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| **RESEARCH ARTICLE**

Cross-Linguistic Structural Priming on the Lexico-Syntactic Representations of Cebuano-English Bilinguals

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| **ABSTRACT**

The effect of previously processed grammatical structure on its subsequent production is referred to as structural priming to explore syntax representations in bilingual brains. This psycholinguistic inquiry investigated the active-passive alternation syntactic category and whether bilingual representations of the first language (Cebuano) and second language (English) are more integrated considering the L2 proficiency. This study conducted two structural priming experiments on 60 Cebuano-English bilinguals from a randomized population exposed to a prime type with verb type manipulation. Research subjects formed their responses concerning the target response drawings. Responses were classified as active, passive, and other to assess priming effects. Additionally, this study followed the mixed between-and-within-subjects design. Priming effects were established in the two studies using the mixed-effects logistic regression analysis. Cross-linguistic priming was found in Study 1 (English to Cebuano) in both verb types with a p-value of ($< .001$). However, cross-linguistic priming was not found in Study 2 (Cebuano to English) in both verb types with a p-value of (0.242). Active utterances were profound in both studies rather than passive structures. The L2 proficiency of the research subjects was statistically significant in Study 1 and not significant in Study 2. This further means that second language proficiency affects Cebuano language production more than English. With the greater likelihood of active utterances, research subjects have not integrated the syntax of both languages, mainly attributed to different language experiences, constituent word order, and unbalanced bilingual proficiency capabilities.

| **KEYWORDS**

Priming, cross-linguistic, bilingual, psycholinguistic, proficiency.

1. Introduction

In bilingualism, it is essential to determine the extent to which the syntax of bilingual languages is compounded. The existing body of knowledge on this subject presents diametrically opposing theoretical perspectives, which up until today, remains a challenging matter being discussed in several languages fora. According to some academics, bilinguals' syntactic structures of languages are defined (de Bot, 1992). In this view, bilinguals have distinct syntactic constructions (for example, transitive construction) for each language, referred to as a separate-syntax account. On the other hand, other scholars claim that languages share structural representations (Hartsuiker et al., 2004). In other words, when a structure is employed in the two languages, bilinguals have just one representation, referred to as the shared-syntax account.

While few researchers have examined inquiries whether structural representations are integrated universally or are unique to each (Fox Tree & Meijer, 2003; Hartsuiker et al., 2004; Loebell & Bock, 2003; Schoonbaert et al., 2007), these researches steadily aid the shared-syntax account. Several issues, however, remain unresolved. One of these difficulties is whether parallel structures in bilinguals share representations despite word order differences. In other words, two languages with particular word ordering for

passive constructions could share an abstract structure. Numerous studies have examined this issue, with inconsistent findings (Bernolet et al., 2007; Chen et al., 2013; Loebell & Bock, 2003; Shin & Christianson, 2009). Thus, this study is grounded in fixing inconsistent findings across languages worldwide.

The majority of psycholinguistic research on language has focused on the discipline of monolingualism. Integrating the two languages is a critical psycholinguistic topic specific to bilingualism. Simply put, linguists continue to puzzle whether bilinguals keep the division between their two languages in some structural aspects of language. The majority of study in this area was on the word or concept representations (Kroll & Stewart, 1994; McElree et al., 2000), with little consideration made to the shared or separate nature of other aspects of language.

Additionally, previous research on bilingual syntactic representation has concentrated on a few syntactic structures studied and recurring language combinations such as Spanish-English, German-English, Dutch-English, and Korean-English. As a result, this study asks how bilinguals embody syntax to prove if they have two entirely separate syntax systems in two languages (separate-syntax account) or an integrated structural system (shared-syntax account). Besides, this study examines whether bilinguals who speak two different language typologies, Cebuano and English, can exchange structural representations by examining cross-linguistic structural priming effects of the transitive constructions in Cebuano–English bilinguals.

No preceding studies in cross-linguistic backgrounds have examined the priming effects of Cebuano-English bilinguals. Based on the literature, a few studies were done in cross-linguistic structural priming, and they did not involve any language in the Philippines. This study becomes the pioneering research in the hyphenated wing of scientific language study. Thus, this study aims to draw linkages between the Cebuano and English languages using direct experimental investigation. With an exceedingly slow interest and attention paid to this research area, it is essential to conduct such a study in the local context to enrich literature and understand the variances of results across languages studied, which will benefit the bilingual education system in the country.

In addressing the gaps mentioned earlier, this research aims to test the idea that grammatical sharing is so widespread in the bilingual mind that it includes even constructs exclusive to one language. To resolve outstanding difficulties regarding the shared-syntax explanation, the current research examines whether structural priming occurs in the Cebuano to English and English to Cebuano language directions. These two languages are substantially divergent regarding typology and word order (Cebuano: V-S-O vs. English: S-V-O).

Notably, this paper analyzes the priming effects of a well-researched construction, the transitive structures, which has not been evaluated in cross-linguistic contexts in previous structural priming experiments. Specifically, this study aims to: examine L1 (Cebuano) cross-linguistic structural priming effects on L2 (English) production in translation-equivalent and unrelated verb conditions of transitive syntactic construction; examine L2 (English) cross-linguistic structural priming effects on L1 (Cebuano) production in translation-equivalent and unrelated verb conditions of transitive syntactic construction; and investigate whether L2 proficiency of the subjects modulates cross-linguistic structural priming effects of transitive syntactic construction.

This psycholinguistic inquiry examines the integrated or independent syntactic representations of L1 and L2 in the bilingual lexicon by examining the language-shared hypothesis, which asserts similar L1 and L2 syntax share representations in the mental lexicon of bilinguals. Language-shared priming with these structures is predicted under the language-shared hypothesis. If subjects generate an L1 construction with a particular structure, they are more likely to produce an L2 utterance with that structure than an alternative form, and vice versa. Notably, the predictions are: cross-linguistic priming effects will be meaningfully strong when the L1 primes and L2 target verbs are translation-equivalents; cross-linguistic priming effects will be suggestively strong when the L2 primes and L1 target verbs are also translation-equivalents; and as the proficiency factor increases among the research subjects, similar representations of L2 and L1 structures become shared.

Fundamentally, it has been established that structural priming may be used to investigate lexical and syntactic representations of monolingual and bilingual speakers. Due to the scarcity of research on this subject, this study should determine whether these findings hold in other languages, such as Cebuano, and whether they depend on word order disparity and proficiency levels. This way, this research undertaking will impact existing literature in the research area, imploring possibilities of connectedness or disparity in research results. Besides, a new language pair (Cebuano and English) will provide some evidence of bilingual structural language production.

Likely, the structural priming technique has provided little insight into how bilinguals represent structural information. When L1 and L2 contain similar structures, most evidence implies that just one shared mental language representation exists. When L1 and L2 have comparable but not indistinguishable structures, they may be related in the mental representations rather than wholly

shared. This research's findings should address this issue, helping speakers display their linguistic profiles, especially during interactions, and formulate information on capabilities in using two languages in a linguistically diverse community.

2. Literature Review

The shared-syntax account assumes that structural representations are common across languages, with just one combinatorial node. Nevertheless, as Kantola & Van Gompel (2011) point out, most early indications for cross-linguistic structural priming are stable with the idea that structural representations are similar but not identical. Cross-linguistic priming occurs when language representations in one language prompt syntactic representations in another. Priming across languages is less than priming in within-language since priming in between-language happens secondarily through related structural connections. Priming within a language occurs by residual activation of a particular node combination. Since both situations entail residual activation of one combinatorial node common throughout languages, the shared-syntax account expects priming to be equally potent inside and across languages.

Structural priming is often used as a technique for examining the construction of structures. Structural priming happens when speakers replicate a structure they come across lately (prime), intending to reuse previously activated syntactic knowledge (Bock, 1986). When people speak or write, they frequently echo the underlying fundamental patterns that they have just created or observed others create. The tendency to repeat certain parts of sentence structure enables researchers to identify several representations people generate while generating or comprehending language. The volume of structural priming studies has centered on monolinguals' understanding and production of single words, with little study on bilinguals' syntactic representations.

Between-language priming research has been neglected in bilingualism, and just a few studies have succeeded in generating ideas on this subject. Loebell and Bock (2003), for example, studied the structural priming of German and English datives among speakers. They discovered that both languages had identical dative constructs (prepositional-object and double object). By contrast, because of the word order discrepancies between English and German, no cross-linguistic priming effects in transitive constructs were seen (passive and active). The study used a picture-description assignment to help German-English bilingual speakers understand lexico-syntactic structures.

Another study on this subject was conducted by Fox Tree and Meijer (2003), who examined the priming effects of dative constructions on Spanish-English bilinguals using a simple recall task approach. Memory can be excluded from this study since it is a demanding skill that may add to the validity of the priming effects being evaluated on speakers. When respondents were provided with an identical phrase structure in Spanish, they could recall the English target sentences. The same remains valid for the target Spanish sentences when provided with an English sentence with a similar structure.

Additionally, Hartsuiker et al. (2004) explored Spanish–English structural priming in dialogues employing a variation of the paradigm in Branigan et al., in which participant pairs alternated describing pictures to one another and deciding if a provided description matched their own. One person created an active or passive statement in Spanish, while the other answered in English. When followed by a Spanish passive, the speaker was more apt to create passives in English than when followed by a Spanish active. Their findings demonstrate that certain structural representations are similar between languages spoken by bilingual speakers.

Besides, Hartsuiker et al. (2016) found comparable findings when using relative clause attachment structures, demonstrating that tiered information structure is wholly integrated across languages. They observed that syntactic priming was constant, whether within or between languages, showing representations of structures across languages are shared entirely.

Comparably, Desmet & Declercq (2006) published another seminal work on cross-linguistic syntactic priming. They concentrated on the cross-language structural priming of relative clauses attached to noun phrases in Dutch-English bilinguals. The results indicated that native Dutch speakers created relative clauses to noun phrases with a higher degree of attachment than those with a low degree. Additionally, when given high-attachment relative sentences in Dutch, native Dutch speakers created high-attachment relative clauses in English. These findings demonstrate a considerable priming effect in a cross-linguistic theory of between-language communication.

The structural priming technique has uncovered much information regarding how bilinguals represent structural information. According to research findings, when two languages have structurally equivalent syntax, there is a single mental representation shared by these two languages (e.g., Hartsuiker et al., 2016; Kantola & Van Gompel, 2011). When two languages have comparable but not alike structures, they may be linked in the mental representations than wholly shared.

Whether cross-language priming happens when two languages' surface components and hierarchical structures are comparable but not akin is debatable. Because the by- in English passives is sentence-final, whereas the by-in German passives are sentence-

medial, Loebell and Bock (2003) concluded that there is no priming in English-German passives. However, Weber & Indefrey (2009) discovered that English final passives were primed in production trials in Dutch by-phrase medial passives (slight priming in Dutch by-phrase final passives). Researchers claimed that the same information structure shared by by-medial and by-final passives caused priming (Fleischer et al., 2012).

Usually, cross-linguistic syntactic priming research has used late bilinguals. However, the structural representations of bilinguals might differ dependent on the L2 developmental stage of the learners. A few studies have looked at this, such as Vasilyeva et al. (2010), who observed cross-linguistic priming of passives from Spanish to English but not from English to Spanish. As Hartsuiker et al. (2004) found in adult bilinguals, children and adults exhibit similar bilingual structural representations.

On the other note, the proficiency level variable has also interplay in the cross-linguistic research. L2 proficiency influences bilingual structural representations (Bernolet et al., 2013; Hartsuiker & Bernolet, 2017). Structural priming was identified in both studies among more competent L2 speakers but not among less proficient L2 speakers. No proficiency effects exist. Expert speakers saw more significant priming whether the structure's head was translation-equivalent. Second-language learners primarily have different syntactic representations in the two languages, but these structures become common as proficiency increases.

On the other hand, the relationship between cross-linguistic priming and L2 proficiency shown in the research of Favier et al. (2019) is comparable to that observed in Bernolet et al. (2013). They looked at self-assessed second language competence as a factor of the degree of syntactic priming in Dutch-English bilinguals and found a solid constructive association. Indeed, their research uncovered no evidence of between-language priming for genitives in less proficient individuals. The results are consistent with a developmental theory of second-language syntactic learning, which postulates that the shared representations required for cross-language priming arise as competence increases. Kutasi et al. (2018) found a significant impact of Scottish-Gaelic competence on passive syntax output in English but no association between priming and proficiency.

The reanalysis of Shin and Christianson's (2009) data indicated common syntactic representations only among dominant Korean and Korean-English bilinguals with higher English proficiency. Typical syntactic processing appears to emerge with L2 English skills. Using common structures automates L2 syntactic processing and approaches L1 syntactic processing (Segalowitz, 2003). Because low-proficiency participants lacked L2 implicit or procedural knowledge and fully developed L2 abstract syntactic knowledge, low-proficiency participants did not show priming effects (McDonough, 2006). Those with high proficiency showed structural priming in L1-L2. There is evidence for the "threshold" theory (Cummins, 1980), which states that threshold degrees of language reliance affect bilingual children's cognitive and academic development. Similarly, when L2 competence reaches a certain level, two language systems' syntactically equivalent patterns become associated in the bilingual mind.

As stated in the literature reviewed, a larger diverse sample size may be necessary to systematically investigate the power of proficiency in syntactic priming and cross-linguistic structural priming. Proficiency is challenging to assess, much more so in a second language. Accurate representations and descriptions of each bilingual participant are required to establish a compelling case for competence being a consistent factor in cross-language research. For that reason, proficiency is one of the variables this study has considered to address this hole in this research interest.

Shin and Christianson (2009) observed that word constituency does not influence cross-linguistic structural priming. In their study, the word constituent for PO structure varies between Korean and English. In the canonical Korean PO structure, the recipient of the predicate is at the onset of the sentence, while in English, it is in the final position. People remembered English DO-structure sentences better after knowing Korean PO structures. Despite the differences in word order between Korean and English PO-structure sentences, cross-linguistic syntactic priming transpires, indicating the two-stage model of bilingual formation.

Other studies have shown language-independent priming of structural characteristics. For instance, Chen et al. (2013) identified the priming of passive structures between Chinese and English bilinguals. The word order of Chinese and English active sentences is the same, while passive phrases are not. Despite this, Chen et al. (2013) demonstrated passive priming in Chinese and English using two unique experiment methodologies (picture description and a confederate-scripting paradigm). Bilinguals were more prone to write passives in their home language after listening and reading to passives in the other language. Thus, cross-linguistic syntactic structure priming does not need identical word order.

In contrast, cross-linguistic research, on the other hand, has shown inconsistent results, depending on the language and method used. Researchers say cross-linguistic syntactic priming is impossible for utterances with diverse word constituencies (Bernolet et al. 2007). Some researchers discovered that priming occurs independently (Desmet & Declercq, 2006; Shin & Christianson, 2009). Loebell and Bock (2003) discovered no evidence of cross-linguistic syntactic priming in passive utterances in English and German,

which have a distinct word constituencies. However, the authors contended that the phrasal forms in the passives in both languages are separate.

Recently, Song and Do (2018) added to the expanding body of research demonstrating cross-linguistic priming effects regardless of word orders in the languages studied. The observation of cross-linguistic syntactic priming, notwithstanding word order, demonstrates that abstract syntax– as opposed to surface structure – may be integrated between languages. Their findings indicate that despite the variation in word order, bilinguals can prime the subject-to-object raising (STOR) structure between Korean and English. Balanced Korean–English bilinguals generated more STOR productions in Korean after being primed with non-STOR statements. Because the word order in English and Korean STOR sentences differ, this priming effect cannot be attributable to surface word order. Additionally, since no case-marks overlapping was seen in the trial, this priming effect is not a surface shape-related priming effect. Hence, these data suggest that the priming effects observed in this experiment resulted from an integrated syntax rather than surface-level structural similarities.

Generally, the findings from research on word constituency properties in cross-linguistic syntactic priming remain contentious. As Shin and Christianson (2009) indicated, the gap between past findings might be explained using various study methodologies. On the other hand, Bernolet et al. (2007)   predicated their findings on the impact of word constituency on experimental methods (picture description or confederate scripting), which incorporates priming in comprehension and production. Consequently, some researchers discovered cross-linguistic syntactic priming, regardless of clausal differences, using non-picture-description tasks to produce utterances (Desmet & Declercq, 2006; Shin & Christianson, 2009). With this, cross-linguistic priming literature requires a deeper evaluation of the impacts of tasks or modalities of the prime structures (comprehension or production), which this study also considers.

To narrow and demonstrate the context of this study relative to the word-order variable, Cebuano and English have different word constituencies and transitive constructions. Cebuano is a predicate-initial language made of verb complexes and noun phrases. Modifiers are sometimes related to the head noun by 'nga.' Negators and adverbials, notably temporal and locative adverbials, are also included in the verb complex. While Cebuano nominal case marking is ergative, inter clausal linking is accusative (Tanangkingsing, 2009). Cebuano's voice patterns likely grammaticalized transitivity. All transitive clauses in Cebuano were the Patient Voice (PV), Locative Voice (LV), and Instrument Voice (IV). Tanangkingsing (2009) developed the idea that intransitive phrases focus on the actor, action, or movement. In contrast, transitive clauses focus on the instrument, patient, and location influenced by an action (the actor remains topical).

Tanangkingsing (2009) elaborated that the Actor Voice (AV) has Cebuano voice indicators. These affixes marking AV constructions are classified as volitional (mi-; ni-; ning-; mo-; mag-; pag-), progressive (nag-; naga-; ga-, mag-; maga; pag-), and potential/spontaneous (naka-; na-; maka-; ma-). There are two possible contrasts. To begin, there are two types of aspect markers: volitional and progressive. Volitional denotes timeliness. The volitional aspect markers often reflect purposeful action and are particularly compatible with activity verbs and motion verbs), while progressive shows length and duration. Second, volitional vs. potential/spontaneous refers to deliberate behavior, while potential/spontaneous refers to chance and spontaneity.

Conversely, Tanangkingsing contended that PV (Patient Voice) clauses constitute Cebuano's default transitive construction. In the literature, these non-actor formulations in Philippine languages have been called passives (Bell, 1976; Wolff, 1962). In Cebuano, these constructions are now considered transitive or ergative (Liao, 2004), implying that both the actor and patient arguments represent central participants, and neither is demoted. The affixes marking PV constructions are volitional (gi-; -on; -a), progressive (g<in>a(paN)-; gi-paN-; pa-ga-...-on; pa-ga-...-a) and potential (na-; ma-). These affixes are inflected for tense, aspect, and mood.

Study shows that passive formulations in languages throughout the globe are structurally diverse, with no common attribute (Croft, 2001), proving that there is a rich structural continuum from active to passive, which is why there is no uniform attribute or description for passives. Rather than a distinct universal category, passive is a cluster of properties and events. It is possible to derive language typology and universals underlying the syntactic space for voice by comparing structural features of voice creations across languages.

Theoretically, this study follows the developmental model of the bilingual acquisition of shared lexical and syntactical constructions of Hartsuiker & Bernolet, (2017). A completely integrated system with common syntactic representations for L1 and L2 is the goal of the framework developed by the two scholars. The explanation is a developmental extension of Hartsuiker et al.'s (2004) shared syntax theory, based on the lexicalist residual activation model of Pickering & Branigan's (1998). All these explanations presume localist mental lexicon representations linked to syntactic-combinatorial information. A lemma may be linked to numerous syntactic-combinatorial nodes. It may also be related to several lemmas. Syntactic-combinatorial nodes are shared across languages in Hartsuiker et al.'s (2016) multilingual adaptation of the paradigm.

This paper is also rooted in the Language Synthesis Model on language representations in bimodal bilinguals (Lillo-Martin et al., 2016). The model's objective is to give a comprehensive analysis of a variety of bilingual grammatical phenomena, such as cross-linguistic influence. Dealing with bilingual data research necessitates using grammatical and representational models capable of accommodating languages. They propose a model in which there are virtually no distinctions between monolingual and bilingual speakers or between manual and spoken modes of communication. Central to the theory is that the cross-linguistic effect in language occurs when bilinguals create lexical items from one that precedes abstract syntactic structures from other languages. Much research shows that bilinguals' relative proficiency in both languages influences cross-linguistic transfer and code-switching behaviors (Van Hell & Tanner, 2012).

Cognate of the LSM hypothesis, this paper is also grounded on the principles of a cognitive theory in bilingualism. Cummins (1980) created the Common Underlying Proficiency theory of bilingualism. The theory may be seen as an iceberg represented by two icebergs. Above the surface, the two icebergs are distinct. That is, in outer discourse, two languages are distinct. The two icebergs are united under the surface, preventing the two languages from functioning independently. Both languages have a common core processing mechanism. The theory is summarized as follows: when a speaker possesses two languages or more, there is a single unified foundation of thinking; people can also function relatively with more languages; informational processing skills and educational attainment can be established through one or two or more languages; and the language the speaker uses in the schools must be adequately developed to face the intellectual encounters.

Hence, the developmental model of bilingual acquisition, the language synthesis model, and the common underlying proficiency theory all complement the study's nature and objective to demonstrate an integrated system of lexico-syntactic representations in a bilingual speaker. These simple theories aim to explain various occurrences in bilingual language formation. In the interest of psycholinguistics, the theories established the study's strength in drawing out linkages, asymmetry, synchronicity, or even disparity using the cross-linguistic approach.

The developmental account of bilingual acquisition predicts cross-linguistic impacts and priming. For example, it predicts that structural priming across languages should increase with proficiency. It also suggests early transfer. It also predicts that prime-target pairings with lexical overlap should prime sooner than ones without (Muylle et al., 2020). Hartsuiker & Bernolet (2017) assume a common syntactic representation if the relevant structures are comparable enough in each language. Even though they vary in specific ways, it is likely that structures are common and undergo cross-linguistic priming.

Hartsuiker & Bernolet (2017) see the completely shared account as the last step of the L2 syntactic acquisition trajectory. A beginner L2 learner would start by acquiring words rather than syntactic representations. To generate a sentence using these words, the learner has to directly mimic a model (e.g., a native speaker) or choose a structure from L1 that works in L2. In other cases, however, relatively short exposure to L2 structure may be enough to override the L1 transfer strategy and encourage imitation of L2 models to create sentences in L2. Initially, these imitations are based on conscious memory recall of exemplar utterances. They occur immediately after a learner perceives an example sentence when there is much lexical overlap with the sample phrase. As the learner progresses through L2 learning, the function of conscious memory may reduce. Structured lexical elements related to syntactic representations may represent formulaic statements in the L2. Initially, such representations would be L2-specific. After enough exposure to L2, the learner will start to create more abstract structures, structures that are shared first within L2 and then across languages.

3. Methodology

3.1 Research Subjects

Sixty Cebuano–English unbalanced bilingual university students from Davao Region's colleges and universities participated in the experimentation. The research subjects were asked to complete the Language History Questionnaire (Li et al., 2020), which provides significant linguistic characteristics about them. To be eligible for the experiment, volunteers must be native Cebuano speakers (regardless of the Cebuano dialect spoken) and capable English speakers (regardless of proficiency level). Additionally, this experimentation targets university students majoring in English, 18 years old and above. Excluded are non-native speakers of Cebuano, enrolled in other degree programs, and already graduated. The research subjects can withdraw from the experimentation at any time, notwithstanding the reasons thereof. A volunteer subject meeting the inclusion characteristics shall replace the slot of the withdrawn research subject.

Subjects were from the Davao Region colleges and universities. The Davao Region is situated in the southeastern region of Mindanao, around the Davao Gulf. The languages spoken in the region include Tagalog, Bagobo, Tagacaolo, Maguindanao, Cebuano, Dabawenyo, Bilaan, Hiligaynon, Mandaya, Ilocano, Manobo, Waray, and others. The study of Dreisbach and Demeterio (2021) revealed that generations X and Z consider themselves proficient in the Cebuano language. They primarily communicate in Cebuano in daily life.

Consequently, it is also the predominant language spoken in Davao, and English is widely spoken in the city. The waves of internal migrants from the northern and central Philippines were brought to Davao by the American-controlled administration of the Philippine Commonwealth, most of whom were already educated in English-speaking institutions. Since then, Americans have established English as the primary language of teaching in the Philippine school system (Reid, 2018).

On the other hand, the appropriate sample size of an experiment is determined by the study's goal and the characteristics of the population under investigation. In general, the bigger the sample size, the better since this increases reliability and permits the application of more advanced statistics. Thus, many consider a sample size of 30 to be the least number of cases necessary if researchers want to do statistical analysis on their data, albeit this is a relatively tiny sample size (Cohen et al., 2007). Researchers must consider the kind of associations they plan to investigate within subgroups of their sample before any data gathering. Besides, the sample size may be hampered by cost - money, time, stress, administrative assistance, researcher numbers, and resources. Hence, with combined observations from related studies, this study considered 60 research subjects for experimentation.
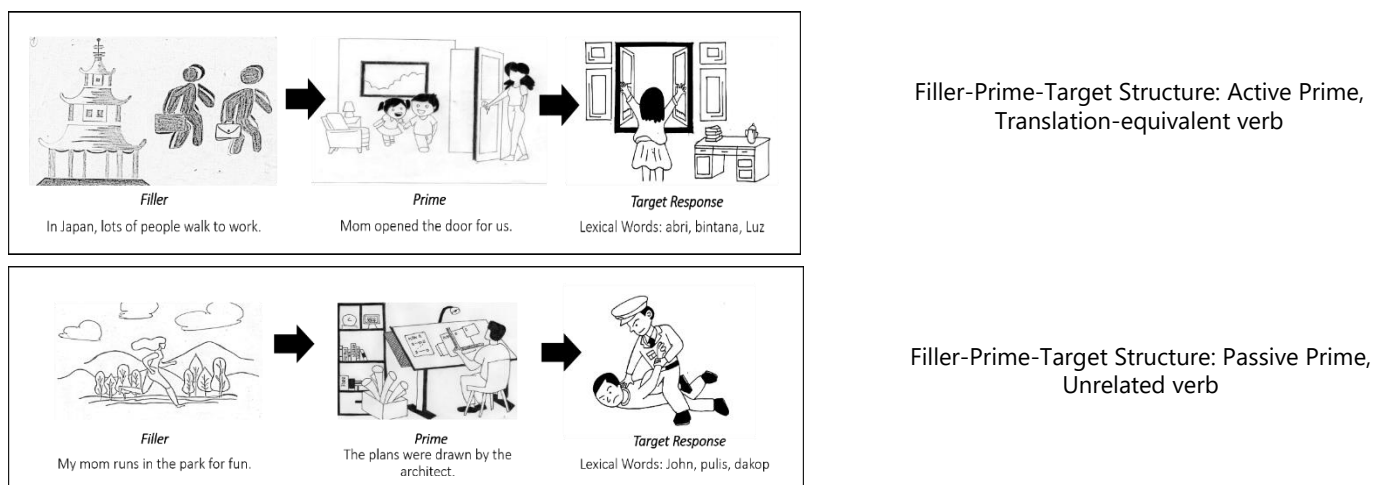
Ideally, researchers may choose individuals whose qualities best match the study's objectives. If there are more acceptable candidates available, random sampling should be utilized (Phakiti, 2014). Random sampling is a method for choosing subjects representative of the target population. Samples chosen at random are representative of the target population. Nevertheless, effectiveness in experimental research relies on subject accessibility. Volunteers are also needed in the case they possess the subject descriptions stipulated. The research sample's characteristics must be comparable or identical to the target population to generalize the results confidently.

3.2 Materials and Instrument

The priming task used 80 black and white drawings commissioned by the researcher to illustrators. Forty experimental trials (20 in each study) and 40 filler items were used as stimuli in the two priming studies. Each illustration depicts two objects: an agent and a patient provided with Cebuano or English nouns to verify that lexical choice does not affect language production. Every illustration was accompanied by a transitive verb describing situations. The experimental items were labeled in English (20) and Cebuano (20). Prime types are active and passive voice sentence constructions.

To assess the lexical boost effect, the verbs interspersed between the priming experimental items and target images were translation-equivalent and unrelated. Filler images depicted a variety of contexts that may be described using an intransitive construction. One set of 10 images was used for active priming, while another set of 10 images was used for passive priming to make up the 20 experimental items in each study. Shown in Figure 1 are the sample experimental items set up in English to Cebuano language direction (Study 1). Displayed in Figure 2 is the sample critical conditions in Cebuano to English (Study 2).
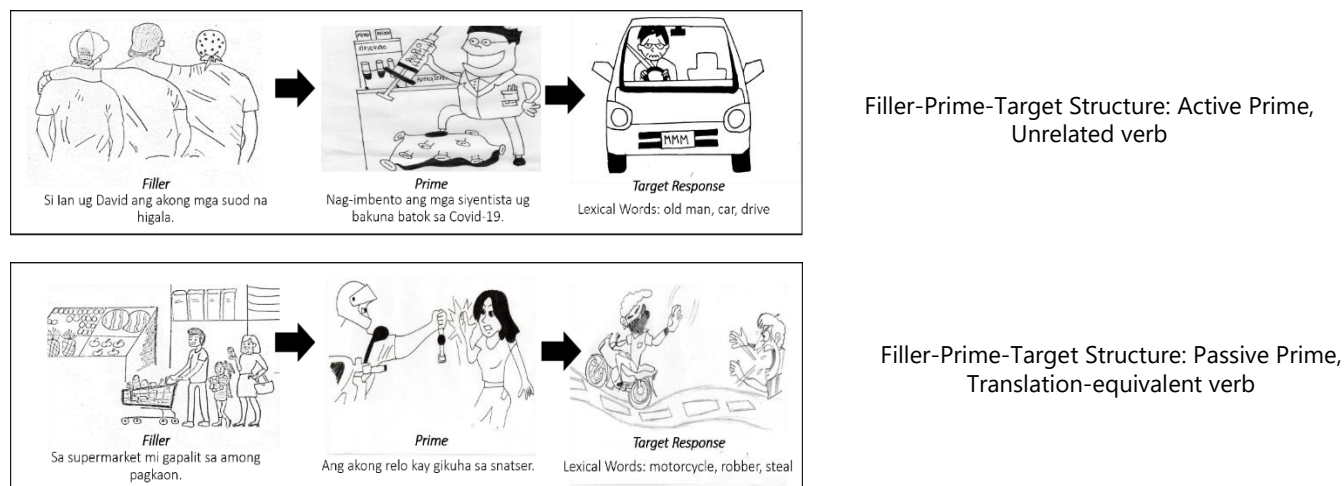
The scoring guide was used to assess the language production of the subjects of the experimental trials. First, the researcher assessed subjects' responses to establish if each utterance was a complete sentence. This coding was used to ascertain subjects' grasp of fundamental structural linkages. A sentence must have a verb and its required elements to be classified as syntactically complete. This coding technique for Cebuano and English responses accounted for the variations in the two languages' syntactic norms.

Filler-Prime-Target Structure: Active Prime, Translation-equivalent verb

Filler
In Japan, lots of people walk to work.

Prime
Mom opened the door for us.

Target Response
Lexical Words: abri, bintana, Luz

Filler-Prime-Target Structure: Passive Prime, Unrelated verb

Filler
My mom runs in the park for fun.

Prime
The plans were drawn by the architect.

Target Response
Lexical Words: John, pulis, dakop

Figure 3. *Study 1 (English to Cebuano) Sample Experimental Items*

The researcher classified transitive replies as passive or active to assess priming effects. All English responses where the patient is in the topic position, followed by auxiliaries and transitive verbs, are categorized as 'passive.' As in previous developmental studies, the 'passive' group contained complete and shortened passives. 'Active' was assigned to an utterance with an agent in the topic position followed by a transitive verb. A third category, 'other,' was created to include non-clause utterances, imperfect transitive phrases, sentence fragments, and complete sentences, including intransitive verbs.

The researcher employed three parallel categories to code Cebuano responses: 'active,' 'passive,' and 'other.' In Cebuano, the active voice is denoted by identifiable affixes, just as passive constructions are. However, as the literature mentions, Cebuano contains several passive building structures. The Cebuano passive structures comprise the patient voice, locative voice, beneficent voice, and instrumental voice. The verbal affixes were used to assess the categories of target constructions in the Cebuano language, as discussed in the literature.

Filler-Prime-Target Structure: Active Prime, Unrelated verb

Filler-Prime-Target Structure: Passive Prime, Translation-equivalent verb

Figure 2. *Study 2 (Cebuano to English) Sample Experimental Items*

The instrument was validated by language experts and speakers of Cebuano and the English language as to the transitive constructions of the priming tasks. The instrument obtained a validation rating of 4.50 from the five in-house validators and one external validator. The result of validation was suited for the experiment and study conduct. After the instrument was validated, it was tested on non-actual subjects of the study to establish the workability of the experimental items. Doing a trial before experimentation is needed since non-actual subjects found understanding the experiment process difficult. Also, the unfamiliar lexicon in Cebuano must be defined to the research subjects before getting their responses. These considerations were improved in the conduct of experiments with actual subjects of this study.

3.3 Design and Procedure
An experimental mixed design, which incorporates both between and within subjects factors, is a design that is often employed in priming research (McDonough & Trofimovic, 2009). In other words, such a design entails repeated measurements of the dependent variable (within-subjects) from distinct groups of subjects (between-subjects). This study used a 2x2x4 mixed between and within-subjects design: the within-subjects factors are: prime type (actives, passives) and verb type (translation-equivalent, unrelated); L2 proficiency level (A2 Pre-intermediate, B1 Intermediate, B2 Upper-Intermediate, C1 Advanced) is the between-subjects factor. This design was used in the study since there are several hypotheses the understudy wished to draw out from cross-linguistic structural priming and the interplay of variables.

Moreover, the researcher adopts a postpositivism paradigm in this experimental research. Postpositivists claim that although truth or reality remains objective, it is also a regulative notion (Phakiti, 2014). Even if the truth is absolute, researchers can never fully know it. However, they can approximate it and get closer to more robust hypotheses, although it is difficult to prove a researcher's idea by merely collecting data that supports it. Researchers must also acquire evidence to debunk it. Postpositivists claim that no theory is immune from objective, logical criticism. This concept follows the notion of scientific objectivity. While this study strives for objectivity, the researcher acknowledges that objectivity in the social sciences and language research is challenging to attain because it involves people, as this study explores.

In order to ensure that the research proceedings would take place smoothly without harming the data extraction in the experimentation, a series of actions were taken. First, after the instrument validation, a letter was sent to the university/college

administration asking permission for volunteer students from the respective institutions to become the study's subjects. After the letter of approval, volunteer subjects, at the random selection meeting the required characteristics, were asked to sign a consent to undergo psycholinguistic experimental trials. The research subjects consented to the specifics of the conduct of the study and the agreed mode of experimentation. Depending on the subject's preference, online platforms like Google Meet and Zoom were utilized as experimentation media.

During the experimentation, preliminary testing was done to obtain needed data on their linguistic profiles and proficiency. At the onset of the pre-experiment, the research subjects accomplished the Language History Questionnaire (LHQ). The online proficiency exam from the British Council gave subjects an estimate of their English proficiency level. To determine English grammar, vocabulary, and phrasing proficiency, there are 30 items, each multiple-choice question with three potential responses. Additionally, takers indicated how certain they were that their response was suitable for each item. Their English proficiency level was determined by the responses they provided and the degree to which they were confident in their responses. They immediately received the estimate of their current English proficiency level at the exam's conclusion.

On the day of the experiment, the experimenter modified a strategy for eliciting answers from research subjects using a picture description task while remaining consistent with similar cross-language priming investigations. The experiment involved two study experimentations successively. In Study 1 (English-Cebuano language direction), research subjects were presented with drawings of transitive acts. Then they listened to an experimenter describe them in Cebuano using either active or passive priming (with translation-equivalent and unrelated verbs). The subjects then described the transitive scenes in Cebuano (target language). Filler items with intransitive descriptions were shown following experimental items to obscure the study's purpose and prevent drawing undue attention to the syntactic structure under investigation.

Study 2 (Cebuano- English language direction) switched the language used to describe the prime and target. Both experiments aim to determine if exposure to a particular syntactic form (active vs. passive) increases the production of that form relative to the alternative form in the target language. All subjects received the same experimental and filler items on active and passive structures (within-subjects design). The ten (10) active primes were used alternately, with verb alternation (translation-equivalent and unrelated verbs) for lexical boost effect determination. The other ten (10) passive primes used the same verb alternation manipulation technique. Study 2 used the same materials as in Study 1 but reversed language orientation.
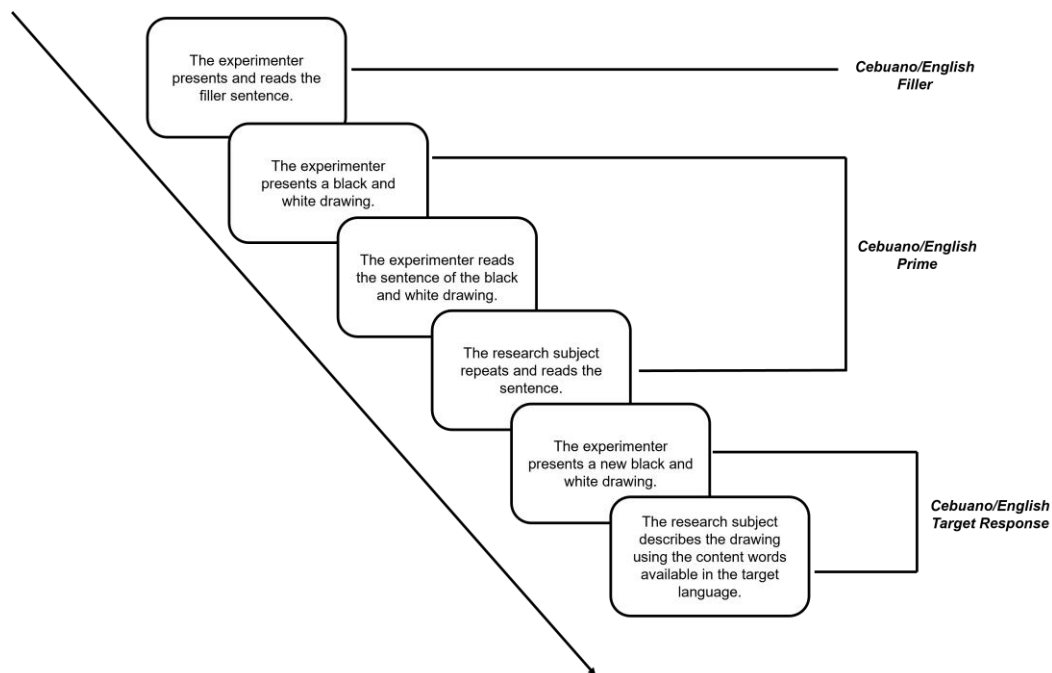
Figure 3. The General Experiment Format in Study 1 and 2.

After transforming and coding data into an appropriate format, it was subjected to appropriate statistical tests to answer the research objectives and prove or disprove the hypotheses and predictions introduced in this study. The collated data was run in

statistical software, Jamovi version 2.3.16.0, with the GAMLj module to examine variable relationships in this study. Statistical measures were used to process data to answer the objectives set in this study.

The generalized mixed model (logistic) was the statistical measure used to analyze the data gathered in this study since the dependent variable is a binomial response. These models may forecast the likelihood of a particular reaction or response and the variables' main effects and interaction effects. Priming effects were calculated based on the analyses performed. Log odds and p-values were used to answer the research objectives and test the predictions stipulated in this inquiry.

Concerning ethical considerations, this paper holds to the ethical norms and criteria established by the University of Mindanao Ethics Review Committee (UMERC). The ethics board approved the study protocol with protocol number UMERC- 2022-195. To perform this study, the researcher meticulously obtained and secured the required permission from school administrators. The researcher confirmed the compatibility of the chosen recruitment groups and assessed the risk level and mitigation strategies (psychological, physical, and socioeconomic). In addition, appropriate approval and consent were obtained from the research subjects ensuring their rights were fully protected.

4. Results and Discussion
4.1 Bilingual Language Profile

At the onset of the pre-experiment in the study, the research subjects were asked first to accomplish the Language History Questionnaire (LHQ). The questionnaire was answered online. Each research subject had a unique participant identification to access the questionnaire. Most bilingualism or multilingualism research utilized abridged or longer self-reported language history questionnaires. The questionnaire assesses bilinguals' or second-language learners' linguistic backgrounds to generate self-reported linguistic measurements in several languages.

The LHQ has a subsection of questionnaire items about the user's linguistic history (background), competence in first, second, or multiple languages (proficiency), context and language usage (immersion), and language dominance and cultural identification (dominance). Shown in Table 1 are the generated means of linguistic measures regarding proficiency, immersion, dominance, and multilingual diversity score of all the research subjects considered in the experimentation.

Table 1. *Research Subjects' Bilingual Profile*

Linguistic Measures	Mean	Standard Deviation
L1 Proficiency Score	0.85	0.13
L2 Proficiency Score	0.79	0.12
L1 Immersion Score	0.78	0.17
L2 Immersion Score	0.69	0.15
L1 Dominance Score	0.97	0.36
L2 Dominance Score	0.72	0.24
L1 to L1 Dominance Ratio	1.00	0.00
L2 to L1 Dominance Ratio	0.79	0.34
Multilingual Language Diversity	1.34	0.39

Many bilingual or multilingual studies have emphasized multilingual speakers' language skills. LHQ delivers an overall proficiency score based on a participant's self-rated skill levels in distinct language components—reading, writing, speaking, and listening. The weights for the four components are 20%, 20%, 50%, and 10%, respectively. More considerable weight was given to the speaking component since this is the most critical skill indicator of proficiency, as was considered in this study. To interpret the result, the aggregated score was normalized from zero to one (with one indicative of the native language-like proficiency level).

The L1 proficiency score of the research subjects generated a mean of 0.85 (SD=0.13), which means that their L1 proficiency is approaching native-like. Meanwhile, the L2 proficiency score generated 0.79 (SD=0.12), which is distant from the native-like proficiency. The data in the L2 proficiency was not considered in this study due to errors in the self-reporting estimation of their level. Instead, the research subjects were subjected to online English-level tests to determine their proficiency group.

On the other hand, the participant's age, age of acquisition of the language skill components, and years of use of each language were used to calculate the immersion score of the research subjects. The scores were normalized to a range between 0 and 1, with 1 implying a language's most native-like immersion level. The generated mean for the L1 immersion score is 0.78 (SD=0.17), while the L2 immersion score is 0.69 (SD-0.15). L2 immersion is less immersive than that of the L1 immersion score. This can be attributed to the age when the research subjects started recognizing their L2 as used only in formal school instruction. Such a language

immersion situation could be distinct from that of a speaker who began learning a language at the same age and is actively using it.

The participant's self-reported competence and the time (hours per day) spent on distinct language components were the basis for calculating the research subjects' language dominance. The scaling factor was used to guarantee that competence and daily usage of a language have equal weight in determining its dominance score, with one (1) as entirely dominant. L1 dominance score generated 0.97 (SD=0.36), while L2 dominance generated 0.72 (SD=0.24). The language dominance ratios between the two languages were also calculated, with L1 to L1 generating perfect one (1) and L2 to L1 generating 0.79 (SD=0.34). Using the ratio may establish whether a research subject is multilingual, or one language dominates.

Additionally, the LHQ provides an aggregated score to represent research subjects' linguistic background and usage. Language utilization in context and diversity described bilingualism and was considered in the questionnaire. The Multilingual Language Diversity (MLD) estimates are based on linguistic dominance. The scores were normalized to a range of 0 to 2, with 0 as monolingual, one as bilingual, and two as multilingual in four languages. The overall MLD score of the research subjects generated 1.34 (SD=0.39). It implies that the research subjects are bilingual. The attribution to which it exceeded perfect 1 was due to the reporting of other languages the research subjects speak.

4.2 Study 1: English (L2) to Cebuano (L1) Cross-linguistic Structural Priming

The purpose of Study 1 was to determine whether the Cebuano-English bilinguals exhibited evidence of cross-linguistic structural priming in this language direction (the prime is in the English language, and the target response is in the Cebuano language). This study used a picture description task as the priming methodology. Besides, L2 proficiency was also explored as an effect in the cross-linguistic structural priming.

Table 2. *Frequency of Active, Passive, and Other Target Responses by Group, Verb Type, and Prime Type in Study 1 (English to Cebuano)*

L2 Proficiency Group	Verb Type	Prime Type	Target Responses		
			Active	Passive	Other
Pre-intermediate	Translation-equivalent	Active	11	14	0
		Passive	17	8	0
	Unrelated	Active	22	3	0
		Passive	10	14	1
Intermediate	Translation-equivalent	Active	48	62	0
		Passive	70	40	0
	Unrelated	Active	102	8	0
		Passive	36	65	9
Upper-Intermediate	Translation-equivalent	Active	59	69	2
		Passive	87	43	0
	Unrelated	Active	117	13	0
		Passive	49	77	4
Advanced	Translation-equivalent	Active	12	23	0
		Passive	22	13	0
	Unrelated	Active	32	3	0
		Passive	9	25	1

Of the 1,200 target sentences produced by the research subjects, 17 were coded as 'other' (1.4%) and deleted these missing data in the study since the constructions considered are dichotomous. The remaining 1,183 responses were coded as either active (598=49.9%) or passive (585=48.7%). The percentage of active sentences produced after the active prime type, 32.75% (393), was higher than the proportion of passive sentences produced after passive primes, 23.75% (285). The information for this language direction is shown in Table 2, itemizing the distribution of responses concerning the prime type, verb type, and L2 proficiency group.
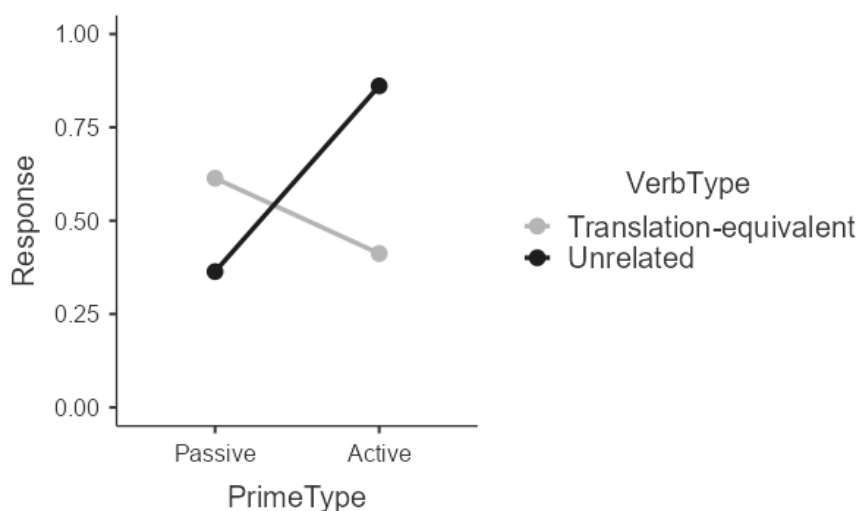
Table 3. *Cross-linguistic Structural Priming Effects Moderated by Verb Types in Study 1 (English to Cebuano)*

| Target Language | Moderator levels | | Estimate | SE | exp(B) | z | p |
	Verb Type	Contrast					
Cebuano	Translation-equivalent	Active - Passive	-0.967	0.198	0.380	-4.88	< .001
	Unrelated	Active - Passive	2.568	0.239	13.038	10.73	< .001

The first coefficient, translation-equivalent verb type, in Table 3 is related to the dependent variable contrast active-passive in Cebuano, as predicted. The exp(B) value is 0.380, with an estimate value of -0.967. This means that the odds of the research subjects choosing active over passive responses after a translation-equivalent verb type are lower since it is less than one. The probability of falling into the active response is less than the probability of falling into the non-target response, the passive. When expressed in probability, the prediction is only 27.53% for an active response and 72.47% for a passive response. As shown in Figure 4 for translation-equivalent results, it is evident that there is a significant response difference. However, there is a statistical significance to the priming function between the prime type, verb type, and the target response since its p-value is .001.

The second coefficient, unrelated verb type, on the other hand, is still associated with the dependent variable contrast active-passive in Cebuano. The exp(B) has a value of 13.038 and an estimate of 2.568. This means that the odds of the research subjects choosing active responses over passive responses after an unrelated verb type are 13.038 times greater than the odds of choosing the passive response as predicted. On the probability equivalent value, the research subjects demonstrated an excessive preference for active responses in unrelated verb types, with a 92.87% prediction over the 7.13% for passive responses. Shown in Figure 4 is a clear preference for active responses in the unrelated verb type condition. Moreover, the unrelated verb type and the priming effect are statistically significant, with a p-value of .001.

The inferential results show a cross-linguistic structural priming effect in the language direction studied. The prediction presented in this study reads that cross-linguistic priming will be considerably higher when the L2 prime and L1 target verbs are translation equivalents than unrelated ones. Generally, there is significant structural priming in this language direction. However, it was surprising that the verb types can be a source of priming effect, not only considering the translation-equivalent verb type. Hence, there is a lexical boost effect to both verb types.

Figure 4. *Cross-linguistic Structural Priming Effects Plot Moderated by Verb Types in Study 1*

The priming effect findings in Study 1 contrast with Bernolet et al. (2007) and Loebell and Bock (2003) since the results support the concept that cross-linguistic structural priming is achievable despite differing word ordering (Chen et al., 2013; Desmet & Declercq, 2006; Hwang et al., 2018; Shin & Christianson, 2009; Song & Do, 2018). Although Cebuano and English have different surface word orders (VSO in Cebuano, SVO in English), Cebuano-English bilinguals tended to produce more active responses in the Cebuano language after exposures to the prime types and verb types in English. In other words, the English language has

helped bilinguals produce active responses in Cebuano. The discovery of structural priming from English to Cebuano provided additional support for the shared-syntax account despite the two language typologies. It suggests that Cebuano and English may share an abstract syntactic structure rather than be influenced by the surface order of constituents in English when constructing Cebuano sentences.

In addition to investigating the chance of cross-linguistic structural priming of the Cebuano-English bilinguals, the current study addressed a significant question about lexical effects on syntactic processing relative to the nature of structural representations in bilinguals. These effects have been investigated with bilingual adults. Study 1 results concerning verb types support Hartsuiker and Bernolet (2017). Their study specifically identified the lexical effects of structural priming in English-Dutch bilinguals. Proficient adult bilinguals demonstrated cross-linguistic priming in the presence and non-existence of lexical overlap (with shared items between the prime and the target). Critically, the structural priming effects were much more significant across languages when the prime sentence and the target had translational counterparts. The appearance of a priming effect in the absence of common items suggests that successful bilinguals have developed abstract, lexically-independent representations of the grammatical structure. Moreover, a rise in the strength of structural priming when the prime and target share lexical items (translation-equivalents) indicates the different roles of lexical variables. However, it is worth noting that this study's unrelated verb type had higher priming effects when examined through odds ratio compared to the translational-equivalent verbs. Hence, verb type in this language direction, English to Cebuano, does not support the lexicalist priming models (Pickering & Branigan, 1998). The lexical boost effect is not needed to be enabled between the lemma and combinatorial nodes of both languages for priming effects to occur in both verb types.
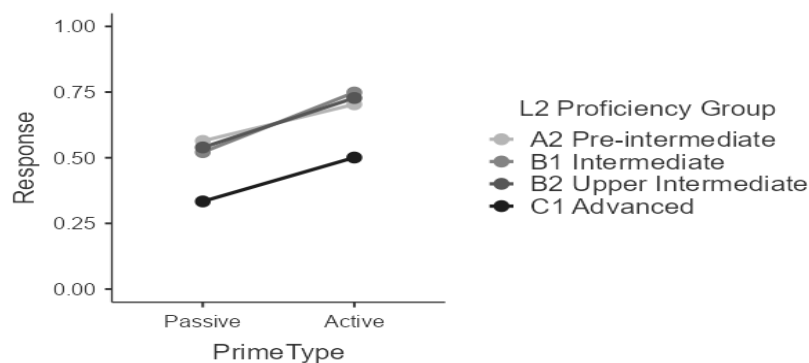
Table 4. *Cross-linguistic Structural Priming Effects Moderated by Proficiency Level in Study 1 (English to Cebuano)*

Moderator levels							
Target Language	**L2 Group**	**Contrast**	**Estimate**	**SE**	**exp(B)**	**z**	**p**
Cebuano	A2	Active – Passive	0.612	0.417	1.84	1.470	0.142
	B1	Active – Passive	0.974	0.211	2.65	4.607	< .001
	B2	Active – Passive	0.883	0.196	2.42	4.514	< .001
	C1	Active – Passive	0.732	0.334	2.08	2.189	0.029

The results in Table 4 report the priming effects moderated by the proficiency level of the research subjects concerning the dependent variable in Study 1 (English to Cebuano). Each proficiency group was tested for its priming effects on the active-passive alternation. The A2 (pre-intermediate group) coefficient has an exp(B) of 1.84 and an estimate of 0.612. The odd ratio suggests that the A2 group produced active responses 1.84 times higher than a passive response during the priming experiment. The probabilities are 64.79% for the active responses and 35.29% for the passive ones. The p-value of 0.142 suggests that priming in this language direction for the A2 proficiency level is not statistically significant or that priming does not occur at this level.

In contrast, priming effects are observed for the three proficiency groups—B1 (intermediate), B2 (upper-intermediate), and C1 (advanced)—since the p-values are less than 0.05 at the alpha level of confidence. The B1 (intermediate) proficiency group has an exp(B) of 2.65, corresponding to a 72.60% likelihood for active responses versus a 27.40% likelihood for passive responses. Besides, the B2 (upper intermediate) proficiency group has an exp(B) of 2.42, or 70.76% likelihood, in the active construction compared to the 29.24% likelihood in the passive construction. Finally, the C1 (advanced) proficiency group has an exp(B) of 2.08 and a 67.53% likelihood for active productions versus 32.47% for passive productions.

With the results described, L2 proficiency, as predicted in this study, significantly affected cross-linguistic priming. The lowest proficiency group has no priming effect, while the upper-level proficiency groups showed priming, as shown in Figure 5. Language proficiency influences the sharing of syntax, according to the model of bilingual language production put out by Hartsuiker & Bernolet (2017). Mainly, bilinguals with limited language competence (L2) store the grammar of the second language distinct from the original language (L1). Their first syntactic representations in the second language are lexically and linguistically unique. As their level of proficiency rises, speakers are exposed to more L2 syntactic structure examples, and as a result, their general, abstract representations of these language forms grow.

Figure 5. Cross-linguistic Structural Priming Effects Plot Moderated by Proficiency Levels in Study 1

In addition, generalization happens across lexical items in the L2 and across languages for comparable L1 and L2 structures. This model of bilingual language processing, in which shared abstract syntactic representations are the result of bilingual learning, is confirmed by new research comparing priming in proficient and less-competent bilinguals (Hartsuiker & Bernolet, 2017). It could explain why the A2 (Pre-intermediate) proficiency group has no priming effect in their production responses due to the low-level proficiency compared to the succeeding proficiency groups.

On the contrary, Khoe et al. (2021) simulated bilingual speakers using an implicit learning model of structural generation to investigate whether proficiency or exposure affects cross-linguistic structural priming. Their findings prove that such moderating effects are absent in the model concurring with the findings provided by Kutasi et al. Together, these behavioral findings and the outcomes of their structural model support an expanded version of Hartsuiker and Bernolet's (2017) developmental account of cross-language structural priming. The model explicitly predicts the absence of such an effect in simultaneous bilinguals and a modulating effect of proficiency in sequential bilinguals.

4.3 Study 2: Cebuano (L1) to English (L2) Cross-linguistic Structural Priming
Study 1 determined whether the Cebuano-English bilinguals exhibited cross-linguistic structural priming in the contrary direction as tested in Study 1 (the prime is in English, and the target response is in Cebuano language). This study used the same picture description task as the priming methodology. L2 proficiency levels were still explored as an impact in the cross-linguistic structural priming.

Table 5. *Frequency of Active, Passive, and Other Target Responses by Group, Verb Type, and Prime Type in Study 2 (Cebuano to English)*

L2 Proficiency Group	Verb Type	Prime Type	Target Responses		
			Active	**Passive**	**Other**
Pre-intermediate	Translation-equivalent	Active	21	3	1
		Passive	24	1	0
	Unrelated	Active	24	0	1
		Passive	24	1	0
Intermediate	Translation-equivalent	Active	99	11	0
		Passive	101	9	0
	Unrelated	Active	107	3	0
		Passive	101	9	0
Upper-Intermediate	Translation-equivalent	Active	118	12	0
		Passive	122	6	2
	Unrelated	Active	126	4	0
		Passive	115	10	5
Advanced	Translation-equivalent	Active	33	2	0
		Passive	31	3	1
	Unrelated	Active	34	1	0
		Passive	33	1	1

Of the 1,200 target sentences supplied by the research subjects, eight were labeled as "other" (0.6%). Since the responses considered are dichotomous, these missing data were omitted from the study. The remaining 1,192 sentences were either active (598 = 49.9%) or passive (594 = 49.5%). The proportion of active sentences created after active primes (562=46.8%) was remarkably more significant than that of passive sentences produced following passive primes (43=3.58%). The distribution of responses according to prime type, verb type, and L2 proficiency level is detailed in Table 5 for this language direction.

Presented in Table 6 are the priming effect results relative to the verb types indicated in English as the target language. The first coefficient, translation-equivalent verb type, is related to the dependent variable contrast active-passive in English, as predicted. The exp(B) value is 0.642, with an estimated value of -0. 443. This means that the odds of the research subjects choosing active over passive responses after a translation-equivalent verb type are lower since it is less than one. The probability of selecting the active reaction is lower than the probability of selecting the passive, non-target response. When expressed in probability, the prediction is only 39.10% for an active response and 60.90% for a passive response. As shown in Figure 6 for translation-equivalent results, it is evident that there is a response difference. However, there is no statistical significance to the priming function between the prime type, verb type, and the target response under this condition since its p-value is 0.167 greater than the alpha level set.

Table 6. *Cross-linguistic Structural Priming Effects in Study 2 (Cebuano to English)*

Moderator levels							
Target Language	Verb Type	Contrast	Estimate	SE	exp(B)	z	p
English	Translation-equivalent	Active - Passive	-0.443	0.320	0.642	-1.38	0.167
	Unrelated	Active - Passive	1.083	0.429	2.954	2.52	0.012

On the one hand, the second coefficient, unrelated verb type, is related to the dependent variable active-passive contrast. The exp(B) is 2.954 with an estimate of 1.083. This means that the odds of the research subjects choosing active responses over passive responses after an unrelated verb type are 2.954 times greater than the odds of choosing the passive response as predicted. On the probability equivalent value, the research subjects preferred active responses in unrelated verb types with a 74.71% prediction over 25.29% for passive responses. Shown in Figure 6 is the preference for active responses in the unrelated verb-type condition. Moreover, the unrelated verb type and the priming effect are statistically significant, with a p-value of 0.012.

The inferential results show that no cross-linguistic structural priming exists in the examined language direction. As predicted, cross-linguistic priming will be substantially more significant when the L1 prime and L2 target verbs are translation-equivalents instead of unrelated ones. There is an uncorrelated prediction in the structural priming in this language direction. As gleaned from Table 6, the unrelated verb type trials are more significant in priming than the translation-equivalent verb type. Hence, the lexical boost effect is discarded in this language direction.
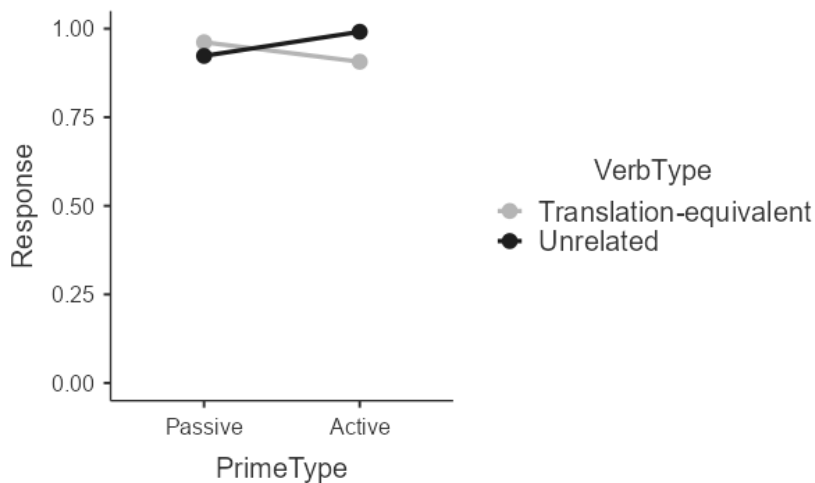
Figure 6. Cross-linguistic Structural Priming Effects Plot Moderated by Verb Types in Study 2

The inferential results show that no cross-linguistic structural priming exists in the examined language direction. As predicted, cross-linguistic priming will be substantially more significant when the L1 prime and L2 target verbs are translation-equivalents

instead of unrelated ones. There is an uncorrelated prediction in the structural priming in this language direction. As gleaned from the table, the unrelated verb type trials are more significant in priming than the translation-equivalent verb type. Hence, the lexical boost effect is discarded in this language direction.

While passive statements were reasonably rare in the unrelated verb-type condition, there was a more significant frequency of passive utterances after the active prime type when the translation-equivalent verb type was examined. Following a Cebuano passive prime, Cebuano-English bilinguals were likelier to make an active English response parallel with the Cebuano active primes. These findings on this language direction priming from Cebuano to English are incompatible with existing theoretical models of bilingual processing that assume common syntax (Hartsuiker & Bernolet, 2017).

In addition, these results are not consistent with other priming research involving adult bilinguals (Hartsuiker et al., 2004). In contrast to studies involving bilingual adults (Bernolet et al., 2007), the present investigation did not demonstrate a lexical boost effect. The number of actives produced in response to active primes was the same in the passive responses. Although a priming effect was examined through unrelated verb types, this difference was not statistically significant. Table 9 summarizes the overall priming effect in the study's combined analysis in both language directions.

This suggests the prospect of developmental changes in the relationships between generalized syntactic representations and lexical lemmas. It is essential to note that while several priming studies with monolingual and bilingual adults have found evidence of a lexical boost in priming (Branigan et al., 2000; Hartsuiker & Pickering, 2008), research has also demonstrated that the effects of a lexical boost in syntactic priming decay. Reitter et al.'s (2006) model also accounts for the lexical boost effect and its exclusivity to short-term priming. They predicted in their model that the lexical boost impacts all lexical elements, not just heads like verbs and nouns.

Moreover, the priming effects dependent on stimulating these syntactic structures are forceful and long-lasting. Thus, while bilinguals are expected to demonstrate evidence of shared, abstract representations of syntax, whether this is long-term is not fixed. To provide a more delicate knowledge of the nature of syntactic representations in bilinguals, manipulations of lexical entries not only in verb type but to other lexical types are deemed valid.

Presented in Table 7 are the results of the priming effects moderated by the proficiency level of the research subjects with the dependent variable in Study 2 (Cebuano to English). Each proficiency group was tested for its priming effects on the active-passive construction. The A2 (pre-intermediate group) coefficient has an exp(B) of 1.14 and an estimate of 0.132. The odd ratio suggests that the A2 group produced active responses 1.14 times higher than a passive response during the priming experiment. The probabilities for active responses are 53.27% and 46.73%, respectively. The p-value of 0.781 suggests that priming in this language direction for the A2 proficiency level is not statistically significant or that priming does not occur at this level.

Table 7. *Cross-linguistic Structural Priming Effects Moderated by Proficiency Level in Study 2 (Cebuano to English)*

Moderator levels							
Target Language	**L2 Group**	**Contrast**	**Estimate**	**SE**	**exp(B)**	**z**	**p**
Cebuano	A2	Active - Passive	0.132	0.476	1.14	0.278	0.781
	B1	Active - Passive	0.494	0.306	1.64	1.614	0.107
	B2	Active - Passive	0.403	0.300	1.50	1.345	0.179
	C1	Active - Passive	0.252	0.385	1.29	0.655	0.512

Similarly, priming effects were not observed for the other three proficiency groups—B1 (intermediate), B2 (upper-intermediate), and C1 (advanced)—since the p-values were higher than 0.05 alpha level confidence. The B1 (intermediate) proficiency group has an exp(B) of 1.64, or 62.12% likelihood for active responses versus 37.88% likelihood for passive responses. Besides, the B2 (upper-intermediate) proficiency group has an exp(B) of 1.50, or 60.00% likelihood, in the active construction compared to the 40.00% likelihood in the passive construction. Finally, the C1 (advanced) proficiency group has an exp(B) of 1.29, with a 56.33% likelihood for active productions versus a 43.67% likelihood for passive productions.
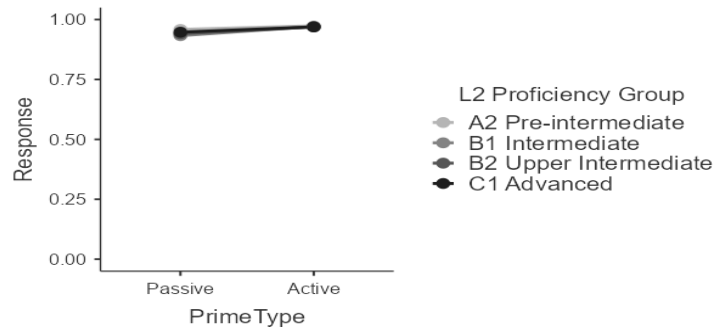
Figure 7. Cross-linguistic Structural Priming Effects Plot Moderated by Proficiency Levels in Study 2

According to the results above, L2 proficiency had no considerable effect on cross-linguistic priming, as was not predicted by this study. All the proficiency groups demonstrated no priming at all in this language direction. Figure 7 shows the slight variation of responses in both prime types and a strong likelihood of active responses. L2 learners with varying skill levels revealed different structural priming effects (Bernolet et al., 2013; Hartsuiker & Bernolet, 2017; Hwang et al., 2018). L2 learners may not establish shared L1-L2 representations until they are proficient. For instance, Hwang et al. (2018) found that Korean learners of English with better English proficiency had increased cross-linguistic structural priming of transitive patterns. Distinct structures may have different shared representation development stages. However, L2 proficiency may affect cross-linguistic structural priming differently depending on how it is measured. This study employed an estimation proficiency test with a relatively small number of items to approximate their language proficiency level. However, cloze tests were used in the study of Hwang et al. (2018), and self-rated L2 proficiency was utilized in Hartsuiker and Bernolet's (2013) study.

Self-rated linguistic skills across modes on a 7-point scale coincide with direct assessments (Lemhöfer & Broersma, 2012). L2 proficiency may affect structural priming from L1-L2 and within L2 (Hartsuiker & Bernolet, 2017). However, other researchers found inconsistent results relative to the role of proficiency level. Kutasi et al. (2018) found a primary effect of Scottish Gaelic proficiency on passive English construction but no priming effect. They suggested a more varied sample to study proficiency's influence in their discussion.

Also consistent with research on cross-linguistic influence is van Dijk and Unsworth's (2022) hypothesis that proficiency differences would explain the diversity in the priming behavior of children bilinguals. This theory is supported by the considerable adverse effects of children's Dutch and Spanish vocabulary scores. Based on an error-based learning theory of priming, bilinguals with poorer language proficiency are anticipated to have less persistent structure representations (Peter et al., 2015). The observation of a negative correlation between priming for proficiency in Spanish and Dutch and priming of ungrammatical structures shows the stability of structural representations in both bilingual children's languages.

4.4 Combined Analysis

Table 8. *Mixed-Effects Logistic Model Results for Cross-Linguistic Priming in Studies 1 and 2*

	X^2	df	p
L2Group	4.643	3.00	0.200
PrimeType	10.749	1.00	0.001
VerbType	17.106	1.00	< .001
TargetLanguage	259.113	1.00	< .001
PrimeType ✳ VerbType	71.776	1.00	< .001
L2Group ✳ PrimeType	0.864	3.00	0.834
PrimeType ✳ TargetLanguage	2.598	1.00	0.107
PrimeType ✳ VerbType ✳ TargetLanguage	11.855	2.00	0.003

To further investigate the results of two-way priming, i.e., whether bilinguals were more likely to demonstrate priming effects in Cebuano or English, a follow-up analysis was performed by combining the responses from Studies 1 and 2. Because samples from

each of these studies were collected separately and participants were not randomly assigned to each experiment, this follow-up analysis is exploratory.

For this analysis, the new variable entered is the target language. A mixed-effects logistic model can determine the likelihood of active responses following active and passive primes by incorporating the variables Prime Type, Verb Type, L2 Group, Target Language, and Participants (as a random factor) and the interaction terms. Table 8 modeled the results showing a significant main effect for prime type (p= .001), verb type (p= .001), and target language (p= .001) but no main effect for the L2 group. There is a two-way interaction effect between the prime type and verb type (p= .001) and a three-way interaction between the prime type, verb type, and target language (p = 0.003). All other interaction terms do not suggest significant effects. These results suggest that irrespective of the response language (Study 1: Cebuano; Study 2: English) and concerning the type of verb used, Cebuano-English bilinguals were more likely to produce active responses following both prime types. Figure 8 shows that Study 1 had variations in their responses, while Study 2 showed the slightest variations.
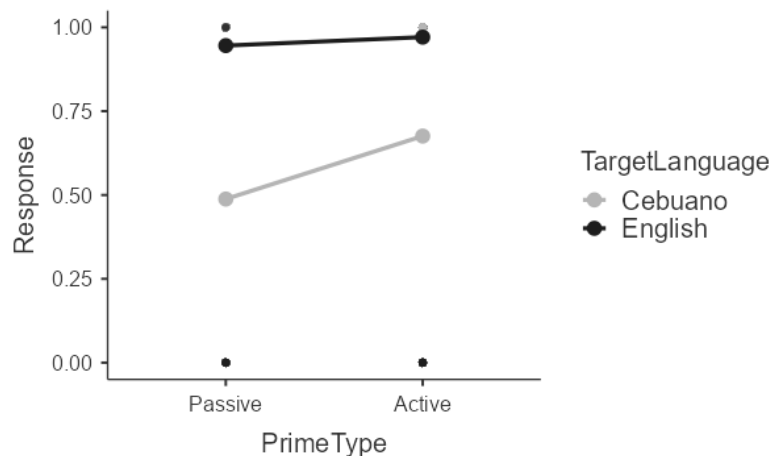
Figure 8. Cross-linguistic Structural Priming Effects Plot in Study 1 (Cebuano) and Study 2 (English)

Summarized in Table 9 is the cross-linguistic priming effect in both target languages. Moreso, the discussion is drawn to the attention of asymmetrical cross-linguistic priming effect from Cebuano to English language direction. Similar surface features in the two languages indicate cross-linguistic structural priming, as demonstrated by Bock. Due to likenesses between English and Spanish passive constructs, Pickering and Ferreira argued that Spanish-English bilinguals might have a similar passive structure. For example, a bilingual speaker of English and Spanish is conscious that both languages have a passive form. However, they may have only one knowledge repository underpinning the passive structure, which they use to create passive sentences in both languages.

Table 9. *Cross-linguistic Structural Priming Effects in Both Target Languages*

Moderator levels						
Target Language	Contrast	Estimate	SE	exp(B)	z	p
Cebuano	Active - Passive	0.800	0.166	2.23	4.81	< .001
English	Active - Passive	0.320	0.274	1.38	1.17	0.242

Note: Simple effects are estimated, keeping constant other independent variables (s) in the model.

However, some data contradicts this analysis. Bernolet et al. (2007) discovered priming with complex noun phrases by examining Dutch-English bilinguals. They discovered a priming effect in Dutch (L1) and then in English (L2), but none in either direction across languages. They established that this absence of priming may have occurred because the Dutch language flips the position of the adjective and verb. Additionally, they tested Dutch and German, two languages with exact word order, and discovered priming from German to Dutch.

The absence of priming is due to changes in word order between languages. Dutch and German position the adjective between the relative pronoun and the verb of the relative phrase. In English, the adjective is inserted behind the relative sentence. Dutch and German share identical word order for adjective-noun phrases, although Dutch and English do not share the same word constituency for noun phrases with relative clause structures.

As in the case of Cebuano, the language is highly dependent on verbal affixes to know the complementation of the verb. The constituent orders of Cebuano are different from English. Cebuano follows the VSO, while English has the standard SVO pattern. The voice system of the Cebuano language is beyond complex than the dual active-passive alternation in English. For instance, when one of the complements is selected as the verb's subject, the particle introducing the complement is replaced with 'ang' or 'si,' or the entire phrase is replaced with a suitable pronoun. The function of the topic (actor, goal, referent, beneficiary, location, instrument) is marked in the verb by the complement connection to the verb. These verbal indicators are known as focus markers or voice markers (Bunye & Yap, 1971).

Given the degree of grammatical disparities within a language expressed collectively, Pickering and Ferreira (2008) postulated that bilinguals share as much grammar knowledge as possible. Although syntactic priming has been applied to typologically comparable languages, the effect of word-order changes has not yet been established in the literature. As in the study of Bernolet et al. (2007), languages that share the same word order for particular structures demonstrate a priming effect, but languages that do not share the same word order do not. However, it is essential to determine if the priming effect directly results from word order similarities or high proficiency. Structural priming studies with typologically related languages have supported the shared syntax account. Nevertheless, cross-language structural priming has failed to produce a priming impact in typologically distinct languages. According to Pickering and Ferreira (2008), typologically distinct languages are unlikely to share structures.

In contrast, the shared syntax hypothesis posits that multiple languages have a common syntactic framework. Previously, syntactic priming research demonstrated that syntactic information is typically shared between typologically related languages. Therefore, bilinguals of typologically comparable languages have a typological advantage due to shared syntax (i.e., Spanish-French, English-Spanish, English-French, French-Italian). However, bilingualism can occur in any language. If the hypothetical shared-syntax cannot account for typologically distinct languages, observing the brain changes of bilinguals who speak typologically divergent languages will be fascinating (Kutlu, 2015).

Cross-linguistic priming occurs when the grammatical qualities of the structural pattern in the originating language and the targeted language are closely linked in terms of function, word order, and other conceptual and surface-level characteristics (Legendre et al., 2013). However, the structural interference observed during bilingual development shows that structures exclusive to one language may be expressed in a manner independent of language. If this is true, then constructions unique to one language should still be usable in the other. This would result in structural interference priming, from a grammatical speech in the source language to an ungrammatical utterance in the target language, as opposed to classical priming, which occurs between grammatical utterances. However, interferences were minimally observed in the production of active-passive alternations in the study since the other constructions were just a few.

Lexical data, such as phonological, orthographic, and semantic representations, are retrieved using the mental lexicon (Dijkstra, 2005). Assuming concurrent coactivation of L1 and L2, research on bilingual lexical processing has shown that those retrieval mechanisms are language nonselective (Kroll et al., 2014). The Revised Hierarchical Model (RHM), developed by Kroll and Stewart and used to demonstrate language development among bilingual speakers, also incorporates this nonselective perspective of language. The RHM proposes that while a conceptual store is shared, lexical information is represented uniquely for each language. More specifically, it describes the access to the conceptual system through conceptual linkages and the intercession between L1 and L2 word structures through lexical connections. Conceptual representations are opened directly in the L1 and obtained through the L1 translation-equivalent in the L2.

Additionally, according to the RHM, there is a poor relationship between L1 and L2 at the lexical level but a high connection between L2 and L1 in the other way (Kroll & Stewart, 1994). The justification for this is that when learning a second language, it is thought that people often translate newly learned words into their original tongue to access the word's notion and, thus, a memory aid. Translating from the first language into the second is less frequent. However, the word-to-concept linkages between L2 languages become stronger as a speaker's proficiency increases. Therefore, L2 competence significantly impacts how strong lexical and conceptual linkages are. Studies with adults (Kroll et al., 2002) and children have verified the RHM's premises (Poarch et al., 2015).

Keatley et al. (1994) have also developed a description of the asymmetry in cross-linguistic priming applied in L2 representation. In order to learn and store the meaning of a new word during L2 acquisition, information from the L1 language system may be copied or transferred to the new L2 language system, at least in part. The L2 representation would primarily contain only a segment of this information, controlled by the different linguistic networks of the L2 store and, over time, by the various experiences of the bilinguals in L2 contexts. The L1 representation would include multiple L1-specific encodings of experiences with the word, including rich connections within and across memory systems. Even in proficient bilinguals, overall L1 representations would have stronger links across memory systems than L2 representations.

Bernolet & Hartsuiker (2018) made a few specific assertions using their shared syntax developmental model on the growth of L2 syntactic structures in late L2 learners. They presume that, in contrast to syntactic acquisition in L1, L2 acquisition in late learners starts with understanding lexical representations without solid linkages to abstract syntactic information. With more expertise, these item-specific lexical representations become more abstract, involving word-to-word abstraction within the L2 and, eventually, language-to-language abstraction. Thus, L2 representations gradually integrate with existing L1 representations as learning progresses. As a result, syntactic processing and production in the L2 resemble those in the L1 more and more as learners advance in proficiency. They also anticipated that L1 influences on syntactic production and processing in the L2 would happen at two different stages of the L2's syntactic development: the initial stage, when the L2's novel syntactic structures are first encountered, and the final stage, when the L1 and L2's shared syntactic structures are fully developed.

Finally, the account supporting the cross-linguistic priming of English to Cebuano language direction can be attributed to the shared-syntax model, as Bernolet & Hartsuiker (2018) advanced that there is a shared lexical and structural system in the priming condition. However, it is interesting to note the no priming effects in the direction of Cebuano to English direction with proficiency level as insignificant in the priming process. The result was explained above attributed to constituent order difference and gleaning from the Revised Hierarchical Model (Kroll & Stewart, 1994), which explains the priming results in this study's two experimentations. This inquiry is an antithesis to the current model of structural priming since it both supports and debunks its postulations relative to the study outcomes.

5. Conclusion and Recommendations

The research subjects formed target constructions in the active-passive syntactic category in each cross-language experiment. Study 1 (English to Cebuano) analyzed 1,183 responses—active and passive sentences. The proportion of active sentences generated by active primes was more significant than that of passive sentences generated by passive primes. In contrast, Study 2 (Cebuano to English) yielded 1,192 responses of the same response structures. The proportion of active sentences generated after active primes was much higher than that of passive sentences generated after passive primes. Other constructions not falling in the active-passive structure were omitted in the analysis of results.

Innovative discoveries in numerous areas of cross-linguistic priming, experimental and corpus-based approaches, distinct linguistic structures, and bilingual speakers of multiple languages all contribute to developing a more robust explanation of shared-syntax theory. Cross-linguistic priming uniquely reflects the dynamics of bilingual language usage, illuminating the relationship between cognitive mechanisms, learning processes, and communicative pressures in bilinguals' spontaneous speech. Theories that conceptualize L1-L2 as creating and developing nodes and connections imply that equal importance is attached not only to how L1 and L2 are connected.

Nevertheless, given that both language structures may be comparable or contrastive, how the language system determines links among nodes and how cognitive mechanisms select specific nodes or the nature of syntactic choices are the thrust of future studies. Besides, L2 proficiency, as a modulating factor, is complex and requires accurate, independent measures. Theorists and linguists in this psycholinguistic research must continue investigating relationships among language use, cognitive processing, and proficiency. Creating a universal model of cross-lingual structural and dimensional sharing of lexical representations and grammar is crucial to understanding language development and use.

The responses in the two experiments were analyzed according to the objectives and predictions of this study using the generalized mixed model advanced statistical analysis. Study 1 (English to Cebuano) showed cross-linguistic priming with a p-value of <.001. Lexical boost effects were also observed in this study since both verb types (translation-equivalent, unrelated) specified significant impact in the priming paradigm. As was predicted, L2 proficiency was also revealed as a moderating factor in the priming effects. Study 2 (Cebuano to English) showed no cross-linguistic priming in the other language direction since the p-value was very high at 0.242. It did not hold in predicting the lexical boost effect since the unrelated verb types showed a primary effect over the translation-equivalent verb types.

As applied in actual linguistic use and productions, evidence-based teaching approaches are one area of inquiry in L2 research that is expanding to comprehend the pathways and rates of L2 acquisition and the amount to which various settings, contexts, and factors influence learning. Using patterns of L1 usage as a pedagogical tool contributes significantly to bilingual education in the country. Observations about cross-linguistic influence and L2 learning of whether the exact mechanisms are used in L1 and L2 learning are good driving forces for understanding language acquisition. Consequently, educators informed by cross-linguistic influence begin addressing L2 acquisition issues.

Importantly, to enhance L2 learning, educators may consider changing pedagogical strategies that are adaptive to learners' past linguistic knowledge and experiences since instruction is attentive to how learners' use of their existing known languages can

influence new language acquisition. Encouraging learners to pay attention to similarities and differences between their L1 and L2 or sensitivity to distinctions between L1 and L2, followed by a series of practice sets, is a crucial teaching strategy for developing better L2 skills. Besides, schools should also reconstruct strict policies of monolingual use of one language (i.e., English only) over the other during productions is needed. It may no longer be appropriate because this study found some cross-linguistic influence in both languages (English and Cebuano). Code-blending, code-switching, and translational activities may increase the chances of immediate L2 acquisition.

According to the shared-syntax theory recommended by Hartsuiker et al., bilinguals share syntactic representations across languages whenever these representations are sufficiently comparable. Theoretically, this study adheres to Hartsuiker and Bernolet's developmental model of the bilingual acquisition of common lexical and syntactic structures. The objective of the framework established by the two scholars is a fully integrated system with shared syntactic representations for L1 and L2. While one language direction (Study 1: English to Cebuano) showed a cross-linguistic substantial priming effect, the other direction failed to observe this effect.

With this, it cannot be accounted for in the theory used in this study. Constituent word order differences or dissimilar transitive constructions or processes, such as the passivization of the Cebuano language, were seen as the potential factor in the result of this study. However, a seminal theory in bilingualism emerged to reflect the result of this study, the Revised Hierarchical Model, suggesting the strong link between L2 to L1 and L1 to L2. Finally, it can be speculated that the two languages understudied, Cebuano and English, have not reached syntax abstraction and supports the view that bilingual speakers only partially share the syntax of both languages.

Future investigations on cross-linguistic structural priming could gain from a longitudinal study since this study only considered cross-sectional data. A longitudinal study would allow future researchers to determine whether and when syntactic representations are lexically based and the developmental routes leading to shared-syntax in bilingual speakers. The study only examined cross-linguistic priming using one syntactic structure, the transitive language form (active, passive), because it is present in English and Cebuano. Future studies must consider a thicker range of syntactic structures comparable in both syntax systems to build or reinforce the concept of abstraction and representation of languages. These research efforts will help direct the correction and assimilation of language development and processing models, accounting for monolinguals and bilinguals.

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