Effects of second language on cognition in English users of L2 Japanese

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Abstract

It is now established that certain cognitive processes such as categorisation are tightly linked to the concepts encoded in language. Recent studies have shown that bilinguals with languages that differ in their concepts may show a shift in their cognition towards the L2 pattern primarily as a function of their L2 proficiency. This research has so far focused predominantly on L2 users who started learning the L2 in childhood or early puberty. The current study asks whether similar effects can be found in adult L2 learners. English speakers of L2 Japanese were given an object classification task involving real physical objects, and an online classification task involving artificial novel objects. Results showed a shift towards the L2 pattern, indicating that some degree of cognitive plasticity exists even when a second language is acquired later in life. These results have implications for theories of L2 acquisition and bilingualism, and contribute towards our understanding of the nature of the relationship between language and cognition in the L2 user's mind.

Keywords: Linguistic relativity , second language acquisition, Triads matching task, Object categorization, L2 Japanese

Resumen

Ya se ha determinado la estrecha conexión de ciertos procesos cognitivos tales como la categorización con los conceptos codificados en el lenguaje. Estudios recientes han demostrado que los bilingües con idiomas que difieren en sus conceptos pueden exhibir un acercamiento en su cognición hacia el esquema de la L2, sobre todo en función de su maestría en la L2. La investigación en este campo se ha centrado sobre todo en usuarios de una L2 que empezaron su aprendizaje de la L2 en la infancia o la primera pubertad. En este estudio nos preguntamos si se pueden encontrar efectos similares en personas adultas que han aprendido una L2. Hablantes nativos de

inglés que aprendían japonés como L2 llevaron a cabo una tarea de clasificación de objetos que incluía objetos físicos reales y una tarea de clasificación on-line de objetos artificiales novedosos. Los resultados muestran una inclinación hacia el esquema de la L2, lo cual indica que existe cierto grado de plasticidad aún cuando se adquiere una L2 a una edad más tardía. Estos resultados tienen incidencia sobre teorías de adquisición de L2 y bilingüismo, y contribuyen al entendimiento de la naturaleza de la relación entre lenguaje y cognición en la mente del usuario de una L2.

Palabras clave: relatividad lingüística ,adquisición de una segunda lengua, tarea de conexión de tríadas, categorización de objetos, japonés como L2

1. Introduction

The question of whether the language we speak influences the way we think (Whorf, 1956) has been at the centre of multi-disciplinary theoretical debate in the fields of Linguistics, Psychology, Anthropology and Philosophy for the better part of the 20th century and beyond (Hunt & Agnoli, 1991; Gumperz & Levinson, 1996; Gentner & Goldin-Meadow, 2003). Due to advances in the field of cognitive science recently it has been possible to investigate the extent of linguistic influence on cognition empirically. A number of recent studies (Lucy 1992; Imai & Gentner 1997; Imai 2000; Lucy & Gaskins 2001, 2003; Imai & Mazuka 2003) have suggested that there may be a link between the way a language quantifies nouns and the way speakers of that language perform in object classification tasks. One such task is the triads matching task. This task requires decisions to be made about the similarity between objects based on common shape or common material. Participants are presented with a standard entity (e.g. a cardboard box) and they are asked to decide if it is more similar to a shape alternate (e.g. a plastic box) or a material alternate (e.g. a piece of cardboard).

Despite methodological differences, the majority of studies show the same pattern. Speakers of English tend to make a shape match significantly more than speakers of Japanese or Yucatec (a native Mexican language) when the standard entity is a countable object (e.g. a cardboard box). However, when the standard entity is a non-countable substance (e.g. hand-cream arranged into a reverse c shape) the differences between the speakers of English and the speakers of Yucatec/Japanese diminish (such that both groups tend to match the reverse c shaped hand-cream with a pile of hand-cream rather than with a reverse c made out of plasticine).

The claim in Lucy (1992) and Lucy and Gaskins (2003) seems to be that in Yucatec/ Japanese all common nouns that refer to inanimate entities are in a sense 'mass',

and their referents are perceived as non-individuated entities. In these languages, nouns cannot take grammatical number marking and cannot be modified directly by numerals (e.g. from Japanese: **san ringo* 'three apple'). Number is optionally expressed through the use of external unitizers, which are called classifiers, with numerals (e.g. *san ko no ringo* ≈ three piece of apple, `three apples'). In English, however, there is an important subdivision within the nominal domain. On the one hand English has mass nouns (*sugar, water*), which cannot take morphological plural marking and need unitizers in order to be quantified (*Three glasses of water please*/**Pass me three water please*). On the other hand, English also has count nouns, which take obligatory plural marking and direct numeral quantification. Their referents are perceived as individuated entities, i.e. as units with a distinct shape and function.

More specifically, Lucy (1992) identifies two crucial features of nouns as relevant to nonverbal classification preferences: [±animate] and [±discrete]. He shows that there is an interaction between these two features and plural marking. According to Lucy (1992), nouns can instantiate three possible settings:

[+animate] and therefore automatically [+discrete]. These are nouns in both English and Japanese/Yucatec that can take plural inflection because they are discrete by virtue of their animacy.

a) [-animate, +discrete]. Nouns carrying these settings are the traditional English count nouns. They take obligatory plural inflection when quantified. Apparently, there are no nouns in Japanese or Yucatec with this setting since nouns in these languages do not take plural marking.

b) [-animate, -discrete]. Nouns carrying these settings are the traditional English mass nouns and all [-animate] nouns in Japanese/Yucatec. These nouns do not take plural marking and in order to be countable they require unitization by means of a unitizer, which in the case of Japanese/Yucatec is the classifier. In this light, English mass nouns resemble all [-animate] nouns in Japanese/Yucatec and this is the basis on which it is often assumed that nouns in classifier languages are in a sense 'mass' and lack the count/mass distinction.

Explicit in Lucy's (1992) account is that nouns with the setting [+discrete] encode an inherent unit of individuation which nouns with a [-discrete] setting lack. According to Lucy (1992), the best perceptual indicator of this inherent unit of individuation is usually the shape of objects. It follows then that in a triads matching task English speakers preferentially match objects according to common shape significantly more than speakers of non-plural-marking classifier languages when the

target entity corresponds to a [+discrete] noun. On the other hand, when the target entity corresponds to a [-discrete] noun differences between the language groups are minimized, i.e. there is a one-to-one mapping between language and cognition.

Consequently, where the languages resemble one another (mass nouns), the cognitive differences are minimised. Where the languages diverge, (count nouns), the cognitive differences are maximised. The conclusion drawn by Lucy and Gaskins (2003) is that the linguistic representation of nominal structure in a speaker's native language may have an effect on the speaker's habitual attention to different types of entities, i.e. the results provide some evidence consistent with the idea that the way we think is influenced by the language we speak (Whorf, 1956).

Recently, under the impulse of Lucy's and other researchers' findings (see Athanasopoulos, in press, for a review), it has been possible to investigate whether learning a second language with contrasting grammatical features from the first changes the way individuals perceive and think about reality and the world around them. Green (1998), Cook (2002, 2003), Pavlenko (1999, 2005) and Jarvis and Pavlenko (2008) offer insightful discussions of the relationship between additional language learning and cognition, calling for research paradigms that integrate a range of investigative techniques, involving tasks that measure explicit linguistic competence and tasks that measure nonverbal behaviour. Several researchers have taken heed of these calls, and have begun investigating the relationship between language and cognition in second language learners and bilinguals. Because the current paper concerns grammatical number marking and object classification, we restrict discussion to those studies that work within that framework, although studies also exist looking at colour perception (Athanasopoulos, 2009; Athanasopoulos et al., 2010), grammatical gender (Bassetti, 2007; Kurinski & Sera, in press), time (Boroditsky, 2001) and action events (Boroditsky, Ham and Ramscar, 2002).

In the domain of grammatical number, Cook et al. (2006) asked Japanese speakers of L2 English to match a standard entity with a shape or material alternate. Results showed that those L2 users who had stayed in the L2-speaking country (UK) for more than 3 years tended to make shape-based similarity judgements significantly more that those L2 speakers who had stayed in the UK for less than 3 years. Using a similar paradigm, Athanasopoulos (2007) tested non-verbal classification preferences in two groups of Japanese and English monolinguals and two groups of Japanese speakers of L2 English, one given task instructions in English, and one given task instructions in Japanese. Results showed that both L2 groups displayed behaviour that was 'in-between' the two monolingual groups, with language of task instruction playing a non-significant role.

Athanasopoulos and Kasai (2008) extended the design of the two previous studies by implementing a similarity judgement task using artificial novel two-dimensional objects. The researchers used artificial novel objects in order to address the issue of implicit verbal encoding by participants during categorisation. In the classic triads matching paradigm, participants were asked to make similarity judgements between real recognisable objects that could be readily labelled with a count or mass noun. Thus the differences in categorisation may be attributed to strategic verbal coding on the part of the participants, rather than a genuine effect of grammatical structure on cognition. By implementing artificial non-recognisable objects, a possible verbal coding bias on the basis of the object's name and its status as a count or mass noun is significantly reduced.

Athanasopoulos and Kasai (2008) asked two groups of Japanese and English monolinguals, and two groups of Japanese speakers of L2 English (one intermediate and one advanced) to match the novel objects based on either common shape or common colour. Results showed that overall, all participant groups made primarily shape-based classifications. However, the degree to which they did so differed, with Japanese monolinguals favouring shape significantly less so than English monolinguals. The intermediate L2 group exhibited primarily L1-based behaviour, resembling Japanese monolinguals, while the advanced L2 group exhibited primarily L2-based behaviour, displaying similar patterns to the English monolinguals. Importantly, this pattern held even for participants that had not lived in the L2-speaking country for more than two weeks. That is, advanced speakers of the L2 who had been living in the L1 speaking country for almost all their lives also shifted their similarity judgements towards those of native speakers of the L2, demonstrating that it is ultimately language proficiency rather than any extra-linguistic factors like length of residence in the L2-speaking country that is ultimately underpinning the shift in cognition in L2 speakers.

1.2 Aims of the current study

Studies on grammatical number marking and object classification preferences have so far shown that proficiency achieved in the L2 is the primary factor influencing the degree to which cognitive patterns shift towards those of native speakers of the L2. Indeed, while intermediate level L2 speakers are primarily influenced by their L1 in their object similarity judgements, advanced L2 speakers seem to shift their cognition towards the L2 as a function of internalization of novel grammatical categories. However, all studies to date have focused on L2 speakers who started acquiring their L2 at a relatively young age, during childhood or early puberty. It is not yet known to what extent individuals who begun acquiring the L2 later

in life will shift their cognitive preferences towards the L2, if at all. The study by Athanasopoulos and Kasai (2008) found some weak effects of age of L2 acquisition on cognition, but the age-range used in that study was quite restrictive (5-12 years old), and in any case did not include any late puberty or adult learners of the L2.

The current study opens up the investigation of effects of second language on cognition in adult L2 learners, in order to address the issue of whether cognitive restructuring is possible when the L2 is acquired after puberty. If adult L2 learners show primarily L1-based cognitive preferences, regardless of degree of proficiency achieved in the L2, it will constitute evidence to show that strong maturational constraints modulate cognitive restructuring in L2 acquisition. If, on the other hand, adult L2 learners shift their cognitive patterns towards the L2, then this will indicate that some degree of plasticity exists even when a second language is acquired post-puberty.

The current study addresses these questions in two experiments, adopting the methodologies used in Cook et al., 2006, Athanasopoulos, 2007, and Athanasopoulos and Kasai (2008). Adult English native speakers with Japanese L2 will be given an object classification task utilising real objects and substances, and asking them to match these with a common shape or common material alternate. The same speakers will also be given an object classification task utilising novel artificial stimuli, to see whether any differential patterns will emerge with stimuli that cannot be readily named with a count or mass noun (which are the crucial categories of interest).

2. Method

2.1 Participants

The participants were 15 monolingual English-speaking adults (10 fell within the 25-49 age-range, 4 within the 18-24 age-range, and 1 within the 50-64 range, 9 female, 6 male), 15 monolingual Japanese-speaking adults (8 fell within the 25-49 age-range, and 7 within the 18-24 age-range, 9 female, 6 male) and 15 native speakers of English with Japanese L2 (7 female, 8 male), who were living in Japan at the time of testing. Eleven participants in this group fell within the 25-49 age-range, 3 within the 18-24 age-range, and 1 within the 50-64 range. Their mean length of stay in Japan was 8.5 years (SD = 5), the mean age of L2 acquisition was 23.9 years old (SD = 8.8). Their average general proficiency in Japanese was intermediate to upper intermediate (mean = 62.7%, SD = 22.6), as measured by the Minimal Test, which measures Japanese proficiency in listening and reading (Maki, Dunton, Obringer,

and Price, 2003). The L2 speakers were also given a gap filling task, requiring them to provide the correct Japanese classifier in the appropriate grammatical context. Their mean score on that test was 33% (SD = 32%). Participants in all language groups were post-graduate students and higher education professionals at Universities in Japan or the UK accordingly. All participants were tested in a University in their respective countries.

2.2 Materials

Shape vs. Material Triads Matching: There were two experimental conditions: A simple objects condition utilising simple shapes made out of a solid material (e.g., a pyramid made out of cork), and a substances condition utilising non-solid materials arranged in a simple shape (e.g. Nivea cream laid in a reverse C shape). The materials were arranged in 8 triads (4 in each condition) with a standard and two alternates, one resembling the standard in shape and one resembling the standard in material. For example, the target cork pyramid had a plastic pyramid as the shape alternate, and some pieces of cork as the material alternate. The target Nivea cream in a reverse-C shape was followed by the two choices of a reverse C shape in hair-gel (same shape) and a pile of Nivea (same material), and so on. The materials used here are the same as those used in Cook et al. (2006), and a full list of materials and triads can be found in that paper. A third condition utilising factory-made artifacts having complex shapes and specific functions (e.g., a ceramic lemon squeezer) was not included in this study as previous studies have repeatedly demonstrated that this particular category of objects is impervious to any linguistic effects, with both Japanese and English speakers consistently making shape-based categorisation choices (see e.g. Imai & Gentner, 1997; Imai & Mazuka, 2003; Cook et al., 2006).

Shape vs. Colour online triads matching: Thirty colour illustrations of novel objects were used as stimuli, organised into ten different triads. Each triad consisted of a standard object and two alternates, a shape alternate, which had the same shape as the standard but different colour, and a colour alternate, which had the same colour as the standard but different shape. All stimuli were drawn and edited on the same scale thus eliminating a potential size variable. Additionally, the colours used within each triad were carefully selected so that the shape alternate was not similar in colour to the standard. Similarly, care was taken so that the colour alternate was not similar in shape to the standard. Finally, the shapes used were arbitrary novel shapes as opposed to highly recognisable shapes like squares, triangles and circles. The materials used in this task were the same as those used in Athanasopoulos and Kasai (2008), and an example of a triad can be found in figure 4 of that paper.

2.3 Procedure

Shape vs. Material Triads Matching: The participants received 8 trials in total. In each trial, the participant was presented with a triad of a standard and two alternates, shape or material. All entities were presented on white paper plates and were covered with a piece of paper. During each trial, the standard was uncovered first, and participants were prompted to pay attention to it. Then the two alternates were simultaneously uncovered and the participants were prompted to point to the entity that is the 'same' as the standard. The language of instruction was always the participant's native language. For the English native speakers the instruction was "Show me which is the same as this". For the Japanese native speakers the instruction was "Kore (this) to (with) onaji-nano (same) wa (topic-marker) docchi (which) desuka (is)" (cf. Imai and Mazuka 2003). Participants were instructed to make their decision at their own pace and according to their own opinion. The order in which the trials were presented was randomized for each participant. Each participant was tested individually in a quiet room.

Shape vs. Colour online triads matching: An interactive computer program was created as a test instrument, using Flash 5 by Macromedia. The participants had to use the computer mouse in order to interact with the program. After reading the instructions on the computer screen, each participant was prompted to click on the 'next' button for the experiment to begin. There were a total of ten trials. Each trial consisted of two stages. In the first stage, the standard novel object appeared on the top of the screen and participants were asked to click on it. In the second stage, once the participants had clicked on the standard, the two alternates appeared side by side underneath the standard and at an equal distance from it, and participants were instructed to click on the alternate that they thought was 'the same' as the standard. The English instruction was "show me which is the same as this, please click". The Japanese instruction was "Kore(this) to(with) onaji-no(same) wa(topic-marker) dochira(which) desuka(is). Onaji-no(same) wo(topic-marker) crikku(click) shite-kudasai(do)."

The position of the alternates relative to the standard was counterbalanced across trials, such that the shape alternate appeared in five out of ten trials on the left side of the screen, and in five out of ten trials on the right side of the screen, and vice versa for the colour alternate. The order in which each trial was presented was randomised for each participant, using Flash's Actionscript. There was no time limit imposed on the participants. Each participant's response was recorded for each trial and was saved as a data file that appeared at the end of the experiment. The order of the Shape vs. Material and Shape vs. Colour tasks was counterbalanced across all participants. Upon completion of both tasks, the L2 speakers completed the M-Test,

the Japanese classifiers gap filling task, and a short biographical questionnaire. At the end of the experiment, participants were thanked and debriefed. The majority of them accepted a small reward for their participation.

3. Results

Shape vs. Material triads matching: Responses were scored as the number of times each participant selected a shape or material alternate in each condition. Scores were then converted into percentages and the mean was calculated for each group of participants. In table 1 a summary of those mean scores is presented.

Table 1. Summary of shape and material proportion (and standard deviations) in the two conditions. Figures are percentages rounded to the nearest whole number.

Count condition			Mass condition	
Groups	Shape	Material	Shape	Material
English monolinguals	87 (17)	13	46 (30)	54
English speakers of L2 Japanese	60 (28)	40	40 (44)	60
Japanese monolinguals	44 (22)	56	39 (22)	61

To examine the overall pattern, a 3 (Group) x 2 (Condition) mixed ANOVA (with Group as a between-subjects factor and Condition as a within-subjects factor) was conducted, with frequency of shape responses in each condition as the dependent variable (cf Imai & Gentner 1997 p.182 footnote 5 and p.183).

There was a significant main effect of Condition, $F(1, 42) = 25.607$, $p < 0.01$, and a significant main effect of Group, $F(2, 42) = 3.863$, $p < 0.05$. Crucially, the Group x Condition interaction was significant, $F(2, 42) = 5.560$, $p < 0.01$, indicating that the degree to which participants varied their shape responses across the two conditions differed amongst the three groups. To probe this interaction further, Tukey HSD pairwise comparisons were used, comparing the means of the three groups for the two conditions. For the Count condition, these showed that the two monolingual groups differed significantly from each other, such that English monolinguals selected

the shape alternate significantly more than Japanese monolinguals ($p < 0.01$). The English L2 Japanese speakers differed significantly from the English monolinguals, selecting the shape alternate less often ($p < 0.01$), but did not differ significantly from the Japanese monolinguals ($p = 0.16$). For the mass condition, the pairwise comparisons showed no significant differences between any of the groups ($p > 0.05$). To see whether the cognitive shift towards the L2 pattern in the English L2 Japanese speakers is related to specific competence with the Japanese classifier system, the proportion of shape responses in the count condition of the triads matching task, and each participant's score on the classifier test were entered into a Pearson's correlation analysis. This showed that the correlation between the two variables was statistically significant, such that the better participants were at providing the correct classifier in the classifier test, the less they selected the shape alternate (opting for the material alternate instead) in the triads matching task, $r = -.509$, $p < 0.05$.

Shape vs. Colour online triads matching task: Responses were scored as the number of times each participant selected a shape or colour alternate. Scores were then converted into percentages and the mean was calculated for each group of participants. In table 2 a summary of those mean scores is presented.

Table 2. Participants' mean percentage proportion (and standard deviations) of shape and colour responses. Figures are rounded to the nearest whole number.

Groups	Shape preference	Colour preference
English monolinguals	98 (6)	2
English speakers of L2 Japanese	85 (21)	15
Japanese monolinguals	69 (24)	31

A One-Way ANOVA with frequency of shape responses as the dependent variable revealed a significant main effect of Group, $F(2, 42) = 9.478$, $p < 0.01$. Post-hoc Tukey tests showed that the Japanese and English monolinguals differed significantly from each other, such that the latter selected the shape alternate significantly more frequently than the former ($p < 0.01$). The English L2 Japanese speakers differed only marginally significantly from Japanese monolinguals ($p = 0.046$), and did not differ significantly from English monolinguals ($p = 0.159$). Pearson's correlations revealed no significant correlation between shape preference in this task and Japanese L2 proficiency, either in the M-Test or in the classifier test.

4. Discussion

Research from the past 20 years or so has breathed new life into the idea that our language may affect the way we think (Lucy, 1992; Gumperz & Levinson, 1996; Bowerman & Levinson, 2001; Gentner & Goldin-Meadow, 2003). Recently, studies have extended the investigation of language effects on cognition to the domain of second language acquisition (Pavlenko, in press; Cook & Bassetti, 2010). The current paper asked whether any degree of cognitive restructuring may be apparent when a second language is learned later in life. Adult L2 learners of Japanese with English L1 were investigated in two object similarity judgement tasks, and their performance was linked to specific proficiency of Japanese classifiers and general proficiency achieved in Japanese.

The results from monolingual participants in experiment 1 (shape vs. substance categorization) confirmed results previously obtained, and clearly show that all groups distinguish between the different target entities, since they all select shape significantly more in the Count than in the Mass condition. However, the between-group differences suggest that the degree to which they do this differs across groups. English monolinguals selected the shape alternate significantly more than Japanese monolinguals in the count condition, whereas differences were minimized between the groups in the mass condition, a pattern very similar to the one reported in Lucy and Gaskins (2003) and Imai and Mazuka (2003). The same pattern was observed in experiment 2 (shape vs. colour categorisation task). When participants were asked to match novel artificial objects, they all showed predominantly a shape bias regardless of language background. However, the degree to which this bias was observed varied depending on the language background of the participant. English monolinguals made more shape-based matches than Japanese monolinguals. These results provide empirical support for the claim made in Imai and Gentner (1997), Imai (2000) and Imai and Mazuka (2003), that the ontological distinction between countable and non-countable entities may be universal, but linguistic typology may enhance or diminish this distinction according to how strictly or how systematically specific linguistic features mark individuation on nouns. In this respect, the results also support Whorf's principle of linguistic relativity (Whorf, 1956), which claims that grammatical features in language affect cognitive representation of reality, and that speakers of different languages think differently.

In both experiments, English speakers of L2 Japanese displayed a group pattern that was in-between the two monolingual groups. These results provide empirical support for Cook's (1991, 1992, 1999, 2003) multicompetence hypothesis which views the person who speaks more than one language as an independent speaker/hearer/thinker, who is unlike monolinguals of either language. The results also

provide support to Grosjean's (1989) related argument that the bilingual person is not two monolinguals in the same body, but a unique language user with a complete language system. More importantly, the correlation between specific second language proficiency and L2 speakers' cognitive patterns in experiment 1 point to a strong link between specific linguistic features in the language that is being acquired, and the degree to which cognitive categorisation patterns shift towards the L2. It is this link with specific language proficiency that reveals the close relationship between language and cognition in a way that is not readily observable by studying monolingual populations only. As argued elsewhere (Athanasopoulos, in press), the field of language acquisition (be it first, second, etc.) is the experimental domain par excellance for the study of the effects of language on cognition, as it allows us to track dynamic changes in language proficiency, and link those to changes in cognitive categorisation.

Looking at the bigger picture, the current study contributes to the ongoing investigation of the effects of second language acquisition on cognition, by showing that cognitive patterns are flexible and susceptible to change even in adult L2 learners. The mechanism underpinning these cognitive changes is likely to be the same as that underpinning cognitive changes in younger learners, as in both younger and older learners it is increasing linguistic expertise in specific grammatical features of the L2 that drives the shift in the L2 speakers' cognition. That is of course not to say that other factors may not be responsible for modulating the relationship between language and cognition in the mind of the L2 user. Because of the dynamic and multi-varied nature of second language acquisition, Jarvis and Pavlenko (2008) and Athanasopoulos (2010) stress the importance of considering factors that pertain to language expertise and knowledge itself, but also factors that have more to do with the sociocultural environment and context where L2 acquisition may take place.

In addition, even though the current results suggest that cognitive restructuring is possible in adult L2 learners, the extent to which this restructuring resembles that found in younger learners remains an issue for further empirical studies. Such studies will directly compare the behaviour of a wide range of L2 learners as a function of age of L2 acquisition in tasks similar to those employed here. It may be the case that the influence of this variable may not be directly observable, but instead it may be a mediating variable in the relationship between language proficiency and degree of cognitive restructuring. For example, Athanasopoulos and Kasai (2008) found that both specific L2 proficiency and age of L2 acquisition could predict L2 cognitive shift, but at the same time the two predicting variables also correlated with each other. In a subsequent analysis, the effect of specific L2 proficiency on cognitive shift remained even when taking into account age of L2 acquisition, while the effect of age of L2 acquisition was abolished when taking into account specific L2 proficiency. On the

other hand, Boroditsky (2001) found a strong effect of age of L2 acquisition on the degree to which Chinese-English bilinguals thought about time in an L1-like or L2-like way, while length of exposure to English played no role whatsoever.

5. Conclusion

There is a growing body of evidence to suggest that speakers of different languages whose grammatical structure differs match stimuli in different ways. The current paper reported two experiments investigating the degree to which speakers of different languages attend to the mass/count distinction cognitively, and the degree to which adult L2 learners shift their cognitive preferences towards the L2. The findings showed similarities and differences between monolingual populations that closely reflected similarities and differences in grammatical structure in their respective languages. L2 speakers showed a pattern that did not fully resemble either monolingual pattern, but was instead in-between. Subsequent analyses showed that the degree to which L2 speakers shifted their categorisation patterns depended on the degree to which they had mastered specific grammatical features of the L2, in this case correct use of numeral classifiers. Given the recent overwhelming interest in the area of linguistic relativity and second language acquisition, more empirical evidence is being gathered across domains and disciplines (see e.g. Cook & Bassetti, 2010; Pavlenko, in press), and we are beginning to obtain a clearer understanding of the precise relationship between language and cognition in the L2 user's mind.

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