Peer-Review
Kusano, Koko. 2025. “Is Syntax Innate or Acquired: A Comparison between Japanese and English Speakers’ Ability to Learn Turkish and Mandarin Syntax.” *Journal of High School Science* 9 (3): 14–49. https://doi.org/10.64336/001c.141847.

I am not sure as to whether the experiment tests the premise of the manuscript. It seems to me that what is being tested is pattern recognition, rather than syntax. It is relatively easy for a respondant to form a pattern such as “if Turkish, then “gift Mary from” is correct, while “gift from Mary” is not. Conversely with Mandarin.
Syntax is more than just the order of words, it is also how those words are combined together to produce ‘well formed’ sentences. For example, " Pattern recognition is the same as syntax” and “pattern recognition and syntax are the same” still needs proper propositions, and methodology (dative, declarative…), tense, mood, noun, adjective…. etc. These are not tested in your experiment.
A well written computer code could ‘learn’ syntax based on your experiment. That should not be the case.
If you can provide me with a rebuttal on my assessment (and present it in the manuscript as well), with references, I will be happy to review the manuscript further.

Dear Reviewer,
Thank you for your thoughtful and constructive feedback on my manuscript, “Is Syntax Innate or Acquired: A Comparison between Japanese and English speakers’ Ability to Learn Turkish and Mandarin Syntax.” I appreciate your careful reading and consideration for publication in *JHSS*. I have now had the opportunity to revise the manuscript in response to your comments. Below are point-by-point responses (in bold). All revisions in the manuscript have been highlighted in yellow.

Reviewer #1

I am not sure as to whether the experiment tests the premise of the manuscript. It seems to me that what is being tested is pattern recognition, rather than syntax. It is relatively easy for a respondant to form a pattern such as “if Turkish, then “gift Mary from” is correct, while “gift from Mary” is not. Conversely with Mandarin. Syntax is more than just the order of words, it is also how those words are combined together to produce ‘well formed’ sentences. For example, "Pattern recognition is the same as syntax” and “pattern recognition and syntax are the same” still needs proper propositions, and methodology (dative, declarative…), tense, mood, noun, adjective…. etc. These are not tested in your experiment. A well written computer code could ‘learn’ syntax based on your experiment. That should not be the case. If you can provide me with a rebuttal on my assessment (and present it in the manuscript as well), with references, I will be happy to review the manuscript further.

I appreciate the Reviewer’s assessment for raising this important point regarding the distinction between pattern recognition and syntactic competence. I appreciate the opportunity to address the feedback.

R1.1
It seems to me that what is being tested is pattern recognition, rather than syntax.

Thank you for raising this concern. I agree that "syntax" can be defined in multiple ways, and I acknowledge that my original manuscript did not adequately specify the theoretical framework of syntax I adopted in my experiment. In the revised manuscript, I have clarified that the study adopts Chomsky's theory of *Universal Grammar* (UG), which defines syntax as an innate system governing word order independent of semantics.

This definition is now explicitly stated in the Introduction (p.3):

> Chomsky's UG theory states that [...] grammar is not derived from semantics. To illustrate this, Chomsky contrasts the nonsensical sentences "Colorless green ideas sleep furiously" and "Furiously sleep ideas green colorless," pointing out that any speaker of English will recognize that only the former is grammatical (4). This suggests that syntax is a cognitive system independent of the meaning of words we acquire throughexperience, rooted instead in innate mechanisms that allow us to intuitively differentiate between correct and incorrect word order.

Within this framework, syntax is *just the order of words,* **regardless of whether** *those words are combined together to produce 'well formed' sentences***. Within this framework, sensitivity to word order alone can serve as a valid proxy for syntactic learning. This approach is consistent with prior research in artificial grammar learning (e.g. Lelekov-Boissard and Dominey, 2002; Westphal-Fitch et al., 2018), which isolates rules-based structure from** *proper propositions, and methodology (dative, declarative…), tense, mood, noun, adjective* **to examine syntactic acquisition mechanisms.**

I have now clarified this definition and rationale in the revised manuscript, particularly in the Abstract and Materials & Methods.

My Abstract (p. 1) now reads:

> Specifically, our study compares Japanese and English speakers' ability to learn Turkish and Mandarin syntax, in concordance with previous studies that used word order as a proxy for syntax.

My Materials & Methods section (p. 8) now reads:

> In our study, we aim to provide additional insights into the ongoing discussion surrounding syntax acquisition. We frame our definition of syntax around Chomsky's *UG* theory, which states that syntax is independent of semantics, solely dependent on the identification and internalization of regularities in word order.
>
> This framework of syntax stands true in experiments involving the probing of syntactic knowledge using artificial grammar, which refers to any form of rules-based structures that are not restricted to the domain of natural languages. For example, Lelekov-Boissard and Dominey (2002) found that linguistic syntactic structure and non-linguistic abstract structure (i.e., artificial grammar) are similar at the neurological level (16). When participants processed the non-linguistic abstract structure — sequences of colored geometric figures — the brain exhibited a late positivity of approximately 500 milliseconds, measured using the event related potential (ERP) which are neurophysiological signals that allow for the analysis of the timing of various cognitive processes (17). This brain response

> is typically observed with linguistic syntactic processing. The study's findings suggest that similar brain mechanisms are involved in processing any form of rules governing structures. Our cognition is predisposed to handle syntax in natural languages similar to how they handle other rules-based structures, which are, in turn, independent of features associated with natural languages such as propositions, methodology, tense, and mood. Likewise, Westphal-Fitch et al.'s (2018)study demonstrates that humans can acquire and generalize abstract rule systems in the visual domain not specific to any language without relying on meaning, using artificial grammars that include hierarchical structure (18). Operationalizing syntax through word order patterns is thus consistent with existing studies on syntactic learning. For this reason, our study focuses on testing participants' sensitivity to word order.

I hope this clarifies the theoretical stance taken in my experiment and demonstrates that the methodology aligns with prior research on rule-based (rather than merely associative) syntactic learning.

R1.2

It is relatively easy for a respondant to form a pattern such as "if Turkish, then "gift Mary from" is correct, while "gift from Mary" is not. Conversely with Mandarin.

I respectfully disagree with this assessment. As shown in the Results section, many participants struggled to generalize the patterns correctly, particularly when applying them to novel sentences.

This is now emphasized in the Discussion (p. 22-23):

> Our participants' performance on novel test sentences in the testing phase did reflect that only about a quarter (26.87%) and less than half (38.81%) got all questions correct for Turkish and Mandarin respectively (*Figures 24* and *25*). Many participants struggled to generalize the patterns productively to new utterances with new contexts. This suggests that syntax, even narrowly defined as pattern recognition, presents a genuine learning challenge. It taps into syntactic competence, not just rote pattern recognition.

R1.3

Syntax is more than just the order of words, it is also how those words are combined together to produce 'well formed' sentences. For example, " Pattern recognition is the same as syntax" and "pattern recognition and syntax are the same" still needs proper propositions, and methodology (dative, declarative…), tense, mood, noun, adjective…. etc. These are not tested in your experiment.

I acknowledge the limitations of my experiment that lie in competing definitions of syntax as *more than just the order of words, [but also] how those words are combined together to produce 'well-formed' sentences***. While our study isolates word order as a proxy for syntax, we recognize alternative frameworks such as Pinker's semantic theory (1984), which posit that semantic understanding plays a central role in syntactic acquisition.**

This limitation is now discussed in detail in the Materials & Methods (p. 8-9) and Discussion (p. 22).

My <u>Materials & Methods (p. 8-9)</u> now reads:

Nevertheless, we recognize there are competing theoretical frameworks of syntax. Today, a commonly accepted theory for syntax is Pinker's (1984) semantic theory (19). This theory contradicts Chomsky's *UG* theory, postulating that the understanding of semantics is what underlies our understanding of syntax. Pinker's theory explains that our instinctive distinction between the entities of an object, place, time, event, proposition, etc. is what allows us to efficiently adopt the syntactic structure of our target language when exposed to it:

> According to the bootstrapping proposal, the child not only has innate syntactic categories, but also has innate semantic flags for them. Thus, there is an innate default assignment of words for objects to the noun class, of actions and changes of state to the verb class, of agents to subject, etc. These assignments enable the child to recognize instances of the syntactic categories in the input before having acquired any syntactic rules of the target language (19).

Such an alternative framework of syntax is evident in neurophysiological findings. Neurological evidence from lesion studies on syntax in patients with agrammatic Broca's aphasia suggests that syntax is a combination of the left cerebral hemisphere (word order) and Broca's area (semantics under word order). Grodzinsky (2000) shares that the "combinatorial aspects of the language faculty reside in the human left cerebral hemisphere, but only the transformational component (or algorithms that implement it in use) is located in and around Broca's area (20)." There are specific brain regions and activity associated with distinct functions — word order recognition and semantics — involved in syntactic processing. Using synthetic brain imaging techniques, Cangelosi and Parisi (2004) present:

> In the computational model, nouns produce more neural activity in the sensory processing layer, while verbs produce more synaptic activity in the layer where sensory information is integrated with proprioceptive input to plan the action. In the human brain, nouns activate more the (posterior) areas of the brain related to sensory and associative processing, while verbs activate more the (anterior) motor areas (21, 22).

Consequently, it is arguable that syntactic learning not only involves pattern recognition, but also meaning making.

My <u>Discussion (p. 22)</u> now reads:

As raised previously in the Materials & Methods section, it is also of contentious debate whether syntax can be defined purely as the order of words. In accordance with Pinker's semantic theory (5) and other neurophysiological evidence, it is arguable that syntax is more than just the order of words, but also a combination of semantics and meaning making.

Despite these considerations, I chose Chomsky's UG framework because it allows us to isolate syntax from semantic confounds and test our core hypothesis about innate syntacticmechanisms. Within this framework, we chose to use natural languages rather than artificial ones to increase ecological validity and maintain relevance for theories beyond UG.

My <u>Materials & Methods (p. 9)</u> now reads:

In spite of these limitations, we chose to implement Chomsky's *UG* theory in our study, in light of his resolute stance on syntax as an innate mechanism, which we viewed as directly relevant to the objectives of our study. While syntax does involve more than just word order, isolating word order controls for semantic confounds and allows for clearer hypothesis testing.

My <u>Discussion section (p. 22-23)</u> now reads:

However, we reiterate that our experiment framed the definition of syntax around Chomsky's *UG* theory and other experiments on artificial grammar, in light of his resolute stance on syntax as an innate mechanism, which we viewed as directly relevant to the objectives of our study. After all, pattern recognition is a valid premise for assessing levels of syntactic learning. Our participants' performance on novel test sentences in the testing phase did reflect that only about a quarter (26.87%) and less than half (38.81%) got all questions correct for Turkish and Mandarin respectively (*Figures 24* and *25*). A considerable number of participants did struggle to apply the new syntax, based on Chomsky's definition, productively to new utterances with new contexts.

Regardless, it is important to acknowledge that a possible improvement of our study may have been to use an artificial language to test syntax acquisition, if we were to frame our definition of syntax around Chomsky's theory. Testing for syntax alone is difficult in natural language, as other language factors — such as lexis, tone, and discourse — may act as confounding variables. However, the goal of this study was to draw conclusions about syntax acquisition while maintaining strong ecological validity. In addition, we see our use of natural instead of artificial language as favorable, as it does not detract from alternative definitions of syntax. Our use of natural language is our way of recognizing other frameworks of syntax not limited to just the order of words. It may be interesting in a future study to investigate a different definition of syntax, and see how results compare.

This balanced approach addresses your invaluable concern while justifying our methodological and theoretical choices.

Thank you for addressing my comments. The paper is much improved from the earlier version. I have some final formatting/ language comments and one methodology comment that needs to be addressed.

1.write the manuscript in past perfect tense, third-person, whereever possible. For example, replace "….we will conduct a literature review…." should be written as "….a literature review was conducted…." etc. Replace everywhere in the manuscript, except in places where it does not make sense; i.e. while discussing prior research etc.

2.Please submit each figure individually as a JPEG file of sufficient resolution. DO NOT include legends in the individual figures.

3.You state that "….They were not able to continue editing their responses if they exceeded 24 hours from the start of the task…." Which means they could have completed the task intermittently. This then puts the entire premise of 'clicks', 'time taken to finish' etc. in question. Explain how exactly the task would be timed if participants could complete it (and edit it) in 24 hours. I am not sure I understand the time mechanics of this experiment.

Dear Reviewer,

I am thankful for the opportunity to submit a second revision of my manuscript, "Is Syntax Innate or Acquired: A Comparison between Japanese and English speakers' Ability to Learn Turkish and Mandarin Syntax." I appreciate that you thought the manuscript carefully addressed many of the comments and concerns of the last revision and was generally greatly improved.

I have now had the opportunity to revise the manuscript in light of your most recent comments and suggestions. Below are point-by-point responses (in bold) to all Reviewer comments. All changes in the manuscript have been highlighted in yellow.

Reviewer #1

Thank you for addressing my comments. The paper is much improved from the earlier version. I have some final formatting/language comments and one methodology comment that needs to be addressed.

1. write the manuscript in past perfect tense, third-person, whereever possible. For example, replace "….we will conduct a literature review…." should be written as "….a literature review was conducted…." etc. Replace everywhere in the manuscript, except in places where it does not make sense; i.e. while discussing prior research etc.
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I appreciate both the Reviewer's assessment that the paper has improved and the opportunity to address the finer details of this paper.

R1.1

1. *write the manuscript in past perfect tense, third-person, whereever possible. For example, replace "….we will conduct a literature review…." should be written as "….a literature review as conducted…." etc. Replace everywhere in the manuscript, except in places where it does not make sense; i.e. while discussing prior research etc.*

I have replaced the manuscript to replace first-person, present perfect, and continuous tense constructions with past perfect, third-person phrasing where I deemed appropriate. Below are selected excerpts where I made such adjustments. My Abstract (p. 1) now reads:

> If language were never taught to a person, would they produce their own? Further, would they reproduce the language that they had never been taught? Goldin-Meadow et al. (2010) found that children born into linguistic isolation produced similar syntactic structures in their language. Amongst the nature-versus-nurture debate on language learning is henceforth the question that has been a longstanding debate among linguists: is syntax innate or acquired? While linguist Noam Chomsky argues in favor of the former as in his theory of the *Universal Grammar (UG)*, Geoffrey Sampson and Jeffrey Elman support the latter. In this paper, a literature review was conducted on a series of theories and studies, consisting of both behavioral and neurophysiological evidence that have contributed to the ongoing discussion on syntax. A novel experimental design was then introduced, which offers new insights into this debate.
>
> Specifically, this study compared Japanese and English speakers' ability to learn Turkish and Mandarin syntax, in concordance with previous studies that used word order as a proxy for syntax. If syntax is innate, both groups should have performed similarly. If

syntax is acquired, Japanese speakers should have performed better in learning Turkish, and English speakers in Mandarin, due to syntactic similarities. The findings supported both hypotheses: both groups performed better with Mandarin, suggesting that syntax may be innate and that there could be an inherent preference for certain syntactic structures — specifically, subject-verb-object (SVO) syntax over subject-object-verb (SOV) syntax. Conversely, the results also suggested that syntax may also be acquired. Japanese speakers learned Turkish better, whereas English speakers learned Mandarin better. Furthermore, with increased exposure to a greater variety of syntactic structures participants performed better. From these findings, it was concluded that both nature and nurture play an equally influential role in shaping syntactic use.

My <u>Materials and Methods (p. 8-10)</u> now reads:

This study aimed to provide additional insights into the ongoing discussion surrounding syntax acquisition. The definition of syntax was framed around Chomsky's *UG* theory, which states that syntax is independent of semantics, solely dependent on the identification and internalization of regularities in word order.

[...]

Consequently, it is arguable that syntactic learning not only involves pattern recognition, but also meaning making. In spite of these limitations, this study chose to implement Chomsky's *UG* theory, in light of his resolute stance on syntax as an innate mechanism, which was viewed as directly relevant to the objectives of this study. While syntax does involve more than just word order, isolating word order controls for semantic confounds and allows for clearer hypothesis testing.

Specifically, this study compared the learning abilities of Japanese and English speakers in acquiring the syntactic structures of Turkish and Mandarin. According to Dryer's classification of syntactic categories based on the order of subject, verb, and object (23), Japanese and Turkish share a similar syntactic structure with a subject-object-verb (SOV) word order, whereas English and Mandarin follow a subject-verb-object (SVO) order. In line with the acquired syntax theory, this study predicted that there would be differences in how Japanese and English speakers acquire the syntax of Turkish and Mandarin. In line with the innate syntax theory, this study predicted that the learning of these languages would be similar across all speakers, regardless of the syntactic structures of their native language.

Unlike most studies on syntax acquisition that primarily focus on children, this study also examined adults. The goal was to uncover patterns and tendencies in language acquisition across all age groups, providing an uncondensed view of how nativism versus empiricism shapes syntax acquisition throughout life. In addition, using natural languages such as Turkish and Mandarin enhanced the ecological validity of the findings. While most studies grounded in Chomsky's theoretical framework of syntax have employed artificial grammars, the use of natural languages offered insights into syntax acquisition tendencies of typical speakers who had been taught explicit syntactic rules in their native language (Japanese and/or English).

R1.2

2. *Please submit each figure individually as a JPEG file of sufficient resolution. DO NOT include legends in the individual figures.*

I have submitted each figure accordingly.

R1.3

3. *You state that "….They were not able to continue editing their responses if they exceeded 24 hours from the start of the task…." Which means they could have completed the task intermittently. This then puts the entire premise of 'clicks', 'time taken to finish' etc. in question. Explain how exactly the task would be timed if participants could complete it (and edit it) in 24 hours. I am not sure I understand the time mechanics of this experiment.*

Thank you for highlighting this methodological concern. I acknowledge that I had not clearly articulated the mechanics of time tracking in the previous versions of my manuscript. Although participants were instructed to complete the task in one sitting, the survey platform (Qualtrics) was set to a 24-hour submission window, which means *they could have completed the task intermittently***. I recognize this as a limitation, one that I realized only after data collection. It was only later that I realized there had been a setting on Qualtrics that made it possible to set the task to 1 or 4 hours instead of 24. I have now laid this out transparently as a limitation in the Evaluation section of the Discussion.**

My Evaluation section of the Discussion (p. 22-23) now reads:

> Another plausible confounding variable is the lack of standardization in the time participants took to complete the questionnaire. Although they were encouraged to complete the task in one sitting, they were technically given up to 24 hours to submit their responses. This means that some participants may have completed the task intermittently, which could have undermined the accuracy of the metrics such as "click count" and "duration." This limitation was only realized after data collection had concluded, despite the availability of settings in Qualtrics that allowed for the response window to be shortened to 1 or 4 hours.
>
> This limitation was acknowledged during data analysis. To account for abnormal completion patterns and potential interruptions, outliers in response time were identified and excluded using the IQR method, as indicated in *Figures 6* and *12*. Nonetheless, future implementations of this study should enforce stricter completion windows and activity tracking features for stronger validity.

To account for this limitation, I applied the Interquartile Range (IQR) method to identify and exclude outliers in response time. I did not explicitly note this in the previous versions of my manuscript, so I have now stated this explicitly in the Results.

My Results (p. 14-15) now reads:

> **1) Mandarin was learned better than Turkish.**
> In Phase 1, participants in the experimental group excluding outliers determined by the Interquartile Range (IQR) method (Turkish: 128.234s, 138.602s, 1766.145s, 162.458s, 125.681s, 118.813s, 225.712s; Mandarin: 67.113s, 93.433s, 61.807s, 61.411s, 91.722s, 80.654s) learned Mandarin significantly faster than Turkish (*Figure 6*). A paired t-test indicated that, on average, participants took 27.25 seconds less to learn Mandarin than Turkish (p-value = 2.449e-14). A similar trend was observed in the control groups, where participants also learned Mandarin faster than Turkish (*Figure 7*). Although a paired t-test could not be conducted on the "Turkish" control group (i.e., familiar or somewhat familiar with Turkish but not Mandarin) due to the small number of participants in this

group, this trend was observed by performing paired t-tests on other control groups. Specifically, the "Mandarin" control group (i.e., familiar or somewhat familiar with Mandarin but not Turkish) took 33.28 seconds less to learn Mandarin than Turkish (p-value = 1.691e-07). However, in the "Both" control group (i.e., familiar or somewhat familiar with both Mandarin and Turkish), participants took 13.67 seconds less to learn Mandarin than Turkish, though this difference was not statistically significant (p-value = 0.2231).

[...]

A t-test showed that, on average, participants in the experimental group excluding outliers determined by the IQR method (Turkish: 40.847s, 32.246s, 28.181s, 39.576s; Mandarin: 26.195s, 21.339s) spent 4.16 seconds longer on Turkish (p-value = 1.323e-10) (*Figure 12*). The control group took less time completing Phase 2 for the language they were familiar with (*Figure 13*). A paired t-test on the *Mandarin* control group revealed they completed Phase 2 5.75 seconds faster for Mandarin than for Turkish (p-value = 4.952e-05). In the *Both* control group, the difference was not statistically significant (p-value = 0.3153).

I appreciate your thoughtful review and the opportunity to strengthen this paper. Hopefully, this paper now addresses all of your concerns and suggestions.

Thank you for addressing my comments. Accepted with conditions:

1.In the References section of the manuscript, please list all the authors. If more than 6, list the first 6 followed by an et al. If < 6, list all the authors. Please generate a SEPARATE file for this and submit it; DO NOT make alterations to the attached document.

2.Please check the attached file carefully, since we have modified some content to better communicate ideas. If you disagree with any of the changes, please state in a separate file.

3.Check if you have designated various age groups with letters the first time you have introduced them in the text. If not, let us know which letters go with which age group.

4.If you have not already done so, please provide us with the assessment questions (any other questionnaires) and any supporting documents so that we can include them as supplementary files upon publication.

5.If you would like to use an image for your publication, provide us with one (needs to be copyright free). We may or may not use it in the final display.