Word associations in tip-of-the-tongue states and developmental changes in the multilingual lexicon

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Issues

• How do the lexicons of an L1, L2, and L3/Ln differ?
• How are lexical items of the different languages connected or affected by each other through cross-language influence?
• To what extent do multilingual speaker’s proficiency and frequency of use of languages affect the representations and processing routes of lexical items in the L1, L2, and L3?
• How do lexical representation and processing in multilingual speakers change over time as a consequence of changes in the language environment?
• A cognitive approach to the study of lexical retrieval
  – that relies on introspection and verbal report of extensive lexical search in natural settings
• Word associations in tip-of-the tongue (TOT) states as a window into bi- and multilingual speakers’ (developing) lexicon?

The study of word associations in TOT states and lexical development in L1, L2, and L3

Three areas it can contribute to:
  1. Form and meaning representations of words in L1, L2, and L3
  2. The strength and source of cross-language influence in extended word search and production
  3. Dynamic changes in the strength (and source) of cross-language influence over time
• A TOT state is a temporary word retrieval failure in which the speaker is certain that s/he knows the target word, and often has access to partial target information and other words related to it (Brown, 1991; Schwartz, 2002).

• Most TOT states contain associations (Reason & Lucas, 1984).

(1) Example. TOT state record with associations (Ecke, 2008)

• *Es cuando cocinas pero en especial pays, pastelillos.*
  [It's when you cook but especially pies and cakes.]
  *Vamos a _____ pastel. [Let's _____ cake.]*

• 3 syllables
• *cocina [kitchen] _____ within a minute*
• *pastel [cake] _____ within a minute*
• *pay [pie] _____ within a minute*
• *bake 3 min*
• *hornear [bake] 5 min*

*Es una palabra que no se utiliza mucho, porque siempre ocupas cocinar, casi no hornear.* [It is a word that is not used much, because you always choose cook, almost never bake.]
• Most associations are similar to the target word in meaning (*semantically related associations*)
• Some associations are similar in sound to the target word (*phonologically related associations*).
• Most associations *share the syntactic category* with the target word (Burke et al., 1991).

I. Developmental changes in the lexicon

• Developing changes in lexical representation are central components of some models of the L1/L2 lexicon
  (Kroll & Stewart’s, 1994, Revised Hierarchical Model of L1/L2 production/translation; Jiang’s, 2000, model of vocabulary acquisition; and Hall & Ecke’s, 2003, Parasitic Model of vocabulary acquisition).
• The models assume more cross-lexical connections (word association) between lexical items at lower proficiency levels (usually in L2 and/or L3) compared to stronger and more stable lexical-conceptual connections (usually, but not always in L1).
• Developmental changes in children’s L1 phonological lexicon over time and with the acquisition of literacy (Aitchison & Straf, 1981; Vihman, 1981)

• Differences in organization between L1 lexicons and L2 lexicons
  – Evidence from speech error data, both in reception and production (Henning, 1973; Laufer, 1991; Poulisse, 1999)
  – Word association studies in L1 and L2 (Chaffin, 1997; Fitzpatrick, 2006; Meara, 1982; Söderman, 1993; Wolter, 2001).

• Differences in organization between the (usually more developed) L1 lexicon and (usually less developed) L2 lexicons
  – Translation recognition tasks (Sunderman & Kroll, 2006; Talamas, Kroll & Dufour, 1999) and
  – Picture naming tasks (González Alonso, 2012) with L2 learners of different proficiency levels in the laboratory.
• Most of these studies suggest a *more form-driven processing of L2* items by less proficiency learners compared to
• a *more meaning-driven processing of L1* items and L2 items by higher proficiency learners.

Form and meaning representations of words in L1, L2, and L3

• We analyzed word associations and corresponding target words in naturally occurring TOT states
  – with respect to their similarity in form and meaning,
  – and whether the associate-target relation types differed in TOT states with words
  – from L1 (most familiar), L2 (less familiar), and L3 (least familiar / novel) (Ecke & Hall, in preparation)
  – and compared them to previous findings with TOT states in an L3 and an L2New (very recently learned L2) (Ecke, 2001, 1996).
Method

• Cognitive diary study of naturally-occurring TOT states.
• 50 native speakers of Mexican Spanish L1 with English as L2 and German as L3
• recorded TOT states of the 3 languages over a period of four weeks.
• Eight diary answer sheets to record recall responses and word search
  – (feeling of knowing = FOK, number of syllables, stressed syllable, letters / sounds, associations, target word if found).

(2) Example of a TOT state with meaning-related association

Traer algo a la mente. [To bring something to mind.]
FOK: 5, 3 Syllables. Es un verbo. [It is a verb.]
• -ar
  • recordar [remember] immediately
  • recuperar [retrieve] immediately
  • reproducir [reproduce] 1 min.
  • revivir [revive] 1 min.
  • evocar [evoke] 5 min.
Fui diciendo palabras parecidas en significado y repitiéndolas hasta recordarla.
[I was saying words similar in meaning and repeating them until I found it.]
(3) Example of a TOT state with form-related association

Canción del grupo Metallica en inglés
[Song of the band Metallica in English]
• FOK: 5, 2 Syllables
• o, aro
• oro [gold] immediately
• Aron [name] immediately
• ron [rum] immediately
• Orion 30 min.

Results

• The participants reported 205 TOT states and 304 word associations overall.
Table 1. Percentages of associate-target relation types in TOT states with L1, L2, L3, and L2New targets

<table>
<thead>
<tr>
<th>Language</th>
<th>FO</th>
<th>ME</th>
<th>FM</th>
<th>NR</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 (Spanish)</td>
<td>24.06</td>
<td>52.36</td>
<td>22.17</td>
<td>1.41</td>
<td>212</td>
</tr>
<tr>
<td>L2 (English)</td>
<td>28.17</td>
<td>54.93</td>
<td>11.27</td>
<td>5.63</td>
<td>71</td>
</tr>
<tr>
<td>L3 (German)</td>
<td>33.33</td>
<td>47.62</td>
<td>19.05</td>
<td>0.00</td>
<td>21</td>
</tr>
<tr>
<td>L3Ex (German)</td>
<td>37.50</td>
<td>41.70</td>
<td>18.70</td>
<td>2.10</td>
<td>48</td>
</tr>
<tr>
<td>L2New (English)</td>
<td>69.44</td>
<td>22.22</td>
<td>8.33</td>
<td>0.00</td>
<td>72</td>
</tr>
</tbody>
</table>

L3Ex = from experimentally elicited TOTs with L3 words (Ecke, 2001); L2New = from an acquisition-recall experiment with L2 words taught before the recall session (Campaña Rubio & Ecke, 2001)

Table 2. Percentages of associate-target relation types in TOTs with L1 & L2 target words (from Ecke, 1996)

<table>
<thead>
<tr>
<th>Language</th>
<th>Relation Type</th>
<th>FO</th>
<th>ME</th>
<th>FM</th>
<th>NR</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 (English)</td>
<td></td>
<td>17.9</td>
<td>55.5</td>
<td>25.5</td>
<td>01.1</td>
<td>263</td>
</tr>
<tr>
<td>L2 (German)</td>
<td></td>
<td>52.9</td>
<td>31.4</td>
<td>15.7</td>
<td>00.0</td>
<td>51</td>
</tr>
<tr>
<td>L1 (Russian)</td>
<td></td>
<td>21.3</td>
<td>33.6</td>
<td>45.1</td>
<td>00.0</td>
<td>122</td>
</tr>
<tr>
<td>L2 (English)</td>
<td></td>
<td>42.3</td>
<td>19.2</td>
<td>38.5</td>
<td>00.0</td>
<td>26</td>
</tr>
<tr>
<td>L1 (Spanish)</td>
<td></td>
<td>13.7</td>
<td>58.2</td>
<td>28.1</td>
<td>00.0</td>
<td>256</td>
</tr>
<tr>
<td>L2 (English)</td>
<td></td>
<td>26.3</td>
<td>55.3</td>
<td>18.4</td>
<td>00.0</td>
<td>38</td>
</tr>
</tbody>
</table>
Observed trend:

- Higher rates of form-related associations for TOT states with novel/more recently learned words (L3 > L2 > L1)
- The representation and processing of new/unfamiliar words is more form-driven, compared to the storage and retrieval of stable/familiar words which is primarily meaning-driven (Chaffin, 1997; Ecke, 1997; Meara, 1982; Talamas, et al., 1999; Söderman, 1993).

Assumptions

- New words are incorporated into the existing conceptual and lexical framework through the speakers' detection and use of similarity between new and already represented information.
- Unconscious and automatic (default) process described as "parasitism" (Hall & Ecke, 2003; Hall & Schulz, 1994).
- It assumes the creation of initial lexical connections between similar information independent of its belonging to a particular language.
• It is necessary to strengthen the form representations of novel words and their access from the corresponding concepts.
• The form-focus and connection to similar already represented structures is likely to weaken over time and to rely on fewer (salient) attributes.
• With time and use, lexical-conceptual relations will strengthen (also Kroll & Stewart, 1994; Talamas et al., 1999).
• Parasitism reduces the learning effort, but will occasionally result in errors including cross-linguistic influence.

II. The strength and source of cross-linguistic influence in extended word search

• Word associations in TOT states of developing multilinguals are also interesting with respect to their language affiliation.
• Are they associations from the language of the target word (within-language associations) or are they “intrusions” from another language (cross-language associations) reflecting cross-linguistic influence (CLI) and (dormant) activation levels in target word search?
L1 influence in L2 target word search
- 76% of associations in naturally occurring TOT states with L2 target words were intra-lingual (within language associations). L1 word search rarely involved associations from L2s (Ecke & Garrett, 1998)

CLI in L3 target word search (Ecke, 2001)
- Most associations (75%) were intra-lingual (from within the L3 German).
- 15% of the associations were English L2 words,
- Only 10% of the associates came from the L1 Spanish.

CLI in fluent Spanish-English bilinguals (Ecke, 2004)
- primarily within-language associations (73% overall), but
- higher rates of cross-language associations (33%) in TOT states in the non-dominant L1 (Spanish) compared to (16%) in the TOT states with words of the dominant L2 (English).
- Language dominance and language proficiency affect the strength and amount of CLI in TOT states.
L2 proficiency and L2 influence in TOT states with L1 target words (Ecke, 2008)

Research Questions

• Do Spanish speakers who experience TOT states with L1 words only search within the Spanish L1 lexicon or do they also retrieve items of the non-target English L2 lexicon?
• Do search patterns and CLI differ between the three groups of English L2 speakers relative to their proficiency level in the L2?
  – Low proficiency (beginners)
  – Intermediate proficiency (500+ on TOEFL)
  – High proficiency (fluent bilinguals)

<table>
<thead>
<tr>
<th>Group</th>
<th>TOT States</th>
<th>Associations</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>443</td>
<td>828</td>
</tr>
<tr>
<td>Low-L2 proficiency group</td>
<td>133</td>
<td>256</td>
</tr>
<tr>
<td>Intermediate-L2-proficiency group</td>
<td>220</td>
<td>386</td>
</tr>
<tr>
<td>High-L2-proficiency group</td>
<td>90</td>
<td>186</td>
</tr>
</tbody>
</table>

Number of reported TOT states (in Spanish only) and associations (Ecke, 2008)
Frequency of TOT states (with L1 words) and cross-language associations (from L2) in the three proficiency groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Low English Proficiency Group (n = 28)</th>
<th>Intermediate English L2 Proficiency Group (n = 76)</th>
<th>High English Proficiency Group (n = 37)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M of TOT states per participant(^1)</td>
<td>4.75</td>
<td>2.80</td>
<td>2.45</td>
</tr>
<tr>
<td>M of associates per TOT state</td>
<td>1.92</td>
<td>1.75</td>
<td>2.07</td>
</tr>
<tr>
<td>% of TOT states with associates in English</td>
<td>9.7</td>
<td>9.1</td>
<td>34.4</td>
</tr>
<tr>
<td>% of associates in English</td>
<td>9.8</td>
<td>5.7</td>
<td>26.9</td>
</tr>
</tbody>
</table>

\(^1\)Mean numbers (M) of TOT states relate to TOT states reported by participants where the target was a Spanish word. TOT states reported with English targets are not included.

Percentage of word associations in English and percentage of TOT states with English associations

- Group                                      %  %
  - Low Engl. Proficiency                   0.8  0.7
  - Intermediate Engl. proficiency         5.7  9.1
  - High Engl. Proficiency                 26.9 34.4
• In the Low-proficiency group of English learners, all except two associations were intra-lingual (Spanish) words.
• Example.

TOT state with exclusively intra-lingual (Spanish) associations

Target description: Es lo que ves a lo lejos y no es nada. [It's what you see in the distance and is nothing.]
• Viste el _____ - parece real. [Did you see the _____ - (it) seems real.]
• 3 syllables, article: el [masculine]
• es-
• reflejo [reflection] 5 min
• espejo [mirror] 30 min
• espejismo [mirage, illusion] 21.45 h

Que al momento de querer acordarme, me desespere y se me cerro el mundo y ahí lo deje hasta q’ el día siguiente sin pensar se me vino a la mente. [When I wanted to remember, I got desperate and the world closed over me and there I let it go until the next day when without thinking it came to my mind.]
• Intermediate-level English users do occasionally report inter-lingual associations (in 9.1% of the TOT states and 5.7% of the associations reported).
• Example.

<table>
<thead>
<tr>
<th>cocina [kitchen]</th>
<th>within a minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>pastel [cake]</td>
<td>within a minute</td>
</tr>
<tr>
<td>pay [pie]</td>
<td>within a minute</td>
</tr>
<tr>
<td>bake</td>
<td>3 min</td>
</tr>
<tr>
<td>hornear [bake]</td>
<td>5 min</td>
</tr>
</tbody>
</table>

Es una palabra que no se utiliza mucho, porque siempre ocupas cocinar, casi no hornear. [It is a word that is not used much, because you always choose cook, almost never bake.]
• About one third of the TOT states (34.4%) experienced by the High-proficiency group included one or more inter-lingual associates. Of all the associates produced by this group, 26.9% were English words.

• Example.

TOT state with intra-lingual (Spanish) and inter-lingual (English) associations

Target description: Los pantalones están en ____ en aquella tienda. [The pants are for _____ in that shop.]

• 2 syllables
• *ganga* [bargain] within a minute
• bargain within a minute
• buy within a minute
• *especial* [special] within a minute
• *oferta* [sale] 1 min

Estaba segura que me sabía esa palabra... Como estaba tratando de traducir “bargain” – mayoría de las palabras que se me venían a la mente eran en inglés. [I was sure that I knew the word… When I was trying to translate “bargain” – most of the words that came to mind were in English.]
Discussion: Associations, CLI and L2 proficiency level

- Low rate of CLI in Low-proficiency group
  - Small vocabulary, low frequency, activation threshold too high for CLI to occur.

- High rate of CLI in the TOT states of proficient L2 speakers
  - Increased L2 vocabulary, more concepts expressible through L2 forms, more potential associations in the L2.
  - Increased use of the L2, lower activation threshold for L2 words regardless of target language, more automatic retrieval of L2 words in L2 contexts, but also in L1 contexts.

  – Decreased use of the L1.
  – Higher activation thresholds in the retrieval of L1 words.
  – Slowed down retrieval and more time/opportunity for L2 intrusions (lexical errors, non-intended code-switching) (e.g. Pavlenko & Jarvis, 2002; Porte, 2003).
Discussion: The structure of the bilingual lexicon

- One common lexicon that integrates L1 and L2 structures at the phonological/orthographic levels.
- Parallel activation of both L1 and L2 information (non-selective access) as opposed to language-specific or selective access (see de Bot, 2004).
- In non-proficient bilinguals, however, the L2 is still too weak to become part of non-selective access. In that case, L1 words are probably retrieved selectively featuring no or very little influence from the L2.

- CLI in the form of word associations is not only possible from L1 to L2, but also from L2 to L1, especially in highly proficient L2 users (cf. McElree et al., 2000).
- Findings are consistent with a dynamic view of language development in the bilingual (e.g., De Bot et al., 2007; Herdina & Jessner, 2002)
A longitudinal study of TOT states, word associations and attrition in a multilingual (Ecke & Hall, forthcoming)

Issues

• Dynamic aspects of lexical retrieval (failure) in a multilingual
• When dominant language environments change
• What effect the increased use of an L3 (English) and L4 (Spanish) has on a speaker’s L1 (and other L2)

The study:

• We tracked TOT states experienced and recorded by one of the authors over 10 years while he was living in the US and Mexico.
• Whether the speaker’s development of an L3 (English) and an L4 (Spanish) resulted in observable L1 (German) attrition — reflected in TOT states and the activation of cross-language and within-language associations during TOT states.
• Whether the kind and relative degree of attrition and cross-linguistic interaction (CLI) changed over time,
• i.e., in four time periods that correspond to significant changes in the speaker’s language learning/use patterns.
Data from four periods

- **1994-1995**: Peter lives in the USA, speaking mostly English, teaching some German, learning Spanish and Portuguese, and reactivating his Russian.
- **1996-1997**: Peter lives in Mexico, speaking mostly Spanish, using English regularly, teaching some German; very little use of Russian and Portuguese.
- **2000-2001**: Peter lives in the USA, speaking mostly English, teaching German; using Spanish at home.
- **2003-2004**: Peter continues to live in the USA and his three major languages stabilize.

Figure 1. Peter’s language use history
Method

- **Cognitive Diaries** (Reason & Lukas, 1984)
- Records in diary sheets include:
  - partial knowledge
  - word associations
  - the target word
  - Approximate time from onset of TOT to association and target recall
- Two typical diary records
A TOT state in Spanish

“Handcuffs” in Spanish
Usaron ______ [They used _____]
4 syllables, fem.
p
pinzas [pincers] 10 sec.
parejas [couples] 30 sec.
gemelos [twins] 40 sec.
esposas [handcuffs] 1 min.

A TOT state in English

Ability to reproduce (a lot)
The egg is a symbol of ______
Fruchtbarkeit immediately
fruitfulness seconds
in seconds
maturity seconds
fertility 2 min.
Analyses

Three main indicators of activation level and potential attrition of languages:

- (the relative frequency of TOTs in each language in relation to other languages and to estimated frequency of use),
- the relative frequency of contribution by each language to cross-language associations in other language TOTs,
- the relative frequency of contribution by each language to within-language associations in same language TOTs.

Expectations

- We expected increasing attrition of the L1 due to its continuous infrequent use:
  - Reflected in higher rates of adjusted TOT states
  - More CLI in TOT states with L1 words
  - Less contribution of L1 words to cross-language associations in other language TOT states
Relative frequency of TOTs

• The problem with total numbers of reported TOTs
• We recalculated TOT rates and adjusted them for self-reported language use (Gollan, Bonnani & Montoya, 2005)
• Multiplying percentages of TOTs by 10 and dividing them by the reported frequency of use.
  – For example, if Peter experienced 30% of the TOTs in a language he used 60% of the time, the adjusted TOT score was (30x10/60) or 5.
  – If he experienced 30% of TOTs in a language he used only 20% of the time, the adjusted score was (30x10/20 or 15).
• The adjusted higher score of the less frequently used language reflects the higher vulnerability of speech to word retrieval failure (attrition) in that language.

Cross-language associations

• Reflect activation levels of competing language systems
• Rates of activation of associations from Language A during a TOT state in Language B reflect 'dormant' activation threshold levels in the Language A lexicon.
• Activation levels change over time as a function of frequency of use.
• Declining rates of cross-language associations from the L1 in TOT states of other languages will be taken as evidence of L1 attrition. Similar or increasing rates of L1 associations in TOT states of other languages would reflect maintenance and stability of the L1.
Within-language associations

- The proportion of within-language associations generated during the TOTs in a language is also a measure of overall activation threshold levels in that language’s sub-lexicon.

Hypothesis 1: Relative frequency of TOT states
- GER > SPA > ENG

Hypothesis 2: Cross-language associations
- ENG > GER > SPA

Hypothesis 3: Within-language associations
- ENG > GER > SPA
Results and discussion

• 108 TOTs and 365 word associations
• TOTs were experienced with
  – Spanish L4 words (38%)
  – English L3 words (36%)
  – German L1 words (15%)
  – (Russian L2 words) (11%)
We expected the following order: GER > SPA > ENG.

- Findings confirm the predicted order only in part.
- The expected L1 attrition over time was not occurring.
- Adjusted L1 German TOT rates reflect an unstable period for Peter's interacting language systems, in which the L1 is negatively affected by the learning/use of three other unstable languages and one stable language.
- The lower L1 TOT rates in the later periods suggest that German has stabilized, perhaps due to the more balanced use of three languages.
- The continues and frequent use of English (a relatively stable L3) produces low adjusted TOT rates throughout.
- Spanish TOT rates are higher than the English rates and increase with time, suggesting that the L4 remains unstable and becomes increasingly vulnerable to retrieval failure after the return to the US.
Figure 5. Percentage of cross-language associations in other language TOT states (Hypothesis 2)
Expected general order was: ENG > GER > SPA.

- The general pattern of findings confirms the hypothesis in part.
- But again the L1 appears to resist attrition over time, despite its relative infrequency of use.
- English and German were the most available competing languages during word search.
- The trend: L1 influence increased with time whereas L3 (English) influence remained stable, in general below L1.
- Words of the relatively recently learned L4 (Spanish) contributed little to cross-language associations.
Figure 6. Percentage of within-language associations for each language (Hypothesis 3)
We expected the following order: ENG < GER < SPA.

- The two more stable languages again behaved more similarly than the two less stable language.
- L1 German (with 89% within-language associations against 80.9% for English) once more proved the more stable of the two with its lowest level of internal competition during the unstable 1994/1995 period.
- The less stable L4 Spanish provoked 67.3% of within-language associations and stayed reasonably level, but with a dip in 2000/2001 after Peter left Mexico.
Summary

• We expected L1 attrition over time, i.e., in periods in which Peter predominantly used his L3 (English) and L4 (Spanish).
• We used three indicators of activation level of languages and attrition in our analysis:
  – (1) the relative frequency of TOT state occurrence in the different languages, and the languages’ contribution to
  – (2) cross-language word associations in other language TOT states and
  – (3) within-language associations in same language TOT states.

Peter’s L3 (English)

The L3 was relatively stable throughout the study period.
Peter’s L4 (Spanish)

- The frequently used, but relatively late learned L4 showed signs of attrition
  - after Peter’s return to an English-dominant environment, despite its continued use in the home.
- The case of Spanish is suggestive of regression.
  - Late learned structures are affected first by attrition.

Peter’s L1 (German)

The speaker’s L1 system is stabilizing over time after a period of relative instability characterized by competition from recently learned L4 and L5, a reactivated L2, and a frequently used L3. The stabilization of the L1 over time was unexpected, but see de Bot & Clyne (1994).
• This seems to confirm that the L1 system is highly resistant to attrition (de Bot, Lowie & Verspoor, 2007) and
• that frequency and recency of use play a less prominent role in L1 attrition (Schmid, 2007).
• However, if attrition is understood to include the temporary impairment of access to a language, then our data suggest some attrition of L1 word retrieval earlier in the period studied.
• In this phase, the speaker’s interacting language systems appear to have come out of balance due to his increased efforts in learning new languages at the cost of maintaining others, including the L1 (see also Linck et al., 2009).

• Multilingual speakers go through periods of relative instability and balance.
• Ease of access to L1 and L2/L3 fluctuates in non-linear ways (de Bot et al., 2007, Jessner, 2003).
Conclusion

• We discussed the use of word associations in TOT states to study lexical development in bi- and multilinguals.
• We proposed and reviewed research on:
  1. Form and meaning representations of words in L1, L2, and L3
  2. The strength and source of cross-language influence in extended word search and production
  3. Dynamic changes in the strength (and source) of cross-language influence over time

Keeping in mind limitations

• Word associations in TOT states are neither a perfect indicator of conceptual and lexical constraints on word retrieval, nor the most sensitive measure to compare the representation/processing of new vs. stable words.
• Natural data vary and are subject to many interacting factors.
• Case studies cannot be generalized, but may be one of the few ways to study multilinguals who vary widely in their language acquisition history, proficiency, and language use patterns.
• To obtain a more complete picture of the organizational principles of the multilingual lexicon, data should be compared to and complemented by other speech data:
  – Lexical substitution errors
  and more controlled laboratory experiments using
  – Free word associations
  – Word categorization
  – Picture naming
  – Word translation
  – TOT state elicitation tasks

Future research

  – Psychologically real principles of organization of conceptual/semantic store
  – The effect of word associations on target word retrieval
  – Dynamic aspects of multilingual speakers’ lexicons
  – Periods of (abrupt) change that require multilinguals to adjust their language system to requirements of a new environment.
  – Non-linear changes including periods of instability, attrition, relearning, and stabilization in the speakers’ lexicons.
Selected Bibliography


