PHENOMENA ASSOCIATED WITH LINGUISTIC RELATIVITY AND COGNITIVE TRANSFER: DRAWING AND PAINTING ACTIONS IN GERMAN-ENGLISH BILINGUALS

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ABSTRACT

This study investigates whether linguistic relativity and conceptual transfer extends to categorization preferences of drawing- and painting actions in German and English monolingual speakers as well as German–English bilinguals. In alignment with the hypotheses, a triad similarity judgment revealed significant differences in separations among all three groups between stimuli showing two types of painting actions which are commonly distinguished in German but not in English. Bilinguals showed categorization preferences of both monolingual groups. However, separations between stimuli showing drawing- and painting actions, two verbs commonly distinguished in English but not in German, were not significantly different between groups. This is likely due to a limitation of the task itself. The study has implications for the study of both linguistic relativity and conceptual transfer which had not been shown for the partial (in-) equivalence among drawing- and painting actions before. In contrast to previous studies, participants had the option to arrange stimuli on a scale that allowed for more than just an odd-one-out arrangement, not restricting the participants to one of two outcomes predefined by the researcher. The results can be interpreted as evidence that speakers may be guided by their native categorization habits but not restricted to them and that categorization preferences can be influenced by habits from two speech communities at the same time.

Keywords: Linguistic Relativity; Whorf; Conceptual Transfer; cross-linguistic differences; conceptual overlap

INTRODUCTION

In this study, I investigated whether phenomena typically associated with linguistic relativity and conceptual transfer (Whorf, 1956; Bylund & Athanasopoulos, 2014; Park and Ziegler, 2014) extend to categorization preferences of drawing and painting actions in German and English speakers.

Linguistic relativity, most famously coined by Benjamin Lee Whorf, claims that speakers of different languages are pointed toward different aspects of the world through being part of their speech communities (Whorf, 1956, p. 221). Prime examples of this study are object categorization studies (Malt et al., 2003), studies of motion event perception (Bylund & Athanasopoulos, 2014), and studies of placement awareness (Koster & Cadierno, 2018).

The study of conceptual transfer concerns language learners who, because of linguistic relativity phenomena, may be required to think about the world in new ways. As learning a foreign language may co-occur with continuing native ways to think about the world, Jarvis (2016, p. 608) defines conceptual transfer as "cross-linguistic influence in the expression and interpretation of conceptual meaning". The field aims to investigate whether cross-linguistic influence in categorization preferences is observable in people who know more than one language.

Signs of phenomena commonly associated with conceptual transfer have been found in intermediate learners especially, while advanced learners often—but not always as Gullberg (2009) found—seem to show behavior that is closer to that of native speakers on experimental tasks (Park & Ziegler, 2014; Bylund & Athanasopoulos, 2014).

BACKGROUND

Verb Categorization and Linguistic Relativity

The focus domain of this study is drawing and painting actions. Though most research in the field has been carried out in the domains of object categorization and motion events, select studies have investigated whether linguistic relativity and conceptual transfer phenomena extend to other action categorization like that of placement events (van Bergen & Flecken, 2017),

throwing actions (Nicoladis & Gao, 2021), and "putting in" vs "putting on" (Park & Ziegler, 2014).

Park and Ziegler (2014) asked Korean and English monolinguals as well as Korean-English bilinguals to choose the odd-one-out of stimuli picture triads showing "put in" and "put on" actions. The two languages differ in how they indicate and group this direction. Results revealed phenomena associated with linguistic relativity as Korean and English monolinguals demonstrated statistically significant differences in choices. The bilinguals with the lowest proficiency behaved most similarly to the Korean monolingual group, which demonstrates phenomena associated with conceptual transfer among the participants. Frequency of Korean use negatively correlated with English monolingual-like behavior on the task.

Nicoladis and Gao (2021) investigated Mandarin-English bilinguals and how they refer to Mandarin prototypical throwing actions in English and Mandarin. Participants labeled video clips that showed prototypical examples of throwing actions habitually referred to with distinct words by Chinese speakers, but difficult to label in English. Nicoladis and Gao found that bilinguals chose a significantly larger variety of labels than English monolinguals. After analysis of patterns, the authors suggest that bilinguals showed several strategies to express what is not translatable to English. Nicoladis and Gao interpreted the findings as evidence of phenomena associated with conceptual transfer in throwing actions.

Van Bergen & Flecken (2017) explored German, Dutch, English, and French native speakers' anticipatory eye movements when listening to Dutch sentences in correlation to whether their native language specifies position in placement verbs (e.g. "put into standing position" vs. "put into lying position", which is common in German and Dutch but not in English and French). All non-Dutch native speakers were learners of Dutch. The authors' eye-tracking results showed consistent related anticipatory eye movements in German and Dutch native speakers when listening to Dutch sentences, whereas English and French native speakers did not predict placement position once they heard the verb in the recorded Dutch sentences. All participants demonstrated proper understanding of Dutch placement verbs. The findings can thus be interpreted as signs of both linguistic relativity and conceptual transfer in placement events.

The Current Study

There is, to the best of my knowledge, no study to date that investigates cross-linguistic differences in cognitive preferences within the lexical realm of actions like painting and drawing. English and German differ with regard to how they categorize painting and drawing actions: drawing on my experience in both languages, I argue that the two English verbs "draw" and "paint" both commonly appear in similar contexts as the German word "malen", except when "paint" is used to refer to coating something in paint as in painting a wall or furniture, in which case "streichen" appears more commonly in German. Following Pavlenko (2009), terms with this relationship are called partial non-equivalents.

Using photograph stimuli depicting realistic drawing and painting actions, I investigated how functional monolinguals of English, functional monolinguals of German, and advanced German–English bilinguals categorize drawing and painting actions. I recorded their similarity judgments when asked to match three different stimuli pictures at a time. The task itself did not require any overt language use. The study included functional monolingual groups as common in linguistic relativity research and a German–English bilingual group, situated in the field of conceptual transfer.

Following review of the literature, I identified the following exploratory research questions: 1) Do previously attested linguistic relativity phenomena extend to the categorization of painting and drawing actions in English and German monolinguals? 2) Do German–English sequential bilinguals show evidence of conceptual transfer when categorizing painting and drawing actions?

As in Park & Ziegler (2014), differences in similarity judging behavior between two monolingual groups is interpreted as a sign of linguistic relativity (see RQ1). Following Jarvis (2016), differences in similarity judging behavior on the nonverbal tasks comparing bilinguals and their native language's monolingual group is interpreted as a sign of conceptual transfer (see RQ2).

METHODS

Participants

        In line with sample sizes of related studies (Cook et al., 2006: n = 36; Park & Ziegler, 2014: n = 17–31; Stepanova & Coley, 2002: n = 22), 32 native English and functional monolinguals from the community of a university in the USA and 32 native German and functional monolinguals studying at or residing around a university in Germany took part in this experiment. Even though all participants had experience learning a second language in formal education, they self-reported a proficiency of 4 out of 10 or lower in English or German as a second language. After exclusion due to all filler triads being answered incorrectly or the report of advanced proficiency in second languages, 24 English monolinguals and 25 German monolinguals were included in the analysis. The groups were recruited to address the first research question of the study.

        Thirty-four German–English sequential bilinguals were recruited from the two communities mentioned above. Bilinguals all had at least 10 years of experience learning English, reported a total average proficiency of 7.3, and indicated an average of 32.6 hours of exposure to English media per week. Their average score on the online available 5-min LexTale English proficiency test was 69.5%.[1] For comparison, the creators of the LexTale indicate that an advanced group of Dutch and Korean English learners averaged at 70.7% (Lemhöfer & Broersma, 2012). 5 bilingual participants were tested in Hawai'i, all other bilingual participants were tested in Germany. After exclusion due to German not being a participant's first language, 31 German–English bilinguals were included in the analysis. The bilingual group was recruited to address the second research question of the study. The samples are convenience samples. Participants were offered course credit or $10/10€ in reward for their time and consented to participate.

Materials

        The experimental materials for the similarity judgment task were 12 critical triads of picture stimuli. The experiment also included 12 filler triads to interrupt similar looking triads.

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[1] The LexTale has proven to be a valid and standardized predictor of English proficiency that exceeds self-rating scores in terms of correlation with other proficiency scores (Lemhöfer & Broersma, 2012).

Critical triads showed painting- or drawing situations, filler triads showed other crafting or work done by hand. Critical item sets were designed to yield two different interpretations so that participants' tendencies to German habits (categorizing artistic painting and drawing as different from covering an object or wall in paint) would prompt an answer that is different from that of those participants that tend to English habits of discriminating (categorizing painting objects, walls, or paintings as different from drawing). Examples of expected results are shown in Figures 1 and 2. The 12 filler triads only had one obvious correct answer in which two stimuli were more similar to each other than the third.

Figure 1

Expected Arrangement by German Monolinguals: Drawing/malen and painting/malen are shown to be more similar to each other than to painting/streichen
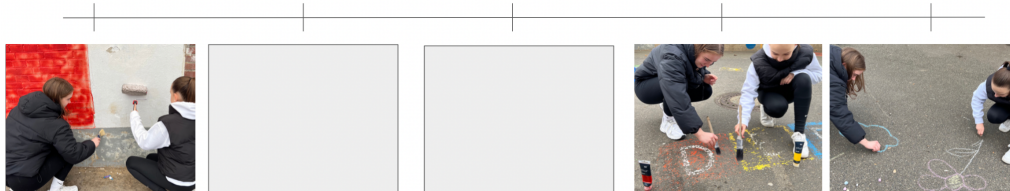

Figure 2

Expected Arrangement by English Monolinguals: Painting/malen and painting/streichen are shown to be more similar to each other than to drawing/malen

The stimuli were presented on an editable Google slideshow displaying the picture triad at the top and a scale with five marks, each complemented by a rectangle underneath, for possible stimuli placement. To avoid results based on the influence of the order of trials, participants were assigned to see one of 12 lists of triads. Each list had a pseudo-random order allowing for critical and filler trials to be alternating. To avoid results based on the influence of the order the three stimuli within each triad are presented in, their order was randomized to be different in each list.

A list of all 24 critical and filler triads, the raw data spreadsheet, and the R code used to analyze the data are available in the OSF repository of this project: https://osf.io/bfdcp/?view_only=cb01ecab387e4e1e81760a1391e29b36.

Procedure

Participants were tested individually in 20-min sessions in a quiet room in Germany or in a lab at the university of the researcher. Before the task, I asked participants to complete the English LexTale test (Lemhöfer & Broersma, 2012). This was not only to solidify group placement and instructional language choice but also to introduce bilingual participants into an English-speaking environment. Then, participants were presented with the slideshow, first showing the scale of 5 marks and boxes, and then containing 24 slides with the experimental triads. According to the instructions, participants dragged each picture into a box on the scale representing the similarity of the actions portrayed. Participants were not encouraged to speak aloud, and the researcher never mentioned the lexical items in question. With all participants conducting the same activity, this experiment addresses both research questions. Figure 3 shows a sample slide from the experiment. Backtracking was not allowed during the task to discourage changing previous answers.

Figure 3
Experiment Interface
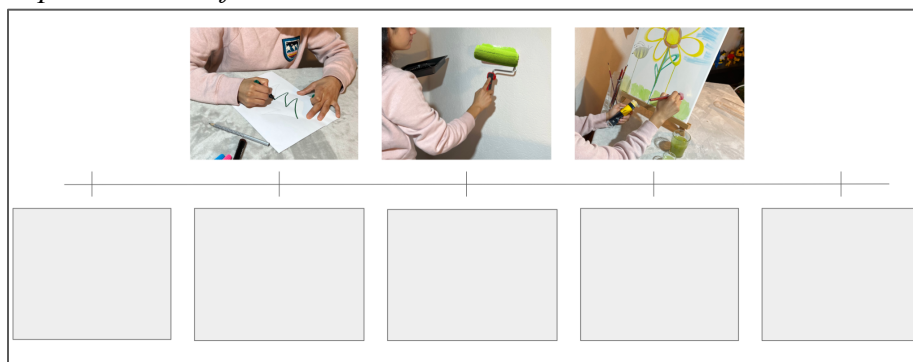
Analysis

As in Stepanova and Coley (2002), the investigated dependent measures are separations of stimuli. Since there are two distinctions of interest, I investigated both separations of drawing- and painting stimuli and streichen and malen stimuli. The dependent variable, in either method of analysis, is not to be understood as a measure of correctness. The chosen by placement on the scale intends to measure perceived similarity of drawing- and painting related actions. Width of separations, i.e., whether stimuli were placed with one or two empty boxes in between, was not regarded to avoid overcomplication of the analysis. The independent variable is group membership. Using an alpha level of 0.05, I conducted two logistic mixed effects models with both participant and trial as random effects using the R function glmer. One model was fitted to predict separations of drawing- and painting stimuli, the other one to predict separations of streichen and malen stimuli. By default, the model uses the English monolingual group as the comparison group. A multinomial logistic regression model was not adequate as the task allowed participants to separate all stimuli or to keep both pairs together. *Emmeans* was used for post-hoc comparisons. It applies the tukey method for p-value adjustment for comparing a family of 3 estimates.

RESULTS

Results are expressed in numbers of separations per participant. Participants solved filler items, which had a correct and incorrect option, at near ceiling in terms of accuracy. Figure 4 shows the distribution of separations in raincloud plots per group. Means are indicated by yellow dots. Drawing- and painting stimuli were separated similarly by all groups: German functional monolinguals separated drawing- and painting stimuli on average 4.6 out of 12 times, English functional monolinguals separated them 4.8 out of 12 times, and German bilinguals separated them 6.2 out of 12 times.

Looking at painting and streichen separations, German functional monolinguals separated the stimuli at an average of 8.3 out of 12 times, while English functional monolinguals separated them less often, 4.3 out of 12 times. German–English bilinguals separated them 6.1 out of 12 times, which falls in between the two monolingual groups.

Visual inspection of the graphs reveals that most participants in the English monolingual group (yellow rain clouds) are clustered in the lower end of both drawing and painting and painting and streichen separations. This is because, in addition to the hypothesized arrangements, participants could also choose to not separate either or to separate all stimuli in a triad. The observed clustering of the English monolinguals suggests that they frequently chose to place all stimuli next to each other. Similarly, the green rainclouds show that separation of both drawing and painting stimuli and painting and streichen stimuli was common—though more likely for the latter. This suggests that, at least at times, German monolinguals separated all three stimuli. The raindrops reflect each individual participant's separations out of all 12 trials.

Figure 4

Distribution of Stimuli Separations Across Groups
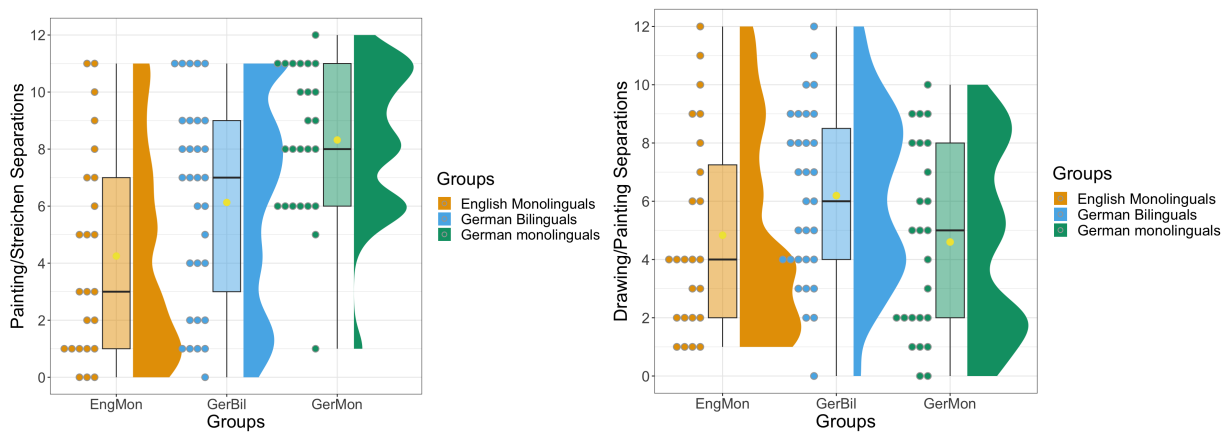
Tables 1 and 2 show group sizes, means, standard deviations, standard errors, ranges, and confidence intervals.

Table 1

Descriptive Statistics for Drawing/Painting Separations by Group

Group	n	M	SD	SE	Minimum Separations	Maximum Separations	CI
English Monolinguals	24	4.83	3.42	0.70	1	12	[3.46, 6.20]
German Bilinguals	31	6.19	2.97	2.97	0	12	[5.15, 7.24]
German Monolinguals	25	4.60	3.23	3.23	0	10	[3.33, 5.87]

Table 2

Descriptive Statistics for Painting/Streichen Separations by Group

Group	n	M	SD	SE	Minimum Separations	Maximum Separations	CI
English Monolinguals	24	4.25	3.63	0.74	0	11	[2.80, 6.70]
German Bilinguals	31	6.13	3.55	0.64	0	11	[4.88, 7.38]
German Monolinguals	25	8.32	2.61	0.52	1	12	[7.30, 9.34]

A logistic mixed effects model revealed that the differences in drawing and painting separation between English monolinguals and German monolinguals was not statistically significant, $p = .682$; neither was the difference between English monolinguals and German bilinguals, $p = .124$. English and German monolinguals as well as German–English bilinguals had similar odds of separating drawing- and painting stimuli. R-squared was calculated using the r.squaredGLMM function of the lmerTest package. The fixed effects explain about 2% of the variance. The random effects add 43% to the variance explained. See Table 3 for the regression coefficients, standard error, p-values, and r-squared of the mixed effects model.

A post-hoc pairwise comparison (see Table 4) revealed that the difference in odds of separating drawing- and painting stimuli between German bilinguals and German monolinguals is also not statistically significant (p = .116).

Table 3

Mixed-Effects Model Results for Drawing/Painting Separations

Fixed Effects						
	Predictors	Coefficient	SE	OR	95% CI in OR	p
	Intercept	0.80	0.34	0.58	[0.26, 1.28]	0.16
	German Bilinguals	-0.90	0.42	1.88	[0.83, 4.31]	0.12
	German Monolinguals	-1.86	0.44	0.84	[0.35, 1.99]	0.68

Random Effects						
	Groups	Variance	SD			
	Participant	1.77	1.33			
	Item	0.73	0.86			

Note. * p < .05, ** p < .01, *** p < .001
marginal R squared: 0.02, conditional R squared: 0.45

Table 4

Post-hoc Pairwise Comparison for Mixed-Effects Model Results of Drawing/Painting Separations

Contrast	Coefficient in OR	SE	p
English Monolinguals – German Bilinguals	0.53	0.41	0.2739
English Monolinguals – German Monolinguals	1.95	0.43	0.9119
German Bilinguals – German Monolinguals	2.25	0.41	0.1157

Note. * p < .05, ** p < .01, *** p < .001

The logistic mixed effects model predicting the odds of painting and streichen separation revealed that the difference between the English monolinguals and German monolingual groups was statistically significant, p < .001. The difference between English monolinguals and German bilinguals was also statistically significant with p = .033. Table 5 shows the regression coefficients, standard error, p-values, and r-squared of the mixed effects model. The fixed effects explain about 10% of the variance. The random effects add another 34% of the variance.

A post-hoc pairwise comparison (see Table 6) revealed that here, German bilinguals and German monolinguals also differ significantly (p = .036).

Table 5

Mixed-Effects Model Results for Painting/Streichen Separations

Fixed Effects						
	Predictors	Coefficient	SE	OR	95% CI in OR	p
	Intercept	-0.86	0.34	0.42	[-0.21, 0.83]	0.0112 *
	German Bilinguals	0.89	0.42	2.45	[1.06, 5.76]	0.0331 *
	German Monolinguals	1.91	0.44	6.79	[2.84, 17.04]	< 0.001 ***
Random Effects						
	Groups	Variance	SD			
	Participant	1.84	1.36			
	Item	0.17	0.41			

Note. * p < .05, ** p < .01, *** p < .001
marginal R squared: 0.1, conditional R squared: 0.44

Table 6

Post-hoc Pairwise Comparison for Mixed-Effects Model Results of Painting/Streichen Separations

Contrast	Coefficient in OR	SE	p
English Monolinguals – German Bilinguals	0.41	0.42	0.0837
English Monolinguals – German Monolinguals	0.15	0.45	<.0001 ***
German Bilinguals – German Monolinguals	0.36	0.41	0.0359 *

Note. * p < .05, ** p < .01, *** p < .001

DISCUSSION

This study shows differences among German and English monolinguals as well as German–English bilinguals in judging the similarity of painting related actions as correlated with common lexical categorization in English and German, which has not been shown before. Following Park & Ziegler (2014), differences in similarity judging among monolinguals is interpreted as a sign of linguistic relativity (RQ1). Following Jarvis (2016), differences in similarity judging comparing German–English bilinguals and the German monolingual group is interpreted as a sign of conceptual transfer (RQ2).

For both research questions of this study, the null hypothesis is rejected partly. English and German monolinguals differed significantly in the number of separations between painting and streichen stimuli, which suggests that English and German monolinguals regarded their similarities differently. German monolinguals separated painting and streichen stimuli significantly more frequently than English monolinguals, which correlates with the more frequent separation of the two in German due to German speakers habitually referring to them with distinct words ("malen" and "streichen").

Though, the range of responses varied greatly among both groups. Park and Ziegler (2014) interpret their similar findings as support for Bassetti and Cook's (2011) and Boroditsky's

(2001) interpretations that speakers may be guided by their native categorization habits but not restricted to them.

However, experimental behavior was not found to correlate with the distinction between "drawing" and "painting" in English (or the non-distinction between them in German). English and German monolinguals did not differ significantly in separating drawing and painting stimuli. The null hypothesis must be accepted in part for the first research question. This does not necessarily suggest that linguistic relativity does not extend to the drawing and painting distinction. In fact, it may show how diverse action-portraying stimuli may be perceived: pictures of drawing and painting can both be seen as doing art, while painting a wall can be perceived as doing work.

According to English monolingual participants' informal reports after the task, this is what prompted them to arrange "drawing" and "painting" next to each other and separating "streichen" from the two—opposite of what was hypothesized. With similar frequency, English monolinguals also decided to arrange all three stimuli without any separations. According to their unrecorded feedback after the task, they wanted to show that drawing is related to painting (as both are art) and that painting (a wall) is also related to painting (as they both use paint).

Similarly, German participants sometimes decided to split apart all three stimuli. Even though they still separated painting and streichen stimuli significantly more often than drawing and painting stimuli (as hypothesized), they reported informally that they often saw differences among all stimuli and that the drawing stimulus could be perceived as someone doing technical drawing, commonly referred to as zeichnen, thus different from "malen", the word used for both drawing and painting. Both could be an explanation for the German monolinguals sometimes not arranging drawing and painting stimuli next to each other like hypothesized. This finding is especially important for anyone wanting to research linguistic relativity and conceptual transfer on the basis of verb partial (in-)equivalence and as a reminder to take caution when mapping lexicogrammatical structures onto behaviors.

In spite of these findings, the statistically significant difference in painting and streichen stimuli separations in the studied sample is in support of the large body of literature about object categorization (e.g., Malt et al., 2004) and placement and direction encoding in verbs (van

Bergen & Flecken, 2017; Park & Ziegler, 2014). This finding thus provides further empirical support to Whorf's (1959) idea of linguistic relativity.

The analysis of differences in painting and streichen separation in the sampled German bilinguals showed significantly different behaviors from both the German and English monolinguals. German–English bilinguals separated painting and streichen stimuli more often than English monolinguals (correlating with the more frequent separation of the two by German speakers). This suggests that what has been referred to as conceptual transfer is occurring: bilinguals show signs of "cross-linguistic influence in the expression and interpretation of conceptual meaning" as Jarvis (2016, p. 608) describes. The German bilinguals that took part in this all had at least 10 years of experience learning English, a total self-reported average proficiency of 7.3 out of 10, and an average of 32.6 hours of exposure to English media per week. Consequently, the results suggest that even advanced learners of English are prone to categorize according to their native language's habits. This finding has significant implications for language teaching as conceptual meaning may not typically be addressed in teaching contexts.

However, the sampled bilinguals still separated painting and streichen stimuli less often than German monolinguals (correlating with the less frequent separation of the two by English speakers). This suggests that the German–English monolinguals also showed signs of what has been called cognitive restructuring (Wang & Wei, 2021; Park & Ziegler, 2014), perceiving differences more similarly to the target speech community. The stage at which this happens in a learner's journey is still unclear in any domain of conceptual transfer. Due to the sample size of the bilingual group, this study cannot make any claims toward this. Park and Ziegler (2014) also point out that a result like this may be interpreted as evidence that bilinguals do not maintain two separate categorization ways that can be accessed in each language environment but that categorization preferences can be influenced by habits from both speech communities at the same time.

CONCLUSIONS

In this study, I investigated the extension of linguistic relativity and conceptual transfer (Whorf, 1956; Bylund & Athanasopoulos, 2014; Park and Ziegler, 2014) to verb categorization. Recent psycholinguistic evidence suggests a close relationship between lexicogrammatical features and categorization behavior in certain aspects of verb perception like position ("put into standing position" vs. "put into lying position" in Dutch compared to English) and direction ("put in" vs. "put on" in Korean and English), which has been attributed to the concepts of linguistic relativity and conceptual transfer. However, this had not been shown for the lexical differences among drawing and painting. In this study, I investigated differences in categorization of different drawing- and painting actions as related to their lexical (in-)equivalence in German and English. In contrast to previous studies, I gave participants the option to arrange the stimuli on a scale that allowed for more than just an odd-one-out arrangement, not restricting the participants to one of two outcomes predefined by the researcher.

The results revealed significant differences in separations between two types of painting ("painting" and "streichen") stimuli among all three groups, English monolinguals, German monolinguals, and German bilinguals, with the bilinguals showing behaviors similar to both groups, thus falling in between the two other groups. This finding supports the research hypotheses. However, the study also revealed that separations between drawing and painting stimuli were not significantly different between groups. This could be due to a wide range of possible interpretations of the stimuli showing drawing- and painting actions.

Since this is the first study researching drawing and painting actions, it can serve as guidance for further research. More importantly, it adds to the growing perspective that linguistic relativity phenomena do not map onto lexicogrammatical cross-linguistic differences in as straightforward a way as sometimes assumed. In addition to providing evidence of linguistic relativity in painting related actions among German and English monolinguals, this paper contributes to the nascent fields of conceptual transfer (Jarvis, 2016) and cognitive restructuring (Wang & Wei, 2021; Park & Ziegler, 2014) showing evidence for both in German–English bilinguals.

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