces the experiments, Section 4 presents Experiment 1 with its results and a discussion of several methodological factors that impacted on the outcomes, Section 5 reports Experiment 2 and discusses its relevance in the context of this study's aims, and Section 6 summarises with conclusions and suggestions for future research.

2 Background

2.1 L2 Semantic Development

Over-generalisations are especially common in L2 production errors attributed to semantic transfer (Ijuro, 1986; Marian & Kaushanskaya, 2007; Ringbom, 1983). For instance, Ringbom (1983) reports one Swedish-English bilingual claimed to have a 'difficult illness', a statement he relates to the Swedish adjective 'svår' meaning both 'difficult' and 'serious' (Ringbom, 1983: 209). Jiang (2004) asserts that behavioural evidence of this kind, associating L2 errors with L1 influence, is commonly found in the literature on L2 lexical acquisition yet little is known of the underlying mechanisms which might provoke such interference.

Research in L2 lexical acquisition has tended to focus on the integration of L2 terms at different levels of the lexicon. Kroll and Stewart (1994) were influential in suggesting that L2 words are initially processed at a superficial level of phonological or orthographic form and therefore accessed semantic content via connections to their L1 translations. This proposal was advanced alongside their Revised Hierarchical Model (RHM) which distinguished two levels of lexical knowledge in the bilingual lexicon, the word level, retaining information about formal properties in separate L1 and L2 stores, and the conceptual level, providing language-general semantic features. As L1 words were assumed to have links to the conceptual layer, the initial stage of processing, using just word-associations, entailed L2 semantic representation being achieved through the L1 and autonomous L2 concept-mediation only occurring later in development.

Evidence for this concept of L2 development has remained divided. Some studies have shown a progression from word-level to concept-mediated L2 processing (Chen & Leung, 1989) and asymmetrical effects in L1 and L2 translation (Keatley, Spinks & De Gelder, 1994; Kroll, Michael, Tokowicz & Dufour, 2002) have also been interpreted as evidence for stronger word-level connections from L2 to L1 forms. However, several studies have shown L1 and L2 translations involve similar mechanisms (La Heij, Hooglander, Kerling & Van Der Velden, 1996; Potter, So, Von Eckhardt & Feldman, 1984) and, in addition, priming between semantically related L1 and L2 words (Salamoura & Williams, 1999) has further suggested an autonomous semantic dimension to L2 processing.

Research in this area continues to advance towards a greater understanding of the processes involved in constructing a functional L2 lexicon. Nevertheless, studying L2 lexical acquisition at a macro-level of word-form, as opposed to conceptual processing, neglects fine-grained aspects of semantic development which are equally important to attaining native-like proficiency. More specifically, confirming a robust independent connection between L2 forms and a conceptual layer does not prove semantic features are activated appropriately for L2 terms.

2.2 The Semantic Transfer Hypothesis (STH)

Jiang's (2000) three-stage model of L2 vocabulary acquisition explicitly addresses L2 development at a lexical micro-level. The model relies on Levelt's (1989) distinction between the two types of knowledge necessary for every word, the lexeme properties of phonology, orthography and morphology and the lemma features of syntax and semantics. Similar to Kroll and Stewart's (1994) word-association stage, Jiang (2000) asserts that newly acquired L2 words exist only as lexemes. However, Jiang (2000) further claims that co-activating L1 translations in L2 processing causes the semantic features in the L1 lemma to copy to the previously incomplete lemma stratum of the L2 words. This second 'hybrid entry' stage of development is the central tenet of Jiang's (2004) STH and explains how L2 processing may demonstrate independent access to concept mediation but persist in evidencing the erroneous effects of negative transfer (Jiang, 2004: 417).

Jiang (2000, 2004) conducted several studies to demonstrate the presence of L1 semantic features in processing L2 words. This work involved giving L2 learners the task of deciding whether two L2 words were semantically related. Chinese- and Korean-English bilinguals were quicker and more accurate to identify related L2 pairs if their closest translation was the same single L1 word. This result was interpreted as indicating that single-translation L2 pairs shared identical semantic lemma features, copied from the same L1 word, which facilitated relatedness judgements by enhancing their semantic overlap. Based on this evidence, the STH offers a compelling explanation of English L2 learners' overextension of *betubetu*, their entries for this word containing the full range of meanings specified in the lemma of its closest translation, *different*.

Several aspects of the STH demand qualification. Its predictions for L1 influenced L2 performance are clear at the hybrid-entry stage but the extent of L2 exposure required for

progressing beyond the initial word-form stage is unspecified. Jiang (2004) claims that a consequence of copying the lemma features from L1 to L2 words is that transfer effects coincide with achieving concept-mediated L2 processing. This assertion is particularly interesting given that some studies have evidenced that conceptual links are developed from the beginning of L2 vocabulary learning. Dörrzapf (1999) taught unfamiliar French words to a group of English native-speakers, using either written L1 translations or pictures to indicate L2 meaning. Following the week-long learning period, semantically-related L1 primes significantly speeded participants' lexical decisions on the recently acquired French words. This effect was obtained regardless of teaching modality and, as the L1 primes had not featured in the learning stage, their facility to interact with L2 words suggested the new vocabulary had been immediately integrated within a semantic network. Relating this finding to Jiang's (2004) proposal suggests that the consequences of lemma level transfer may also be observable from the onset of L2 lexical acquisition.

The STH does not differentiate words for semantic type. However, recent research suggests word-type may moderate L1 influences. Several studies of language processing in bilinguals have shown that concrete words can be translated more quickly than abstract words (Van Hell & de Groot, 1998a/b). The Distributed Feature Model (de Groot, 1992) explains the concreteness effect as a result of more numerous shared semantic features between L1 and L2 concrete words which co-activate translation equivalents from a common concept. This model was founded on the premise that concrete words have tangible referents and are therefore likely to encode universally experienced physical qualities. Marian and Kaushanskaya (2007) suggested that concreteness also increases transfer. Their analysis of the descriptions of short films provided by Russian-English bilinguals in either their L1 or L2, indicated that L2 verbs and concrete nouns were more likely to be assigned L1 meanings than abstract words. These conclusions have implications for explaining overextension of *betubetu* by transfer as the adjective *different* represents a contextually-dependent abstract relationship between nouns in the discourse rather than a readily definable material referent. Therefore, significant individual variation in the semantic representation of *different* may render its features less likely to transfer.

Concreteness constraints on transfer require further investigation. Recent evidence suggesting that multiple meanings particularly affect abstract word processing offers one possible method of testing this assumption. Tokowicz and Kroll (in press) showed that the typically observed concreteness advantage in translation could be eradicated if abstract words were controlled for polysemy. For example, Spanish-English bilinguals translated abstract words

with the same single dominant meaning in English and Spanish quicker than concrete words, but abstract words with more than one meaning were translated more slowly. The authors do not discuss the implication of their findings for transfer but, in the context of the present study, the ‘marked effect of ambiguity for processing abstract words’ yields some interesting predictions (Tokowicz & Kroll, in press). The STH predicts that overextension results from transferring the multiple readings of *different* to *betubetu*. Therefore, it is suggested that English L2 learners with ambiguous representations of *betubetu* should process this word less efficiently than those who have converged on the single internal reading. Evidencing this hypothesis would not only indicate transfer occurs for abstract words but would also extend Tokowicz and Kroll’s findings to instances of polysemy that are transfer induced.

The STH was conceived to fulfil a requirement for psychological ‘model-driven’ theories of L2 vocabulary learning (Jiang, 2004: 417). However, studies which support its principal tenets so far cannot unequivocally conclude that L1 influences arise from lemma-level semantic processes. For instance, the single L1 translation effects obtained by Jiang (2000, 2004) may have originated from learners’ form-based knowledge of the L2. If both L2 forms had been coincidentally encoded in memory with a single L1 form, judgements of semantic relatedness may have been achieved without copying any semantic information to the L2 words. In addition, inter-lingual L2 teaching methods may have served to enhance this apparent transfer effect. As mentioned in Section 1.3, using L1 translations to teach L2 learners the core meanings of new L2 words may encourage learners to conduct the majority of L2 semantic processing via their L1. It is possible that English L2 learners’ overextension of *betubetu* was promoted by the frequent co-presentation of *betubetu* and *different* in the learning process and, therefore, it is unclear whether semantic transfer can occur independently from explicit instruction.

2.3 Overextension of *Betubetu*

In order to explain overextension by semantic transfer it is necessary that *different* permits multiple interpretations in English. Duffield et al. (2005) cited asymmetrical mapping as evidence for a properly ambiguous *different*. However, with the exception of their research, work on the readings of *different* is almost entirely theoretical (Carlson, 1987; Moltman, 1992) and behavioural data is currently insufficient to validate this claim. Indeed, updated responses from Duffield, Matsuo, Wood and Churchill (in press) Japanese native-speaker controls imply that semanticists may overestimate the generality of *different*. Adult Japanese native-speakers were reluctant to endorse an internal reading of *tigau* in the TVJs and picture-

choice task and, of the two mutually exclusive readings, preferred an external interpretation. As *tigau* and *different* are said to be equivalent in meaning (Takano, 2004), it may be that transferring a similar preference for external readings of *different* contributed to learners overextending *betubetu*. However, Duffield et al. (2005, in press) discussed the possibility a Principle of Contrast (Clarke, 1987) encouraged the Japanese native-speakers to prefer external readings of *tigau* in an attempt to reduce the semantic overlap between this word and the partially synonymous, *betubetu*. This factor is irrelevant to English interpretations of *different* and therefore, it is possible that English native-speakers may instead prefer internal readings. Should this behaviour be evidenced it would suggest transfer is a redundant explanation for English L2 learners' more frequent overextension of *betubetu*.

At present, these suggested preferences can only be inferred from the frequency of 'yes' responses to the internal and external readings of *betubetu* and *tigau* in Duffield et al.'s (2005, in press) TVJs and picture-choice tasks. Takano's (2004) semantic theory only distinguishes *betubetu* and *tigau* relative to the exclusive internal and external readings and the acquisition of this subtle semantic juxtaposition is the focus of the present study. However, it should be noted that Japanese native-speakers also accepted the maximal contrast readings most often for both *betubetu* and *tigau*. This result was congruent with English children's favoured interpretation of *different* (Duffield et al. 2005, in press). Maximal contrast readings intersect both internal and external readings and therefore it cannot be unequivocally concluded that neither one exclusive reading was a factor in the increased rate of maximal contrast acceptance. Nevertheless, the findings indicate a complex interaction between prescriptive semantics and native-speakers' conception of word meaning.

This interaction requires investigation using a more sensitive method than TVJs or picture-choices. For instance, recent linguistic research conducted using magnitude estimation (Bard, Sorace & Robertson, 1996) has shown that native-speakers and L2 learners are able to systematically quantify fine-grained linguistic intuitions (Sorace, 1996). Demonstrating a similar hierarchy of relative acceptability within the semantics of *different*, *tigau* and *betubetu* would further complicate the task of the English L2 learner. Should these critical adjectives lack a clearly defined set of accurate meanings, becoming a native-like speaker requires not only the ability to acknowledge which prescriptive semantic range is most appropriate to *tigau* and *betubetu* but also the sensitivity to observe which interpretations are most likely to be used.

Despite the potential for transfer to explain overextension, an alternative explanation exists. It is also possible that English L2 learners mistook *betubetu* as being entirely synonymous with the Japanese word *tigau* and therefore assigned the restricted term an inappropriately broad range of meanings. Two factors support this claim. First, news corpora indicate that, in Japanese, *tigau* is more frequent than *betubetu* (Mainichi Shimbun corpus, 2007). Therefore, learners may be led to assign *betubetu* the wider meaning of the more common term. Second, *betubetu* is in a lexical subset-superset relationship with *tigau* and studies indicate that widening from the subset to superset range is possible in lexical development when learners fail to recognise that partial synonyms within the target language are ‘not interchangeable in all contexts’ (Akanke, Adedeji & Okanlawon, 2006: 81). This process of lexical widening, encouraging *betubetu* to encompass the same meaningful scope as *tigau*, could occur independently from English L1 influences and presumably would affect Japanese L2 learners regardless of their native language. The present study aims to disentangle these influences.

3 Introduction to Experiments

Two experiments were conducted for the present study. The STH predicts facilitation of identical one-to-one mappings and negative interference between L1 and L2 words which only partially correspond in meaning. A significant L1 influence in L2 learning predicts English L2 learners should achieve target-like semantic structures for *tigau* but overextend *betubetu* to accommodate the external reading of *different*. However, widening from the subset word *betubetu* to the semantics of the superset word *tigau* also explains the behaviour. This issue of falsification was discounted in both experiments by employing a cross-linguistic comparison to discriminate between the competing experimental hypotheses. Beck (2000) asserts that the distinction between interpretations of *different* necessitates a binary lexical choice between two mutually exclusive adjectives in German, *verschieden* expressing within-sentence comparisons, internal readings in Carlson’s (1987) terms, and *anders* reserved for discourse-level contrasts, Carlson’s external readings. This analysis suggests that *verschieden* and *betubetu* share analogously restricted semantics and, therefore, the STH predicts that transfer should assist acquisition, rendering German L2 learners less vulnerable to overextension. In contrast, transferring the exclusive external reading of *anders* to *tigau* would inhibit L2 semantic development as both words commonly allow external interpretations but *tigau* is additionally flexible towards internal readings.

These mapping differences between English, German and Japanese offer a means of identifying transfer in Japanese L2 learning; if L2 semantic development is contingent on L1 structures, overextension of *betubetu* should prove largely specific to English speakers whilst German speakers should eschew internal readings of *tigau*. However, if the subset-superset relationship between *betubetu* and *tigau* is sufficient to promote widening of *betubetu*, both English and German speakers should succumb equally to this error. Further, in terms of internal and external readings, the English adjective *same* and its German translation *gleich* both map directly to the Japanese adjective *onaji*. Transfer predicts equal English and German facilitation in this case and, as *onaji* is not in a subset-superset relationship with any partial synonym in Japanese, the word should be immune to the influence of widening. Therefore, observing equivalent English and German performance with this word would control for either group's superior proficiency enhancing their understanding of *betubetu* or *tigau*. The following experiments investigate these claims.

4 Experiment 1

4.1 Aim

Experiment 1 was a computerised novel-word learning task using E-Prime experimental software. The rationale for this experiment was to establish transfer as the cause of English L2 learners overextending *betubetu* (Research Question 2) and to discount the involvement of explicit instruction in the process (Research Question 3).

4.2 Method

English and German native-speakers were taught three novel-words, representing *betubetu*, and *tigau* using a series of pictures designed to portray their meanings. The pictures were based on those used in Duffield et al.'s (2005) picture-choice task. Participants were instructed to deduce the meanings of the novel-words from the accompanying pictures and that their understanding of each word would later be tested. Testing was achieved using a word-choice and yes/no judgement task. A written questionnaire and an L1 post-test were then performed to confirm participants had understood the task (see Appendix 8.1 for example questionnaires).

Participants completed Experiment 1 in isolation receiving no instructional input from the experimenter in either the learning or the test phase. Assuming the semantic information is retrieved from the L1 lexicon and contributes to picture interpretation, it is reasonable to suggest that L1 semantic structure may impact on their understanding of the novel-words.

4.3 Participants

Sixteen English native-speakers and 16 German native speakers were paid to participate. All were students or staff members at universities in the Edinburgh region and although some had advanced knowledge of linguistics, none reported learning Japanese.

4.4 Procedure

Experiment 1 involved four phases: novel-word learning, novel-word testing, a written questionnaire and an L1 post-test. Participants completed all four phases consecutively on the same day.

4.4.1 Learning Phase

Three novel-words *fep*, *dal*, and *gop*, matched for phonological and orthographic length, were created to represent the semantic properties of *betubetu*, *tigau* and *onaji*. These novel-words were legitimate non-meaningful English and German phonological forms and were recorded with neutral intonation and edited to identical duration for use as auditory stimuli. To further ensure formal features did not influence performance, participants were randomly allocated to three experimental groups, each exposed to a different combination of novel-words and meanings as shown in Table 1.

Experimental Group	Japanese Word		
	<i>betubetu</i>	<i>tigau</i>	<i>onaji</i>
1	<i>fep</i>	<i>gop</i>	<i>dal</i>
2	<i>gop</i>	<i>dal</i>	<i>fep</i>
3	<i>dal</i>	<i>fep</i>	<i>gop</i>

Table 1: Novel-words used in Experiment 1.

The pictures used to define the novel-words were combined to indicate a range of five readings: two-item same, different, internal, external and same. Maximal contrast readings were not included in the novel-word learning design in order to reduce the number of mappings to be consigned to memory within a limited timeframe. Figure 1 presents example readings.

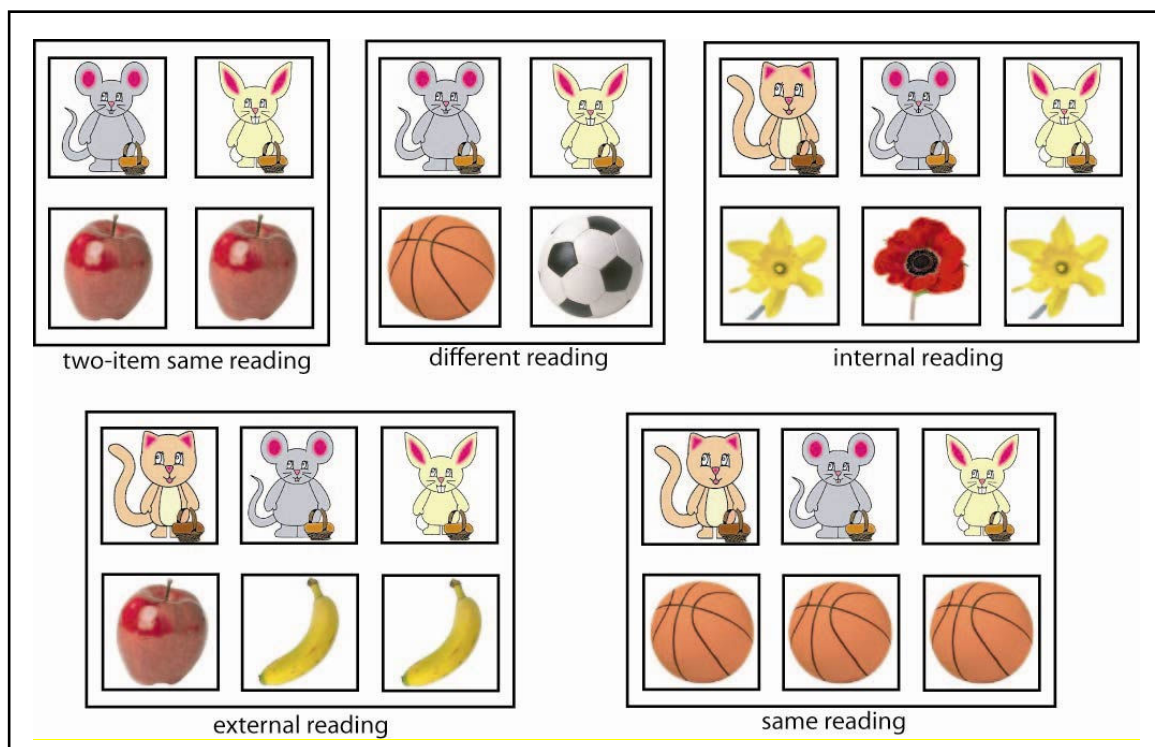


Figure 1: Example pictures for the five readings.

Participants' ability to infer the significance of the semantic field was critical to Experiment 1 informing on the relevant issues. The pictures displaying two characters with items, two-item same and different, were used to sensitise participants to the basic concepts of sameness and contrast, and to introduce the more subtle semantic distinction between the internal and external readings. In addition, three pictorial versions were constructed for each reading. Each version depicted a set of items from a different category: flowers, vegetables or fruit. This created a final set of 15 pictures: five readings x three versions. Table 2 presents the accurate pairing of readings with Japanese translations representing the novel-words.

	Japanese translation of novel-word		
	<i>betubetu</i>	<i>tigau</i>	<i>onaji</i>
Reading	different, internal	different, internal, external	two-item same, same

Table 2: The accurate readings for the Japanese translations of novel-words.

The individual pairs of pictures and novel-words were presented to participants in sequence on the screen. For each pair, the picture appeared on the screen first and remained for 1000 msec before the novel-word sounded and appeared underneath. The critical internal, external and same reading pictures were timed to appear on the screen in two stages: the three characters and the item underneath the first character appeared first, followed after 1000 msec by the simultaneous appearance of the final two characters' items. This staged picture completion established the item below the first character as a previous contrast set to which the subsequently appearing items could be compared, thereby enhancing the distinction between internal and external readings. The completed picture remained on the screen for 1000 msec before it was joined by the novel-word.

The pairs were initially presented in a fixed order: *onaji*–two-item same, *betubetu*-different, *tigau*-different, *onaji*–same, *betubetu*-internal, *tigau*-internal, and *tigau*-external. This measure increased the artificial nature of the task but was necessary to directly oppose the two-item same and different pictures and to emphasise their fundamental contrast in meaning. Subsequently, the pairs were repeated in a random order to eliminate interference from memory effects and to allow time for consolidating theories of meaning.

Each participant encountered a total of six exposures to each reading of the novel-words *tigau* and *onaji*: the three versions for each reading encountered twice, once in the fixed order and

once in the random presentation. The number of exposures to the novel-word *betubetu* was increased in order to equal the number of presentations involving the novel-word *tigau*, which, by virtue of being the superset term, appeared in twice the number of pairs. Participants encountered six exposures to the novel-word *betubetu* paired with two-item same, different and same readings and twelve exposures to the critical internal reading (four exposures to each of the three versions in the fixed order and the random presentation). As a consequence, the novel-word forms were encountered equally but participants were shown internal readings paired with the novel-word *betubetu* twice as often as the novel-word *tigau*.

Experiment 1 instructions were given in the participants' L1. Participants were informed that in the learning phase novel-words and pictures were always paired accurately and they were allowed unlimited time to examine each completed pair, using the keypad to advance through the presentation. A short storyboard presentation preceded the learning phase to contextualise the pictures. The story depicted the three characters visiting a market stall to buy items. During this introduction, the characters and items were configured to resemble the learning phase pictures and an animated arrow moved from each of the items in the bottom half of the screen to the basket of the character directly above. This demonstrated the relationship between characters and items that participants were intended to infer from the pictures in the learning phase.

4.4.2 Test Phase

Experiment 2 employed a word-choice task and a yes/no judgement task.

4.4.2.1 Word-Choice Task

The word-choice task was a variation on the picture-choice method developed by Duffield et al. (2005). Successive pictures from the learning phase were presented above the three novel-words on the screen. Participants used the keypad to select which of the novel-words described the picture. This method was preferred over a picture-choice task as presenting several pictures simultaneously may invite visually salient features to influence responses. It was not possible to integrate a staged picture completion in this task to accentuate the difference between internal and external readings. Therefore, the learning phase pictures were slightly adapted by minimising and offsetting the first character and item to achieve a similar effect. Figure 3 presents an example word-choice item.

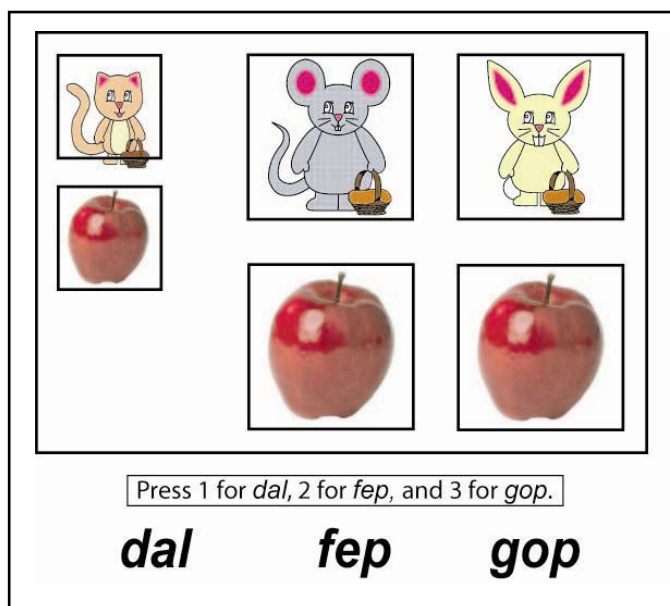


Figure 2: Example novel word-choice item for the reading same.

Participants were instructed to choose as many words as they thought were accurately represented by the picture. This enabled both *betubetu* and *tigau* to be selected for the internal reading where they were synonymous. Each participant completed 30 word-choices, six for each of the five readings introduced in the learning phase, in two randomised blocks of 15.

4.4.2.2 Yes/No Judgement Task

Participants then made speeded yes/no judgements to accurate and inaccurate pairings of novel-words and pictures. A set of 45 yes/no judgement pairs were created by crossing the three novel-words with the fifteen learning phase pictures. The pictures in this task incorporated the same staged completion used in the learning phase, with the exception that the novel-words preceded the completion of the picture to allow adequate reading time before registering a response. Participants used the keypad to indicate, as quickly as possible, whether they perceived the picture to accurately represent the meaning of each novel-word. Reaction times were measured from the onset of picture completion. Each of the 45 yes/no judgement pairs was judged twice except for the pairings *onaji*–two-item same, *onaji*-same, *tigau*-same, and *betubetu*–internal which were judged four times to balance the number of ‘yes’ and ‘no’ responses for each novel-word. This led to a total of 108 judgements which were performed in two randomised blocks of 54.

4.4.3 Questionnaire and L1 Post-Test

Subsequent to the yes/no judgement task, participants completed a written questionnaire in which they were asked to briefly describe, in their L1, the meaning of each novel-word. The L1 post-test was then administered, comprising the word-choice and yes/no judgement tasks re-administered with the novel-words replaced by their closest English or German translations. This was to ensure that participants' understanding of the experimental items conformed to the semantic theory underlying the predictions of STH for the current study (see Section 3).

In the L1 word-choice task, English participants chose from *same* and/or *different* to describe each of the 15 pictures whilst German participants chose from *anders*, *gleich* and/or *verschieden*. Both groups made a total of 30 L1 word-choices in two randomised blocks of 15. In the L1 yes/no judgement task, English participants judged accurate and inaccurate pairs featuring either *same* or *different* whilst German participants judged *anders*, *verschieden* or *gleich*. Participants judged only three examples of each L1 word paired with one of the five meanings to prevent the experiment becoming excessively lengthy. Therefore, English participants with two L1 words made fewer L1 yes/no judgements than the Germans with three.

4.5 Results

The results of the questionnaire and the L1 post-test are presented first to contextualise the subsequent novel-word findings. As the responses to two-item same and different readings were not directly relevant to the purpose of the study, only the internal, external and same readings are included in the analysis.

4.5.1 Questionnaire

The questionnaire indicated that participants had understood the intentional relationship between characters and items from the arrangement of individual components within each picture as 15 fifteen responses explicitly mentioned that the characters owned their items (see Appendix 8.2 for participants' individual questionnaires). However, two English participants (10 and 16) stated that the novel-words *betubetu* and *tigau* referred to whether or not the pictures for internal and external reading portrayed characters with the exact items they had chosen in the story. Despite their ability to correctly identify the meaning of the novel-word *onaji*, these definitions suggest that potentially some judgements were founded on misleading

criteria. As a precautionary measure, a separate analysis of results was conducted excluding these two English participants but did not alter the direction or magnitude of any effect. Therefore, their responses are included in this section as there is no principled way of distinguishing the erroneous questionnaires from those which did not attempt to define particular novel-words.

4.5.2 L1 Post-Test

Responses in the L1 post-test were not intended for detailed analysis but were examined to confirm that participants could interpret the experimental pictures in accordance with the expectations of the present study.

4.5.2.1 L1 Word-Choice Task

Figures 3a and 3b display the percentage of selections English and German participants made for each possible word-choice response in the L1 task.

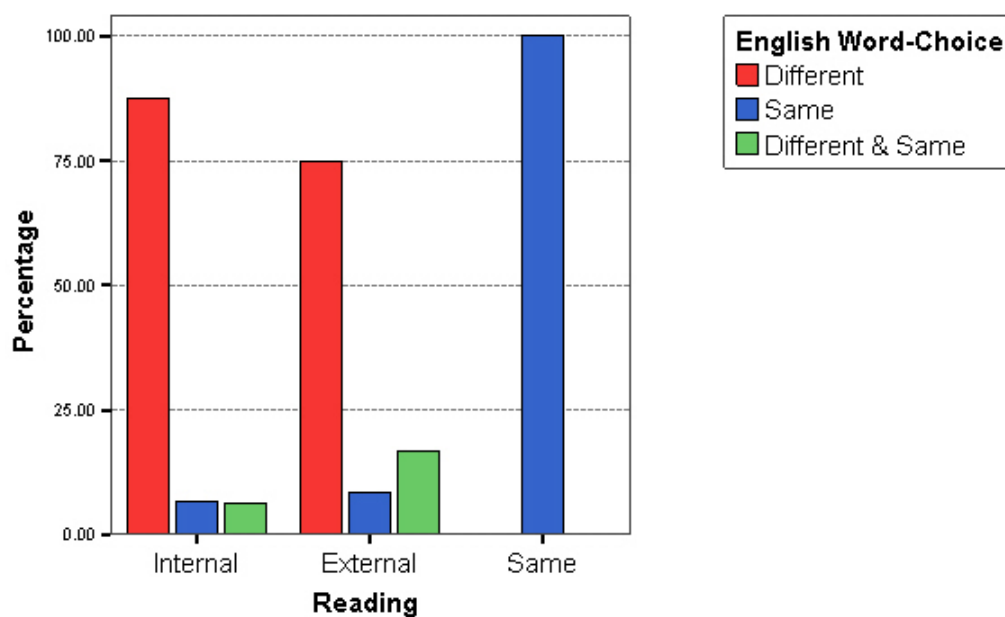


Figure 3a: Percentage response for English L1 word-choices.

Figure 3a shows that English participants overwhelmingly chose *different* for both internal and external readings and *same* for same readings. *Same* was also occasionally chosen for internal and external readings, either individually or with *different*, a selection which is likely to result from the observation that the pictures for internal and external readings always

featured two identical items. Nevertheless, the English L1 word-choices generally indicate a successful mapping of English words to experimental pictures.

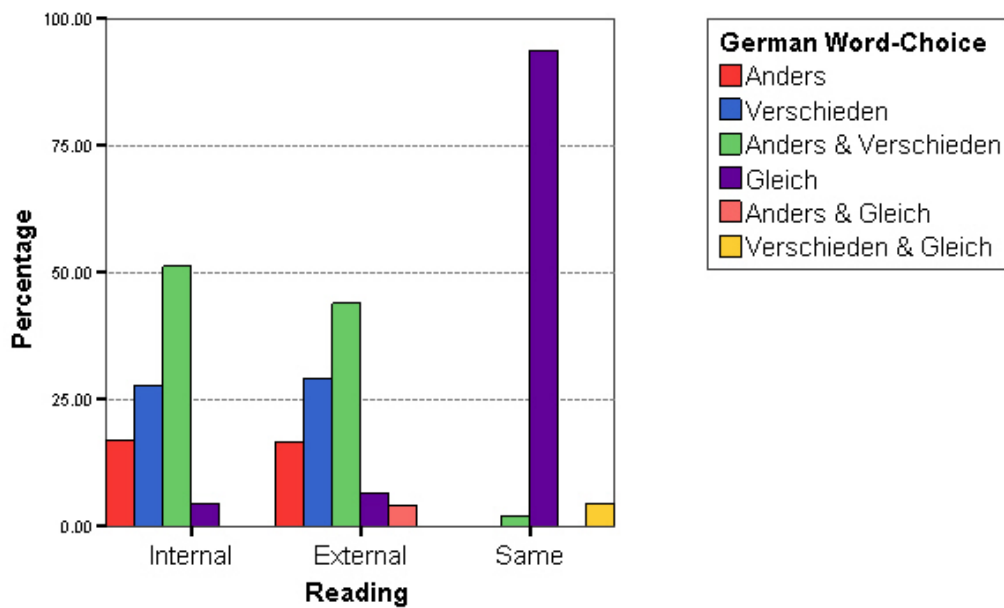


Figure 3b: Percentage response for German L1 word-choices.

Figure 3b shows that German L1 word-choices did not systematically distinguish *verschieden* and *anders* for internal and external readings. Contrary to the semantic theory underlying the present study, German participants selected almost identical L1 words for these pictures and the high frequency of *anders* & *verschieden* answers suggests that the L1 words were freely interchangeable although *gleich* was chosen consistently for the reading same.

4.5.2.2 L1 Yes/No Judgement Task

Figures 4a and 4b display the percentage ‘yes’ responses to the various English and German L1 yes/no judgement pairs.

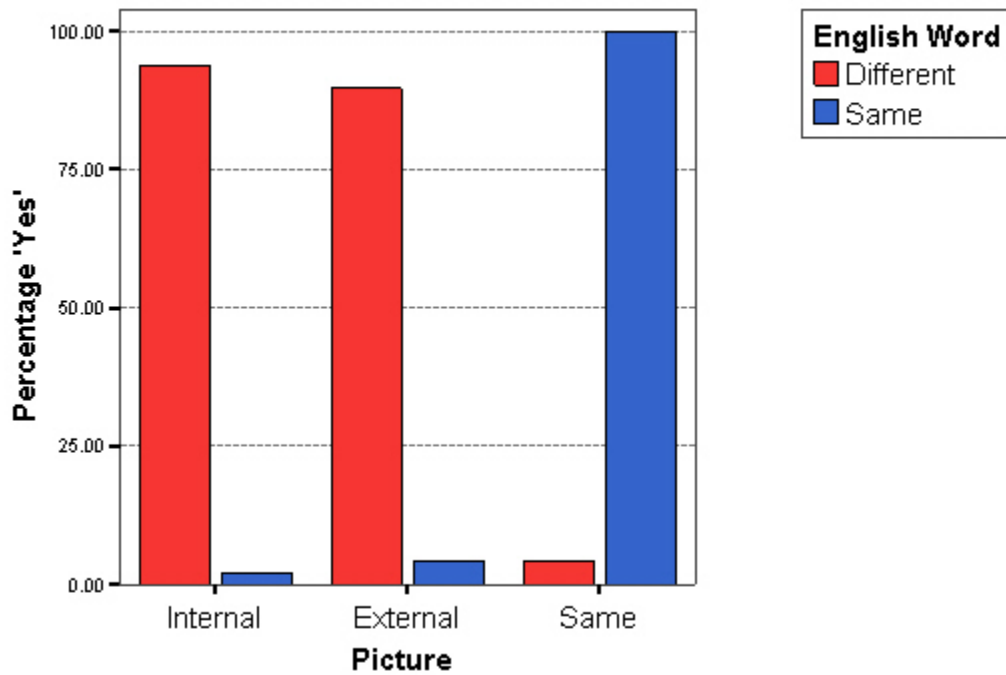


Figure 4a: Percentage English 'yes' responses in L1 yes/no judgement task.

Figure 4a shows that English responses in the L1 yes/no judgement task coincided with the semantic theory, accepting *different* with internal and external readings approximately equally and typically consenting to *same* with the reading same.

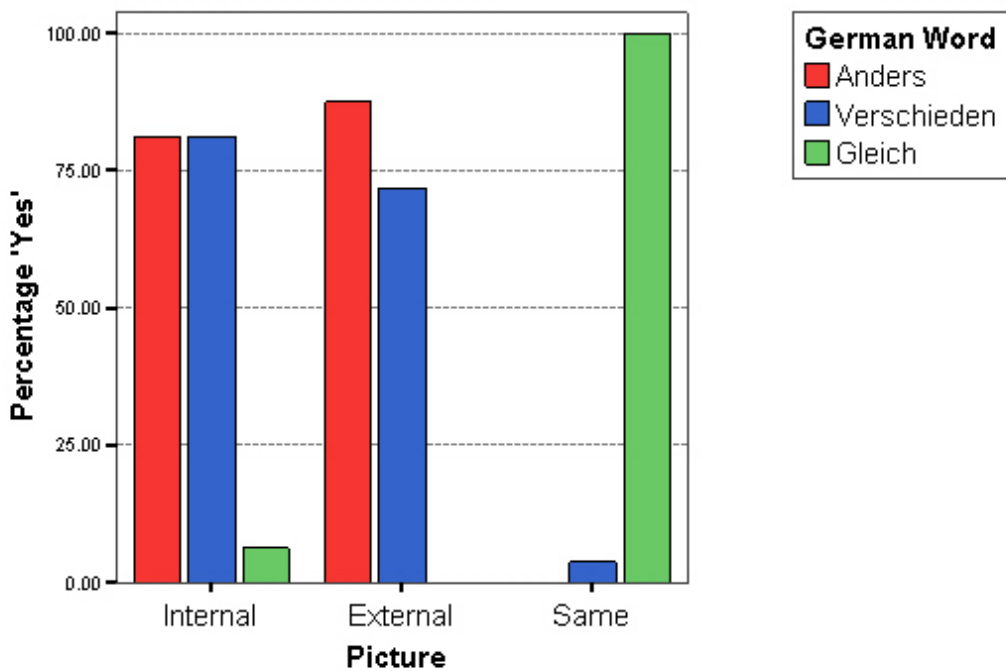


Figure 4b: Percentage German 'yes' responses in L1 yes/no judgement task.

Figure 4b shows the German responses again failed to demonstrate the predicted semantic distinction between *anders* and *verschieden*. Both *anders* and *verschieden* were accepted equally with an internal reading and although *anders* was marginally preferred to *verschieden* with external reading, the frequency of ‘yes’ responses to *verschieden*–external pairs was unexpectedly high compared with the predicted zero acceptance rate.

4.5.3 Summary

English and German responses in the word-choice and yes/no judgement tasks indicated that the experimental items successfully conveyed the fundamental opposition between ‘sameness’ and ‘contrast’, encoded by the English words *different* and *same*, but did not elicit the distinction between internal and external readings, critical to the present study. As German participants did not reliably relate their L1 words to the internal and external readings, these results are clearly problematic for explaining cross-linguistic differences in novel-word learning as effects of L1 transfer. Nevertheless, the results from the novel-word learning task are detailed below and discussed in the light of these findings.

4.5.4 Novel-Word Tests

All the analyses in the following section were also performed with experimental group, rather than language group, as the between-subjects variable. The effect of experimental group was not significant in any analysis (all $ps > .05$), and therefore, comparisons are reported only for the two language groups with the novel-words referred to using their Japanese translations.

4.5.4.1 Novel Word-Choice Task

Table 3 presents the percentage word-choice in the novel-word task.

word-choice	Reading					
	Internal		External		Same	
	English (%)	German (%)	English (%)	German (%)	English (%)	German (%)
<i>Onaji</i>	0	0	7.3	13	94.8	93.5
<i>Betubetu</i>	36.5	30.2	13.5	8	1	0
<i>Tigau</i>	35.4	5.4	60.4	54.3	0	0
<i>Betubetu & Tigau</i>	26	63.4	7.3	23.9	0	0
<i>Onaji & Betubetu</i>	0	0	2.1	0	3.2	4.3
<i>Onaji & Tigau</i>	1	0	8.3	0	0	2.2
<i>Onaji & Betubetu & Tigau</i>	0	0	0	3.3	0	0

Table 3: Percentage response for novel word-choices.

Table 3 shows that the accurate novel-words were chosen most frequently for each reading. For instance, both groups produced near-ceiling levels of *onaji* word-choices for the reading same and chose *tigau* most frequently for the external reading. The internal reading responses suggest some cross-linguistic differences with *betubetu* chosen most frequently by the English group whilst *betubetu & tigau* was preferred by the German group. Nevertheless, as the English group chose *tigau* nearly as often as *betubetu* for this reading, it seems both were recognised as valid answers. Inaccurate word-choices were typically limited to multi-word responses. It is possible that participants used multi-word responses as a strategy to maximise the probability of registering an accurate word-choice. However, strategic responses are unlikely as three-word responses were extremely infrequent, and two-word responses almost never featured with the reading same.

As shown by Table 3, both groups' most frequent error was choosing *betubetu* for external readings. The following definition of a *betubetu* overextension word-choice was used to compare the two groups: the sum of *betubetu* and *betubetu & tigau* word-choices for the external readings. Word-choices for external readings which featured *onaji* were excluded from the category of overextensions as neither transfer nor widening explained this behaviour and, additionally, *onaji* is technically accurate for external readings therefore these responses address a related but not directly relevant question of ambiguity¹.

¹ The adjectives *same*, *onaji* and *gleich* exhibit a similar ambiguity to that described for *different* in Section 1.2. For example, replacing *different* with *same* would still enable Statement 1 to accurately describe Scenario B, the external reading, but would inhibit its potential to describe Scenario A, the internal reading.

The frequency of English and German overextensions was compared using a Mann-Whitney *U*-test. The result was not significant, $U = 115.5, p > .05$, and contrary to the predictions of the STH, the percentage of English overextensions ($Mdn = 8.35$, sum of ranks = 251.50) was generally consistent with the German group ($Mdn = 8.35$, sum of ranks = 276.50). This result is unsurprising considering the lack of dissociation between *verschieden* and *anders* in the L1 post-test.

However, Table 3 shows the German group produced generally more word-choices categorised as overextensions. Subtracting the percentage of overextension-type responses for external readings from internal readings shows that the German group produced 61.7% fewer overextensions for external readings whilst the English group only produced 51.8% fewer. This trend was investigated using a repeated measures mixed ANOVA which treated reading (two levels: internal and external) as the within-subjects factor and language (two levels: English and German) as the between-subjects factor. The result showed significant main effects for reading, $F(1, 30) = 40.97, p < .0001, \eta_p^2 = .577$, and language, $F(1, 30) = 7.25, p < .0001, \eta_p^2 = .195$, but failed to produce the expected interaction, $F(1, 30) = 1.58, p > .05$. Nevertheless, the percentage change suggests the German group was indeed more sensitive to the difference in readings and its consequences for word use.

The word-choices were examined to determine whether the German group avoided choosing *tigau* for an internal picture. The sum percentage of English and German *tigau* and *tigau & betubetu* word-choices for internal readings was compared using a Mann-Whitney *U*-test but the result was not significant, $U = 105.5, p > .05$, and, on average, *tigau* word-choices for internal readings were marginally more frequent in the German ($Mdn = 100$, sum of ranks = 286.50) as opposed to the English group ($Mdn = 66.7$, sum of ranks = 241.50).

4.5.4.2 Novel Yes/No Judgement Task

Figures 5a, b and c show the percentage English and German 'yes' responses.

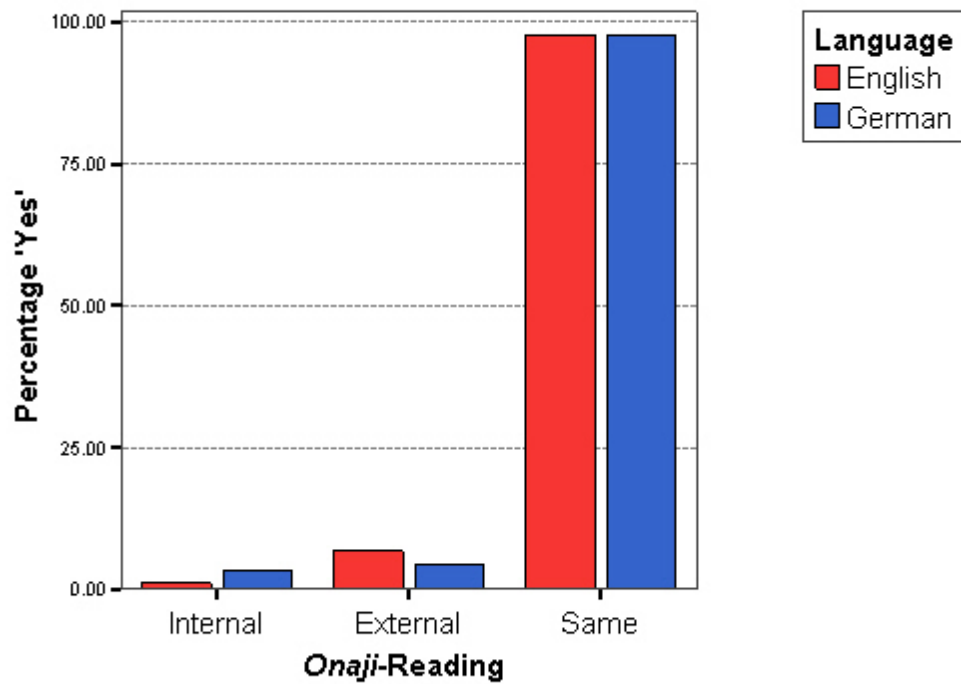


Figure 5a: Percentage 'yes' responses for *onaji* yes/no judgements.

Figure 5a shows that both groups achieved high levels of accuracy when judging *onaji*. 'Yes' responses approached near-ceiling levels for the accurate reading same and were extremely infrequent for the internal and external readings. However, *onaji* was accepted marginally more often for technically accurate external readings, especially by the English group.

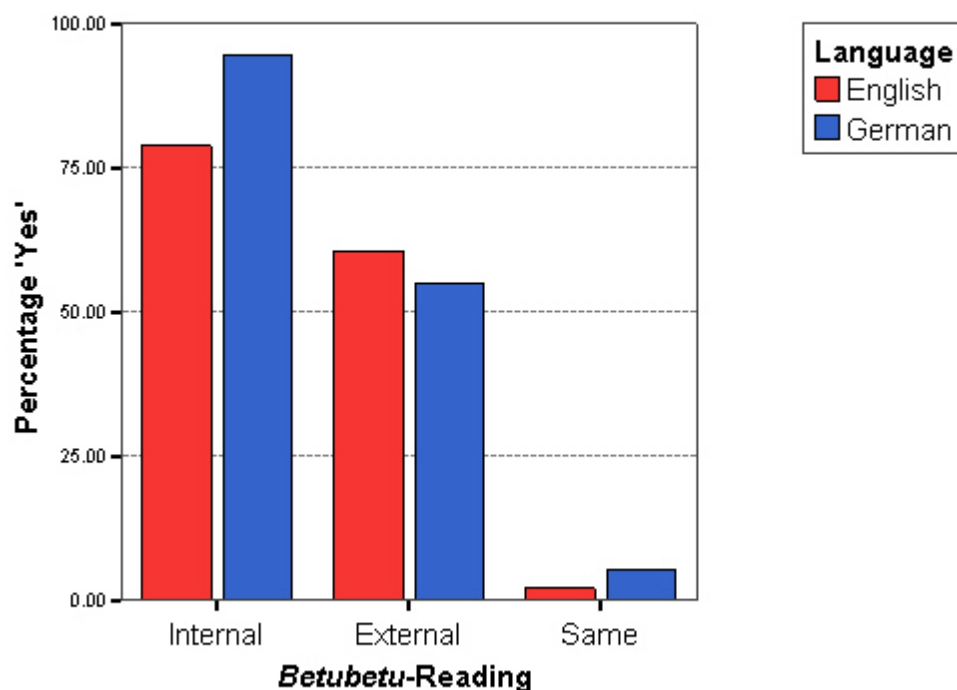


Figure 5b: Percentage 'yes' response for *betubetu* yes/no judgements.

Figure 5b shows that 'yes' responses were generally infrequent for the inaccurate *betubetu*–same pairs. However, they were considerably more numerous for the external reading which was also inaccurate for *betubetu*, representing an overextension of the term. An independent t-test showed that the frequency of 'yes' responses to *betubetu*-external pairs was not significantly different between the English and German groups, $t_{30} = -.338, p > .05$. However, as in the word-choice task, the difference in 'yes' responses between *betubetu*-internal and *betubetu*–external pairs suggests the German group were more effective in avoiding this erroneous response, producing 49.7% fewer 'yes' answers for external readings whilst the English group produced only 39.5% fewer.

This result was examined using a repeated measures mixed ANOVA with reading (three levels: internal, external and same) as the within-subjects variable and language group (two levels: English and German) as the between-subjects factor. The main effect was significant for reading, $F(2, 60) = 63.92, p < .0001, \eta_p^2 = .917$, but not for language, $F(1, 60) = 2.56, p > .05$, and whilst the interaction was also not significant, $F(2, 69) = 1.51, p > .05$, the raw numerical data again indicates that sensitivity to the accuracy of the reading varied between groups.

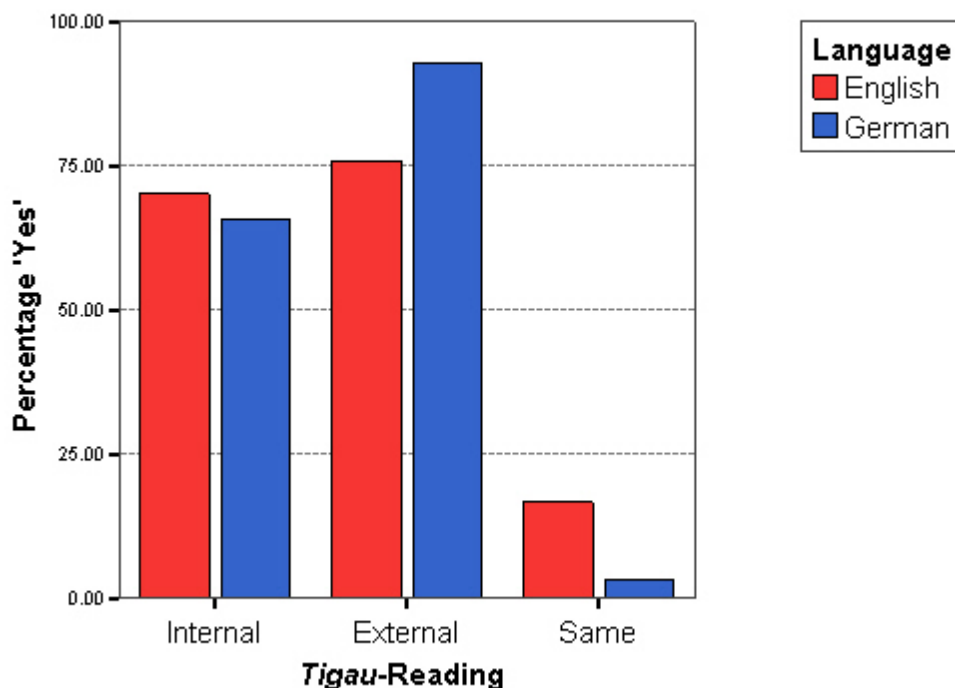


Figure 5c: Percentage 'yes' responses for *tigau* yes/no judgements.

Figure 5c shows that both groups accepted *tigau* with an internal reading more often than an external reading but the German group showed a more dramatic increase in 'yes' responses. Indeed, in comparison with their acceptance of *tigau*-internal pairs, German speakers produced 26.8% more 'yes' responses for *tigau*-external whilst the English group produced only 5.8% more. A repeated measures mixed ANOVA, performed on the frequency of 'yes' responses for each reading, showed a main effect of reading (three levels), $F(2, 60) = 83.72$, $p < .0001$, $\eta_p^2 = .915$, whilst language group (two levels) was not significant, $F(1, 30) = .329$, $p > .05$, and neither was the suggested interaction, $F(2, 60) = 1.78$, $p > .05$.

Contrasts comparing internal and external readings showed that the frequency of English and German 'yes' answers did not differ significantly, $F(1, 30) = 1.83$, $p > .05$. However, the interaction was significant for the external and same readings, $F(1, 30) = 5.85$, $p < .05$, $\eta_p^2 = .163$. As shown in Figure 5c, this result reflects a higher rate of English acceptance for *tigau*-same pairs in comparison to the German group who, in contrast, tended to accept *tigau*-external pairs more often. This suggests that the German group were better able to distinguish the accurate external reading of *tigau* from the erroneous same reading.

4.5.4.3 Novel Yes/No Judgement Reaction Times

Reaction times were analysed for the correct responses only. The data was corrected with a log transformation and outliers exceeding two standard deviations above and below the mean for each word were excluded, affecting 4.97% of the total data.

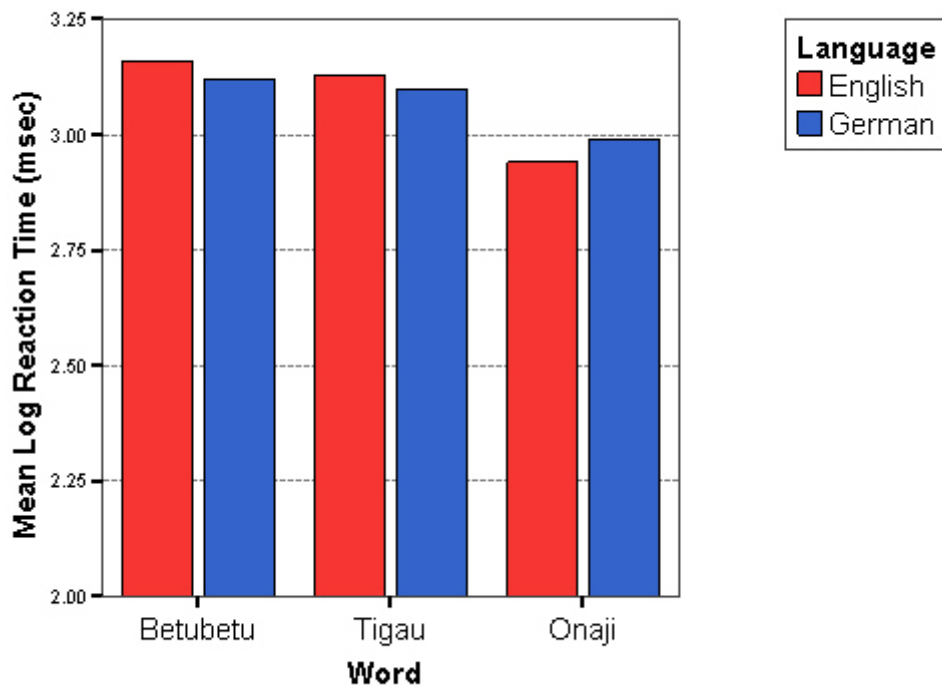


Figure 6: Mean log reaction times for novel words.

Figure 6 shows that whilst both groups responded most promptly to pairs featuring *onaji*, the English group appeared marginally quicker for this word. In contrast, the German group were quicker at judging *betubetu* and *tigau*. This trend was further investigated by examining the reaction times for each word-picture pair and performing a series of independent t-tests for the three readings of each word. All effects are reported with Bonferroni corrected levels of significance, $p < .0167$ (*1-tailed*) and Figures 7a, b and c display the mean log reaction times (msec) for the various pairs.

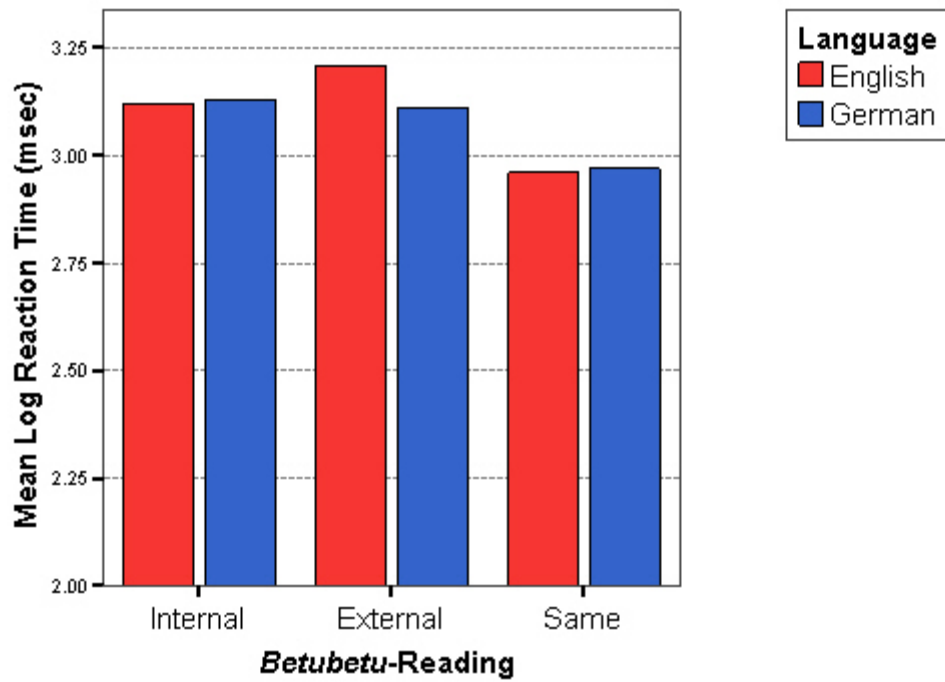


Figure 7a: Mean log reaction times for *betubetu*.

The difference in English and German response latencies was not significant for rejecting the erroneous *betubetu*-same pairs, $t_{169} = .512, p > .0167$, nor for accepting accurate *betubetu*-internal pairs, $t_{148} = .032, p > .0167$. Further, although Figure 7a indicates a marginal German speed advantage for rejecting *betubetu*-external pairs, the effect of language was not significant for judging this overextension, $t_{94} = -2.023, p > .0167$.

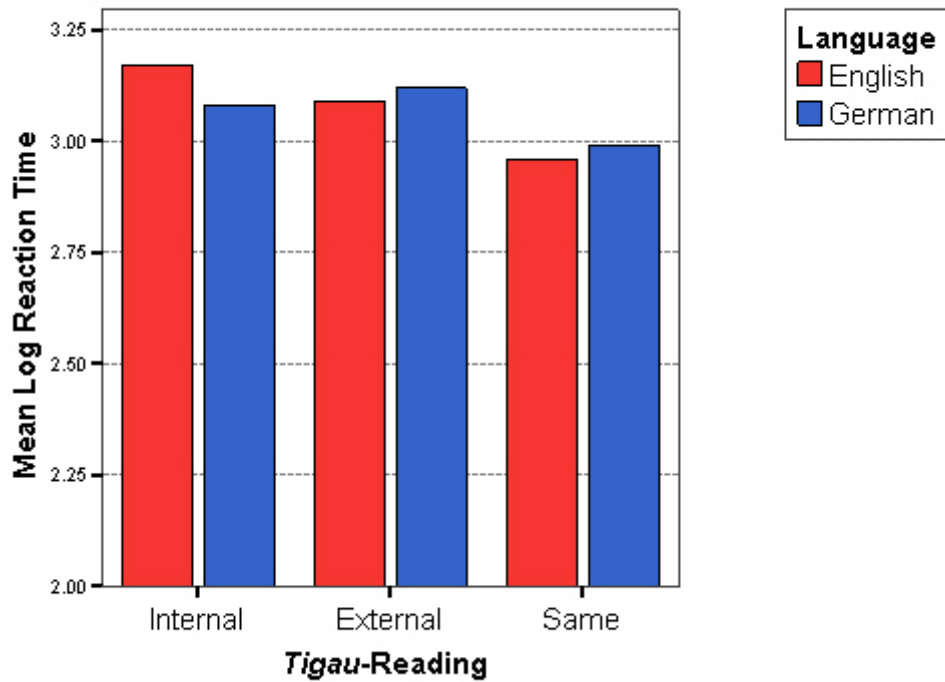


Figure 7b: Mean log reaction times for *tigau*.

Figure 7b shows that *tigau*-same pairs were judged most quickly by the English and German group. The effect of language was not significant for reactions to this erroneous pair, $t(269) = -2.007, p > .0167$, nor were response latencies significantly different for accepting either accurate *tigau*-internal, $t(119) = -1.989, p > .0167$, or *tigau*-external pairs, $t(152) = -.614, p > .0167$.

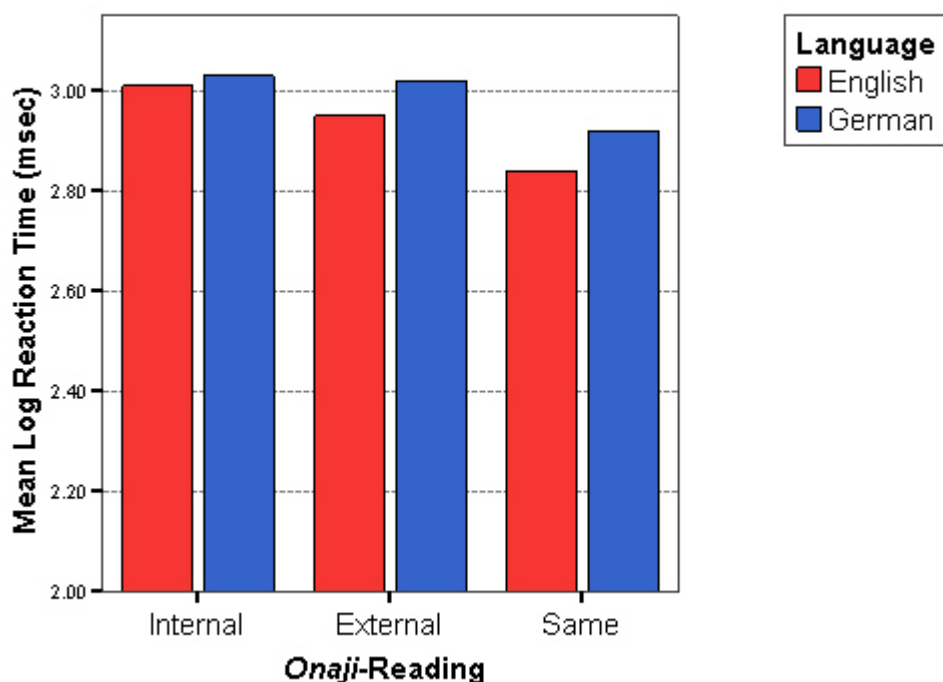


Figure 7c: Mean log reaction times for *onaji*.

Figure 7c indicates that the English group were faster to accept all three *onaji* pairs. Indeed, this apparent advantage was significant both for same, $t(168) = 2.876, p < .001, r = 2.876$, and external readings, $t(159) = 2.417, p < .001, r = 0.19$, although not for internal readings, $t(171) = .401, p > .0167$.

This unforeseen difference was investigated by performing a single independent t-test on the reaction time data collapsed within each group to establish whether English speakers were generally quicker to register a response. The non-significant result, $t(1465) = .568, p > .05$, showed that on average, English reaction times ($M = 3.02, SE = 2.23$) were similar to German reaction times ($M = 3.03, SE = 2.22$) across the task. A final unplanned comparison of log transformed L1 yes/no judgement reaction times for *same* and *gleich* pairs examined the possible effect of L1 influences. The effect of language was not significant when these direct translations were paired with same, $t(76) = .493, p > .0167$, external, $t(72) = -.357, p > .0167$, or internal, $t(74) = -1.175, p > .0167$, readings indicating that the English speed advantage was specific to certain pairings in the novel-word task.

4.5.4.4 Summary

Performance with *onaji* was highly accurate throughout the novel-word tasks. The German and English groups both recorded a similar number of *betubetu* external overextensions in both tests of novel-word meaning and neither group particularly avoided internal readings of *tigau*. However, there was a general tendency for the German group to exhibit increased sensitivity to the accuracy of the readings. English and German reaction times in the yes/no judgement task were typically well-matched for each word-picture pair although the English group were significantly quicker to deliver accurate judgements of *onaji*-same and *onaji*-external pairs. Section 4.6 discusses these findings.

4.6 Discussion

Challenging the STH depended on the fundamental premise that German employs *verschieden* and *anders* to lexicalise the distinction between internal and external readings. However, in the L1 word-choice task *anders* and *verschieden* were chosen with equal frequency for both internal and external readings and although a marginal preference for external readings of *anders* appeared in the yes/no judgement task, this was not sufficiently pronounced to indicate a reliable semantic distinction existed between the terms. It is possible that knowledge of English had altered the German participants' perception of their native vocabulary and levelled the anticipated difference between the English and German participants' L1 state. German participants were sampled from English universities and immersion in English may have encouraged semantic convergence between the L1 and L2 lexicons, merging previously distinct representations for *anders* and *verschieden* towards the common English translation, *different*, which English participants accepted with both internal and external readings. No detailed language histories were gathered from participants in Experiment 1, and therefore, the influence of 'bidirectional transfer' (Pavlenko & Jarvis, 2002) suggested by the L1 post-test is based on the assumption that university study in a foreign language requires a high degree of L2 proficiency.

However, the results of Experiment 1 suggest that methodological, rather than linguistic, factors contributed to the unexpected patterns in L1 performance. It is probable that the delayed picture completion format gave insufficient emphasis to the contrast between internal and external readings. The novel-word appeared on the screen after all items were presented and participants may have failed to register the significance of the temporal contrast involved in the staged picture presentation, simply focusing on the configuration of items once the

picture was static. Therefore, rather than interpreting the pictures as internal or external readings associated with any specific L1 words, it seems that the internal pictures symbolised ‘middle item different from left and right’, whilst external pictures indicated ‘left item different from middle and right’. The questionnaire responses, which focus on the ordering of individual items, support this explanation, with several participants reporting that internal and external readings displayed items which were ‘mixed’.

Such behaviour confirms that German participants failed to relate the experimental materials to the critical L1 words and consequently it is implausible to suggest they influenced any cross-linguistic differences in novel-word learning. Due to the likely impact of these methodological problems, it is inappropriate to directly relate Experiment 1 to the initial research questions. Nevertheless, Experiment 1 yielded effects deserving of discussion.

Experiment 1 demonstrated overextension can occur spontaneously in vocabulary acquisition. All participants consistently identified the semantic properties of *onaji* but erroneously selected *betubetu* in external reading word-choices and in responding ‘yes’ to *betubetu*-external pairs. In addition, reaction times indicated a speed advantage for judging *onaji* pairs that surpassed response latencies for both *tigau* and *betubetu*. Considering previous reports of time penalties in polysemous word translation (Tokowicz & Kroll, in press), these findings implicate multiple readings in both English and German representations of *betubetu* even though, like *onaji*, this word was unambiguous in the learning phase.

This behaviour cannot be attributed to any specific L1 semantic influences and is consistent with an effect of subset to superset widening encouraging the use of *betubetu* with the more numerous semantic properties of *tigau*. Such overextension of *betubetu* is especially interesting given that participants were exposed to twice the number of pairs indicating the accurate internal reading of *betubetu* than any other meaning in the learning phase, including the external reading of *tigau*. This suggests that frequency was ineffective in moderating overextension and therefore, it is probable that unguided lexical acquisition will result in the meaning of a subset term being extended to the semantic range of a partially synonymous superset word.

Perhaps the most intriguing finding from Experiment 1 was the tangible differences between English and German performance. German participants demonstrated an increased sensitivity to the contrast between internal and external readings in the novel word-choice and yes/no judgement tasks, limiting the frequency of their *betubetu* word-choices and ‘yes’ responses to *betubetu* with external readings relative to internal readings more substantially than the

English group. The effect was not statistically significant but, considering Experiment 1's small sample size, the magnitude of the difference strongly suggests German participants were more attuned to the restricted interpretation of *betubetu*. These findings cannot be explained in terms of L1 influences and are puzzling considering that all participants learnt from the same sub-optimal materials.

One possible explanation is that multilingual abilities favoured the German group's novel-word learning. This group may have been generally more adept at deciphering the structure of the novel L2 lexicon having previously acquired English to a level of competence sufficient to study at an English university. In particular, their existing L2 proficiency may have facilitated their acquisition of the partially synonymous novel words. Research in bilingualism shows that mutual-exclusivity biases are often relaxed to accommodate a dual vocabulary (Davidson, Jergovic, Imami & Theodos, 1997; Davidson & Tell, 2005). Indeed, the German speakers tended to evidence a firmer understanding of synonymy in their responses, giving *betubetu* & *tigau* answers more frequently in the word-choice task and often explicitly describing the terms as synonyms in the questionnaire. In contrast, English participants produced more one-word responses in the novel word-choice task.

The greater readiness of multilingual German participants to acknowledge synonymy as a legitimate feature of the L2 lexicon may have conferred an advantage in processing the semantic properties of *betubetu* and *tigau*, freeing more time to assess and discriminate readings. This explanation is founded on the assumption that English participants, studying in their home country, generally had less L2 learning experience and were therefore more likely to resist synonymy. Also, time spent examining the specific attributes of items in the internal pictures in order to differentiate *betubetu* and *tigau* may have distracted English participants from focusing on their subset-superset relationship. Overall, the outcome of English learning was a less definite understanding of the integral structure in the novel lexicon and the specific contribution of internal and external readings in determining the lexical overlap.

Whilst there is no direct evidence to verify this observation, it is supported by apparent qualitative differences in English and German participants' novel lexicons. For example, in the yes/no judgement task the English group accepted more *tigau*-same pairs than the German group, suggesting they experienced more interference between the visual features common to the external and same readings, both displaying two identical adjacent items. German participants seemed less vulnerable to over-generalisation resulting from non-linguistic pressures, clearly disassociating *tigau* from the same reading they reserved for *onaji*. Further, the English speed advantage for *onaji* may reflect a speed-accuracy trade-off

whereby English responses were generated with less regard for the underlying structure of the novel lexicon. Reaction times were calculated only from correct answers and, therefore, a general tendency for faster English responses may have been obscured for the other words due to the number of correct answers being insufficient to reveal a statistical effect. This account is supported by the specificity of the behaviour, the English advantage limited to judgements of *onaji*, where accuracy was highest, and not replicated in L1 performance. These explanations all require further exploration, which should include a more comprehensive examination of participants' previous experience with L2 learning. Nevertheless, it seems that German group may have been advantaged by their particular facility for acquiring languages with semantic overlap in the structure of the lexicon.

4.7 Summary

Several methodological problems prevented Experiment 1 addressing the original research questions. Nevertheless, a review of performance across all the tasks indicated that subset to superset widening is probable in L2 acquisition when learners have no particular L1 semantic representation for the L2 terms and are not explicitly instructed in the learning process. Consequently, Experiment 1 demonstrated that transfer from ambiguous L1 terms is not a prerequisite for L2 overextension, but failed to unequivocally identify either transfer or semantic widening as a likely explanation for the overextension of *betubetu* by English learners of Japanese. Experiment 2 addresses these issues.

5 Experiment 2

5.1 Aim

The purpose of Experiment 2 was to investigate differences between English L2 learners' and Japanese native-speakers' interpretations of *tigau* and *betubetu* (Research Question 1) and to identify L1 influences in the responses of L2 learners (Research Question 2).

5.2 Method

Experiment 1 was inadequate for examining English and German native-speakers' semantic preferences for their L1 terms. Therefore, Experiment 2 employed a revised methodology to investigate Japanese words as well as to confirm English and German native-speakers'

understanding of their L1 terms. Magnitude estimation (Bard, Sorace & Robertson, 1996) was used as studies have proved it sufficiently sensitive for exposing subtle distinctions in linguistic acceptability (see Section 2.3). Assuming the semantic theory is accurate for *different*, *anders*, and *verschieden*, the STH predicts that English L2 learners should assign higher ratings of acceptability to *betubetu*'s external reading than Japanese native-speakers and German L2 learners. In addition, German L2 learners should exceed Japanese native-speakers in demonstrating a preference for external readings of *tigau* whilst English L2 learners may find internal and external readings more equally acceptable. Employing this method also offered a general indicator of participants' L2 proficiency as larger discrepancies in acceptability ratings between obvious semantic anomalies and accurate meanings suggests a more definite understanding of the Japanese word. Detailed language histories were also obtained to expose any effects.

5.3 Participants

Twelve English native-speakers, 12 German native-speakers, 11 Japanese native-speakers, living in the UK, Germany and Japan participated in the experiment. In addition, eleven English L2 learners of Japanese and five German L2 learners of Japanese were recruited from UK and German universities and businesses. The criteria for L2 participation was an intermediate or advanced knowledge of Japanese.

None of the participants had previously participated in Experiment 1 and no English or German L2 learners completed L1 versions of Experiment 2. Prior to the test, language histories were collected from all participants except for Japanese native-speakers for whom technical difficulties prevented gathering subject details reliably. This information is reported with results in Section 5.6.1.

5.4 Procedure

Experiment 2 employed several computerised magnitude estimation experiments, conducted via the internet using WebExp2 experimental software. There were three versions of the experiment, a Japanese version, an English L1 version and a German L1 version. Whilst online studies exert only limited control over extraneous participant variables, this method was necessary to recruit sufficient numbers of L2 learners.

Participants for each version were instructed they would see a series of sentence-picture pairs, each one different, and that their task was to assign a number to the pair to represent how well the sentence described the picture relative to a reference sentence-picture pair. The reference pair was presented only once, prior to viewing the experimental items, to reduce the amount of visual information on the screen at any one time. Participants were instructed in their L1 throughout.

Prior to rating the test sentence-picture pairs, participants were trained to estimate the relative length of six lines as well as the acceptability of six practise sentence-picture pairs which were unrelated to the present study. This training phase was based on a comparable procedure used by Keller and Alexopoulou (2007) to familiarise participants with the technique.

5.5 Materials

The test sentence-picture pairs featured the pictures from the word-choice task in Experiment 1 with an additional set of pictures to represent maximal contrast readings. The number of picture variations for each reading was increased from three to five by adding the categories of instruments and vegetables² to the existing object-types of fruit, flowers and balls, enabling more judgement data for each reading.

The set of twenty-five pictures (five readings: different, internal, external, same, maximal contrast each x five versions: fruit, flowers, balls, vegetables, instruments) was crossed with a set of sentences featuring either *betubetu*, *tigau* or *onaji* in the Japanese experiment, *different* or *same* in the English L1 experiment and *anders*, *verschieden* or *gleich* in the German L1 experiment.

The Japanese sentences were modelled on those used in Duffield et al.'s (2005) picture-choice task and were written in Kanji characters and in Kanji with Hiragana to support L2 learners' understanding of the script. Participants in the Japanese experiment were informed that two scripts would be used and that both sentences were identical in meaning. Figures 8a, b and c present three example Japanese sentence-picture pairs.

² The German L1 test replaced the vegetable pictures with shapes due to problems translating the phrase '*different vegetables*' with sufficient clarity.

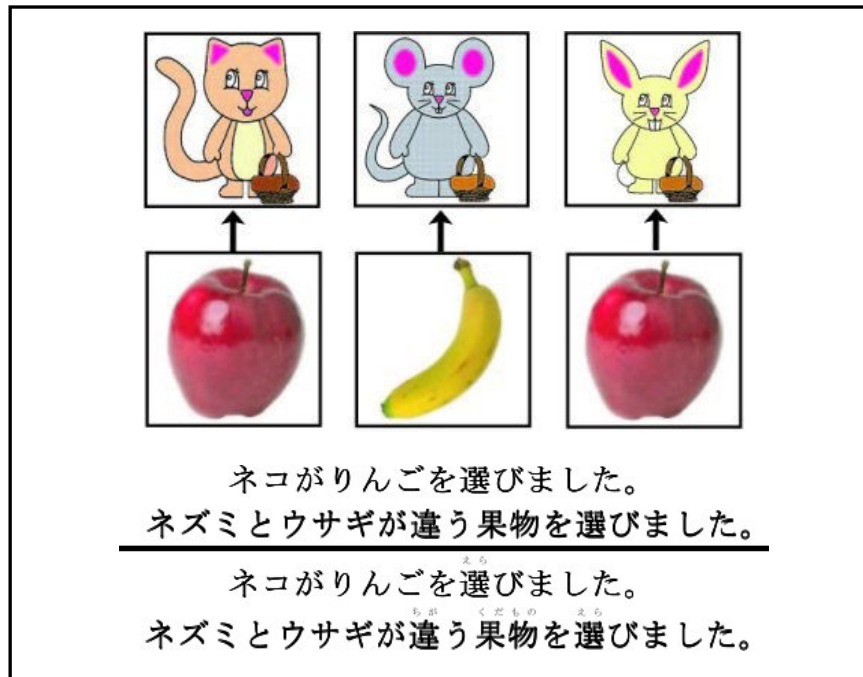


Figure 8a: Example *tigau*-internal sentence picture pair, 'The cat chose an apple. The mouse and the rabbit chose *tigau* fruit.'

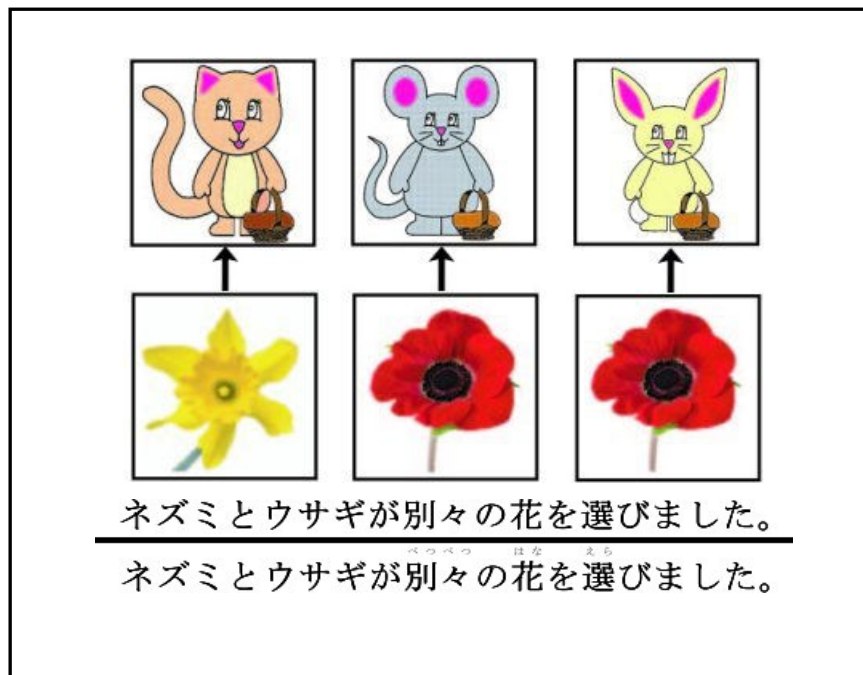


Figure 8b: Example *betubetu*-external sentence picture pair, 'The cat chose a yellow flower. The mouse and the rabbit chose *betubetu* flowers.'

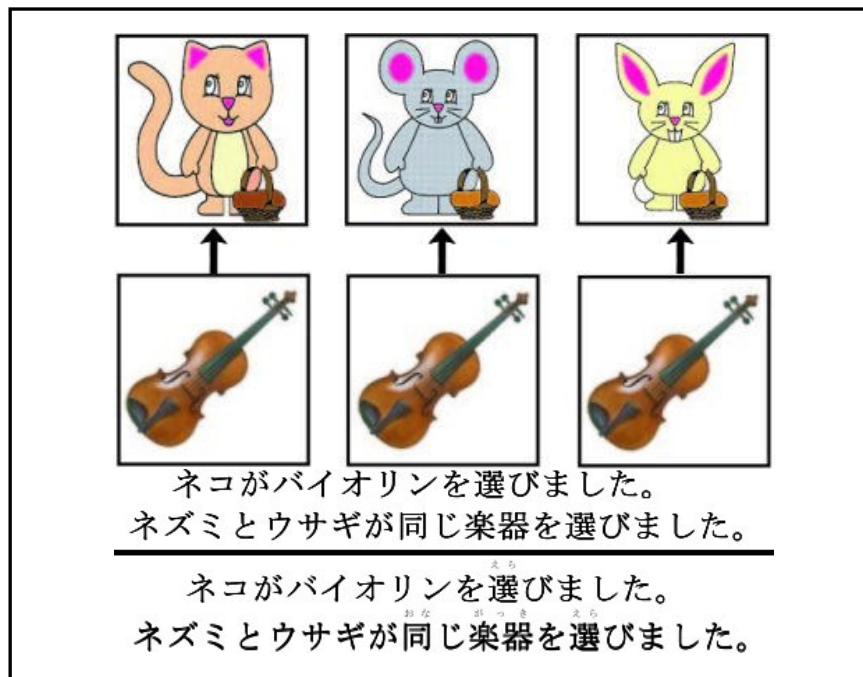


Figure 8c: Example *onaji*-same sentence picture pair, 'The cat chose a violin. The mouse and the rabbit chose *onaji* instruments.'

A set of fillers was also created to prevent participants from becoming unnaturally sensitised to the investigated ambiguity and to balance the number of semantically acceptable and anomalous pairs. The fillers involved various spatial prepositions, relational terms and comparative adjectives and Figure 9 presents a Japanese example.

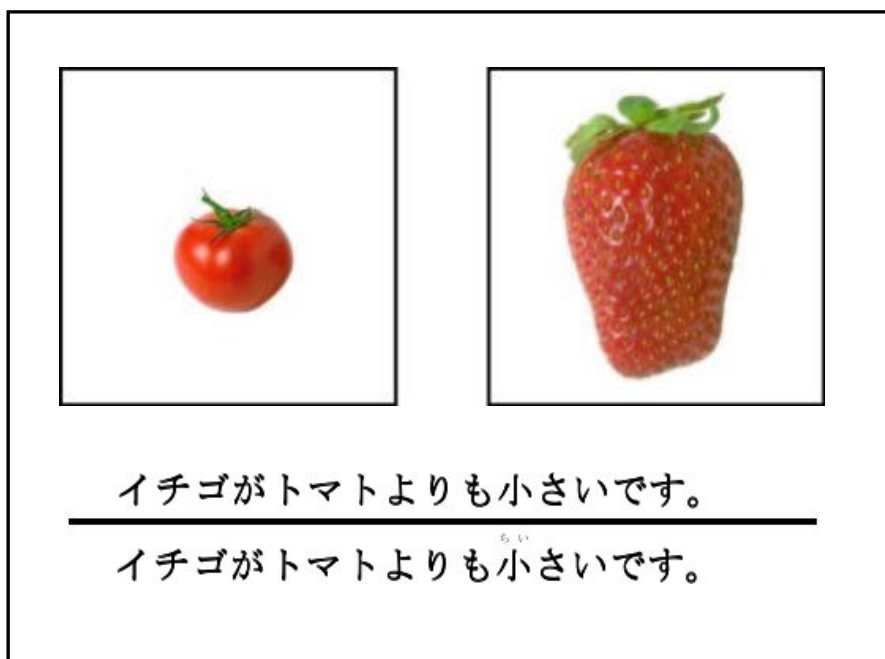


Figure 9: A semantically anomalous Japanese filler, 'The strawberry is smaller than the tomato.'

The number of fillers equalled the number of test sentence-picture pairs in each version of the experiment. Therefore, participants in the Japanese and German L1 experiments judged a total of 150 sentence-picture pairs (75 test pairs and 75 fillers) whilst, due to the use of a single word *different* in English, participants in the English L1 experiment judged only 100 (50 test pairs and 50 filler pairs). Participants encountered test sentence-picture pairs and fillers in a random order although the reference pair was the same for all.

5.6 Results

This section first reports the findings from the English and German L1 experiments, followed by the results from the Japanese experiment.

The responses from each experiment were prepared for analysis by dividing each participant's ratings for the test sentence-picture pairs by their rating for the reference pair and log transforming the values. This is standard procedure in magnitude estimation studies.

The fillers were not included in any analyses.

All effects are significant, $p < .0001$ (*1*-tailed), unless stated otherwise.

5.6.1 English and German L1 Experiments

Table 4 shows the number of additional languages spoken by the English and German native-speakers, their level of proficiency and any potential relevance to the present study.

Native-Speaker Group	Number of additional languages spoken for each level of proficiency.			
	Beginner	Intermediate	Advanced	Bilingual
English (<i>n</i> = 12)	9 (2 German)	4 (2 German)	0	0
German (<i>n</i> = 12)	0	3	9 (9 English)	5 (3 English)

Table 4: Additional languages of English and German L1 participants.

German native-speaker group possessed a wider knowledge of other languages at a higher level of proficiency than the English group. Further, all the German native-speakers reported advanced or bilingual English ability whilst English native-speakers possessed only limited knowledge of German.

Two repeated measures ANOVAs were performed on the English and German L1 test sentence-picture pair acceptability ratings. These involved two within-subject factors, word with two levels (*different, same*) in English and three levels (*verschieden, anders, gleich*) in German, and reading, with five levels (different, same, internal, external, maximal contrast) in both languages.

5.6.1.1 English L1

Mauchly's test indicated that the assumption of sphericity had been violated for the main effect of reading, $\chi^2(9) = 35.53$, and the interaction between word and reading, $\chi^2(9) = 61.68$. Therefore, Greenhouse-Geisser corrected degrees of freedom were used ($\epsilon = .68$ for reading and $.59$ for the interaction).

The English analysis showed significant main effects for both word, $F(1, 49) = 8.21$, $\eta_p^2 = .143$, and reading, $F(2.72, 133.38) = 13.57$, $\eta_p^2 = .213$. Importantly, the interaction was also significant, $F(2.34, 114.63) = 137.63$, $\eta_p^2 = .737$, indicating that the semantic properties of the

antonyms *different* and *same* influenced participants to rate these words differently with the various readings.

Repeated contrasts were used to qualify this interaction. Table 5 presents the results of comparing *different* and *same* ratings between each adjacent reading and indicates which of the two English words was preferred for each reading.

Reading	Preferred English Word	Interactions
different	<i>different</i> > <i>same</i>	$F(1, 49) = 73.89^{***}$
same	<i>same</i> > <i>different</i>	$F(1, 49) = 5.08^{***}$
internal	<i>different</i> > <i>same</i>	$F(1, 49) = 21.76^{***}$
external	<i>same</i> > <i>different</i>	$F(1, 49) = 23.66^{***}$
maximal contrast	<i>different</i> > <i>same</i>	$F(1, 49) = 23.66^{***}$

*** significant, $p < .0001$

Table 5: Repeated contrasts and preferences in the English L1 experiment.

Table 5 shows significant contrasts between *different* and *same* at each level of reading comparison, confirming that these words were treated as semantically distinct. However, it should be noted English native-speakers judged external readings as more acceptable with *same* than *different*, a finding that reflects the ambiguous status of *same* (see footnote, page 23).

A repeated measures ANOVA was also performed on judgements of *different*. This confirmed the main effect of reading, $F(3.78, 177.52) = 92.90$, $\eta_p^2 = .612$, and contrasts established that all readings were rated significantly differently, indicating that some interpretations were fundamentally preferred over others. Figure 10 illustrates this hierarchy of preferences and reports the contrasts.

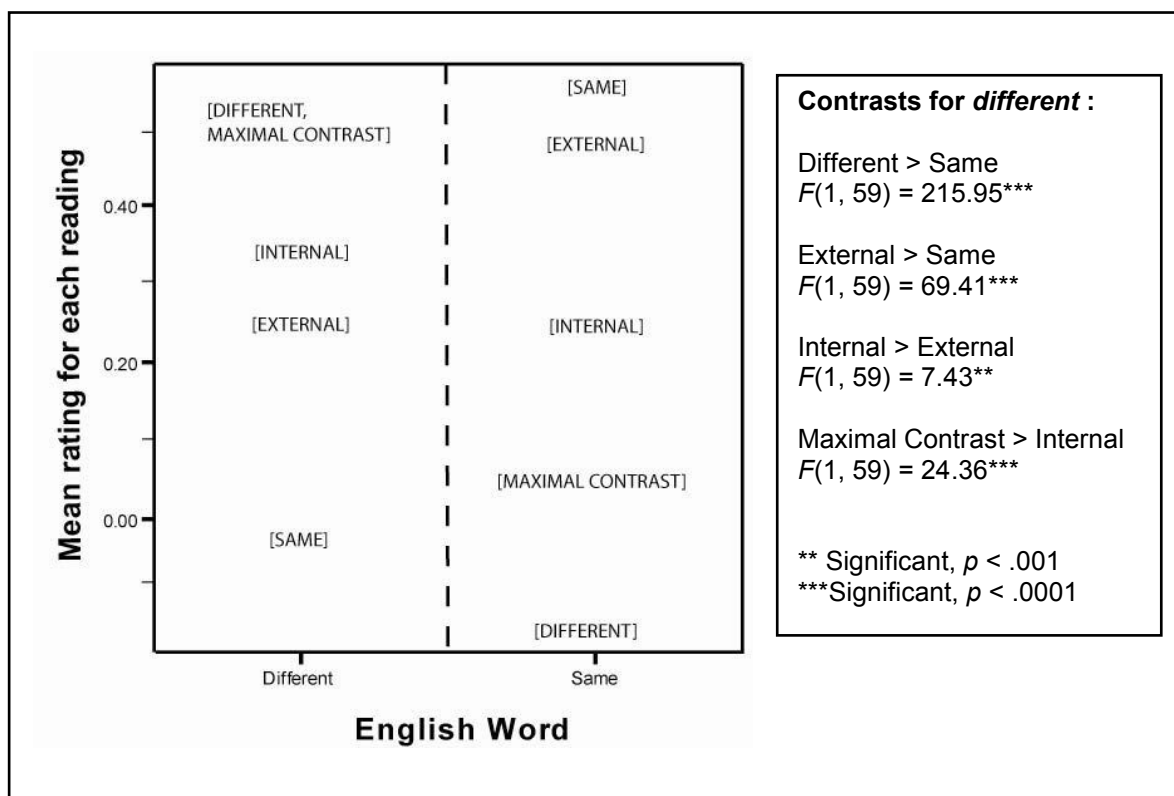


Figure 10: English L1 participants' mean log ratings with contrasts for *different*.

Figure 10 displays that maximal contrast readings were judged as most acceptable for *different* and whilst both internal and external readings were much more acceptable than the anomalous same readings, internal readings were significantly preferred.

5.6.1.2 German L1 Results

Mauchly's test was significant for the main effects of word, $\chi^2(2) = 27.68$, as well as reading, $\chi^2(9) = 24.63$, and for the interaction, $\chi^2(35) = 130.54$. Therefore, Greenhouse-Geisser corrected degrees of freedom were used ($\epsilon = .59$ for word, $.71$ for reading and $.46$ for the interaction).

There were main effects for word, $F(1.78, 28.34) = 23.87$, $\eta_p^2 = .499$, and reading, $F(2.83, 67.91) = 14.36$, $\eta_p^2 = .374$, and a significant interaction, $F(3.71, 89.08) = 40.54$, $\eta_p^2 = .628$. Pair-wise comparisons of the three words, performed with Bonferroni corrections, showed that the acceptability of *anders* did not differ significantly from *verschieden*, $t(1) = -.033$, $p > .05$, but both *anders*, $t(1) = .246$, $r = .23$, and *verschieden*, $t(1) = .213$, $r = .21$, judgements

were significantly different from *gleich*. These findings indicate that the ratings were more similar for the partial synonyms, *anders* and *verschieden*, than for the antonym *gleich*.

Table 6 shows the results of comparing ratings for (i) *anders* and *gleich*, and (ii) *anders* and *verschieden* between each adjacent reading and indicates which words were preferred.

Reading	Preferred German Word	Interactions
different	i. <i>anders</i> > <i>gleich</i> ii. <i>anders</i> = <i>verschieden</i>	i. $F(1, 24) = 84.15^{***}$ ii. $F(1, 24) = .167$
	i. <i>gleich</i> > <i>anders</i> ii. <i>anders</i> = <i>verschieden</i>	i. $F(1, 24) = 21.21^{***}$ ii. $F(1, 24) = 1.71$
internal	i. <i>anders</i> > <i>gleich</i> ii. <i>anders</i> = <i>verschieden</i>	i. $F(1, 24) = 2.67$ ii. $F(1, 24) = 37.06^{***}$
	i. <i>anders</i> = <i>gleich</i> ii. <i>anders</i> > <i>verschieden</i>	i. $F(1, 24) = 37.46^{***}$ ii. $F(1, 24) = 34.67^{***}$
external	i. <i>anders</i> > <i>gleich</i> ii. <i>anders</i> = <i>verschieden</i>	
maximal contrast	i. <i>anders</i> > <i>gleich</i> ii. <i>anders</i> = <i>verschieden</i>	

*** significant, $p < .0001$

Table 6: Repeated contrasts and preferences in the German L1 experiment.

Table 6 shows that *gleich* was also scored as highly acceptable with an external reading, similar to the English L1 result for *same*. However, German native-speakers judged only *anders* as equally acceptable to *gleich* for external pictures, preferring *verschieden* with an internal reading.

Ratings of *anders* and *verschieden* were submitted to two separate repeated measures ANOVAs. These confirmed the main effect of reading for *anders*, $F(1.83, 84.38) = 74.73$, $\eta_p^2 = .619$, and *verschieden*, $F(2.79, 131.23) = 54.06$, $\eta_p^2 = .537$, and contrasts were significant at each level, as shown by Figure 11.

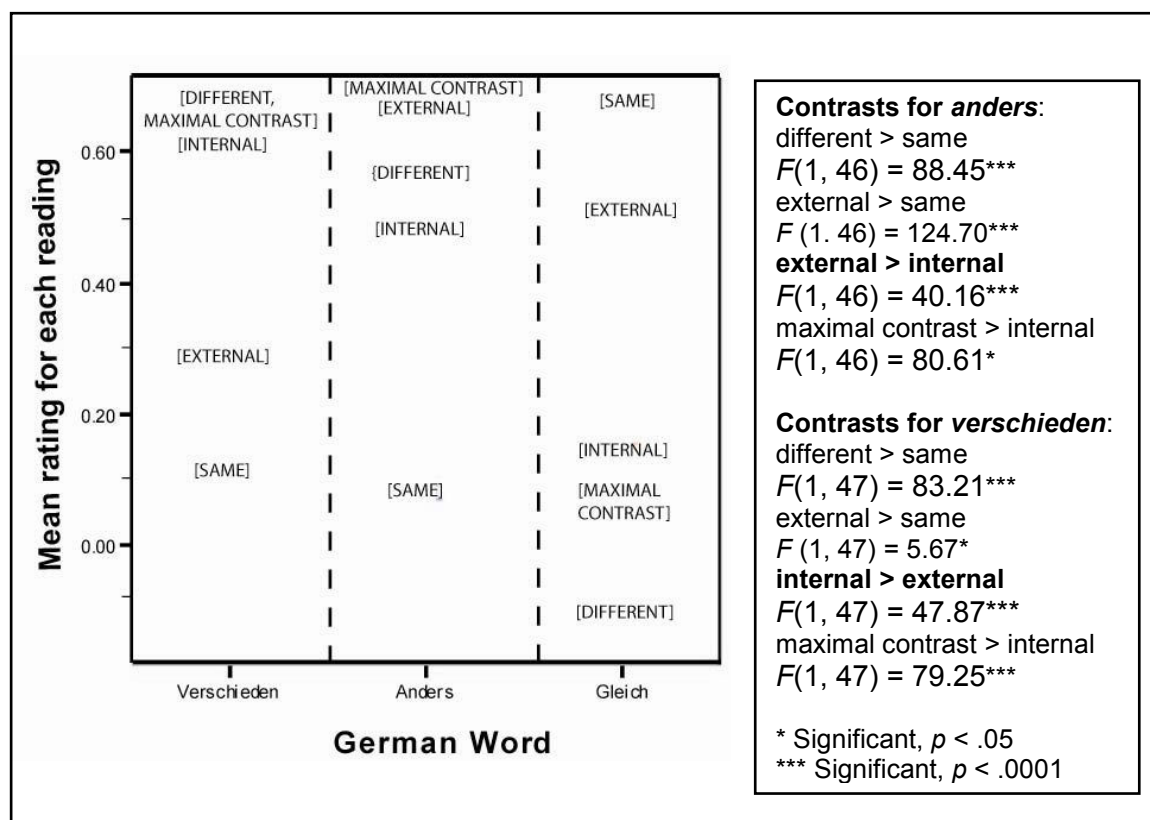


Figure 11: German L1 participants' mean log ratings with contrasts for *anders* and *verschieden*.

Figure 11 shows that German native-speakers favoured maximal contrast readings for both *anders* and *verschieden* but also showed a significant preference for internal readings of *verschieden* and external readings of *anders*, coinciding with Beck's (2000) semantic theory.

5.6.1.3 Summary

English native-speakers' ratings indicated that the 'true' ambiguity of *different* may be challenged by strong interpretational preferences for internal and maximal contrast readings. Importantly, German native-speakers significantly dissociated their preferred interpretations of *anders* and *verschieden* in the direction predicted by the semantic theory, restoring the rationale for investigating cross-linguistic differences between the two groups of Japanese L2 learners.

5.6.2 Japanese Experiments

Tables 7a, b and c show the L2 learners' language histories.

L2 Learner Group	Length of Formal Instruction (years)	Age Japanese Learning Began (years)	Time Spent in Japan (months)
English (<i>n</i> = 12)	3.36 (<i>S.D</i> = 2.68)	18.92 (<i>S.D</i> = 5.38)	26.29 (Range = 0 - 83)
German (<i>n</i> = 5)	2.160 (<i>S.D</i> = 0.73)	19.00 (<i>S.D</i> = 3.10)	72 (Range = 0 - 72)

Table 7a: L2 learners' average experience of learning Japanese.

Table 7a shows that the English L2 learner group had more formal instruction whilst the German L2 learner group had spent more time living in Japan. However, there was also considerable individual variation in both groups' length of residency.

L2 Learner Group	Self-Rated Proficiency (1 = no ability – 5 = native-like ability)				Self-Rated Frequency of Use (1 = never/rarely used – 5 = main language)
	Listen	Read	Write	Speak	Everyday Use
English (<i>n</i> = 12)	3	3	3	3.5	3
German (<i>n</i> = 5)	2	3	3	3	3

Table 7b: L2 learners' median self-reported ratings of Japanese proficiency and usage.

Table 7b suggests that the German and English L2 group was satisfactorily matched in level of Japanese use and proficiency, although English L2 learners reported higher ratings of listening and speaking ability.

L2 Learner Group	Number of additional languages spoken for each level of proficiency.			
	Beginner	Intermediate	Advanced	Bilingual
English (<i>n</i> = 12)	7 (2 German)	4	3	3 (1 German)
German (<i>n</i> = 5)	1	2	5 (5 English)	0

Table 7c: Additional languages of L2 participants.

Table 7c indicates that the English L2 learner group had experience of more languages than the German L2 learner group. This disparity is a product of the large difference in group size. However, German L2 learners again exhibited a more advanced knowledge of English than English L2 learners did of German.

A repeated measures mixed factorial ANOVA was used to compare the acceptability judgements of Japanese native-speakers and English and German L2 learners. There were two within-subjects variables, word (three levels: *tigau*, *betubetu*, and *onaji*) and reading (five levels: different, same, internal, external, and maximal contrast), and one between-subjects variable, native-language (3 levels: Japanese, English, and German).

Mauchly's test was significant for the main effects of word, $\chi^2(2) = 47.99$, and reading, $\chi^2(9) = 92.73$, as well as the interaction, $\chi^2(35) = 954.26$. Results for these effects are reported with Greenhouse-Geisser corrected degrees of freedom ($\epsilon = .77$ for word, $.81$ for reading and $.28$ for the interaction).

As observed in the English and German L1 experiments, there were significant main effects of word, $F(1.54, 211.21) = 99.23$, $\eta_p^2 = .420$, and reading, $F(3.25, 445.72) = 14.35$, $\eta_p^2 = .095$, as well as a significant word-reading interaction, $F(2.25, 308.24) = 23.70$, $\eta_p^2 = .410$. The main effect of native-language only approached significance, $F(2, 137) = 2.92$, $p = .058$. However, there were significant two-way interactions between word and native-language, $F(1.54, 211.21) = 6.12$, $\eta_p^2 = .082$, and reading and native language, $F(3.25, 445.72) = 14.35$, $\eta_p^2 = .076$, and, most importantly, a significant three-way interaction between all the variables, $F(2.25, 308.24) = 4.07$, $p < .01$, $\eta_p^2 = .056$. This final result indicates that participants' L1 was a factor in their Japanese acceptability judgements and therefore represents a crucial result for the present study.

Three additional repeated measures ANOVAs, performed separately on the judgements of each native-language group, were employed to explore the complex three-way effect. Each ANOVA involved two within-subjects variables: word (2 levels) and reading (5 levels).

In the Japanese native-speaker analysis, Mauchly's test was significant for the main effects of word, $\chi^2(2) = 41.67$, and reading, $\chi^2(9) = 99.06$, as well as the interaction, $\chi^2(35) = 628.57$ and degrees of freedom were corrected using Greenhouse-Geisser estimates ($\epsilon = .65$ for word, $.59$ for reading and $.19$ for the interaction). Mauchly's test was also significant for the effects

of word, $\chi^2(2) = 19.45$, and reading, $\chi^2(9) = 51.14$, in the English L2 analysis, and reading in the German L2 analysis, $\chi^2(9) = 35.00$. The interaction also significantly violated sphericity in both L2 groups (English L2: $\chi^2(35) = 409.12$, German L2: $\chi^2(35) = 119.40$). As such, these effects are also reported with Greenhouse-Geisser degrees of freedom (English L2: $\epsilon = .78$ for word, $.73$ for reading and $.30$ for the interaction, German L2: $\epsilon = .56$ for reading and $.44$ for the interaction).

As shown in Table 8, all three native-language groups produced significant main effects of word and reading and word-reading interactions.

Effect	Japanese Native-Speakers	English L2 Learners	German L2 Learners
Word	$F(1.30, 69.93) = 76.62, \eta_p^2 = .420^{***}$	$F(1.56, 91.84) = 64.431, \eta_p^2 = .143^{***}$	$F(1.97, 47.37) = 12.85, \eta_p^2 = .349^{***}$
Reading	$F(2.36, 127.34) = 16.99, \eta_p^2 = .095^{***}$	$F(2.91, 171.53) = 8.83, \eta_p^2 = .213^{***}$	$F(2.23, 53.44) = 4.96, \eta_p^2 = .171^{**}$
Interaction	$F(1.49, 80.27) = 48.10, \eta_p^2 = .410^{***}$	$F(2.38, 140.51) = 69.77, \eta_p^2 = .737^{***}$	$F(1.97, 47.37) = 12.85, \eta_p^2 = .474^{***}$

** significant, $p < .001$, *** significant, $p < .0001$

Table 8: Main effects and interactions in the Japanese Experiment.

Repeated contrasts explored the interactions within each group. Table 8 displays the results of comparing ratings of *tigau* and *onaji* between each adjacent reading and also indicates which word was most preferred.

	Japanese Native-Speakers		English L2 Learners		German L2 Learners	
Reading	Pref.	Interact.	Pref.	Interact.	Pref.	Interact.
different	<i>tigau</i> > <i>onaji</i>	$F(1, 54) = 72.74^{***}$	<i>tigau</i> > <i>onaji</i>	$F(1, 59) = 112.79^{***}$	<i>tigau</i> > <i>onaji</i>	$F(1, 24) = 53.13^{***}$
same	<i>onaji</i> > <i>tigau</i>	$F(1, 54) = 41.56^{***}$	<i>onaji</i> > <i>tigau</i>	$F(1, 59) = 128.82^{***}$	<i>onaji</i> > <i>tigau</i>	$F(1, 24) = 43.268^{***}$
internal	<i>tigau</i> > <i>onaji</i>	$F(1, 54) = 24.08^{***}$	<i>tigau</i> > <i>onaji</i>	$F(1, 59) = 35.61^{***}$	<i>tigau</i> > <i>onaji</i>	$F(1, 24) = 3.78$
external	<i>onaji</i> > <i>tigau</i>		<i>onaji</i> > <i>tigau</i>		<i>onaji</i> > <i>tigau</i>	
maximal contrast	<i>tigau</i> > <i>onaji</i>	$F(1, 54) = 43.50^{***}$	<i>tigau</i> > <i>onaji</i>	$F(1, 24) = 43.50^{***}$	<i>tigau</i> > <i>onaji</i>	$F(1, 24) = 19.49^{***}$

*** significant, $p < .0001$

Table 9: Repeated contrasts and preferences for Japanese native-speaker and L2 learner acceptability ratings of *tigau* and *onaji*.

Table 9 shows that Japanese native-speakers and English L2 learners produced highly significant interactions between *tigau* and *onaji* at all compared levels of reading, and showed identical preferences for each reading with these two words. Germans L2 learners matched Japanese native-speaker preferences but failed to significantly dissociate *tigau* and *onaji* for internal and external readings. This non-significant German L2 finding reflects their higher ratings of *tigau*–external pairs which contributed to a less marked preference for *onaji* in this category. This result is illustrated by Figure 12.

Higher German L2 ratings of *tigau*–external pairs were predicted by transfer. This effect was further explored in the repeated contrasts between *betubetu* and *tigau*, shown in Table 10.

Reading	Japanese Native-Speakers		English L2 Learners		German L2 Learners	
	Pref.	Interact.	Pref.	Interact.	Pref.	Interact.
different	<i>betubetu</i> > <i>tigau</i>	$F(1, 54) = .01$	<i>tigau</i> > <i>betubetu</i>	$F(1, 59) = 4.88^{**}$	<i>tigau</i> > <i>betubetu</i>	$F(1, 24) = 2.30$
same	<i>betubetu</i> > <i>tigau</i>		<i>tigau</i> > <i>betubetu</i>		<i>betubetu</i> > <i>tigau</i>	
internal	<i>betubetu</i> > <i>tigau</i>	$F(1, 54) = .55$	<i>tigau</i> > <i>betubetu</i>	$F(1, 59) = 3.15$	<i>betubetu</i> > <i>tigau</i>	$F(1, 24) = .08†$
external	<i>tigau</i> > <i>betubetu</i>	$F(1, 54) = 7.64^{**}$	<i>betubetu</i> > <i>tigau</i>	$F(1, 59) = 1.53$	<i>tigau</i> > <i>betubetu</i>	$F(1, 24) = 2.20$
maximal contrast	<i>betubetu</i> = <i>tigau</i>	$F(1, 54) = 4.80^*$	<i>betubetu</i> > <i>tigau</i>	$F(1, 59) = 1.01$	<i>tigau</i> > <i>betubetu</i>	$F(1, 24) = 2.54$

* significant, $p < .05$, ** significant, $p < .01$

Table 10: Repeated contrasts and preferences for Japanese native-speaker and L2 learner acceptability ratings of *tigau* and *betubetu*.

Table 10 presents several results distinguishing L2 learners from Japanese native-speakers as well as differences between the L2 learner groups. Japanese native-speakers were the only group to significantly differentiate ratings of *betubetu* and *tigau* between internal and external readings. This result illustrates that Japanese native-speakers judged *betubetu*-internal pairs as more acceptable than *tigau*-internal pairs and *tigau*-external pairs as more acceptable than *betubetu*-external pairs. This pattern was predicted by the semantic theory.

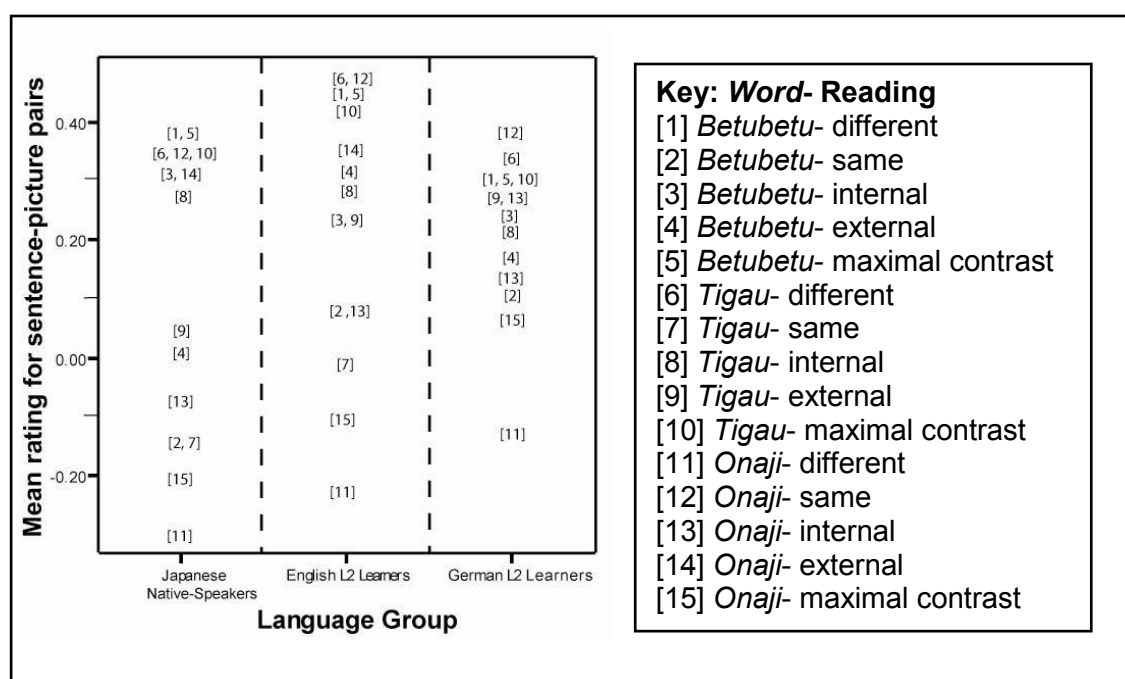


Figure 12: Japanese native-speaker and L2 learners' mean log ratings for *betubetu*, *tigau* and *onaji*.

Figure 12 shows that only the German L2 learners conformed to the Japanese native-speakers' relative preferences for *betubetu* and *tigau* with internal and external readings. English L2 learners showed a contrary preference, favouring *betubetu* with an external reading. In addition, English L2 learners demonstrated uniquely high ratings for *betubetu* with a same reading, producing the significant interaction between *betubetu* and *tigau* with different and same readings shown in Table 9.

However, German L2 learners did not consistently outperform English L2 learners. English L2 learners judged pairs featuring *tigau* similarly to Japanese native-speakers and preferred internal over external interpretations whilst German L2 learners favoured *tigau* with external rather than internal readings and used a narrower range of values for the majority of sentence-picture pairs.

Figure 12 also displays common behaviours uniting the three native-language groups. The pairings of *onaji* with two-item different, maximal contrast and internal readings, intended as highly semantically anomalous, consistently clustered in the lower ranges of acceptability for all groups, although Japanese native-speakers produced the lowest ratings of acceptability. Similarly, the three groups assigned maximal contrast pictures extremely favourable ratings

with *betubetu* and *tigau*. These shared aspects of performance indicate that the L2 learners' judgements were founded on systematic semantic principles.

5.6.2.1 Summary

Japanese native-speakers conformed to the semantic theory by preferring external readings with *tigau* rather than *betubetu*. Between the L2 groups, German L2 learners tended to perform more like Japanese native-speakers in their acceptability judgements for *betubetu* whilst English L2 learners achieved more native-like judgements of *tigau*. All three groups performed similarly with *onaji*. Section 5.7 discusses these patterns alongside other findings from Experiment 2.

5.7 Discussion

This section examines the findings from the present study in the context of the initial research questions. As Experiment 1 failed to generate the necessary insight into transfer, the results of Experiment 2 are the primary focus of the discussion, although appropriate general observations from Experiment 1 are included.

Experiment 2 successfully addressed the methodological issues raised in Experiment 1. Acceptability judgement data elicited with magnitude estimation proved extremely informative, demonstrating that English and German native-speakers were able to discriminate the relevant semantic properties of their L1 adjectives. As the German native-speakers studied in Experiment 2 reported being proficient in English, their ability to differentiate German L1 words confirms that methodological factors, rather than bidirectional transfer effects, were responsible for Experiment 1's unexpected L1 post-test results. Japanese native-speakers also demonstrated the appropriate contrast between *betubetu* and *tigau*, confirming the fundamental premises of the present study and endorsing the relevance of the research questions.

5.7.1 Research Questions

(1) Do English L2 learners of Japanese discriminate between *tigau* and *betubetu* like Japanese native-speakers?

Experiment 2 showed that Japanese native-speakers preferred external readings presented with the word *tigau* rather than *betubetu*, verifying the critical assumption that the meaning of *betubetu* is more restricted (Takano, 2004). The favouring of maximal contrast readings for both terms confirmed Duffield et al.'s (2005, in press) earlier findings although the present study showed that Japanese native-speakers judged internal, rather than external readings, as next most acceptable for *tigau*, contradicting the preference observed by Duffield et al. This discrepancy may be a product of methodological differences as Duffield et al.'s TVJ task permitted only 'yes' or 'no' answers whilst magnitude estimation enabled fine-grained acceptability judgements. Sorace and Keller (2005) recognised that 'acceptability judgements [often] fail to provide a clear-cut division between fully acceptable and fully unacceptable sentences' and therefore, Experiment 2 may have elicited a deeper insight into Japanese native-speakers' semantic intuitions than can be inferred from any previous work (Sorace & Keller, 2005: 1498). This proposal could be validated by extending Experiment 2 to a larger sample of Japanese native-speakers.

Experiment 2 showed that the English L2 learners' interpretations of *betubetu*, *tigau* and *onaji* bore many similarities to the judgements of Japanese native-speakers. Both groups deemed *onaji*-same pairs highly acceptable whilst anomalous *onaji*-different, internal and maximal contrast pairs were assigned low acceptability ratings. In addition, the English L2 learners significantly disassociated *tigau* from *onaji* in a manner consistent with the preferences of Japanese native-speakers. This demonstrates an equal ability to detect the strong semantic distinction between these words and clearly indicates the L2 learners' capacity to make fine-grained acceptability judgements in Japanese.

However, for some words, the two groups diverged fundamentally. Japanese native-speakers consistently favoured *betubetu* over *tigau* with all readings except for the critical external reading. In contrast, English L2 learners generally preferred *tigau* to *betubetu* with different and internal readings but reversed this trend with external readings, favouring *betubetu* instead. Such inflated ratings of acceptability for an overextended external reading of *betubetu* were predicted by Duffield et al.'s (2005) results and the STH. However, the English L2 group also demonstrated unprecedented levels of acceptance for *betubetu*-same pairs,

suggesting a general uncertainty of *betubetu*'s intended meaning. This supposition is explored in the context of Research Question 2 which concentrates on accounting for overextension.

Japanese native-speakers and English L2 learners were also distinguished by the extent to which they perceived uses of *betubetu* and *tigau* to be acceptable. The Japanese native-speakers' highly significant interaction ($p < .0001$) between ratings for internal and external readings of *betubetu* and *tigau* indicates that these words were firmly dissociated by their internal and external semantic properties. English L2 learners failed to replicate this effect, suggesting a minimal sensitivity to the relevance of internal and external readings for differentiating these words.

As English L2 learners discriminated *tigau* from *onaji* like native-speakers, it seems that relative semantic distance was a factor in L2 performance. Such behavioural differences may signify underlying structural dissimilarities in the native-speaker and L2 learner lexicons. It is possible that Japanese native-speakers mapped *betubetu* and *tigau* to a more distinct range of features than English L2 learners and, therefore, benefited from an enhanced semantic dissociation between these words. This explanation would coincide with Zhang's (1995) study which reported significant variation between native-speakers' and L2 learners' semantic representations of degree adverbs, but more focused investigation is needed to verify this effect.

(2) Is English L2 learners' behaviour with *tigau* and *betubetu* influenced by the L1 translation *different*?

English native-speakers, participating in the English L1 experiment, confirmed that internal and external readings were both acceptable for *different*, occupying the mid-range of acceptability between the preferred maximal contrast reading and the strongly disfavoured same reading. However, like Japanese native-speakers' preferences for *tigau*, internal readings of *different* were significantly preferred over external readings, suggesting that the two do not have equivalent semantic status and casting doubt on the proper ambiguity of the term.

German native-speakers expressed a preference for external over internal readings of *anders*, and internal over external readings of *verschieden*. This suggests that despite quantitative similarities between the Japanese and German lexicons, where both languages employ two words for *different*, there are qualitative differences in their underlying representations which may promote divergent semantic judgements. Indeed, Experiment 2 indicated that the

observed cross-linguistic differences between the structure of English, German and Japanese directly correlated with language-specific tendencies in L2 performance.

The primary focus of this study was to investigate whether English L2 learners accepted *betubetu* with an external reading more emphatically than Japanese native-speakers and German L2 learners. Experiment 2 evidenced this behaviour. Both Japanese native-speakers and German L2 learners judged external and same readings of *betubetu* as anomalous, whilst English L2 learners preferred external over internal readings of *betubetu* and even favoured *betubetu*-external over *tigau*-external pairs. This asymmetry in the L2 groups was predicted by the STH as *betubetu*'s closest German translation, *verschieden*, shares a similar semantic restriction whilst the most compatible English word, *different*, is theoretically more inclusive.

However, other findings from Experiment 2 imply caution is necessary before attributing this key aspect of English L2 behaviour to transfer. The results of the English L1 experiment showed that, whilst internal and external readings clustered closely in the rankings for a preferred interpretation of *different*, external readings were generally less well favoured. This preference is the opposite of that expressed by English L2 learners for *betubetu*, suggesting it is unlikely to have been encouraged by their L1. In addition, as mentioned for Research Question 1, English L2 learners produced unusually high ratings for *betubetu*-same pairs. This behaviour was neither foreseen by the STH nor explained by widening the subset word *betubetu* towards the meaning of the superset term *tigau*, and instead appears to indicate the term was simply unfamiliar to the English L2 group.

Although high ratings for maximal contrast readings of *betubetu* indicate some understanding of its equivalence to *different*, an assertion of unfamiliarity is plausible in light of evidence that *betubetu* is comparatively infrequent in Japanese (see Section 2.3). Consequently, it is reasonable to suggest that factors general to making acceptability judgements in an L2 contributed to overextension. A comparison of the scales devised in all versions of Experiment 2 supports this conjecture as L2 judgements were typified by higher estimates of acceptability for all the pairs whilst native-speakers utilised lower ranges more frequently.

The ratings of *tigau* appear to offer a more comprehensive insight into non-native-like behaviour. Experiment 2 showed that German L2 learners were unique in preferring external to internal readings of *tigau*. This trend was not exhibited by English L2 learners who, despite their less competent performance with *betubetu*, converged on a native-like internal preference. The STH predicted this particular asymmetry in L2 learner behaviour, caused by

transferring a heavily weighted external reading from *anders* to *tigau* and, in addition, several factors enhance the probability of an L1 effect.

First, the universal unpopularity of external readings for all words equivalent to English *different*, except for German L1 ratings of *anders* and German L2 ratings of *tigau*, suggests a unique correlation between the two words. Second, the ability of German L2 learners to assign low acceptability ratings to *betubetu*-same pairs suggests their level of Japanese lexical knowledge was advanced beyond the English L2 group and it might be expected they should achieve generally more native-like interpretations and not, as these findings suggest, be outperformed in judging the more common term.

As a consequence of these observations, transfer is a plausible explanation for German L2 performance, an influence of *verschieden* promoting native-like judgements of *betubetu* but *anders* encouraging deviant behaviour with *tigau*. In contrast, English L2 learners' flawed understanding of *betubetu* seems to have inhibited their potential to associate this term with a relevant L1 word but transferring an internal preference for *different* seems to have facilitated their convergence on the Japanese native-speakers' representation of *tigau*. This explanation is consistent with Jiang's (2004) assertion that L2 learners must reach a threshold of competence before transfer is achieved and, if verified, these findings would further indicate that hierarchically organised semantic preferences can also carry from the L1 to the L2.

The results of Experiment 2 should be cautiously interpreted, given the small sample size, especially for the German L2 group. For instance, the Principle of Contrast (Clarke, 1987) that German L2 learners apparently enforced between *betubetu* and *tigau* may reflect an experimental artefact resulting from multiple exposures to internal and external readings of *betubetu* and *tigau*, rather than an L1 influence. Repeated judgements may have artificially sensitised this group to the principal semantic contrast and encouraged polarisation of the terms during the task. Whilst English L2 learners should have been equally affected, their unfamiliarity with *betubetu* may have averted similar behaviour.

The apparent deficit in English L2 competence is surprising considering that self-assessment of Japanese speaking, reading, writing and listening ability indicated their equal, if not marginally superior, proficiency to the German L2 group. Therefore, the results of Experiment 2 suggest that self-reported aptitude in these four general areas cannot directly predict L2 performance. This proposal coincides with Zhang's (1995) observation that an 'individual's private semantic model is not readily generalizable between sets of lexical items or levels of proficiency' and supports his assertion that proficiency must be examined on a

lexically-specific basis for insightful L2 research (Zhang, 1995: 225). Due to considerable individual variation in the L2 learner backgrounds, such an investigation is beyond the scope of the present study but remains an option for future inquiry.

Despite these difficulties in interpreting the findings of Experiment 2, it should be noted that the observed behaviour was incompatible with an effect of subset to superset widening. Experiment 1 indicated that widening influenced the acquisition of novel-words organised in a subset-superset relationship yet Experiment 2 demonstrated that L2 learners' ratings for the subset word *betubetu* were inconsistent with judgements of the superset term *tigau*. Whilst English L2 learners overextended *betubetu*, their internal preference for *tigau* indicates the influence of the superset word's wider external reading was not the impetus for this behaviour. Similarly, German L2 learners, who strongly preferred external readings of *tigau*, demonstrated more restricted interpretations of *betubetu*, further confirming that ratings of *betubetu* were not orientated towards *tigau* and that different criteria were applied to the two words.

Confirming transfer in the present study would have important consequences for research in L2 semantic development. In addition to showing that L1 interpretational preferences are active in L2 processing, this study that L1 influences do not observe concreteness constraints, as Marian and Kaushanskaya (2007) propose, but may also enter the representations of abstract relational terms. As a consequence of these findings, it seems that extending Experiment 2 to compare native-speaker with L2 learner judgements across a wider range of adjectives with variable mappings would also generate profitable insights into the mechanisms of L2 meaning.

(3) Is English L2 learners' representation of *tigau* and *betubetu* a result of explicit teaching?

Experiment 1 was designed to directly investigate the role of instruction in transfer but was impeded in this purpose by methodological factors (see Section 4.6). The results of Experiment 2 are currently insufficient to discount the influence of explicitly taught translation equivalents provided to L2 learners without elucidating the incompatible aspects of meaning. Although the high levels of English L2 learners' acceptance for *betubetu*-same pairs suggests that teaching is an unlikely explanation at least for this non-native behaviour, the possibility is more difficult to exclude for the German L2 learners whose ratings of *betubetu* and *tigau* were generally consistent with their closest L1 translations.

Despite these limitations, Experiment 2 was instrumental in exposing the variable range of acceptable readings Japanese native-speakers acknowledged for *betubetu* and *tigau*. For instance, external readings were preferred with *tigau* over *betubetu* but both mappings were considerably more acceptable than either word with a same reading, a finding that is compatible with Duffield et al.'s (2005) observation that Japanese native-speakers sometimes accepted *betubetu* with an external reading in their yes/no judgement task. This suggests that the degree of semantic overlap between *betubetu* and *tigau* is considerably greater than the theory prescribes and, therefore, the clearly defined subset-superset relationship underlying the novel-words in Experiment 1 distorted the shades of meaning which naturally permeate the words Japanese.

The results of Experiment 2 imply that using theoretical linguistic analysis to identify the incompatibilities of L1 and L2 mappings would not generate the complex semantic representations necessary to native-like performance. Indeed, it is difficult to imagine how any formal teaching method could enable L2 learners to acquire precisely the same delicate and flexible intuitions that native-speakers possessed. This observation affords fresh relevance to the apparent effect of previous L2 learning observed in Experiment 1. Experiment 2 could not verify the connection between more extensive multilingual abilities and the facility to reach native-like judgements for the closely related Japanese terms. However, given the diversity of the semantic representations being acquired, any additional influences sensitising L2 learners towards native-speaker preferences would be integral to their L2 success.

6. Conclusion

Attempts to investigate the role of explicit instruction in the transfer process were impeded by methodological problems. However, the present study successfully used magnitude estimation for investigating L2 semantic development, specifically, the acquisition of two Japanese translations for the English adjective *different*. The findings supported previous work by Duffield et al. (2005) who originally identified this interesting example of one-to-many mapping, showing that English L2 learners extended the meaning of the word *betubetu* beyond the range of acceptable meanings generally acknowledged by Japanese native-speakers.

This behaviour was examined in the context of possible L1 influences on L2 semantic representations, comparing English with German L2 learners of Japanese. Both groups shared

some tendencies in L2 semantic acceptability judgements, namely a weaker discrimination of the partially synonymous L2 terms, but principally evidenced divergent semantic preferences for the Japanese words. This asymmetrical L2 performance was sufficient to discount overextension caused by widening from the subset word *betubetu* to the superset term *tigau* but high rates of English L2 acceptance for anomalous same readings of *betubetu* prevented attributing their deviant understanding of this word to L1 semantic content.

Nevertheless, German L2 learner judgements for Japanese words, which were typically in the direction of their closest L1 translations, and English L2 learners' ability to replicate Japanese native-speakers' preferred construal of *tigau*, both indicated that L1 semantic preferences had the potential to precipitate convergence on native-speaker norms. Such correlations do not guarantee causality and should be further investigated by extending the study to involve a wider sample of L2 learners and materials. Finally, other possible factors affecting L2 semantic development, such as previous L2 experience and proficiency, were discussed.

This study raises multiple issues, both developmental and theoretical, which would benefit from further investigation. Focused cross-linguistic comparisons offer strong explanatory potential in L2 lexical acquisition where learners must converge on native-speakers' semantic preferences, and magnitude estimation is the optimum tool to achieve these insights.

7 References

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8 Appendices

8.1 Example Questionnaires

Participant #:	Group:	Language:
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Please briefly describe the meaning of each word in the spaces provided:

dal:

gop:

fep:

Participant #:	Group:	Language:
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Bitte beschreiben Sie, was die wörter bedeuten.

dal:

gop:

fep:

8.2 Participants' Questionnaires

Participant #: 1	Group: 1	Language: German
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Bitte beschreiben Sie, was die wörter bedeuten.

dal:

gleich

gop:

erstes + letztes (von 3) gleich

erstes + zweites ungleich
(von 2)

fep:

zweites + letztes (von 3)
gleich

Participant #: 2	Group: 1	Language: German
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Bitte beschreiben Sie, was die wörter bedeuten.

dal:

Das gleiche Objekt wird von ellen genommen.

gop:

Die ersten beiden Tiere nehmen unterschiedliche Objekte. Bei drei Tieren ist es egal, ob die beiden rechten gleiche oder unterschiedliche Objekte nehmen.

fep:

Benachbarte Nagetiere nehmen unterschiedliche Objekte.

Participant #: 3 Group: 1 Language: German

Bitte beschreiben Sie, was die wörter bedeuten.

dal:

gleich

gop:

keine Ahnung/ no idea

fep:

Keine Ahnung/ no idea maybe something with symmetry

Participant #: 4	Group: 1	Language: German
------------------	----------	------------------

Bitte beschreiben Sie, was die wörter bedeuten.

dal:

3 (or everything) are the same

gop:

the left of the right is different from the others

fep:

the middle is different from the others

Participant #: 5 Group: 2 Language: German

Bitte beschreiben Sie, was die wörter bedeuten.

dal:

unterschiedlich

gop:

unterschiedlich

fep:

gleich

Participant #: 7	Group: 2	Language: German
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Bitte beschreiben Sie, was die wörter bedeuten.

dal:

Bei 2 Tieren: beide Tiere nehmen unterschiedliches in den Korb
3 Tiere: entweder das mittlere Tier nimmt etwas anderes als die beiden anderen in dem Korb, oder das mittleren rechte Tier nehmen das gleiche und das linke Tier etwas anderes

gop:

bei 2 Tieren: synonym zu dal
3 Tiere: mittleres Tier nimmt etwas anderes als die beiden anderen Tiere

fep:

Alle Tiere nehmen das gleiche in ihren Korb

Participant #: 8	Group: 2	Language: German
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Bitte beschreiben Sie, was die wörter bedeuten.

dal:

mindestens ein Objekt ist verschieden

gop:

mindestens ein Objekt ist verschieden

fep:

alle Objekte sind identisch

Participant #: 9	Group: 2	Language: German
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Bitte beschreiben Sie, was die wörter bedeuten.

dal:

Die Tiere kaufen verschiedene Dinge.

gop:

Die Tiere kaufen verschiedene Dinge.

fep:

Die Tiere kaufen dusselbe Dinge.

Participant #: 10	Group: 2	Language: German
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Bitte beschreiben Sie, was die wörter bedeuten.

dal:

so etwas wie "verschieden"

Bei 2 Dingen haben 'gop' und 'dal' das gleiche bedeutet; bei 3 Dingen wurde 'dal' benutzt, wenn das unterschiedliche in der Mitte oder links am Rand erschien, aber das kann ich nicht in Worten ausdrücken

gop:

so etwas wie "verschieden" (also Katze/Maus/Hase habe verschiedene Dinge eingekauft)

bei 2 Dingen = 'dal'

bei 3 Dingen nur wenn die unterschiedliche sache in der Mitte erschien

fep:

so etwas wie "gleich" oder "dasselbe"- ah wenn Katze, Maus, und Hase das gleiche eingekauft haben, ist dieses Wort erschienen (bei 2 oder 3 Dingen)

Participant #: 11	Group: 3	Language: German
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Bitte beschreiben Sie, was die wörter bedeuten.

dal:

“verschieden”

Die Tiere auf dem Bildschirm haben unterschiedliche Blumen/Fruchte/Balle

gop:

“das gleiche”

Alle Tiere auf dem Bildschirm haben die gleiche Blume/Frucht oder den gleichen Ball

fep:

“verschieden”

Siehe dal

Participant #: 12 Group: 3 Language: German

Bitte beschreiben Sie, was die wörter bedeuten.

dal:

unterschiedlich

gop:

alle gleich

fep:

unterschiedlich

Participant #: 13	Group: 3	Language: German
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Bitte beschreiben Sie, was die Wörter bedeuten.

dal:

verschiedene Exemplare der gleichen Reinenfolget Anzahl
(objekte?) spielt keine Rolle
Nicht klar welche weiteren Variablen eine Rolle spielen ob zB
drei einkaufende ? auch 'dal' wären od. Nicht)

gop:

gleiche Gegenstände, ? von Anzahl
(s. 'dal': nicht klar ob Objektstatus/Nicht eine Rolle spielen)

fep:

synonym zu 'dal'

Participant #: 14 Group: 3 Language: German

Bitte beschreiben Sie, was die wörter bedeuten.

dal:

maus hat ein verschiedenes symbol
katze und Hase das gleiche

gop:

Die gleiche symbole
Zwei gleiche symbole
Kein unterschied

fep:

Zwei gleiche symbole
Katze unterschiedlich

Participant #: 15	Group: 3	Language: German
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Bitte beschreiben Sie, was die wörter bedeuten.

dal:

“Dal” bedeutet “unterschiedlich/ verschieden”.
Es Zeigt das etwas nicht gleich ist.

gop:

“Gop” bedeutet das etwas das selbe ist. “Gop” steht für “gleich”
und wird benutzt wenn man Dinge beschreibt die einheitlich
sind.

fep:

“Fep” hat die selbe Bedeutung wie “Dal”. Es steht für
unterschiedlich sein.

Participant #: 16	Group: 2	Language: German
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Bitte beschreiben Sie, was die wörter bedeuten.

dal:

different or mixed
unterschiedlich oder gemischt

gop:

different or mixed
= synonym of dal
Unterschiedlich oder gemischt
= synonym von dal

fep:

same or equal
gleich

Participant #: 1	Group: 1	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

means that everything matches

gop:

means that two match and one doesn't, but it goes A-B-A

fep:

means that two match and one doesn't, and it goes A-A-B or A-B-B or A-B

Participant #: 2	Group: 1	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

pictures all look the same (identical)

gop:

2 different pictures in a random order

fep:

2 different pictures in a random order with different animals

Participant #: 3	Group: 1	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

all the animals in the picture have the same thing

gop:

Either the cat or the mouse has a banana or basketball or a daffodil (while the other two have apples, poppies, footballs)

fep:

Either the cat or the mouse has an apple a football or a poppy (while the other two have bananas, basketballs or daffodils)

Participant #: 4	Group: 1	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

All 3 objects are the same for each animal or if shown 2 animals and the objects are the same.

gop:

The 3 objects are not identical; the 1st object can match the 2nd or 3rd object. When shown 2 objects, they can be the same or different.

fep:

The 3 objects are not identical; the 1st must match the 3rd. When shown 2 objects, they must be different.

Participant #: 5	Group: 1	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

the two or 3 objects the animals got were the same

gop:

Bunny and cat got the same object? I don't really know.

fep:

Mouse and cat must be the same? I don't know. Sorry!

Participant #: 6	Group: 2	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

OF THE SAME CATEGORY/HAVE SOMETHING IN COMMON
BUT NOT EXACTLY THE SAME

gop:

DIFFERENT/NOT EXACTLY THE SAME

fep:

(EXACTLY THE) SAME.

... two items are “fep”

... two items are exactly the same

Participant #: 7	Group: 2	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

Either the R or far L picture was different, the other 2 were the same. There was often the wrong proportion of items eg 2 bananas, 1 cherry instead of 2 cherries, 1 banana, word might mean "different"

gop:

The middle picture is different-the grey mouse always has a different item to the other 2. Word might mean "middle" maybe?

fep:

The 3 items are the same. They are the same whether there are 2 or 3 boxes. The 3 pictures are identical. Word might mean "same" or "identical"?

Participant #: 8	Group: 2	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

3: The two on the right are different OR middle is different.
Groups of 2: the items are different.

gop:

3: Only the middle is different eg apple, banana, apple.
For groups of 2: different (same as dal)

fep:

All the same

Participant #: 9	Group: 2	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

different pair\group- perhaps depends on order it comes after other words?

gop:

different pair\group- not quite sure about the difference between dal & gop!

fep:

the same (two or more items)

Participant #: 10	Group: 2	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

when items were correct (not what they chose in the story)

gop:

appeared when items were correct

fep:

when all items were the same but not necessarily correct

Participant #: 11	Group: 3	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

cat and rabbit buy the same items of ball, fruit or flowers

gop:

cat, rabbit and mouse all buy the same item

fep:

Rabbit and mouse buy the same item of ball, fruit or flowers

Participant #: 12	Group: 3	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

this means two items the same one different I think it depends on which object there is two of, but unsure. Also when only 2 bears, 2 different items is usually dal

gop:

This is when all items are the same- 3 the same or two the same- doesn't matter what item.

fep:

Similar to dal. 2 objects the same, one different. Not sure when to use which. Say ABB more likely to be fep than ABA but not always
Fep not common when only 2 items.

Participant #: 13	Group: 3	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

I'm sorry, I haven't the faintest idea!

gop:

2 things the same together or 3

fep:

don't know

Participant #: 14	Group: 2	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

varied/different (w/r/t members of a group)

gop:

varied/different (w/r/t members of a group)

fep:

Identical/the same

Participant #: 15	Group: 3	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

At least two objects together which are different. Either two different or two the same and one different.

gop:

Means objects which are the same as each other eg a pair or more

fep:

The same construction as dal

Participant #: 16	Group: 1	Language: English
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Please briefly describe the meaning of each word in the spaces provided:

dal:

identical (objects)

gop:

false- not true to fact – each animal had different objects to those in the story

fep:

true- each animal had the right objects