

## SCIENTIFIC INVESTIGATIONS

## Sleepy, tired, drowsy, and fatigue have different meanings for a university student sample

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**Study Objectives:** This pilot study aimed to investigate differences in the semantic meanings that individuals attribute to the words “sleepy,” “fatigued,” “tired,” and “drowsy.”

**Methods:** Ninety-six undergraduate students ranked the target words on 3 independent dimensions (evaluative, potency, and activity) to assess their meaning using the semantic differential technique. Participants also completed online questionnaires to assess their sleep difficulties and current states of sleepiness and fatigue.

**Results:** There were significant differences between all 4 words in connotative meaning on the evaluative dimension,  $P < .05$  for all post-hoc comparisons, with the differences largest between “sleepy” and “fatigued.” “Drowsy” was significantly closer in meaning to “sleepy” than to “fatigued,”  $P = .04$ , and “tired” was not significantly closer in meaning to “sleepy” or “fatigued,”  $P = .13$ . No significant association was found between insomnia severity index scores and “sleepy” ratings,  $r_{(s)} = 0.08$ ,  $P = .42$ , but a small effect was found with “fatigued” ratings,  $r_{(s)} = 0.24$ ,  $P = .02$ .

**Conclusions:** These preliminary findings indicate that individuals consider these words as distinct concepts, relatively unaffected by the current severity of their insomnia symptoms. This adds to the argument for not using these words interchangeably, which we encourage sleep medicine researchers and clinicians to consider when employing these words in research and clinical practice.

**Keywords:** sleep, fatigue, insomnia, drowsy, excessive daytime sleepiness, treatment terminology

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### BRIEF SUMMARY

**Current Knowledge/Study Rationale:** The words “sleepy,” “fatigued,” “tired,” and “drowsy” are similar words that are often used in the sleep research and clinical fields. However, it has been previously argued that these words should not be used interchangeably as they refer to different symptoms. The present study quantitatively examined the semantic meanings of these words to determine whether they indeed refer to distinct concepts.

**Study Impact:** The findings indicate that individuals consider these words distinct from each other, with “sleepy” rated considerably more positively than “fatigued.” It is argued that these words should not be used interchangeably to avoid misunderstandings not only in physician–client interactions but also in public health advocacy initiatives.

### INTRODUCTION

The words “sleepy” and “fatigued” are frequently used as if they are synonymous, yet the sleep literature indicates that these words refer to distinct concepts.<sup>1,2</sup> These differences in word meaning are clear in clinical insomnia populations where, for example, fatigue is a key diagnostic symptom, but sleepiness is not. Individuals with insomnia who experience chronic levels of fatigue commonly score in the nonclinical range on self-reported measures of daytime sleepiness.<sup>3,4</sup> In comparison, narcolepsy is a sleep disorder associated with excessive daytime sleepiness but not high levels of fatigue.<sup>5</sup> Sleep disorder symptomatology demonstrates that the words “sleepy” and “fatigue” represent 2 distinct concepts, at least in a clinical context. These differences in word meaning may have potential implications in clinical settings since the synonymous use of these words may affect the operationalization and treatment of sleepiness and

fatigue symptoms,<sup>1</sup> and in public information campaigns (eg, road signs and advertisements), since certain words such as sleepy or drowsy may be more effective than other words to reduce drowsy driving.

Further, individuals with clinical sleep disorders may attribute different meanings to the words “sleepy,” “tired,” and “fatigued” compared to the general population due to their unique perspectives on these states. For instance, individuals with insomnia may have more negative connotations associated with “fatigue” than good sleepers since it is a key symptom of insomnia, one that significantly impacts their quality of life. On the other hand, healthy individuals may describe fatigue as normal, relaxing, and temporary.<sup>6</sup> Additionally, the term “sleepy” may hold more positive connotations for the insomnia population compared to good sleepers because insomnia is characterized as the inability to experience sleepiness at desired sleep times.<sup>7</sup> Therefore, feeling sleepy would indicate increased

likelihood of being able to fall asleep at desired bedtime. Despite this, previous research ( $n = 125$  across 2 studies) has not found any difference in the meanings attributed to the words “sleepy,” “tired,” and “fatigued” between individuals who scored high or low on the Pittsburgh Sleep Quality Index (PSQI).<sup>8,9</sup> However, high scores on the PSQI can indicate poor sleep arising from a number of possible sleep disorders with differing symptomatology.<sup>10</sup> The present study tested for potential associations between insomnia symptom severity and word meaning.

In an earlier pilot study, Sukovic et al.<sup>8</sup> found that the words “sleepy,” “tired,” and “fatigued” differed when they used the quantification of meaning available with the semantic differential technique of Osgood et al.<sup>11</sup> Sukovic found that the word “tired” had a more negative appraisal than “sleepy” and “fatigue” and was perceived as being more negative than “tired.”<sup>8</sup> The present study extended this initial work by testing whether these words continue to differ in meaning in today’s language ( $> 14$  years after the original study), whether “drowsy” differs in meaning from “sleepy,” “tired,” and “fatigue,” and whether there are differences in the meanings that good sleepers and poor sleepers attribute to these words. Based on prior research, we predicted the following:

1. On the evaluative dimension (positive to negative in meaning), individuals would rate “fatigued” as the most negative word, followed by “tired,” “drowsy,” and “sleepy.”
2. Insomnia symptom severity would be positively correlated with ratings of “fatigued” on the evaluative dimension (ie, individuals with higher insomnia symptom severity would rate “fatigued” as more negative than those with lower insomnia symptom severity).
3. Additionally, insomnia symptom severity would be negatively correlated with ratings of “sleepy” on the evaluative dimension (ie, individuals with higher insomnia symptom severity would rate “sleepy” as more positive than those with lower insomnia symptom severity).

## METHODS

### Participants

Ninety-six participants were recruited from Flinders University, Australia (age range = 18–53 years; see participant demographics in **Table 1**). All participants were Australian residents and proficient in English as measured by a brief language proficiency test. This study was reviewed and approved by the Flinders University Social and Behavioral Research Ethics Committee (project number: 8400). All participants gave full, informed consent.

### Materials

#### Semantic Differential Questionnaire

The present study used the Semantic Differential Questionnaire developed by Sukovic.<sup>8</sup> It was based on Osgood et al.’s semantic differential technique, which can be used to quantify connotations about a given object, event, or concept (word).<sup>11</sup> This is achieved using bipolar adjectives placed on Likert scales (ie, sad

**Table 1**—Participant demographics and sleep characteristics.

Variable	Total Sample (n = 96)
Age, years, mean (SD)	21.49 (6.66)
Sex, males/females, n (%)	20 (20.8)/76 (79.2)
ISI scores, mean (SD)	9.55 (5.35)
ESS scores, mean (SD)	8.22 (3.71)
FFS scores, mean (SD)	11.51 (6.16)

ESS = Epworth Sleepiness Scale, FFS = Flinders Fatigue Scale, ISI = Insomnia Severity Index, SD = standard deviation.

vs happy). Individuals are given a word, eg, “sleepy,” and asked to rate where this word fits on these scales. The questionnaire contains 13 7-point bipolar Likert scales, which are averaged to derive scores on 3 dimensions. The scales pleasant vs unpleasant, fulfilled vs frustrated, tolerable vs intolerable, calm vs agitated, and easy vs difficult assess the evaluative dimension. Higher scores on this dimension indicate more negative connotations of the word. The scales valuable vs worthless, light vs heavy, strong vs weak, and gradual vs sudden were used to assess the potency dimension. Higher scores on this dimension indicated more potent connotations. Finally, the scales active vs passive, fast vs slow, voluntary vs involuntary, and deep vs shallow were used to assess the activity dimension. Higher scores on the activity dimension indicated more passive (or less active) connotations. Some scales were reverse coded to align directionality between scales when the dimension scores were calculated. In the present study, good internal consistency was found for this questionnaire (Cronbach’s  $\alpha = 0.84$ ).

The semantic differential technique proposes the existence of a multidimensional semantic space. Here, evaluation, potency, and activity act as independent dimensions in this 3-dimensional space where concepts can be plotted. When concepts differ in space, we are observing a difference in their connotative meaning. Using Euclidian 3-dimensional geometry, the distances between words in space can be calculated and compared statistically. The 3 scores for each dimension represent a point in 3-dimensional space and is known as the *D* score. The equation is as follows:

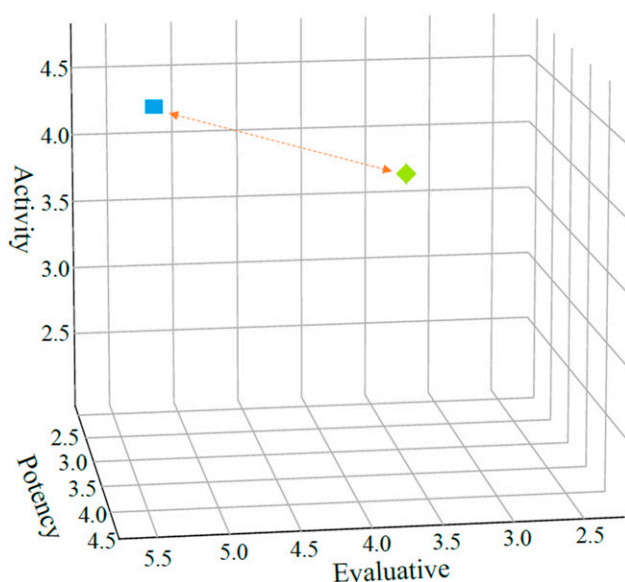
$$D = \sqrt{(E1 - E2)^2 + (A1 - A2)^2 + (P1 - P2)^2},$$

where 1 and 2 refer to the scores for 2 separate words on these dimensions.

The degree to which words differ in connotative meaning can then be assessed based on their distance from each other in this 3-dimensional semantic space.<sup>11</sup> See **Figure 1** for a demonstration of this technique.

A fifth word, “enthusiastic,” was included in the 13-item semantic differential questionnaire. The word acted as a calibration check for the instrument’s sensitivity. “Enthusiastic” is a concept very distinct from “sleepy,” “fatigued,” “tired,” and “drowsy” and therefore should be located distantly in semantic space.

**Figure 1**—Example of 2 concepts differing in semantic space, with axes representing subscales of the Semantic Differential Questionnaire.



### Insomnia Severity Index

The Insomnia Severity Index (ISI) was administered in the present study to assess subclinical and clinical insomnia symptoms.<sup>12</sup> The ISI is a 7-item self-report questionnaire that measures the nature and severity of insomnia symptoms, and their daytime consequences. It has high internal consistency, with Cronbach's  $\alpha$  ranging from .74 to .92.<sup>12,13</sup> Bastien et al<sup>12</sup> also reported high levels of concurrent validity between the ISI and other valid measures of insomnia, as well as high content validity.

### Participant characteristics

Additional questionnaires were administered to describe the characteristics of the study sample, namely the Epworth Sleepiness Scale (ESS)<sup>14</sup> and the Flinders Fatigue Scale (FFS).<sup>15</sup> Standard questions were also administered to assess age and sex.

### Procedure

After being informed about the study and providing written consent to participate, participants were asked to complete the 13-item Semantic Differential Questionnaire separately for each of the 5 words of interest ("sleepy," "tired," "fatigued," "drowsy," and "enthusiastic") via an online survey (Qualtrics Software, Seattle, WA). Written instructions were provided on how to rate the 5 concepts (see the **supplemental material**), modified from the original instructions.<sup>11</sup> Participants then completed the ISI, ESS, and FFS following the Semantic Differential Questionnaire to avoid contamination. Attention checks were placed throughout the questionnaire (ie, tick 2 to this question, don't respond to this question) to ensure valid results were collected, with the intention that data from any

participants failing the attention checks would be excluded from analysis; however, no one failed the checks. Participant demographic data (ie, age and sex) were also collected at the end of the survey.

### Statistical analyses

All analyses were conducted using IBM SPSS Statistics (v 25; IBM Corporation, Armonk, NY). Repeated measures analyses of variance (ANOVAs) were conducted to test for differences between words on each semantic dimension. Where appropriate, Bonferroni-adjusted post-hoc comparisons were conducted to test for differences between specific words. The Greenhouse-Geisser correction was used on all repeated measures ANOVAs as the sphericity assumption was violated. Paired samples *t* tests were conducted to determine whether "tired" and "drowsy" were closer in meaning to "sleepy" or "fatigued" by comparing their distance in 3-dimensional space. Additionally, Spearman correlations were conducted to test whether ISI scores were associated with individual's ratings of words as positive or negative in meaning (the evaluative dimension). The alpha value of .05 was used to determine statistical significance for each analysis. Cohen's *d* was calculated to assess the magnitude of all effects.

## RESULTS

### Sensitivity test of the Semantic Differential Questionnaire

Planned pairwise comparisons from repeated measures ANOVAs revealed that the word "enthusiastic" differed significantly from the words "sleepy," "tired," "fatigued," and "drowsy" across all semantic dimensions [evaluative:  $F(3.47, 325.67) = 165.66, P < .001$ ; potency:  $F(2.88, 270.56) = 195.89, P < .001$ ; activity:  $F(3.56, 334.85) = 164.87, P < .001$ ]. See **Table 2** for all descriptive statistics. "Entusiastic" was rated significantly lower (ie, more positive) on the evaluative dimension compared to the words "sleepy" ( $d = 1.29$ ), "tired" ( $d = 2.70$ ), "fatigued" ( $d = 3.74$ ), and "drowsy" ( $d = 2.57$ ),  $P < .001$  in all post-hoc comparisons. Moreover, "entusiastic" was rated significantly lower (less potent) on the potency dimension than "sleepy," "fatigued," "tired," and "drowsy,"  $P < .001$  in all post-hoc comparisons. The effect sizes were large;  $d = 2.80, 3.24, 2.86$ , and  $3.35$ , respectively. Finally, "entusiastic" differed significantly from all 4 words on the activity dimension, with significantly lower mean scores (more active) reported in comparison to "sleepy" ( $d = 2.98$ ), "tired" ( $d = 2.86$ ), "fatigued" ( $d = 2.90$ ), and "drowsy" ( $d = 2.99$ ),  $P < .001$  in all post-hoc comparisons. These results confirm the Semantic Differential Questionnaire as a measure sensitive to differences in word meanings.

### Comparison of scores on semantic dimensions

To investigate how the 4 sleep-related words (sleepy, tired, drowsy, fatigued) differed from each other, repeated measures ANOVAs were conducted to compare words on the 3 semantic dimensions separately. See **Table 2** for means and standard deviations of dimension scores and **Table 3** for mean

**Table 2**—Mean (standard deviation) scores for each word on the 3 dimensions.

Words	Semantic Differential Dimensions		
	Evaluative	Potency	Activity
Enthusiastic	2.44 (0.75)	2.13 (0.74)	2.46 (0.71)
Sleepy	3.75 (1.23)	4.30 (0.81)	4.68 (0.78)
Drowsy	4.38 (0.76)	4.46 (0.73)	4.82 (0.86)
Tired	4.89 (1.04)	4.32 (0.79)	4.56 (0.76)
Fatigued	5.54 (0.90)	4.64 (0.81)	4.81 (0.90)

differences and Cohen's *d* comparisons between words on each dimension. Scores on the evaluative dimension differed significantly between the 4 words,  $F(2.61, 245.29) = 73.10$ ,  $P < .001$ . Planned pairwise comparisons indicated that all words significantly differed from each other on this dimension, with "sleepy" rated the most positive word, followed by "drowsy," "tired," and "fatigued" as the most negative. A repeated measures ANOVA further indicated that scores differed significantly between the 4 words on the potency dimension,  $F(2.86, 268.84) = 6.74$ ,  $P < .001$ . Post-hoc comparisons indicated that "fatigued" was rated more potent than "sleepy" and "tired," both  $P = .002$ . There were no other significant differences on this dimension. The repeated measures ANOVA comparing scores on the activity dimension was also significant,  $F(2.73, 256.85) = 2.92$ ,  $P = .04$ . However, post-hoc comparisons found no significant differences between any of the words on the activity dimension, all  $P > .07$ . See [Figure 2](#) for an illustration of these words in three-dimensional space.

### Distance between words in 3-dimensional space

**Table 4** contains the descriptive statistics for distance scores between all words in 3-dimensional space. A paired samples *t*

test was conducted to determine whether the distance in 3-dimensional space between "tired" and "sleepy" was significantly different compared to the distance between "tired" and "fatigue." In other words, the *t* test was able to indicate whether "tired" was significantly closer/further in semantic space (and therefore closer/further in semantic meaning) to "sleepy" than to "fatigue" (the sleep-related words furthest apart in 3-dimensional space). There was no significant difference in the distances between "tired" and the words "sleepy" and "fatigue,"  $t(94) = 1.52$ ,  $P = .13$ .

Similarly, a paired samples *t* test was conducted to determine whether the distance between "drowsy" and "sleepy" was significantly different compared to the distance between "drowsy" and "fatigue." "Drowsy" was significantly closer in 3-dimensional space to "sleepy" than to "fatigued,"  $t(94) = 2.05$ ,  $P = .04$ .

### Associations between insomnia symptom severity and semantic meaning

We predicted that ISI scores would be positively correlated with ratings of "fatigued" and negatively correlated with ratings of "sleepy" on the evaluative dimension. To test both hypotheses, Spearman correlations were conducted to assess the

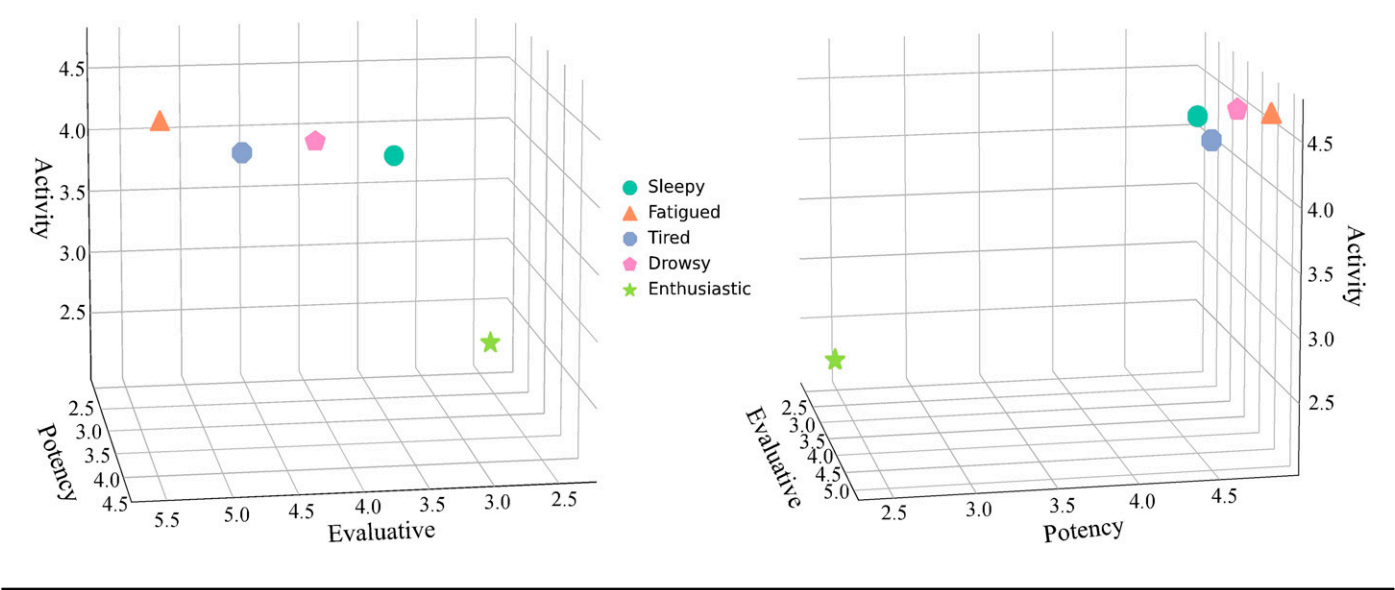
**Table 3**—Mean differences (SE) and Cohen's *d* values comparing each word on the 3 dimensions.

Words	Sleepy		Tired		Drowsy	
	M <sub>diff</sub> (SE)	<i>d</i>	M <sub>diff</sub> (SE)	<i>d</i>	M <sub>diff</sub> (SE)	<i>d</i>
Evaluative dimension						
Fatigued	1.80 (0.15)*	1.66	0.66 (0.11)*	0.67	1.16 (0.11)*	1.39
Sleepy			−1.14 (0.13)*	1.00	−0.63 (0.13)*	0.62
Tired					0.51 (0.11)*	0.56
Potency dimension						
Fatigued	0.34 (0.09)*	0.42	0.32 (0.09)*	0.40	0.18 (0.08)	0.23
Sleepy			−0.02 (0.08)	0.03	−0.16 (0.08)	0.21
Tired					−0.14 (0.09)	0.18
Activity dimension						
Fatigued	0.14 (0.12)	0.15	0.26 (0.10)	0.30	−0.01 (0.12)	0.01
Sleepy			0.12 (0.10)	0.16	−0.15 (0.09)	0.17
Tired					−0.26 (0.10)	0.32

\*Post hoc comparison  $P < .05$ . M<sub>diff</sub> = mean difference, SE = standard error.



**Figure 2**—Mean point in semantic space for each concept in 3-dimensional semantic space, with axes representing subscales of the Semantic Differential Questionnaire.



association between ISI scores and the evaluative meaning of the words “sleepy” and “fatigued.” There was a significant but small negative correlation between ISI scores and ratings of “fatigued” on the evaluative dimension,  $r_{(s)} = -0.24$ ,  $n = 94$ ,  $P = .02$ . There was no significant association between ISI scores and ratings of “sleepy” on the evaluative dimension,  $r_{(s)} = 0.08$ ,  $n = 95$ ,  $P = .42$ .

DISCUSSION

The aim of the present study was to examine whether the words “sleepy,” “tired,” “fatigued,” and “drowsy” produced differences in connotative meaning. The greatest difference in word meaning was between “sleepy” and “fatigue,” which indicates that this university student sample viewed these words as significantly distinct concepts. “Tired” was located between “sleepy” and “fatigued” on the evaluative dimension (at a similar distance between the 2 words), indicating it was considered worse than “sleepy” but better than “fatigued.” This study also extended prior research by examining the meaning of “drowsy,” which was found to be closer in meaning to “sleepy” than

“fatigued.” However, significant differences with relatively large effect ( $d = 1.39$ ) on the evaluative dimension between “sleepy” and “drowsy” suggest that researchers and clinicians should be hesitant to use these words as synonyms for one another. Additionally, insomnia symptom severity did not affect the meanings that individuals attributed to “sleepy” but had a small effect on “fatigued.” However, large effects may not have been observed due to few individuals with ISI scores indicating clinical levels of insomnia.

These preliminary results provide evidence that these words are different in semantic meaning. In particular, “fatigued” was rated more negative than “sleepy” and “tired,” and “tired” was rated more negative than “sleepy,” as was predicted and found in a prior study, suggesting that these words still hold similar meanings in today’s society, almost 15 years after the initial work.<sup>8</sup> Differences between “sleepy” and “fatigued” could be explained by how they are conceptualized by the public. Fatigue is commonly associated with pathological experiences,<sup>16</sup> often linked with almost all chronic illnesses and other expressions of psychological distress.<sup>17</sup> Thus, it is possible that an individual’s experiences with fatigue, often being linked with undesirable health states (eg, chronic fatigue, depression, illness, etc), could result

**Table 4**—Mean (SD) distances between words in semantic space.

Words	Sleepy		Drowsy		Tired	
	Mean	SD	Mean	SD	Mean	SD
Fatigued	2.41	1.33	1.91	0.97	1.62	0.88
Sleepy			1.68	0.86	1.81	1.02
Drowsy					1.58	0.89

SD = standard deviation.

in negative connotations toward the word. In comparison, “sleepy” is a reversible state and may be linked to the imminent reduction of sleepiness and restoration of alertness following a period of sleep, such as after a brief nap<sup>18</sup> or normal nocturnal sleep.<sup>19</sup> “Tired” seems to be intermediate to “fatigued” and “sleepy” and thus may be the more generic term used when an individual is either too tired to be more discriminating or is experiencing both sleepiness and fatigue. Future research could investigate differences in meanings with other similar words, such as “distracted,” “weary,” and “exhausted,” as well as words similar to the reference word “enthusiastic” to elucidate the relative distance between word meanings.

The observed differences between “sleepy,” “tired,” “fatigued,” and “drowsy” have potentially important implications. This study adds to the argument made by Pigeon et al<sup>1</sup> by indicating that university students also view the words “sleepy,” “tired,” and “fatigued” as distinct concepts and suggests that they should not be equated when conversing with the general public, as the different semantic meanings of these words (and negative connotations toward some words in particular) may affect interpretation. For example, public information campaigns (eg, road signs and advertisements) encouraging drivers to stop if they are experiencing “fatigue” may not be as effective as using a more appropriate term such as sleepy or drowsy, assuming the latter are more likely to be related to the likelihood of actually falling asleep at the wheel of a vehicle.

The inclusion of the word “drowsy” was a novel addition to the present study. “Drowsy” was significantly closer in 3-dimensional space to “sleepy” than to “fatigued” but was still significantly different in meaning, namely on the evaluative dimension. The state of “drowsiness” is most often conceptualized as the transitional state between wakefulness and sleepiness and should not be (and perhaps is not) confused with feelings of sleepiness.<sup>20</sup> Drowsiness may be seen as inconvenient; the individual is not yet ready for sleep but cannot continue to undertake activities as effectively as they were when in their wakeful state.<sup>20</sup> As discussed by Johns,<sup>20</sup> in clinical practice it is encouraged to separate feelings of drowsiness with sleepiness. Yet, aiming to help differentiate “sleepy” and “fatigue,” Pigeon et al<sup>1</sup> suggested that sleepiness be conceptualized as drowsiness. The results of the present study suggest that equating “sleepy” with “drowsy” may be inappropriate, and therefore clinicians and researchers should still be hesitant to treat the terms synonymously.

Contrary to predictions, there is no strong evidence to suggest that the meanings that individuals attribute to these words are affected by insomnia symptom severity, as shown by the small association between “fatigued” meaning and ISI scores. However, the present study likely did not observe an adequate number of individuals with clinical insomnia symptomology and was therefore likely underpowered to detect a relationship. Only 14 participants (15%) scored 15 or above on the ISI, indicating clinical insomnia symptoms (moderate severity). Additionally, the relatively low sample size and recruitment from only 1 source (with this sample being representative of this university’s student population) limits the ability to generalize these findings across contexts and populations. Further limitations include the heterogeneity of the sample (eg, limited age

range) and a lack of measures for other demographics (eg, other languages spoken) and health conditions that could affect the meanings that individuals attributed to these words (such as symptoms of sleep disorders other than insomnia, or psychiatric conditions). Future research should aim to recruit from a variety of populations from various contexts to thoroughly test this and other potential relationships.

In summary, this study provided preliminary evidence to suggest that the terms “sleepy,” “drowsy,” “tired,” and “fatigued” are viewed as distinct concepts. Not only do they appear to differ in their phenomenology<sup>21</sup> but they also differ in their quantified connotative meaning. Researchers and clinicians are encouraged to be hesitant about using these words interchangeably. Further research is needed to replicate these findings, particularly with a higher number of individuals with sleep disorders in order to determine whether this clinical population attributes different meanings to these words than the general public.

## ABBREVIATIONS

ANOVA, analysis of variance

ISI, Insomnia Severity Index

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## DISCLOSURE STATEMENT

All authors have seen and approved the final manuscript. The authors report no conflicts of interest.