Sleep, Lexicon, and Morphosyntax in L2 Spanish Acquisition

Research Thesis

Presented in partial fulfillment of the requirements for graduation *with Research Distinction* in Spanish in the undergraduate colleges of The Ohio State University

by

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Introduction

This study focuses on the effects of sleep on L2 Spanish as manifested in the lexicon and morphosyntax of university students. This study is relevant to all second language learning environments, specifically Spanish classrooms.

Description of the Phenomenon

Research indicates that, internationally, students are not sleeping enough, and North American students were reported to sleep the least (Gradisar, Gardner & Dohnt, 2011). The sleep foundation advises that young adults (18-25 years old) get seven to nine hours of sleep per night for proper healthy functioning (Suni, 2022). However, studies show that over half of college students get less than seven hours of sleep per night (Harvard, 2021). Additionally, the percentage of adults who reported to have short sleep duration (less than seven hours of sleep per 24-hours) were the highest in the southeastern U.S. in states like Ohio and Michigan (CDC, 2022). The lack of proper sleep is especially concerning among the population of university students in foreign language courses as existing research points to a relationship between sleep quantity and second language learning outcomes (e.g., Koninck et al. 1990; Sicard & de Bot 2013; MacDonald 2015; Kim & Fenn 2020). The present study is the first to look at this in Spanish L2, and at the specific subdomains of morphosyntax and lexicon. Additionally, past research on sleep and L2 languages has utilized either highly-labor intensive measures for sleep, e.g., electroencephalography (e.g., De Koninck et al. 1989), or very simplistic ones, e.g., simply asking how many hours a student had slept the previous night (e.g., MacDonald 2015.) In contrast, this study utilizes the Pittsburgh Sleep Quality Index -a measure widely used in sleep

research- to examine the relationship between sleep quantity and quality with executive function (Buysse et al., 1988).

Sleep and cognitive retention

Guzmán (1992)

In 1992, Eugenia Guzmán completed a comprehensive review of the scientific literature on sleep and learning at the time. In different sections, Guzmán summarized the pathways of research surrounding the biological functions of sleep. Guzmán starts with an overview of sleep neurophysiology and the possible role of the rapid eye movement (REM) stage of sleep in learning. She then continues on to delve deeper into electroencephalographic (EEG) changes in sleep during learning, and then finishes with an exploration on the learning effects of deprivation of certain sleep stages. To initiate the summary of the scientific literature, Guzmán cites Jenkins and Dallenbach's (1924) study that observed that college students had greater retention when they were allowed to sleep between the learning and rest intervals as opposed to remaining awake and active. This discovery can be described by the idea of sleep allowing for memory consolidation processes to take place. The literature review describes how the association between sleep and memory consolidation is hypothesized to be linked directly to the relationship between the hippocampus and the locus coeruleus. This is attributed to Hobson's finding that the hippocampus generates a hippocampal theta rhythm when its attention is directed at a specific stimulus. The hippocampal theta rhythm is proportional to the amount of useful information to be learned and diminishes when the stimulus is already known. This connects back to sleep in how the hippocampal theta also has significant flare-ups during REM sleep. Therefore, due to the information and memory consolidation processes taking place during sleep, we can hypothesize

that our study will similarly show greater retention with higher sleep quantities. In our area of interest, Spanish second language acquisition, this might be seen as a direct relationship between language proficiency scores and quality and quantity of sleep.

EEG changes have been demonstrated by various studies to indicate this relationship between sleep and learning. Summarizing the findings of two French studies, Guzmán states that a significant increase in REM percentage occurs in the nights following complex and "significant" learning. This conclusion is observed in the literature for both animal and human subjects. In Leconte et al.'s 1973 experiment using rat test subjects, the number of correct answers was directly related to an increase in REM sleep. This finding is consistent with the observation of De Koninck in humans of a significant positive correlation between language learning progress and increases in the percentage of REM sleep, specifically, efficient language learners exhibited an increase in REM percentage during a French-immersion course. The literature review expands on this topic with the observation that as learning progresses, the increase in REM tapers off to no increase when the individual has mastered the task. Given these results, our study assumes that efficient learning leads to an increase in REM sleep because of the need for greater sleep in order to undergo the cognitive processes for retention. Thus, when content mastery is achieved, significantly less REM is necessary as the learning has already taken place. This might be demonstrated in that advanced/fluent speakers may have lower REM percentages than beginners. However, we cannot confirm this since we were not able to measure the different stages of sleep; only sleep quality and quantity overall.

Gais, Mölle, Helms, Born (2002)

Wanting to further the study of the underlying mechanisms of the apparent positive effect of sleep on memory, Gais et al. examined spindle activity, as registered on an

electroencephalograph, in specific sleep stages after learning. His study referenced past research on the electrophysiological features of sleep and the occurrence of rhythmic theta activity during REM sleep which are suspected to reflect memory processes. However, Gais et al. followed the trend in the literature to transition to looking at non-REM sleep under the assumption that this sleep stage is when novel information is transferred from the hippocampus to the neocortex and integrated into long-term memories. Most of the scientific literature points to REM sleep as being related to learning, but his results found another sleep stage, non-REM sleep, to be affected by learning experience. His study examined the changes in EEG activity during sleep "after extensive training on a declarative learning task" in comparison with a control task. The non-learning control task was said to have equal visual stimulation and cognitive strain to the manipulated learning task. The duration of each sleep stage and spindle density was measured. The sleep spindle densities were found to have been greater for those who completed the learning task. In conclusion, long-term memory and spindle density during sleep have a significant positive relationship.

Sleep and language-learning

De Koninck J. et al. (1989)

Now that we have familiarized ourselves with the evidence for how sleep aids learning in general, we can narrow in on the context of interest for our study: language-learning. De Koninck et al.'s 1989 study was among the first to explore the topic at hand: the interactions between language learning and sleep. The study built from the already long-proposed idea that REM sleep is in some way involved in information processing methods, citing Dewan's (1970) 'Programming Hypothesis' and the alternative 'reverse learning' hypothesis by Crick and

Mitchinson (1983). De Koninck et al. also referred to Leconte's (1973) study conducted on animals in which "increases in REM sleep following learning tasks were related to learning efficiency." In De Koninck et al.'s study, ten native English-speakers took a six-week French immersion course at the University of Ottawa. Their sleep was observed on four consecutive nights before, during, and after the course with the use of standard electrophysiological measures in a laboratory setting. Efficient language learners were defined as those who showed a greater than four percent improvement on French L2 proficiency tests (De Konninck does not give details as to what dimensions of language are measure by this test.) Those with greater than four percent improvement on this test demonstrated an increase in REM sleep during the course. Therefore, a significant positive correlation was found between language learning progress and increases in the percentage of REM sleep from pre-course to course periods. This finding was consistent with the prior animal studies, further confirming the existence of an efficiency factor in the relationship between quantity of REM sleep and complex learning, including language learning.

Batterink et al. (2014)

Another study that confirms the notion that sleep facilitates learning is Batterink et al.'s experiment that examined specifically the acquisition of linguistic rules. As Batterink referenced from Paradis and Ulman's 2014 study, the regularities in natural languages are often learned implicitly. Batterink's study functioned under the hypothesis that information processes during sleep contribute to this extraction of patterns in language. The study design was based on Leung and Williams' 2012 and 2015 studies in which participants were explicitly told that artificial articles (gi, ul, ro and ne) described distance. However, the participants were not made aware

that the articles were also governed by another semantic feature of noun animacy with half of the articles being used to indicate animate nouns and the rest for inanimate nouns.

	Participants were *not* told…	
	Animate	**Inanimate**
Participants were told…		
Near	gi	ro
Far	ul	ne

The participants' learning of the hidden rule was shown in slower response times to phrases that violated the rule. Batterink's experiment deviated from Leung and Williams' in that event-related brain potentials (ERPs) were also used as an indicator of rule knowledge and the violation trials were spread out in the learning blocks as opposed to a single violation block at the end. Participants took a ninety-minute nap in between the two twenty-minute learning sessions, but the nap period was elongated if the subject was still in slow-wave sleep (SWS). In addition, participants filled out two questionnaires regarding the quality and quantity of their sleep the night before the experiment took place. This questionnaire was described to have some of the same items that are present in the Pittsburgh Sleep Quality Index (PSQI), which was utilized for our study. The results of Batterink's study showed that those who had greater slow-wave and REM sleep during the nap exhibited "increased sensitivity to the hidden linguistic rule in the second session." Thus, the experiment demonstrates that the quality of sleep was a contributing factor to the absorption and retention of linguistic rules. Our study aims to test if

these findings are replicable in the context of second-language proficiency for the natural language of Spanish. In other words, we will also attempt to observe the effect of quality and quantity of sleep on language-acquisition. However, our study format differed in that our includes strictly observational data.

MacDonald (2015)

MacDonald's 2015 study was deemed to be the first of its kind to examine the relationship between amount of sleep and English as a Foreign Language (EFL) test performance. The basis of this research and our own is that the literature shows that internationally, students are not getting enough sleep, and as we have seen, this has large implications for learning and performance. MacDonald's study included seventy-five university students in Japan studying medical English. The study's manipulation was the use of "guidance on the importance of sleep" via a ten-minute presentation to the experimental group. This intervention was not a very strong manipulation, and thus should have been either eliminated or reviewed for an alternative. Our project strays from this use of manipulation by collecting observational data only. However, MacDonald's study's measure of initial ability was appropriate and useful due to its experimental design. This was done by administering a "fifteen-item vocabulary quiz at the beginning of the second lecture (before the guidance was given to the experimental group)" to see if there was a difference between the groups (MacDonald, 2015). The students' sleep quantities were surveyed randomly at the end of the test by asking them to voluntarily write on the test sheet how many hours they had slept the previous night. Due to a lack of precision in what the experimenters were asking of the participants, some students reported a range of hours which the experimenters had to average. The measure of language performance was then assessed with two tests: a fifteen-question vocabulary quiz (to represent

declarative memory) and a second one consisting “of five sections; namely, listening, expressions, taught vocabulary (similar to the vocabulary quiz), untaught vocabulary, and short essay questions." The second longer test represented both declarative memory and procedural memory tasks. A similar approach was taken in our study’s administration of two foreign language performance tasks along with an intake of reported sleep quantity. The results were consistent with the literature, demonstrating that greater sleep resulted in better test performance. Individuals exhibited “differences of up to 31% between sleep-deprived students and those who received sufficient sleep. The major limitation of this study, just as MacDonald’s, is “the inability to monitor student’s precise sleep times and sleep quality.” Despite it being a limitation, self-reported sleep quantities are a method consistent with the literature norms.

Global Summary

To summarize this literature review, past studies all point to the relationship between greater cognitive retention with higher sleep quantities. Furthermore, many studies support the notion that language learning progress has a significant positive correlation with increases in percentage of REM sleep. Such past literature focuses on the quality of sleep in terms of non-REM versus REM sleep. On the contrary, this study assesses subjective overall sleep quality. Additionally, the present study is the first of its kind to look at the relationship between sleep and test performance of specifically Spanish as a second language.

Research Questions

1. Does sleep quantity predict L2 Spanish morphosyntax and/or lexicon?

2. Does sleep quality predict L2 Spanish morphosyntax and/or lexicon?
3. Which dimension of language in the PSQI, if any, is most predictive of lexicon or morphosyntax?

Methodology

Participants

The sample for this experiment is made up of forty-seven native English-speakers who attended Spanish courses at the Ohio State University. Seventy survey entries were collected in total, but only forty-seven of those entries were fully completed. This study was the first to administer separate tests of morphosyntax and lexicon concurrently. Therefore, many respondents abandoned the survey before completing it, due to its length. Participants were from varying course levels ranging from the three-course core language sequence (Spanish 1101, 1102 and 1102) required of all university students to the intermediate to advanced-level courses required of Spanish majors and minors. There were 24 females, 20 males, 2 non-binary respondents, and 1 respondent who chose not to disclose their gender identity. The participants' ages ranged from 18 to 25+ years old.

Procedures

Participants were approached in OSU campus buildings in which Spanish classes were held. An IRB-approved recruitment script was read to participants, and they signed an IRB-approved consent document before being given the electronic survey on the Qualtrics platform, containing our measures. The Qualtrics survey began by asking participants to provide consent via a university IRB-approved virtual consent form. If consent was provided, the survey

proceeded with a screening question to eliminate heritage learners of Spanish. This study did not allow participants to be heritage speakers because of the confounding variables resulting from prior knowledge of the language. In total, one participant was excluded for being a heritage speaker of Spanish. There are currently few heritage learners of Spanish at OSU, and we were trying to construct a relatively homogeneous sample to eliminate possible confounds in our results.

Pittsburgh Sleep Quality Index

Because of limited funding and resources, conducting in-person laboratory sleep visits was not feasible. Therefore, rather than using standard electrophysiological sleep measures, alternative self-report measures were used. After passing the screening question, participants filled out our shortened version of the Pittsburgh Sleep Quality Index (PSQI), which collected information on the individual's overall sleep quality over a 1-month time interval (Buysse et al., 1988). The instrument has been validated with a variety of clinical populations and is widely used, with a Cronbach's alpha of 0.83. The original PSQI consists of 19 self-reported items and five items reported by the bed partner/roommate, with both Likert-scale and open-ended questions. The present study excluded from the original PSQI question 5j that asked the individual to "list other reasons why [they] had trouble sleeping during the past month." This step was taken to reduce the amount of data to be processed for this study. Additionally, the five questions in the original PSQI which are to be rated by the respondent's bedpartner or roommate were also excluded. These five questions are only used for clinical information and are not calculated into the scoring of the PSQI, therefore were not necessary for our study. The shortened version also allowed for the survey completion time to be shorter, which was beneficial for data collection in that it reduces the likelihood of a low response rate. Two

attention checks were included in the survey, with the first at the end of the matrix in question five and the second at the end of the PSQI. The attention checks were as follows:

1. If you are reading this, choose less than once a week
    a. Not during the past month
    b. Less than once a week
    c. Once or twice a week
    d. Three or more times a week

All participants included in the dataset passed all attention checks. A complete copy of the modified PSQI can be found in the appendices.

Each item corresponds to one of the component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction. Component 5, sleep disturbances, is originally calculated by first assigning scores to the responses for items 5b-5j and taking a sum of these scores. Since item 5j was not used in our modified PSQI, we replaced it with item 5a in the scoring. In the context of our study, we will refer to item 5a as subjective sleep latency. The component scores have a range of 0-3, with 0 indicating no difficulty and 3 indicating severe difficulty. The component scores are summed to calculate a global PSQI score, which has a range of 0-21. The full PSQI scoring rubric is included in the appendices. A global score of "0" indicates no difficulties in all areas and a score of "21" indicates severe difficulties in all areas.

Morphosyntax – Wisconsin Spanish Proficiency Test

The next task administered in the survey was the modified Wisconsin Spanish Proficiency Test (WSPT) previously utilized by Kirk et al 2021 to measure L2 Spanish

morphosyntax. The original test contains a total of 36 questions divided into three sections. However, only sections 1 and 2 test morphosyntactic knowledge. Our study utilized only section 1 of the WSPT to reduce the survey length. Twenty fill-in-the-blank questions were included as well as one attention check in between question seventeen and eighteen. All participants passed the attention check. Participants were instructed to choose the answer which correctly completes the sentence in Spanish. If they thought the sentence was correct as is, they were instructed to select the option "no hay cambio," or "no change required" as illustrated by the following example.

1. Hay _____ mil personas aquí.
    a. Un
    b. Una
    c. Uno
    d. No hay cambio

Lexicon – Diploma de Español para Extranjeros (DELE)

Next, the participant completed the modified Diploma de Español para Extranjeros (Kirk et al., 2021) to measure L2 Spanish lexical development. The Diploma de Español para Extranjeros (DELE) which was first used in Duffield and White (1999), has 50 questions divided into two sections. Section 1 is the first 30 questions which are fill-in-the-blank with multiple-choice responses and the second section is a clause test with the remaining 20 questions. Kirk et al.'s analysis excluded the second section because it did not exclusively measure lexicon. Following Kirk et al., the present study utilized only the first section of the DELE, consisting of thirty questions, with an additional attention check placed between questions twenty-seven and twenty-eight. This assessment had a similar format to the WSPT,

with each of the sentences in Spanish containing a blank indicating that a word or phrase had been omitted. The participants were instructed to select the answer choice that best completed the phrases. It includes items such as the following:

1. Al oír del accidente de su buen amigo, Paco se puso _____ .
    a. Alegre
    b. Fatigado
    c. Hambriento
    d. Desconsolado

Language experience variables

Lastly, the individual filled out a series of questions regarding their study abroad experience. If the individual selected that they had studied abroad before, they were then surveyed on the location and duration of the study abroad experience. Participants also answered what percent of their time abroad was spent listening to as well as speaking Spanish. To finish off the survey, the individual answered three questions regarding demographics in which they provided their gender identity, ethnicity, and age.

Results

Descriptive Statistics

A summary of the descriptive statistics of the results for the PSQI, WSPT, and DELE is given in table 1. On the PSQI, possible scores can range from 0 to 21. In the present study, actual scores ranged from 5-18 and the mean PSQI score was 10.09 with a standard deviation of 2.9.

The average global PSQI score was greater than 5, indicating that on average the study individuals are "having severe difficulties in at least two areas, or moderate difficulties in more than three areas" (Buysse et al., 1988). The component scores can range from 0-3, with 0 indicating no difficulty and 3 indicating severe difficulty. Subjective sleep latency scores ranged from 0-3 and subjective sleep quality scores ranged from 0-2. Their respective means were 1.47 and 1.19, meaning that on average, the participants are experiencing less than moderate difficulty in these areas. In other words, on average, participants answered that once a week in the past month they could not get to sleep within 30 minutes. Additionally, the mean for subjective sleep quality was "fairly good."

On the WSPT, possible scores can range from 0 to 20. Actual scores ranged from 2 to 20 with a mean score of 13.23 and a standard deviation of 4.47. The range of possible scores on the other language measure, the DELE, was 1-30. The actual scores for the DELE ranged from 4 to 29, with a mean of 15.3 and a standard deviation of 6.59.

	Global PSQI	WSPT	DELE	Subjective Sleep Latency	Subjective Sleep Quality
Mean	10.085	13.234	15.298	1.468	1.191
Std. Deviation	2.895	4.473	6.587	1.018	0.537
Minimum	5.000	2.000	4.000	0.000	0.000
Maximum	18.000	20.000	29.000	3.000	2.000

Table 1- Descriptive Statistics of Study Variables

The 13 PSQI items had a reliability coefficient (Cronbach's alpha) of 0.629. To be considered good reliability, a coefficient of .7 is conventional.

The following histogram shows the distribution of hours per night of sleep of our sample.

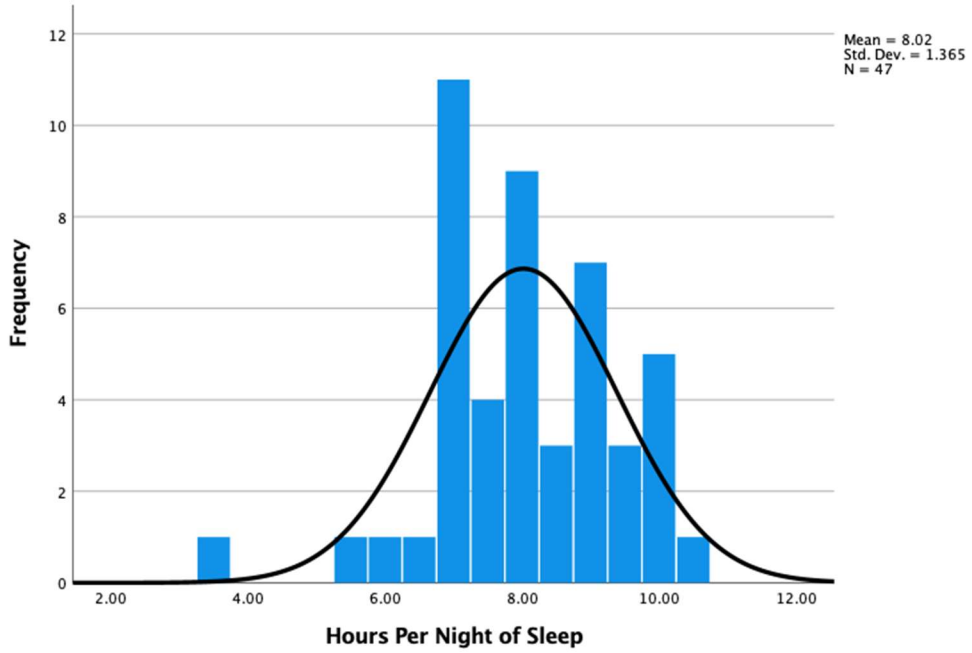

Figure 1 – Histogram of Hours of Sleep Per Night in the Sample

In item 4 of the PSQI, participants reported their hours of sleep per night during the past month. The mean for this reported sleep duration was equivalent to 6-7 hours per night. Meanwhile, we calculated a more exact sleep duration by subtracting the participants' reported usual getting up time (item 3) from their bed time (item 1). The mean calculated number of hours of sleep per night in our sample was 8.02 hours, with a standard deviation of 1.37 hours, and 8 hours is the median number of hours of sleep per night. 27 of 47 participants (57%) were getting 8 or more hours of sleep per night.

Inferential Statistics

To analyze the relationship between the sets of scores we used correlation and regression analyses. Pearson Product Moment Correlations were calculated for the study variables. These are reported in Table 2.

	Lexicon (DELE)	Morphosyntax (Wisconsin)	Subjective Sleep Latency	Subjective Sleep Quality	PSQI
Lexicon (DELE)	1	.764***	.309*	.395**	.180
Morphosyntax (Wisconsin)		1	.329*	.379**	.213
Subjective Sleep Latency			1	.389**	.601***
Subjective Sleep Quality				1	.538***
PSQI					1

Table 2 – Pearson Product Moment Correlations of Study Variables. *p<.05, **p<.01, ***p<.001.

Following Cohen (1988), a correlation coefficient (r) of less than |.30| indicates a weak relationship and a coefficient between |.30| and |.50| constitutes a moderate relationship. In our data, the PSQI did not show a significant correlation with either of language measures (r = .213, p = .15 for Morphosyntax and r = .180, p = .226 for Lexicon). Therefore, we cannot conclude that there is a significant relationship between Global PSQI scores and morphosyntax and lexicon. In contrast, Subjective Sleep Quality significantly correlated with Lexicon (r = .395, p = .006) and with Morphosyntax (r = .379, p = .009). Similarly, Subjective Sleep Latency

significantly correlated with Lexicon (r = .309, p = .034) and with Morphosyntax (r = .329, p = .024). These relationships are illustrated in Figures 2 and 3.

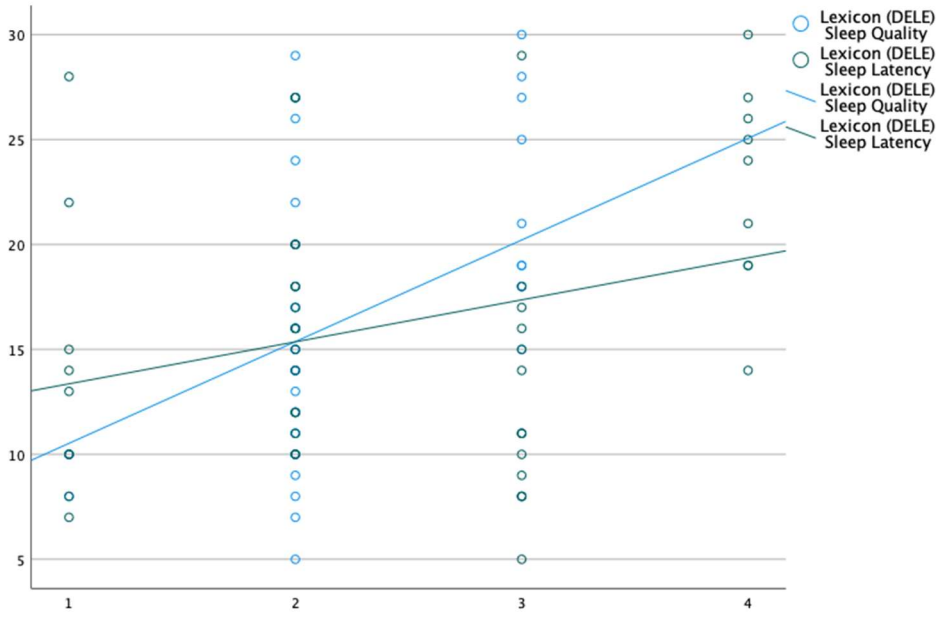

Figure 2 – Relationships between Sleep Quality, Subjective Sleep Latency and Lexicon

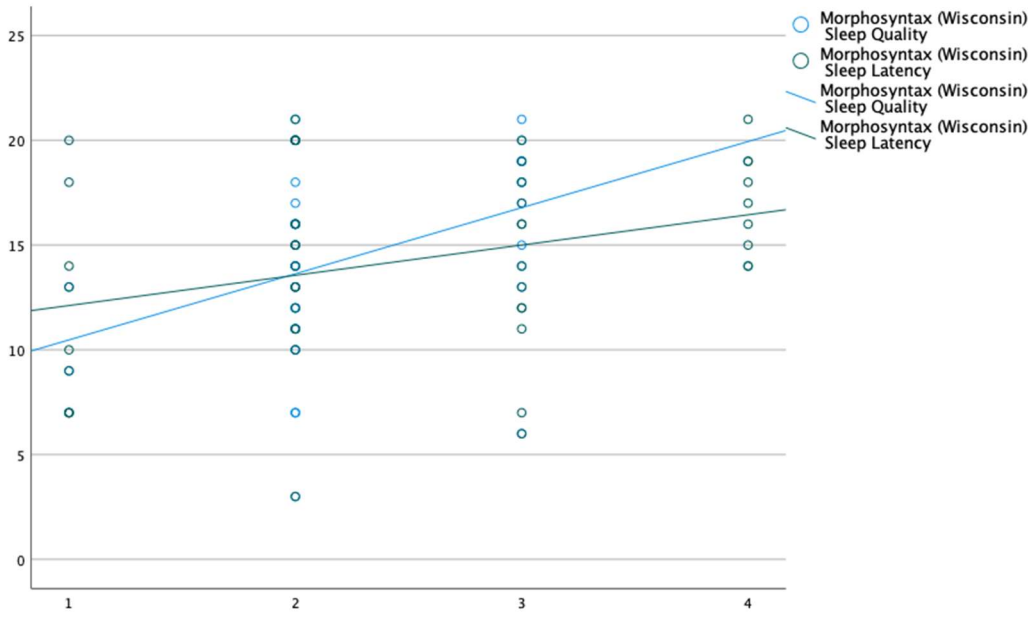

Figure 3 – Relationships between Sleep Quality, Subjective Sleep Latency and Morphosyntax

We found collinearity in our model in that Overall Sleep Quality and Subjective Sleep Latency also correlate with one another (r = .389, p = .007). Given this collinearity, we can ask whether each of these variables accounts for unique variance in the two language outcome variables, or whether their variance overlaps. To sort this out, we performed a stepwise linear regression on each language variable which reduced the predictors to exclude subjective sleep latency.

In Table 3, we report our stepwise linear regression of Overall Sleep Quality and Subjective Sleep Latency on DELE lexicon scores.

Predictors	Null	Model 1	Model 2
Sleep Quality		4.845 (1.679)**	3.970 (1.812)*
Sleep Latency			1.186 (.956)
Constant	16.298 (.960)	5.681 (3.786)	4.670 (3.851)
AIC	311.57	305.59	305.11

Table 3 – Stepwise Linear Regression of DELE Lexicon (*p< .05, **p < .01)

In Table 3, we see that variables were included in the regression model with p value of less than .05 and excluded with a value of greater than .10. Model 1 has a very similar AIC value to Model 2 (lower is better) and includes the only significantly predictive independent variable, so Model 1 is preferred.

Predictors	Null	Model 1	Model 2
Sleep Quality		3.155 (1.149)**	2.464 (1.232)
Sleep Latency			.938 (.650)
Constant	14.234 (.652)	7.319 (2.590)	6.519 (2.619)
AIC	275.19	269.90	269.73

Table 4 – Stepwise Linear Regression of WSPT Morphosyntax (*p< .05, **p < .01)

In Table 4, we see that variables were included in the regression model with *p* value of less than .05 and excluded with a value of greater than .10. Model 1 has a very similar AIC value to Model 2 (lower is better) and includes the only significantly predictive independent variable.

Discussion

First and foremost, participants in our sample appear to be sleeping more than participants in the prior studies reviewed suggested that they would be. Existing research, carried out before the pandemic, reported that more than 50% of undergraduates in North American universities get less than 7 hours per night of sleep, while 57% of our sample gets more than 8 hours per night. Speculating, this change may be related to the global pandemic in some way.

Returning to our research questions, we find that sleep quantity, and the global PSQI, are not predictive of either language outcome. In contrast, both subjective sleep quality and reported sleep latency are significantly associated with higher scores on our measures of morphosyntax and lexicon. Considering collinearity of these two variables, we carried out a stepwise linear regression, which showed that in fact only subjective sleep quality is significantly predictive of morphosyntax and lexicon. Importantly, a higher score on the sleep quality item indicates worse quality of sleep. This implies that the worse the quality of sleep that our participants perceived that they were experiencing, the better their scores on lexicon and morphosyntax.

Taken together, these findings suggest that our participant were sleeping a lot, compared to prior generations of students, and that it is the student who feel the most sleep-deprived who are in fact succeeding in 2 important linguistic dimensions that are taught in OSU Spanish classes.

In this way, the contributions of the study do not align with prior research in showing that sleep quantity and test performance are positively related, as sleep duration was found to be insignificant. However, the findings do confirm a possible relationship between sleep quality and language acquisition.

Conclusion

Among the benefits of sleep are mood stability and lower levels of stress (Vox Creative, 2022). Anxiety and stress are known factors of sleep quality. Further research should look at sleep as a mediator between anxiety and performance. Past research has shown that "limited REM sleep overall has been found to increase activity in limbic brain structures, which increases stress." This may be related to Kirk et al.'s finding that language anxiety significantly and negatively affects both morphology and lexicon. Additionally, future studies must consider the context of the research as post-pandemic and the impact of COVID-19 on sleep.

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Appendices

Modified PSQI

Instructions:

The following questions relate to your usual sleep habits during the past month *only*. Your answers should indicate the most accurate reply for the *majority* of days and nights in the past month.

Please answer all questions.

During the past month, when have you usually gone to bed at night?
(Format your answer as 00:00pm or am)

Usual bed time:

_____

During the past month, how long has it usually taken you to fall asleep each night?

- ○ less than or equal to 15 minutes
- ○ 16-30 minutes
- ○ 31-60 minutes
- ○ greater than 60 minutes

During the past month, when have you usually gotten up in the morning?
(Format your answer as 00:00pm or am)

Usual getting up time:

_____

During the past month, how many hours of *actual* sleep did you get at night? (This may be different than the number of hours you spend in bed.)

- ○ more than 7 hours
- ○ 6-7 hours
- ○ 5-6 hours
- ○ less than 5 hours

For each of the remaining questions, check the one best response. Please answer *all* questions.

During the past month, how often have you had trouble sleeping because you...

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
Cannot get to sleep within 30 minutes	○	○	○	○
Wake up in the middle of the night or early morning	○	○	○	○
Have to get up to use the bathroom	○	○	○	○
Cannot breathe comfortably	○	○	○	○
Cough or snore loudly	○	○	○	○
Feel too cold	○	○	○	○
Feel too hot	○	○	○	○
Had bad dreams	○	○	○	○
Have pain	○	○	○	○
If you are reading this, choose less than once a week	○	○	○	○

During the past month, how would you rate your sleep quality overall?

- ○ Very good
- ○ Fairly good
- ○ Fairly bad
- ○ Very bad

During the past month, how often have you taken medicine (prescribed or “over the counter”) to help you sleep?

- ○ Not during the past month
- ○ Less than once a week
- ○ Once or twice a week
- ○ Three or more times a week

During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

- ○ Not during the past month
- ○ Less than once a week
- ○ Once or twice a week
- ○ Three or more times a week

During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

- ○ No problem at all
- ○ Only a very slight problem
- ○ Somewhat of a problem
- ○ A very big problem

PSQI Scoring Rubric

Scoring Instructions for the Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI) contains 19 self-rated questions and 5 questions rated by the bed partner or roommate (if one is available). Only self-rated questions are included in the scoring. The 19 self-rated items are combined to form seven "component" scores, each of which has a range of 0-3 points. In all cases, a score of "0" indicates no difficulty, while a score of "3" indicates severe difficulty. The seven component scores are then added to yield one "global" score, with a range of 0-21 points, "0" indicating no difficulty and "21" indicating severe difficulties in all areas.

Scoring proceeds as follows:

Component 1: Subjective sleep quality

Examine question #6, and assign scores as follows:

Response	Component 1 score
"Very good"	0
"Fairly good"	1
"Fairly bad"	2
"Very bad"	3

Component 1 score: _____

Component 2: Sleep latency

1. Examine question #2, and assign scores as follows:

Response	Score
≤ 15 minutes	0
16-30 minutes	1
31-60 minutes	2
> 60 minutes	3

Question #2 score: _____

2. Examine question #5a, and assign scores as follows:

Response	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

Question #5a score: _____

3. Add #2 score and #5a score

Sum of #2 and #5a: _____

4. Assign component 2 score as follows:

Sum of #2 and #5a	Component 2 score
0	0
1-2	1
3-4	2
5-6	3

Component 2 score: _____

Component 3: Sleep duration

Examine question #4, and assign scores as follows:

Response	Component 3 score
> 7 hours	0
6-7 hours	1
5-6 hours	2
< 5 hours	3

Component 3 score: _____

Component 4: Habitual sleep efficiency

(1) Write the number of hours slept (question # 4) here: _____

(2) Calculate the number of hours spent in bed:

Getting up time (question # 3): _____

– Bedtime (question # 1): _____

Number of hours spent in bed: _____

(3) Calculate habitual sleep efficiency as follows:

(Number of hours slept/Number of hours spent in bed) × 100 = Habitual sleep efficiency (%)

(_____/_____) × 100 = _____%

(4) Assign component 4 score as follows:

Habitual sleep efficiency %	Component 4 score
> 85%	0
75-84%	1
65-74%	2
< 65%	3

Component 4 score: _____

Component 5: Sleep disturbances

(1) Examine questions # 5b-5j, and assign scores for *each* question as follows:

Response	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

#5b score _____

c score _____

d score _____

e score _____

f score _____

g score _____

h score _____

i score _____

j score _____

(2) Add the scores for questions # 5b-5j:

Sum of # 5b-5j: _____

(3) Assign component 5 score as follows:

Sum of # 5b-5j	Component 5 score
0	0
1-9	1
10-18	2
19-27	3

Component 5 score: _____

Component 6: Use of sleeping medication

Examine question # 7 and assign scores as follows:

Response	Component 6 score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

Component 6 score: _____

Component 7: Daytime dysfunction

(1) Examine question # 8, and assign scores as follows:

Response	Score
Never	0
Once or twice	1
Once or twice each week	2
Three or more times each week	3

Question # 8 score: _____

(2) Examine question # 9, and assign scores as follows:

Response	Score
No problem at all	0
Only a very slight problem	1
Somewhat of a problem	2
A very big problem	3

Question # 9 score: _____

(3) Add the scores for question # 8 and # 9:

Sum of #8 and #9: _____

(4) Assign component 7 score as follows:

Sum of # 8 and #9	Component 7 score
0	0
1-2	1
3-4	2
5-6	3

Component 7 score: _____

Global PSQI Score

Add the seven component scores together:

Global PSQI Score: _____

Modified Wisconsin Spanish Proficiency Test

Instructions

Choose the answer which correctly completes the sentence. If the sentence is correct as is, select the option No hay cambio.

Hay _____ mil personas aquí.

- un
- una
- uno
- No hay cambio

X: Mi tío tenía un coche muy bonito. Y: ¿De qué color? X: _____ rojo y negro.

- Era
- Fue
- Estaba
- Eran

Cuando yo _____ joven, fui a Chile.

- fue
- soy
- era
- fui

Juan me dijo _____ su hermana iba a visitar España el año que viene.

- que
- cual
- quien
- No hay cambio

– ¿Quisieras ayudar a la gente pobre?
– Sí, quisiera _____.

- ayudarla
- ayudarlas
- la ayudo
- los ayuda

Cuando necesito dinero, _____ pido a mi padre diez o quince dólares.

- le
- lo
- les
- los

_____ un examen el viernes.

- Ha
- Es
- Está
- Hay

– ¿Cuando es tu cumpleaños?
– Es _____ tres de abril.

- ○ a
- ○ en
- ○ el
- ○ No hay cambio

¿Conoces a alguien que _____ bien?

- ○ cante
- ○ cantes
- ○ cantas
- ○ cantar

Si no estuviéramos en clase, _____ en la playa.

- ○ estamos
- ○ estaremos
- ○ habríamos
- ○ estaríamos

No hay duda de que ellos _____ dinero.

- ganan
- ganen
- ganasen
- hayan ganado

– ¿Debo decirte la verdad?
– Sí, ¡ _____ la verdad!

- dime
- me dice
- me dices
- me digas

– Anoche hablé con Ricardo.
– ¿Y qué dijo?
– Que _____ hoy.

- él te llame
- te llamo
- te haya llamado
- te llamaría

Su esposa esperaría hasta que él _____.

- volviera
- volvería
- haya vuelto
- había vuelto

Paco es _____ alto _____ Juanita.

- tan, de
- tan, que
- más, de
- más, que

El edificio es alto pero la montaña es más alta.
– El edificio es _____ la montaña.

- alto como
- más alto que
- tan alto como
- menos alto que

Cuando la vi, _____ triste.

- ○ estás
- ○ estaban
- ○ estaba
- ○ estuviera

If you are reading this, choose carrots

- ○ Carrots
- ○ Radishes
- ○ Onions
- ○ Potatoes

Voy a buscar _____ mi abrigo.

- ○ a
- ○ por
- ○ para
- ○ No hay cambio

Enrique compró unas rosas y _____ las dio a sus padres.

- me
- le
- se
- les

¡Cuidado! ¡No _____ caigas!

- se
- te
- tú
- ti

Modified Diplomas de Español como Lengua Extranjera

Instructions Each of the following sentences contains a blank indicating that a word or phrase has been omitted. Select the choice that best completes the sentence.

Al oír del accidente de su buen amigo, Paco se puso _____ .

- alegre
- fatigado
- hambriento
- desconsolado

No puedo comprarlo porque me _____ .

- falta
- dan
- presta
- regalan

Tuvo que guardar cama por estar _____ .

- enfermo
- vestido
- ocupado
- parado

Aquí está tu café, Juanito. No te quemes, que está muy _____ .

- dulce
- amargo
- agrio
- caliente

Al romper los anteojos, Juan se asustó porque no podía _____ sin ellos.

- discurrir
- oír
- ver
- entender

¡Pobrecita! Está resfriada y no puede _____ .

- salir de casa
- recibir cartas
- respirar con pena
- leer las noticias

Era una noche oscura sin _____ .

- estrellas
- camas
- lágrimas
- nubes

Cuando don Carlos salió de su casa, saludó a un amigo suyo:
-Buenos días, _____ .

- ¿Qué va?
- ¿Cómo es?
- ¿Quién es?
- ¿Qué tal?

¡Qué ruido había con los gritos de los niños y el _____ de los perros!

- olor
- sueño
- hambre
- ladrar

Para saber la hora, don Juan miró el _____ .

- calendario
- bolsillo
- estante
- despertador

Yo, que comprendo poco de mecánica, sé que el auto no puede funcionar sin _____ .

- permiso
- comer
- aceite
- bocina

Nos dijo mamá que era hora de comer y por eso _____ .

- fuimos a nadar
- tomamos asiento
- comenzamos a fumar
- nos acostamos pronto

¡Cuidado con ese cuchillo o vas a _____ el dedo!

- cortarte
- torcerte
- comerte
- quemarte

Tuvo tanto miedo de caerse que se negó a _____ con nosotros.

- ○ almorzar
- ○ charlar
- ○ cantar
- ○ patinar

Abrió la ventana y miró: en efecto, grandes lenguas de _____ salían llameando de las casas.

- ○ zorros
- ○ serpientes
- ○ cuero
- ○ fuego

Compró ejemplares de todos los diarios pero en vano. No halló _____ .

- ○ los diez centavos
- ○ el periódico perdido
- ○ la noticia que deseaba
- ○ los ejemplos

Por varias semanas acudieron colegas del difunto profesor a _____ el dolor de la viuda.

- aliviar
- dulcificar
- embromar
- estorbar

Sus amigos pudieron haberlo salvado pero lo dejaron _____ .

- ganar
- parecer
- perecer
- acabar

Al salir de la misa me sentía tan caritativo que no pude menos que _____ a un pobre mendigo que había allí sentado.

- pegarle
- darle una limosna
- echar una mirada
- maldecir

Al lado de la Plaza de Armas había dos limosneros pidiendo _____ .

- pedazos
- paz
- monedas
- escopetas

Siempre maltratado por los niños, el perro no podía acostumbrarse a _____ de sus nuevos amos.

- las caricias
- los engaños
- las locuras
- los golpes

¿Dónde estará mi cartera? La dejé aquí mismo hace poco y parece que el necio de mi hermano ha vuelto a _____ .

- dejármela
- deshacérmela
- escondérmela
- acabármela

Permaneció un gran rato abstraído, los ojos clavados en el fogón y el pensamiento _____ .

- en el bolsillo
- en el fuego
- lleno de alboroto
- Dios sabe dónde

En vez de dirigir el tráfico estabas charlando, así que tú mismo _____ del choque.

- sabes la gravedad
- eres testigo
- tuviste la culpa
- conociste a las víctimas

Posee esta tierra un clima tan propio para la agricultura como para _____ .

- la construcción de trampas
- el fomento de motines
- el costo de vida
- la cría de reses

Aficionado leal de obras teatrales, Juan se entristeció al saber _____ del gran actor.

- ○ del fallecimiento
- ○ del éxito
- ○ de la buena suerte
- ○ de la alabanza

Se reunieron a menudo para efectuar un tratado pero no pudieron _____ .

- ○ desavenirse
- ○ echarlo a un lado
- ○ rechazarlo
- ○ llevarlo a cabo

If you are reading this, choose cats

- ○ Dogs
- ○ Ducks
- ○ Birds
- ○ Cats

Se negaron a embarcarse porque tenían miedo de _____ .

- ○ los peces
- ○ los naufragios
- ○ los faros
- ○ las playas

La mujer no aprobó el cambio de domicilio pues no le gustaba _____ .

- ○ el callejeo
- ○ el puente
- ○ esa estación
- ○ aquel barrio

Era el único que tenía algo que comer pero se negó a _____ .

- ○ hojearlo
- ○ ponérselo
- ○ conservarlo
- ○ repartirlo