



Evidence for Relativistic Effects in the Construal of Transitive Events

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Abstract

During the last two decades, experimental evidence for language-mediated effects on cognition has surfaced in numerous studies. These studies relate to semantic fields as diverse as number, gender, spatial orientation, and color, inter alia. One subject that has received relatively little attention in such experimental research is the potential for relativistic effects on event construal. In this study we present evidence for such effects, by considering differing event discrimination strategies across two populations. The first of these is comprised of speakers of a language, Karitiãna, which obligatorily indexes verbs according to whether they denote semantically intransitive or semantically transitive events. The second of these is comprised of speakers of a language, English, whose grammar does not appeal to the distinction in the same manner. A triad-discrimination task was utilized to assess the rates at which Karitiãna speakers discriminate actions in a 'transitivity-oriented' fashion. The results of the task suggest that Karitiãna speakers evince heightened transitivity-orientation when contrasted to English speakers. The results are generally consistent with a relativistic account.

Key words: linguistic relativity, transitivity, ergativity, perception, Karitiãna

1. Introduction

In the last two decades or so, there has been a florescence of research on linguistic relativity. This research relates to cognitive domains such as spatial orientation (Levinson 2003), quantity recognition (Everett & Madora 2012, Everett 2013a), gender perception (Flaherty 2001), substance classification (Imai & Mazuka 2007), the perception of time (Boroditsky et al. 2011), and even the categorization of colors (Gilbert et al. 2006, Drivonikou et al. 2007). The relativistic effects that surface in these and dozens of other studies are often subtle ones, but in many cases are far from trivial. For a comprehensive survey of contemporary research on linguistic relativity, see Everett (2013b).

While the experimentally based study of linguistic relativity is growing

significantly, there are many areas of cognition that have yet to be tapped into by this nascent field. This is evidenced by the fact that the domains cited in the preceding paragraph relate primarily to static concepts or relationships rather than events. Despite the explosion of work on this topic, there is little crosslinguistic research designed specifically to test for cases of relativistic effects on event perception (though see Regier & Zheng (2007) and Papafragou et al. (2001)). No research to date has offered support for the existence of verbally motivated relativistic effects on event discrimination.

Perhaps the most typologically pervasive distinction between verb types is that between intransitive and transitive verbs. The distinction between syntactically intransitive and syntactically transitive clauses is a putative linguistic universal. As many researchers have noted, the semantic distinction between intransitive and transitive verbs is more fluid, and certainly not ubiquitous in the same sense (see Givón (2001:109) and Payne (1997:171) for two of many typologically oriented discussions of this distinction). For instance, in languages such as Latin, Dyirbal (see Dixon 1994:6), and Karitiâna, verbs are strictly categorized into either of the two categories. In languages such as English, the distinction is less rigid, with many (though not all) verbs displaying fluidity, i.e. permitting either transitive or intransitive usages. In the case of other languages the distinction is apparently not even lexically oriented, with any given verb allowing intransitive or transitive implementation, though accompanying morphological alterations may be required (as in, e.g., Boumaa Fijian—see Dixon 1988:200-19).

2. *Semantic Intransitivity/Transitivity in Karitiâna*

One particularly clear case of a language in which the semantic distinction in question has numerous morphosyntactic correlates is Karitiâna, a split-ergative Tupí language. The distinction can be most simply exemplified by considering basic differences in inflection patterns in declarative clauses. As we see in the Table 1 (taken from Everett 2010), intransitive verbs may be prefixed with *i-* in such clauses, while transitive verbs are not. The free morpheme *in* is a 1st person singular pronoun, while the *-t* suffix is a nonfuture tense marker attached to vowel-final verb roots.

| Intransitive Verb | Translation | Transitive Verb | Translation |
|--------------------------|-------------------|-----------------------|---------------|
| <i>in i-taktaktaŋa-t</i> | 'I swam' | <i>in naka-mi-t</i> | 'I hit X' |
| <i>in i-sombak</i> | 'I looked around' | <i>in naka-kip</i> | 'I cut X' |
| <i>in i-hadna-t</i> | 'I breathed' | <i>in naka-i-t</i> | 'I ate X' |
| <i>in i-seŋa-t</i> | 'I crouched' | <i>in naka-ma-t</i> | 'I made X' |
| <i>in i-mbik</i> | 'I sat' | <i>in naka-mhip</i> | 'I cooked X' |
| <i>in i-pikina-t</i> | 'I ran' | <i>in naka-hira-t</i> | 'I smelled X' |

| | | | |
|---------------|------------|--------------|--------------|
| in i-tarika-t | 'I walked' | in naka-hit | 'I gave X' |
| in i-tat | 'I went' | in naka-pit | 'I took X' |
| in i-kisep | 'I jumped' | in naka-pidn | 'I kicked X' |

Table 1. Examples of the semantic intransitivity/transitivity distinction in Karitiãna.

Crucially, the distinction between verb types reflects a clear dichotomy in the categorization of event types. In the table, those events that require one participant only are denoted via verbs inflected with *i-*, while those events that require more than one participant are denoted via verbs inflected with *naka-*. The permissibility of these prefixes in declarative clauses relates specifically to this semantic distinction, a distinction that is reified in a remarkably consistent fashion. Other factors are involved in the usage of these two prefixes, but here we are focused simply on their role in demarcating verb types into two broad categories. The distinction evident in Table 1 is clearly a semantic one, since verbs denoting semantically transitive events are marked in a transitive fashion even when they occur in syntactically intransitive clauses without an overt second argument. The semantic dichotomy surfaces in numerous other ways in Karitiãna grammar. We will not survey the relevant grammatical features here, since they are presented elsewhere in the literature (Everett 2010). In essence, Karitiãna grammar appeals to a verbal distinction whereby those events requiring that two or more participants be 'on stage', in the sense of Langacker's (1987, 1991) useful billiard-ball type model, are clearly distinguished from those events requiring that one and no more than one participant be 'on stage'. The relevant morphosyntactic distinction in Karitiãna reflects a clear and consistent differentiation of two basic event types.

We sought to test whether the pervasive distinction between semantically intransitive and semantically transitive events has demonstrable effects on Karitiãna speakers' construal of novel events. This area of investigation seemed potentially fruitful since the distinction between event types is systematically appealed to nearly every time a verb is uttered (even in non-declarative clauses), and can hardly be claimed to be trivial in that respect. Furthermore, the distinction is not an esoteric or typologically remarkable one, suggesting that any results obtained could be readily contrasted with experimental work with other language groups. Finally, since the distinction of event types is simple yet both abstract and seemingly opaque to metalinguistic awareness (judging from interviews with native speakers), its investigation could allow for the reduction or elimination of other (non-linguistic) explanations of any results, e.g. the presence of general cultural factors. One criticism of some relativity-oriented linguistic research is that cross-group cognitive disparities are attributed to the languages of the experimental participants, when the disparities in some cases may simply provide evidence of some other divide, perhaps cultural. In the case at hand, it is unclear how cultural differences could impact the perception of transitive or intransitive events. There is no evidence of the relevant distinction across the

two cultures, aside from the linguistic data.

3. *Experiment and Analysis*

3.1 Participants and Methods

The objective of this study was simply to detect whether Karitiãna speakers perceive events with more than one participant as being more distinct from those with only one participant, when contrasted to the speakers of some language without the same clear grammatical distinction evident in Table 1. English is such a language. Eighteen Karitiãna adult speakers (approximately 10% of the adult population) participated in the study, for modest remuneration. Twenty-eight English speakers volunteered for the study, and received college credit or modest remuneration. Participants were tested individually. The majority of speakers for both groups tested were young adults in their late teens and early twenties. A number of older speakers were also tested, however, for each group.

The experiment was designed in order to test for differences in the perception of very abstract events. For this reason, the events depicted were of the action-chain, billiard-ball type. This model of event depiction has been crucial to the development of cognitive grammar, and is employed heavily in the work of Langacker (e.g. 1987, 1991). It seemed natural to construct our stimuli with reference to this model, so that semantically transitive and semantically intransitive events could be readily contrasted in an abstract fashion.

The experiment took the form of a basic triad-discrimination task. Such tasks have been employed in previous work on linguistic relativity (e.g. Lucy & Gaskins 2001). Subjects were presented with a series of brief videos containing a triad of billiard-ball type events. That is, groups of three events were presented simultaneously on a computer screen. The screen was divided into three sectors: a top-left, top-right, and bottom central sector. Two of these sectors contained 'events' that involved the collision (or other interaction) of two 'participants', represented via basic shapes such as circles (in the tradition of the billiard-ball model). The third event contained only one 'participant', yet was similar to one of the remaining events in some other respect. Participants were instructed to group those two events that they found to be most similar. Crucially, in the case of all of the triads, the event depicted in the bottom sector could be naturally grouped with either of the top two events, in accordance with the discrimination strategy chosen by the participants. The event in the bottom sector is henceforth referred to as the 'pivot', in accordance with the terminology typically employed for triad discrimination tasks. The distance between sectors was controlled for, so that the bottom event was located equidistant to the top two events in the case of all triads.

In the sample triad depicted statically in Figure 1 (recall that actual stimuli

involved moving objects), the pivot could be grouped with the event in the top-left sector, since these events each involve more than one 'participant'. In this case the top-left event is a "canonical event" (Langacker 1991:286) in the cognitive grammar tradition, in which one billiard ball travels toward and makes contact with another. The pivot could also be categorized with the event in the top-right sector, however, since both of these events involve participants of the same color. Either discrimination strategy is possible, however the prediction of the relativistic account is, we submit, that the former discrimination strategy should be more pervasive in the responses of the Karitiána-speaking subjects since their language's grammar evinces such a clear distinction between events requiring more than one participant and those requiring only one participant. For that reason, we refer to the former discrimination strategy as the 'transitivity-oriented' selection pattern.

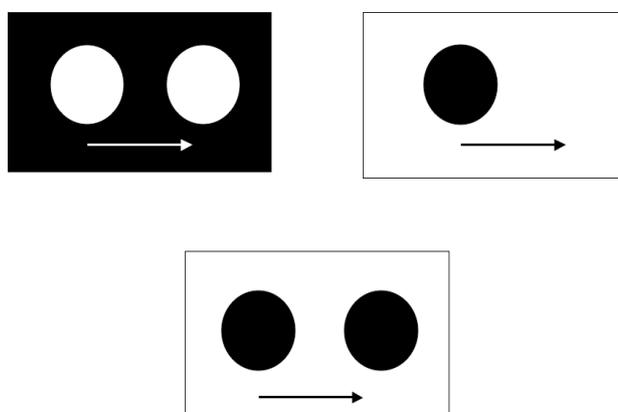


Figure 1. One of the fifteen triads employed, in which discrimination could be based on a 'transitivity-oriented' choice or a color-oriented choice. Arrows represent direction of movement of a circle in the actual video.

Fifteen video triads such as that depicted statically in Figure 1 were presented to each of the experiment participants. In the case of all triads, the pivot could be naturally grouped with one of the top events, and these top events could not be naturally grouped with each other. The location of the events was controlled for, so that the transitivity-oriented selection appeared in the top-left and top-right sectors in an equal number of triads. The remaining event located in the upper portion of the screen could be grouped with the pivot according to other factors such as color of 'participant', as in Figure 1, or size, as in Figure 2. Two other factors employed were object shape and direction of motion. For the sake of space we present only a sample of the stimuli here. Not all stimuli consisted of black and white images only, and the range of shapes employed also varied--as is evident by the usage of octagons in Figure 2. The purpose of employing various colors and shapes was to prevent misleading cross-group disparities from surfacing merely as a result of minutia associated with particular stimuli. (The issue of such variables is taken up further in 3.3.)

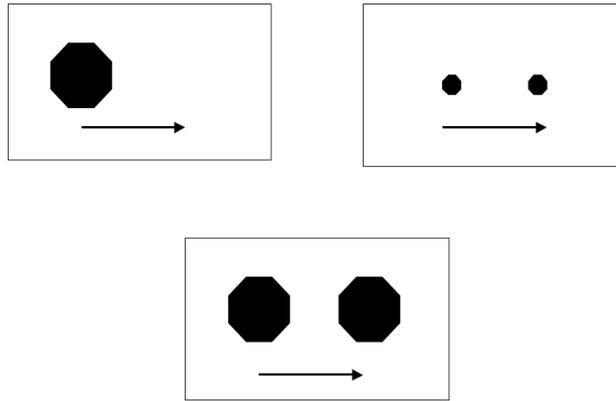


Figure 2. One of the fifteen triads employed, in which discrimination could be based on a 'transitivity-oriented' choice or a size-oriented choice.

In some cases the non-transitivity-oriented selection was favored by the presence of more than one discriminating factor. So, in Figure 3 for example, the event in the top-right sector could be grouped with the pivot because both events contain 'participants' of similar color and size, while the only similarity between the event in the top-left sector and that in the pivot is the presence of more than one participant.

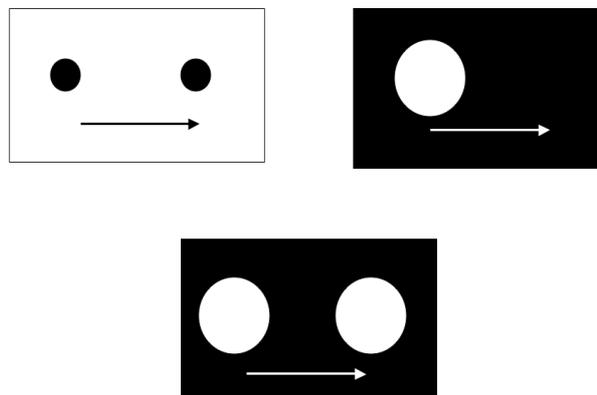


Figure 3. One of the fifteen triads employed, in which discrimination could be based on a 'transitivity-oriented' choice or a size/color-oriented choice.

Crucially, numerous distracter triads were interspersed with the fifteen triads of actual stimuli. Each of the distracter stimuli also consisted of three videos, presented simultaneously as in the case of the actual stimuli. An example of a distracter triad of stimuli is depicted in Figure 4.

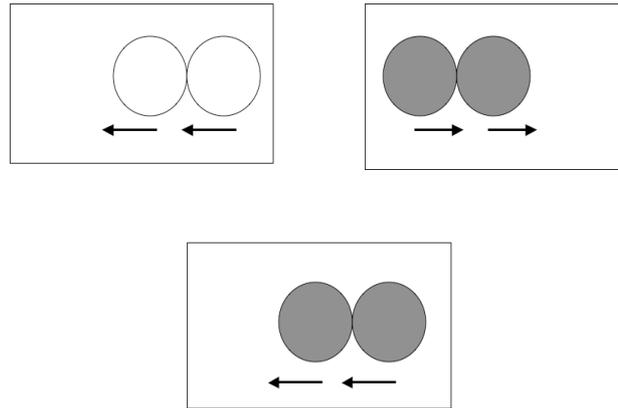


Figure 4. Sample distracter triad. In such cases, number of participants could not possibly inform the discrimination strategy employed by subjects. In this case, the pivot could be grouped with the top-left according to direction of motion, or with the top right according to color.

The distracter videos were generally quite similar to the actual stimuli, with the crucial caveat that the discrimination strategies employed in their grouping could not rely on the distinction between one or more-than-one participants. The purpose in employing such distracter triads was to prevent the participants from consciously developing strategies related to transitivity (i.e. participant number) that could be systematically applied across stimuli. Brief follow-up interviews conducted with a number of the participants suggested that they in fact did not develop consistent strategies for all the actual stimuli.

Each of the fifteen sets of simultaneous videos lasted approximately 5-10 seconds, and each participant was allowed to view each set multiple times prior to making his/her selection and proceeding to the next triad. There was no discernible disparity between the two groups vis-à-vis the number of times the videos were shown prior to selection. In general, the participants generally viewed each video one-to-four times prior to grouping two of the members of the triad. For each triad, including those in the distracter tasks, participants typically made their selections by pointing to the relevant sectors of the computer screen containing the videos that were judged to be most similar. In some cases speakers chose to voice their choices, by saying for example "top-left and bottom are the most similar". The entire task lasted approximately 15 minutes per speaker, though there was clear inter-speaker variation in duration, despite the absence of any obvious cross-group variation according to this parameter. The order of the stimuli was randomized prior to presentation.

3.2 Overall Results

To test for cross linguistic differences in the responses to the stimuli, all responses were categorized as 'transitivity-oriented' or 'non-transitivity-

oriented'. The former responses were those in which participants grouped stimuli based on the fact that they involved two participants, despite the presence of other potential bases of discrimination. The relativistic perspective would seem to predict that the Karitiãna participants should exhibit a tendency towards transitivity-oriented discrimination, when contrasted with the English speakers. However, the relativistic account does not predict the degree to which this tendency might surface, nor whether it should surface in the case of all the stimuli. After all, it is possible that such a tendency could fail to surface simply because of the type of stimuli selected for this study. Admittedly, numerous other stimuli-types could be designed, however those employed here seemed a useful place to start given their abstract nature.

At the coarsest level, the data did exhibit the predicted tendency. In the case of the English-speaking respondents, 107 out of 420 responses (28 participants x 15 stimuli videos) were consistent with the transitivity-oriented discrimination pattern. In the case of the Karitiãna-speaking respondents, 103 out of 270 responses (18 participants x 15 stimuli videos) were consistent with the transitivity-oriented discrimination pattern. This difference was significant ($p=0.0006$, χ^2 (with Yates correction)=11.874). In other words, English speakers selected the transitivity-oriented grouping approximately 25% of the time, while Karitiãna speakers did so 38% of the time. Chance rate would be 50%, so in both cases there was a tendency to discriminate the stimuli videos according to other factors (e.g. object size, shape, color, or direction of movement) more frequently than according to transitivity. So it is clearly not the case that Karitiãna speakers consistently discriminate according to transitivity only, for these stimuli at least. Again, though, the relativistic account makes no predictions regarding consistent perception of any particular set of designed stimuli. It simply predicts that, if cross-group variance in degree of transitivity-oriented perception surfaces, we should expect a tendency towards more transitivity-oriented perceptions in the case of the Karitiãna subjects.

Such a coarse analysis of the data is a useful starting point but can be misleading since it glosses over factors such as inter-speaker variation and cross-group discrimination differences according to the other factors involved in the selections of the stimuli, i.e. object size, shape, color, and direction of movement. For example, with respect to inter-speaker variation, there were clear differences between individual response patterns across the groups. In the case of the English-speaking subjects, the proportion of transitivity-oriented responses ranged from 0-60%. In the case of the Karitiãna-speaking subjects the proportion of such responses fell anywhere from 0-87%. The proportions of transitivity-oriented responses, for all of the 46 participants in the study, are plotted in Figure 5.

simply selecting randomly (or if some large number of them did so) during the experiment. The second piece of evidence is more nuanced and entails splitting the Karitiãna respondents into two groups, for reasons that will crystallize momentarily.

As was mentioned above, the majority of the respondents for this study were college-aged, either in their late teens or early twenties. This was true in the case of 22 of the 28 English-speaking respondents, and 13 of the 18 Karitiãna-speaking respondents. The Karitiãna respondents were selected because they were present in the city of Porto Velho, Brazil, at the time the data were collected, and because all of them volunteered for the study. It so happened that 5 of the 18 participants were older. While the ages of these older participants could not be ascertained with certainty, they were classified as older because all of them clearly appeared to be over the age of thirty, and all agreed that they were at least that old. Three were at least fifty years old. In the case of the English-speaking respondents, six of the respondents were also over the age of 30.

When the responses of the older Karitiãna are separated from those of the younger Karitiãna, a clear pattern emerges as we see in Figure 6.

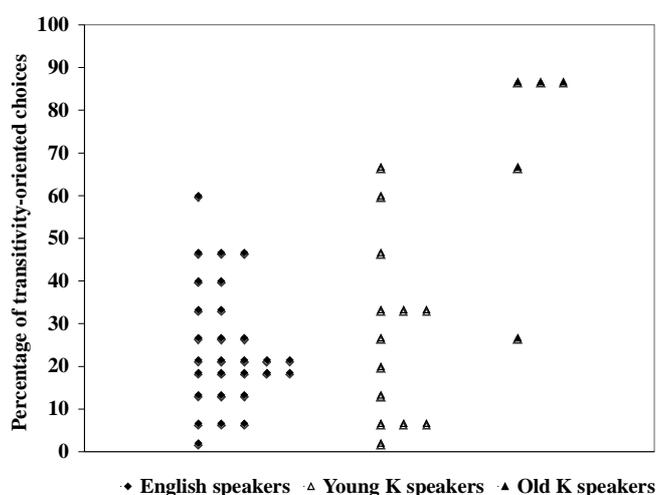


Figure 6. Plot of all individuals' response rates, with young and old Karitiãna speakers charted separately.

Specifically, we observe in Figure 6 that the older Karitiãna respondents had a much more marked tendency to discriminate events in a manner that is consistent with the relativistic account's predictions. In fact, the mean proportion of transitivity-oriented responses for these five speakers was 70.7% (s.d. 26.1). For the remaining Karitiãna respondents, the rate was 27.2% (s.d. 21.2). There is a readily discernible disparity between English speakers and older Karitiãna speakers. While the younger Karitiãna did employ transitivity-oriented discriminations more frequently when contrasted with their English-

speaking counterparts, this difference is much less pronounced.

So, why might there be a discrepancy between the older and younger Karitiãnas' responses? We believe the most plausible account for this discrepancy is simply that the younger speakers are generally much more fluent in Portuguese than the older speakers. Most of the approximately 300 Karitiãna speakers live primarily in the largest Karitiãna village ($9^{\circ}17'45''$ S, $64^{\circ}00'00''$ W) near the city of Porto Velho, though many frequently visit the city for a variety of purposes. The younger adults, however, typically spend more of their time in the city and have had much more schooling in Portuguese. As a result, they are generally much more proficient in that language, and many are functionally bilingual. This is not typically the case for the older speakers.

Tellingly, the data suggest that the older and more monolingual Karitiãna speakers' responses were oriented towards transitivity at a much greater rate than the bilingual younger speakers'. This finding actually provides stronger evidence that the cross-group differences are linguistically based, since the greater rates of Karitiãna monolingualism correspond neatly with the greater rates of transitivity-oriented event construal. It should be noted, however, that the results for the young Karitiãna are somewhat problematic for the predictions of our relativistic account, to the extent that they only slightly exceed those for the English speakers vis-à-vis transitivity orientation. The relativistic account would seem to predict that their responses should more closely resemble those of the older Karitiãna speakers, when the data in Figure 6 suggest that they more closely resemble those of the English speakers. This resemblance is somewhat superficial, however, as we will see in the following section.

It is worth underscoring that the differences between younger and older Karitiãna speakers were not simply due to lack of familiarity with the task, or lack of task comprehension. If the differences were due to such factors, we would expect a greater amount of random variation in the older adults' responses. Instead what we find is greater consistency of response patterns.

3.3 Analysis of results across stimuli categories

The tendency for older Karitiãna participants to discriminate the event triads in a transitivity-oriented fashion surfaced regardless of the other potential discrimination factors involved in the stimuli. Recall from the discussion of methods above that the triads allowed for discrimination according to various potential factors. Two events from each triad could be grouped according to transitivity, while two could be grouped according to factors such as color (see Figure 1), size (see Figure 2), shape, or direction of movement (of the sort depicted in the distracter task in Figure 4). In some cases more than one of these factors could be employed to discriminate events at the expense of the transitivity-oriented grouping. In other words, some of the stimuli were

constructed so that, intuitively at least, they would inherently disfavor the grouping of events according to transitivity. The purpose of designing some of the stimuli in this manner was to test the extent to which some speakers would continue to discriminate events in a transitivity-oriented fashion. In other words, we hoped to establish some sort of threshold at which all speakers would resort to non-transitivity-oriented factors when construing the overall similarity between events. The expectation generated by a relativistic account would be that English-speakers might reach this threshold more readily than Karitiãna speakers. In other words, while English speakers might have a tendency to discriminate some actions according to transitivity, this tendency would only surface for certain kinds of stimuli, most likely those involving a limited set of alternate discrimination factors.

The stimuli utilized could be grouped according to eight different factors (or factor interactions) that potentially formed the non-transitive basis for the grouping of two events. These factors or factor interactions were 1) size, 2) color, 3) color and size, 4) color and shape, 5) color and direction, 6) shape, 7) shape and direction, and 8) color, shape and direction. The expectation was that transitivity-oriented choices made by the English-speaking participants would involve stimuli that contained alternate choices based on single factors such as 1), or 2), or 6). It would have been surprising to find, for instance, that English speakers favored (at a greater rate than their Karitiãna counterparts) transitive selections for stimuli involving factor interactions such as 7) and 8). As we see in Figure 7, this prediction is met to the extent that the transitivity-oriented choices of English speakers generally surfaced when the stimuli involved triads with only one other possible discriminating factor.

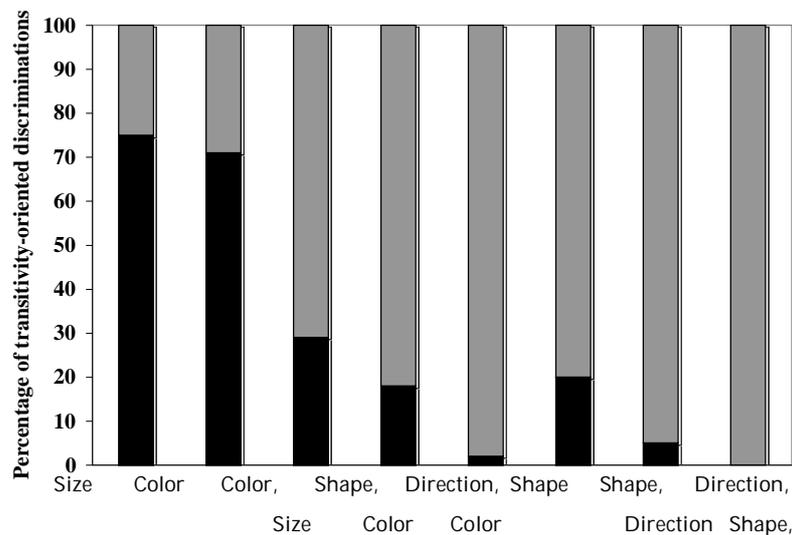


Figure 7. Discrimination strategies for English-speaking subjects, according to stimuli type. Dark portions of bars represent the ratio of transitivity-oriented choices, gray portions of bars represent the ratio of choices made according to other factors, labeled below each column.

It is apparent in Figure 7 that the English speakers' transitivity-oriented discriminations were restricted in their distribution. Specifically, they typically occurred with stimuli that involved choices of the sort: transitivity vs. size, or transitivity vs. color. Interestingly, in the case of triads involving these factors, the English speakers clearly actually favored transitivity-oriented groupings. It is unclear why this was the case. For six of the eight triad types, including all of those with more than one disfavoring factor for basis of discrimination, the English speakers did in fact tend to discriminate events in a non-transitivity-oriented fashion.

Figure 8 depicts the responses of the older more monolingual Karitiãna participants, in the same manner the responses of English-speakers are depicted in Figure 7.

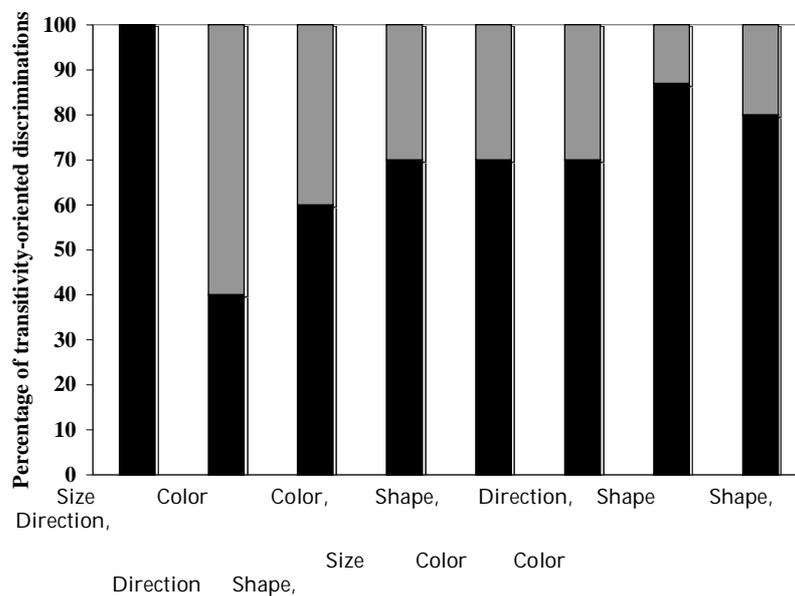


Figure 8. Discrimination strategies for more monolingual Karitiãna subjects.

As we see in Figure 8, the more monolingual Karitiãna speakers' event discrimination patterns were consistent across stimuli categories. That is, regardless of the conflicting factors allowing for alternate discriminations, they grouped events according to transitivity in a majority of the cases. The only category of stimuli that presented an exception to this trend was that involving color only.

When we contrast Figures 7 and 8 we see that, for seven of the eight stimuli categories, the older Karitiãna presented greater proportions of transitivity-oriented responses, when contrasted with the English speakers. It seems clear, then, that the transitivity-orientation of more monolingual Karitiãna speakers is not the result of particular discrimination strategies used for a small set of the stimuli. Perhaps most significantly, these speakers tended to group perceived actions according to transitivity even in those cases in which the

alternate grouping was favored by multiple factors. Even in the case of those stimuli that could be grouped according to transitivity or according to direction, shape, and color, the older Karitiãna most frequently grouped the pivot with the transitive event. As can be seen in Figure 7, the English speakers did not cross this threshold of transitivity-orientation in any cases. That is, in all cases in which English speakers were presented with such stimuli, they selected a pair of events that did not share the feature of transitivity.

When we examine the cross-category responses of the younger, less monolingual Karitiãna, we see that their responses are closer in some respects to those of the English speakers, and closer in other respects to those of the older Karitiãna. As was mentioned above, their responses exhibited relatively low rates of transitivity-orientation. In this way they were more similar to the responses of English speakers than we might have predicted. However, as a contrast between Figures 7 and 9 suggests, this similarity was not due to similar patterns of discrimination across all stimuli types. As can be seen in Figure 9, the younger Karitiãna perceived events according to transitivity at a fairly constant rate across stimuli types, unlike the English speakers, whose transitivity-oriented perceptions were confined primarily to two stimuli categories.

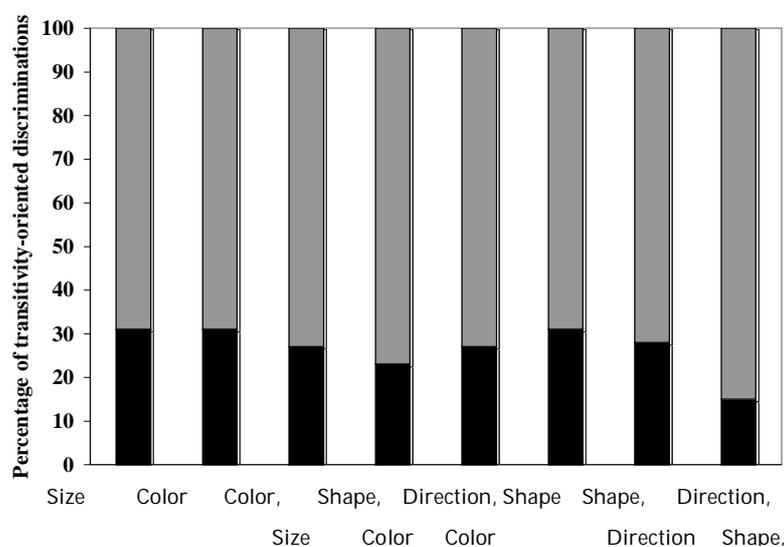


Figure 9. Discrimination strategies for young Karitiãna-speaking subjects, according to stimuli type.

While young Karitiãna speakers only discriminated events according to transitivity in the minority of cases, they did exhibit some transitivity-orientation for each of the stimuli categories. For example, in some cases they grouped events according to transitivity even when the other grouping was favored by three categories (direction, shape, and color). In other words, their responses did cross this transitivity-orientation threshold, unlike their English-speaking counterparts.

The analysis of discrimination patterns across stimuli categories reveal that the Karitiãna discriminated events 'transitively' at least some of the time, for all stimulus types. The English speakers only tended to discriminate events according to transitivity in the case of two categories of stimuli. In stark contrast, the older (more monolingual) Karitiãna utilized transitivity-oriented discrimination the majority of the time, for seven of the eight stimulus categories.

4. Discussion and conclusion

The data provided here offer clear evidence of disparate event-construal patterns across two populations. One potential motivation for these cross-group disparities is the presence of corresponding differences in the two languages represented. Specifically, the grammar of one language (Karitiãna) indexes a clear dichotomization between verbs denoting events with more than one participant, and verbs denoting events with only one participant. The grammar of the other language does not. This linguistic discrepancy plausibly motivates the experimental subjects' performance on the non-linguistic discrimination task. At the least, the data presented here are consistent with this relativistic claim.

This consistency of our results with a relativistic hypothesis is just that, of course, consistency. It is a truism that correlation does not necessarily imply causation, and other lurking variables may explain the consistency in this case. It is unclear at this point, however, what these other variables might be. One potential factor is that of schooling. As was mentioned above, the younger Karitiãna have had access to a fair amount of schooling, which is modeled after Brazilian schooling in the region. If such a factor is at play, however, it is unclear why the responses of the older Karitiãna responses are not randomly distributed, but are instead much more consistent with the relativistic predictions. Put simply, while we appreciate the possibility that other factors may motivate the discrepancies in the discrimination patterns, it is unclear what other candidate variables may be involved. The most plausible motivating variable, we believe, is that presented above.

While these data are generally consistent with a relativistic account, they are not as consistent as we might have liked in one crucial respect: the responses of the young Karitiãna and those of the English speakers did not differ much in absolute terms. That is, while the young Karitiãna favored transitivity-oriented event groupings at a greater rate, the disparity across the two populations was marginal. Nevertheless, young Karitiãna speakers utilized transitivity-oriented discrimination strategies across all stimulus types, unlike their English-speaking counterparts.

While this study only reports on the results of one experiment, the experiment incorporated numerous stimulus types. Significantly, for seven of the eight

types employed, the more monolingual Karitiãna exhibited more transitivity-oriented perceptions. The performance of these monolingual speakers was particularly consistent with relativistic predictions. Perhaps the greatest weakness of the study is that only five such speakers were considered, due to limitations of the sample pool of Karitiãna in Porto Velho and to more general demographic factors. Specifically, older Karitiãna make up only a handful of the adult population. Nevertheless, the relativistic interpretation we are suggesting here would be buttressed by clear replication among an even larger cross-section of the older Karitiãna population. For now we must rely on the results so far obtained, which do represent over 10% of the adult population.

As was mentioned above, one criticism of research on linguistic relativity is that crosslinguistic disparities in task performance are frequently ascribed to linguistic rather than cultural differences between the groups in question. One strong point of the sort of investigation presented here is, we believe, that the results have no clear relationship to the two cultures involved, beyond the languages of those cultures. Given the abstract nature of the stimuli, and given the abstract and metalinguistically opaque nature of the linguistic distinction that plausibly motivates the cross-population discriminatory disparities, it is hard to see what sort of cultural factors beyond the linguistic might synchronically motivate the more transitivity-oriented perception of the Karitiãna. Conversely, there is a clear grammatical distinction appealed to countless times daily by the Karitiãna, one that serves as a clear and plausible motivation for our results. While the abstract nature of the stimuli in this study could be perceived as a weakness in some sense (along the lines of "How do these stimuli actually relate to real-world perceptions?"), we believe that it may also be a strength in that it helps preclude straightforward non-linguistic interpretations of the data.

Replication of these results with other tasks is of course desirable. Furthermore, we hope that this line of research may be followed-up on with similar experimental work among other language groups. After all, the grammatical distinction at the heart of this study is not typologically anomalous. Many languages make clear distinctions between verbs denoting semantically intransitive or semantically transitive events.

Levinson et al. (2002), in a discussion of individual languages' effects on spatial reasoning, make the following relevant observations: "A language provides its learners with a rich but unique representation system, which affords some cognitive operations, enforces others, and inhibits the development of yet further notions." In short, the data and analysis presented here are consistent with this claim and the relativistic position more generally, since they suggest that the Karitiãna language helps to "enforce" the distinction between transitive and intransitive events in the minds of its speakers.

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