

## MEANING OF AWE IN JAPANESE (CON)TEXT: BEYOND FEAR AND RESPECT

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Awe is theorized as an emotion appraised by perceived vastness and need for accommodation. This theoretical framework was developed with a review of spatially and temporally distributed literature mostly in the American and European cultural context, and is assumed to be culturally universal. However, awe as described by Japanese literature, was not explicitly included in the original theorization. We tested whether this framework generalized to the Japanese context by analyzing how Japanese awe-related words (e.g., “畏敬/*ikei*”) are used in Japanese text. A topic model was used to extract topics in contexts as an index of meaning. Results show that (1) the meaning of awe was statistically dissociable from similar but distinct meanings of fear and respect, and (2) the dissociating topics included transcendent entities such as god, spirits/ghosts, and powerful beings. Japanese meaning of awe includes vastness (i.e., transcendence) that goes beyond typical respect (i.e., power distance) requiring an accommodation of one’s mental framework.

**Key words:** awe, Japanese, text analysis, topic model

### INTRODUCTION

The emotion of awe is theorized as an emotion with perceived vastness and need for accommodation as its key appraisal dimensions (Keltner & Haidt, 2003). Awe is often felt towards nature, such as the ocean, huge trees and the universe, because of their vastness in scale, and requires a cognitive accommodation of one’s mental framework to process. Awe-inspiring targets could also be social, such as charismatic leaders who inspire people with their charisma and creativeness.

This theoretical framework was developed through a review of spatially and temporally distributed literature, and is assumed to be a culturally universal framework of awe. Indeed, the framework has been influential, and has inspired several empirical and psychological investigations of awe (Bai et al., 2017; Gordon et al., 2017; Gottlieb et al., 2018; Koh et al., 2019; Piff et al., 2015; Razavi et al., 2016; Rudd et al., 2012; Shiota et al., 2006, 2007, 2017; Stellar et al., 2015; Taylor & Uchida, 2019; Yaden et al., 2019).

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Supportive evidence for this framework has been generated mainly from empirical research in the Western context (Yaden et al., 2019). Nature and art/music have been listed as dominant elicitors of awe (Shiota et al., 2007), where people appraised vastness and/or smallness of the self (Bai et al., 2017; Piff et al., 2015; Shiota et al., 2007). The awe-eliciting stimuli also evoked appraisal of need for accommodation leading to with perception of supernatural agents as a product of accommodation process (Valdesolo & Graham, 2014).

This theoretical framework captures several types of awe elicitors and awe-related features and consequences. These elicitors are peripheral, in that their features (i.e., beauty, virtue, and threat) need not be shared over every type of awe experiences (by contrast, the core appraisals of vastness and need for accommodation are central features). Here, an examination of awe in the Japanese context provides a good test case for examining a cross-cultural generalization of the framework, as definitions of awe according to Japanese literature was not included in the original theorization. In the next section, we introduce awe in the Japanese context.

#### *Awe in the Japanese Context*

Awe in the Japanese context can sometimes include negative emotional appraisals. Such a negative appraisal of awe also exists in cultures outside Japan (Gordon et al., 2017; Piff et al., 2015; Taylor & Uchida, 2019). For example, beauty in nature can sometimes be threatening (e.g., volcano). Sublime is theorized to be as a feeling of vastness and beauty in the context of threat (Gordon et al., 2017; Keltner & Haidt, 2003). A powerful king may also appear threatening due to the power he has to issue punishments. This negative appraisal of awe is, nonetheless, more salient in the Japanese context. One reason is language: Japanese has two main words for awe, “*ifu*/畏怖” and “*ikei*/畏敬”. As Japanese is an ideographic language, a character represents a set of meanings, and words that share the same characters tend to have similar meanings. The first character “畏” could be a noun (i.e., “*osore*/畏れ”) or a verb (i.e., “*osoreru*/畏れる”, and “*kashikomaru*/畏まる”) and could represent an awe-related meaning: modesty-related ‘shrinkage’ in situations of vastness. In addition, the words “*ifu*/畏怖” and “*ikei*/畏敬” respectively convey fear (indicated by the second character “怖”), and respect or a positive evaluation (indicated by the second character “敬”). Japanese speakers may also confuse these two words with either fear or respect, or even use these words in reference to mixtures of fear and respect in different component ratios.

Therefore, these words with the character “畏” indicates awe. To be specific, they represent mixtures of fear and respect towards transcendent entities such as gods and/or great beings, encapsulating connotations of vastness (i.e., transcendence of elicitor) and other associations (i.e., fear). Although the need for accommodation component is not explicitly included in the definition, the ‘respect’ component of Japanese awe implies that the transcendence or power distance of the elicitor is beyond what a typical elicitor of respect would usually possess. Consequently, an attempt for assimilation of such magnitude into existing mental representations would instead require a cognitive accommodation of one’s mental framework. The variability of awe might also be

reflected in the different words of *ifu* and *ikei* with the former referring to a more negative variant of awe. In sum, this dictionary definition appears to be consistent with the theoretical framework by Keltner and Haidt (2003). Nevertheless, a validation of such an assumption would require further empirical research on Japanese definitions of awe, which is unfortunately very scarce. Fortunately, a notable exception is a series of work by Muto (2014, 2016).

Muto (2014) compared the meaning of awe-related words with other respect-related emotional words in Japanese. A multi-dimensional scaling showed that “*ifu*” and “*ikei*” are at the negative extreme of the respect-related words, with “*ifu*” being more negative. Therefore, with such negative connotations, the Japanese words for awe are dissociable from other respect related words. Muto (2016) developed a scale that measures an individual’s trait-like tendency to feel negative awe, as dissociated from other respect-related emotions. Nevertheless, while the theme of respect is power distance and although respect is felt towards superordinates, it is unclear from this line of research if awe-related words indeed capture the large magnitude of power distance that is above and beyond typical respect, requiring an accommodation of one’s mental framework. In other words, it is still not empirically clear whether the Japanese meaning of awe is simultaneously dissociable from that of fear and respect, rather than mere mixture of fear and respect.

### *The Current Study*

The current study compared Japanese meanings of awe with that of fear and respect. We attempted to extract meaning of these emotions from Japanese text corpora based on two theoretical assumptions. Firstly, the variability of the meaning of emotion and affective states are conceptualized as distributed points in representational space of emotion, that reflect the similarity structure of meaning/states (e.g., how an awe experience is similar to a fear experience). Secondly, people construct the emotional representation (at least, to a certain extent) based on co-occurrence statistics of words in a language. In a representational space, some affective states were coherently clustered to constitute an emotional category that corresponded to one emotional label (e.g., nostalgia), but other affective states were distributed in a more graded way between two emotional categories/labels (e.g., fear and anxiety; Cowen & Keltner, 2017; Cowen et al., 2019). A representation space captured variation of meanings of the same emotion such as happiness, anger, shame, and respect (Boiger et al., 2013; Muto, 2014; Uchida & Kitayama, 2009). The similarity structure was also reflected in neural representation of emotion (Saarimäki et al., 2016, 2018).

How do people extract meanings of emotion to construct a representation space? Semantic cognition literature has long suggested that people utilize co-occurrence structures of words to extract word meanings, and to construct semantic representation based on similarities of meaning (e.g., Elman, 1990; Griffiths et al., 2007; Hoffman et al., 2018). We applied this co-occurrence statistics-based approach to extract meanings of awe, fear, and respect. To be specific, we utilized topic modeling (Griffiths et al., 2007) to extract latent topics from textual contexts for awe-, fear-, and respect-related words

occurred. Topic modeling assumes that a set of words (i.e., textual contexts, e.g., sentences) is generated by a shared topic. A set of topics and its association to every word are then extracted and estimated based on the co-occurrence structure within a corpus of words. For example, if words such as god, faith, and spirits co-occur with the word 'awe', this suggests that 'awe' could be associated a latent topic of religiosity. We can then interpret this result as reflective of the association between awe and religiosity. Here, we run this model to test co-occurrence of awe-related words together with that of fear- and respect-related words, and thus evaluate whether and how they share topics. The logic here is similar to how factor analyses are used to examine underlying psychological constructs. For example, personality, as a psychological construct, is assumed to systematically influence a set of behavior. By measuring behavior, (typically through scale items, e.g., Likert scales) a factor analysis can then extract personality types (sets) that are most likely given the covariance structure of the items in the scale. In topic modeling, a 'context' (e.g., sentence or paragraph) corresponds to a person who behaves in a certain way as measured by scales and indices. Similarly, the 'topic' of our method corresponds to the underlying personality (or other psychological construct) latent variable of the above analogy. The frequency of words in one context corresponds to a set of responses for a set of items (e.g., scales) from one person, with the frequency of the words covarying in a certain way. With topic modeling, we can extract 'topics' of textual contexts that surround the usage of awe-words (and others), and can then compare the distribution of the topic with that of other words, such as fear and respect. This is similar to conventional methods where personality researchers compare two or more groups of people (e.g., Japanese vs. North Americans) to assess if the groups differ in aspects of personality (e.g., neuroticism and extraversion).

The co-occurrence statistics-based approach, in a broad sense, resonates with the idea that the meaning of an emotion is dynamically constructed via integrating a set of situational and internal cues (Hoemann et al., 2017). Textual contexts for emotional words are good approximations of the sets of contextual cues that are associated with the meaning of an emotion because language is as informative, facilitating interpersonal communication and regulation of each other's emotional state (Gendron & Barrett, 2018; Wierzbicka, 1999). Indeed, co-occurrence statistics has been demonstrated to be informative enough to approximate valence, arousal, and dominance of emotional words (Recchia & Louwerse, 2015). Topic models have been shown to be able to differentiate social affections in web-based texts (Bao et al., 2009), to extract emotional components, such as anger and anxiety, from a psychotherapy corpus (Imel et al., 2015), and to estimate a writer's emotional states from Facebook language to predict future diagnoses of depression better than clinical screening tests (Eichstaedt et al., 2018). Thus, topic model is a promising approach to extract and compare the meaning of emotional words.

With this approach, we tested (1) whether the meaning of awe is statistically dissociable from fear and respect, and (2) what kind of topics differentiate the meaning of awe-related words from fear- and respect-related words. This is to examine if the Japanese meaning of awe is consistent with theorizations by Keltner and Haidt (2003) in inclusions of vastness and need for accommodation as associated concepts.

## METHODS

### *Corpus*

We used The Balanced Corpus of Contemporary Written Japanese developed by the National Institute for Japanese Language and Linguistics (Maekawa et al., 2014). It is a validated and representative corpus of Japanese because consisting of 100 million words across a variety of genres with strict random sampling of texts from books, magazines, newspapers, business reports, textbooks, PR documents, web postings (from Yahoo answers), blogs (from Yahoo Blogs), poetry, legal documents, and minutes of the national diet. As a result, it is a widely used corpus that has been used/cited at least 999 times as of October 2, 2019 (National Institute for Japanese Language and Linguistics, 2019). Using the Shonagon query system, we retrieved contexts for target words (i.e., awe-, fear-, and respect-related words).

### *Target Words*

Awe-related words included “畏敬<sup>1</sup>” (161), “畏怖” (149), “畏れ” (199), “畏ま” (29), and “畏み” (8), considering inflection. The numbers in parentheses indicate the number of retrieved instances/context. Respect-related words included “敬意” and “敬う”, both sharing the character “敬” with “畏敬”. There were 755 and 1777 retrieved instances respectively for “敬意” and “敬う”. For fear-related words (“恐怖” and “怖い”), both sharing the character “怖” with “畏怖”), we retrieved 3801 and 3215 instances respectively for “恐怖” and “怖い”. As contexts for respect and fear outnumbered contexts for awe, we randomly sampled 500 instances for each of the fear- and respect-related words.

### *Textual Contexts*

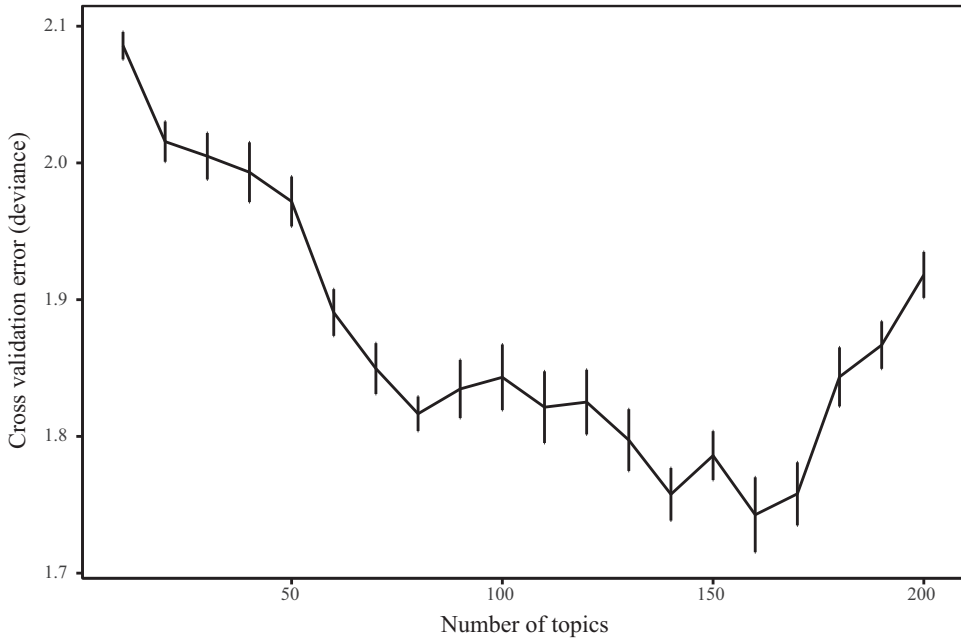
Textual context was operationally defined as 40 letters before and after target words, following the default settings of the query system. If there are less than 40 letters either before or after the target word (e.g., target words appear in the beginning of a chapter), we included in each context as many letters as possible. Each context was submitted to morphological analysis using the RMeCab package (Ishida, 2017) in R, and words were parsed into their basic forms. Following which, words in the contexts were selected for further analysis if they met the following criteria: all words had to appear five times or more in the entire set of retrieved contexts. All words had to be either noun, adjective verb, adjective, or verb, and either “一般/common”, “自立/main”, “サ変接続/noun-verbal”, “形容動詞語幹/adjective-base”, “固有名詞/noun proper” or “ナイ形容詞語幹/nai-adjective”. The analysis also excluded frequent but relatively meaningless words (i.e., “する/do”, “ある/be”, “ない/not be”, “なる/become”, “いる/be”). Finally, the analysis excluded target words (that happened to appear in a context of other target words) and closely related words (i.e., “畏敬”, “畏怖”, “畏れる”, “畏い”, “畏れ多い”, “尊敬”, “敬意”, “恐怖”, “怖い”, “念”). The word “念/feeling” was excluded because it frequently co-occurred with awe-related words “畏怖” and “畏敬” but would not contribute to dissociating the meaning of awe from meaning of fear and respect. One context for respect-related word was removed from analysis because no word in the context remained after filtering. Accordingly, 2549 contexts with 1417 types of words were analyzed.

Each context was further transformed into a “bag-of-words”, or a vector where elements represent token frequency of each type of word in the context. The vector is similar to participant vector in a typical personality research whose elements represent responses for each item. Although the bag of words omits any sequential information in the original textual context, it still captures a gist of the themes in the context, much like how order of behavior is informative in human behavior (e.g., “a smile after an angry face” differs from “an angry face after a smile”) but yet can be omitted when extracting a ‘gist’ of participants’ personalities.

### *Topic Model and Classification*

Topics were extracted from bag-of-words by latent dirichlet allocation with variational EM algorithm (Blei et al., 2003) by using the topicmodels package (Grün & Hornik, 2011) in R. A multinomial regression was then run on the extracted distribution of topics to predict the class of target word (i.e., awe, fear, or respect). We also used a lasso regression (regularized regression; conducted in R using the glmnet package,

<sup>1</sup> Since we analyzed Japanese text, we report the original Japanese form of the words to enhance reproducibility of the analysis. English translations are specified if necessary.



**Fig. 1.** Cross Validation Error as a Function of the Number of Topics

*Note.* Error bars indicate 95% confidence intervals.

Friedman et al., 2010) to improve generalizability. In this data fitting process, there were two important parameters that needed to be determined: one is the number of topics and the other is the regularization term  $\lambda$  used in the lasso regression. These parameters were determined by examining cross-validation error. First, the number of to-be-extracted topics for the regression model was set arbitrarily to ten and iteratively increased to 200 in units of 10. For each iteration of the model,  $\lambda$  was further determined through cross-validation error. The set of contexts was divided into ten folds and each fold was used once as a testing set with the other used as a training set. The regression model corresponding to the lowest cross validation error (i.e., smallest error) was used to identify the optimal  $\lambda$  and number of extracted topic. As Fig. 1 indicates, a model with 160 extracted topics showed the lowest error and was thus used in the main analysis together with the associated  $\lambda$ . In the main analysis, the regression model was fit over all the textual contexts to test if the meaning of awe-related words is statistically dissociable from that of fear- and respect-related words.

## RESULTS

### *Classification of Contexts for Awe-, Fear-, and Respect-Related Words*

Table 1 shows the confusion matrix between predicted class and the ground truth. Unfilled circles in Fig. 2 indicate classification accuracy for each type of emotion. The accuracy for awe was 29.7%. One might argue that it is not above the nominal chance level of 33% (i.e., a random selection from three categories). However, awe-related contexts were less frequent than other emotions and baseline tendency is lower for the model to classify the context as awe than fear and respect. To empirically calculate the chance level and statistically compare it to the model's performance, we ran a

Table 1. Confusion Matrix Between Predicted Class and Ground Truth

Ground truth	predicted		
	Awe	Fear	Respect
Awe	162	253	131
Fear	43	816	141
Respect	51	255	693

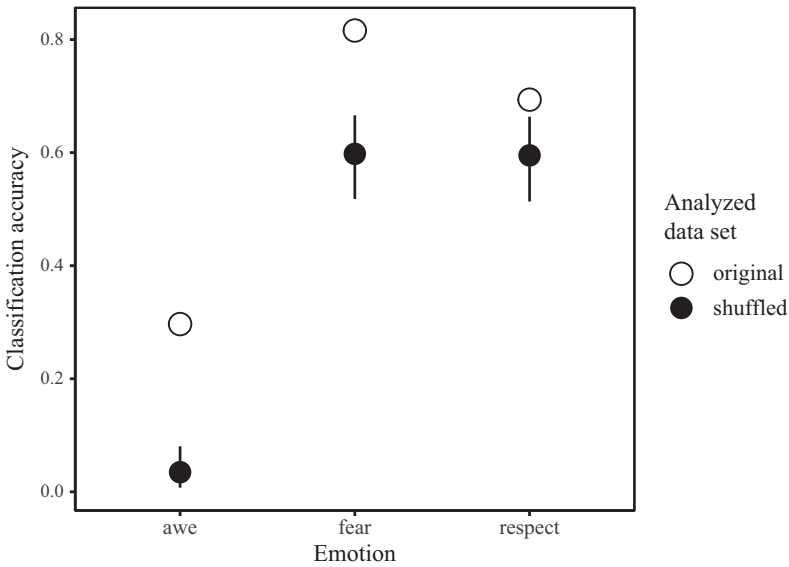


Fig. 2. Classification Accuracy

Note. Error bars indicate range of the distribution.

permutation test. The to-be-predicted emotion labels (awe, fear, respect) were randomly shuffled and submitted to the lasso regression with the same  $\lambda$  parameter as the original ones. Note that the labels no longer have systematic relationship with the topic distribution and only the baseline frequency is retained. We resampled the model 1000 times with different random seeds for a more robust measure. Filled circles in Fig. 2 indicate mean and range of the accuracy for shuffled models (i.e., empirical chance levels). The accuracy for the original model is well above these revised chance levels ( $p < .001$ , permutation mean [range] = 3.5% [0.7%:8.0%]), suggesting that the meaning of awe is dissociable from that of fear and respect.

#### *Similarity Structure of Awe, Fear, and Respect*

This section analyzed whether the meaning of awe overlapped with that of fear and respect. To directly examine the similarity structure of these emotions, we analyzed net

inputs for the softmax function (i.e., latent linear variables) of the multinomial regression. If two emotions (e.g., awe and fear) are similar to each other, net inputs to the two categories should positively correlate. The correlations were  $r = -.08$  for awe and fear,  $r = -.57$  for awe and respect, and  $r = -.78$  for fear and respect. Consistent with the previous analysis, awe was distinct from the other two emotions. Nonetheless, the distinctions were more modest (i.e., correlated less negatively) than the distinction between fear and respect. In other words, awe and fear had more (latent) similarities than fear and respect, and awe and respect had more (latent) similarities than awe and fear. To statistically confirm this pattern, we performed another permutation test where we repeatedly computed differences between fisher-transformed awe-fear correlation and fear-respect correlation, and between awe-respect correlation and fear-respect correlation in the 1000 resampled regressions with shuffled emotion labels. Differences between fisher-transformed awe-fear correlation minus fear-respect correlation (0.96) was larger than chance ( $p < .001$ , permutation test mean [range] =  $-0.03 [-0.58:0.67]$ ). Differences between fisher-transformed awe-respect correlation minus fear-respect correlation (0.39) was larger than chance ( $p = .017$ , permutation test mean [range] =  $-0.03 [-0.67:0.63]$ ).

#### *Topics That Dissociate Awe From Fear and Respect*

In this section, we analyzed how the meaning of awe differs from that of fear and respect. Table 2 shows ten topics with largest regression coefficients to the awe category with the topic number indicating the rank of the coefficients. In other words, the textual contexts that mention these topics are likely to be categorized as awe contexts. Each topic has its associated word distribution and Table 2 shows ten ‘most related’ words generated by each topic and their probabilities, and can be interpreted similar to factor loadings for items in a psychological scale.

Vastness-related words and themes appeared in some topics. Topic 1 was related to religiosity, spirituality, or supernatural beings, and associated with words such as “神/god”, “道/road/tao”, “信仰/faith”, “靈/spirit/ghost”. Although other topics were not predominantly about religiosity, spirituality, or supernatural being, some topics occasionally highlighted religious words such as “神聖/sacred” in topic 2 and “儀式/ritual” in topic 7. Power-related words were also associated with some topics. Topic 3 was related to power or status and was associated with words such as<sup>2</sup> “奉る/give [towards superordinate person]”, “宮/palace”, and “主上/master/Highness”. Topic 5 also seemed directly associable with concepts of “権力/power” or “権威/authority”. Powerful historical figures were also associated with some topics (i.e., “秀吉/Hideyoshi” [a warrior who once ruled Japan] in topic 6 and “慶喜/Yoshinobu” (an Edo-era Shogun) in topic 10. Nature and/or aesthetic beauty are prototypical elicitors and themes of awe in the Western context (e.g., Shiota et al., 2006, 2007) that also appeared in topics 6 and 9. These results suggest that Japanese meaning of awe includes vastness, as seen through

<sup>2</sup> The “bag-of-word” treatment does not consider the word order, and sender and receiver of awe. There were words related to *lower* power or status (e.g., “庶民/common people” in topic 10). Given awe is an emotion felt by subordinates to superordinates, these words are inferred to describe the subordinates in the text.



Table 2. Top Ten Awe-Predicting Topics

	Topic 1		Topic 2		Topic 3		Topic 4		Topic 5	
	Words	Prob.	Words	Prob.	Words	Prob.	Words	Prob.	Words	Prob.
神	god	.457	多い	.454	下	.167	表情	.345	こめる	.261
道	road/tao	.123	考える	.385	奉る	.115	浮かぶ	.146	よい	.224
信仰	faith	.092	待つ	.063	答える	.115	作る	.133	権力	.131
光景	scenary	.062	神聖	.039	鳥	.079	急	.106	権威	.122
霊	spirit/ghost	.049	ダメ	.035	向く	.071	奥	.093	意	.094
読者	reader	.037	松	.025	飛ぶ	.062	肉	.066	名誉	.066
匂い	smell	.031	-	-	宮	.062	軽蔑	.029	組織	.047
駆る	drive	.031	-	-	主上	.053	おののく	.027	内部	.028
					Highness		shudder		inside	
律	rule/law	.03	-	-	若者	.044	お母さん	.014	物語	.009
数	number	.019	-	-	内侍	.044	上手	.014	存	.009
					maid of honor		skillful		be present	

Table 2. (continued)

	Topic 6		Topic 7		Topic 8		Topic 9		Topic 10	
	Words	Prob.	Words	Prob.	Words	Prob.	Words	Prob.	Words	Prob.
自然	nature	.483	顔	.722	足	.242	覚える	.315	口	.225
接す	interact	.088	別	.142	そのもの	.135	震える	.153	食べる	.186
進める	advance	.073	儀式	.053	体験	.135	寒い	.095	言える	.157
現象	phnomena	.066	者	.037	一種	.106	重い	.076	庶民	.108
秀吉	Hideyoshi/ a warrior who once ruled Japan	.066	笑顔	.036	水	.097	肩	.067	地位	.085
軽蔑	insult	.063	押す	.01	呼吸	.077	美	.057	將軍	.05
加える	add	.051	-	-	まわり	.068	説く	.057	かぶる	.049
目的	purpose	.027	-	-	空気	.048	親しい	.048	きく	.049
含む	imply	.023	-	-	歌	.048	浮かべる	.048	慶喜	.049
重要	important	.022	-	-	観察	.013	直面	.048	驚き	.021
					observation		face/in the presence of		surprise	

supernatural beings, social power and nature.

Other topics highlighted include facial expression and responses to awe. The content of the expression or response was sometimes unspecified but there were nevertheless some clues, such as “おののく/tremble/shudder” in topic 4, “笑顔/smile” in topic 7, and “震える/shiver” in topic 9 (cf. Yaden et al., 2019).

## DISCUSSION

The current study analyzed how awe-related words are commonly used in Japanese text to extract the meaning of these words. Results showed that the meaning of awe was indeed statistically differentiable from that of fear and respect. The themes that dissociate awe from the other emotions were related to vastness in the context of transcendence (e.g., god) and social power (e.g., a powerful ruler). Considering that the influential theoretical framework for awe (Keltner & Haidt, 2003) and subsequent empirical research have largely omitted awe in the Japanese/East Asian context, our findings provide novel evidence for the cross-cultural generalizability of the framework to the Japanese cultural context. Japanese meaning of awe is not merely a mixture of fear and respect but also includes vastness.

### *Does Japanese Meaning of Awe Include Need for Accommodation?*

Need for accommodation is the other central appraisal of awe in the theoretical framework by Keltner and Haidt (2003). The awe-predicting themes did not explicitly include a ‘need for accommodation’ component, and this might threaten the universality of the framework. However, it should be noted that awe was dissociable from respect. This is despite respect having associated themes of power distance, that relate somewhat conceptually to vastness. Accordingly, we suggest that the dissociation of awe from respect indicates that the awe-eliciting power distance or transcendence is greatly differentiated from typical respect-eliciting power distance, and that it might require some form of cognitive accommodation processes. Awe was also dissociable from fear: awe-related threats to one’s world view or internalized meaning systems are dissociable from mere fear (Heine et al., 2006). The Japanese meaning of awe might imply threats to one’s meaning system beyond fear, and this may also require cognitive accommodation processes (e.g., experiencing an earthquake may lead people to realize their own vulnerability). Relatedly, if perceived need for accommodation is elicited in an awe experience, it enhances the tendency to perceive supernatural agency (Valdesolo & Graham, 2014; see also Proulx & Heine, 2009). The awe-predicting themes did include supernatural being such as gods and spirits that could be a product of this (perceived) need for accommodation. Taken together, the Japanese meaning of awe is likely to include the need for accommodation component, albeit in an implicit manner.

### *Potential Cultural Differences*

Here, we focused on the culturally universal core components of awe (i.e., vastness

and need for accommodation) and the current research does not provide rigorous cross-cultural comparison to demonstrate any difference in meaning of awe between Japanese and other cultures (e.g., North American cultures). Nevertheless, it would be useful to discuss potential cultural difference in awe between Japanese and other cultures/languages because previous empirical research on awe has mostly targeted Western, especially North American, samples. As Keltner and Haidt (2003) theorized, awe is a broad emotion that can be flavored with both positive (e.g., beauty) and negative (e.g., threat) elements. One potential cultural difference is, therefore, its valence. In the Western context awe has been consistently identified as having positive appraisals (e.g., Rudd et al., 2012; Shiota et al., 2006, 2007, 2017; Tong, 2015, but see Gordon et al., 2017; Piff et al., 2015). However, existing cross-cultural comparison showed that individual tendency to feel positive awe (Shiota et al., 2006) is extreme in the United States among the compared countries (Razavi et al., 2016). Japanese/East Asian countries have higher natural disaster risk, that is associated with prosocial and collectivistic tendency (Li et al., 2013; Oishi & Komiya, 2017; Oishi et al., 2017; Uchida et al., 2014). Given that awe, especially the small self component, mediated the effect of threatening as well as beautiful natural scenery and prosocial tendency (Guan et al., 2019; Piff et al., 2015), prevalence of threat-based awe is speculated to be higher in Japan/East Asia. Consistent with these findings, our current study showed that awe was not completely separable from fear, but also closer to fear than respect was.

Another potential cultural difference is in the social engagement of elicitors. Reflecting interdependent self-construal (Markus & Kitayama, 1991), socially engaged emotions are more important in Japanese context than North American context where independent self-construal is dominant (Kitayama et al., 2006). Similarly, social/in group hierarchy is more salient in Japan than North America where an egalitarian norm is more dominant (Triandis, 1995). Accordingly, power distance should thus be more salient as an elicitor of awe in Japan. Consistent with these ideas, the current analysis showed that awe was not completely separable from respect, but also closer to respect than fear was. As respect is an emotion that subordinates feel towards superordinates, Japanese meaning of awe includes power distance as an elicitor. In addition, our results showed that awe is used in contexts of power distance (e.g., powerful person or authority) even in the component that dissociates awe from fear and respect. These suggestions for cultural difference are still preliminary and future research could compare two or more cultures to test such cultural diversity directly for the emotion of awe.

#### *Implications for Individual Difference Research*

Our approach provides a quantitative measure of content validity of trait-level awe scales (Muto, 2016; Shiota et al., 2006) that explicitly use the word “awe/畏怖/畏敬/畏れ” (e.g., “I often feel awe”; Shiota et al., 2006). These scales do not solely consist of these labels, but also uses items that capture the appraisals of vastness and need for accommodation without explicitly using the labels. If the label words had a different meaning than previously assumed and measured (by the items without labels), then it disturbs the content validity and internal consistency of the scale. The current study

provides additional evidence for the accuracy of ‘awe’ labels in Japanese. Nevertheless, the same problem may be relevant to the context of cross-cultural comparisons. Using/translating labels by itself might risk the cross-cultural equivalence of the measure, because the meaning of the label words could vary easily across cultures/languages, especially if explicit contexts are omitted. The current study validates the accuracy of labels for “awe” in Japanese as having a similar meaning to the English concept of awe.

### *Methodological Implications*

The theoretical framework by Keltner and Haidt (2003) was developed through literature review. Specifically, the literature review was explicitly guided by experts (i.e., researchers) and considered relevant philosophical directions and literature. Subsequent empirical research targeted associated behavioral or psychological tendency of lay people, and lay conceptualization of the emotion. Such a combination of theoretical and empirical work is a tried-and-tested, useful approach in psychological science. Our novel computational approach lies somewhere in-between. The current study conducted a ‘literature review’ using machine learning, where the target literature included not only texts by ‘experts’, but also lay people (e.g., blogs). In cross-cultural research, cultural products approaches often have larger effect sizes than behavioral measures. This is putatively because cultural products reflect shared knowledge/tendencies that are emphasized by cultural elites, and/or because cultural products have survived (implicit) selection by lay people within the culture (Morling & Lamoreaux, 2008). Analysis of text, or cultural products in general, can also be a new and useful method for emotion research. Machine learning approaches have also recently started to contribute to emotion research (e.g., Cowen & Keltner, 2017; Cowen et al., 2019). Machine learning and/or computational analysis approach have unique advantages when compared to traditional analysis methods in psychology for similar research questions (e.g., text coding by research assistants). For one, it provides a more objective and reproducible measure than coding. A procedure for computational analysis is communicated with less ambiguity (e.g., via sharing of R scripts) whereas research assistants’ training scheme and coding procedures are typically difficult to convey without ambiguity. It also allows us to utilize large-scale data, that may provide opportunities to robustly estimate effects in more realistic settings (e.g., a large number of texts in the real world), over open-ended responses from a small number of participants in a controlled but artificial experiment setting. As the current research illustrates, a combination of machine learning with cultural products analyses could potentially provide a novel and powerful tool for emotion research.

### *Limitations*

The current study heavily relied on linguistic information to estimate Japanese meanings of awe. Language is a good approximation of how people experience the world; in communicating and regulating emotions via language. We successfully demonstrated that what is labeled as “awe” was consistent with the theoretical framework (Keltner & Haidt, 2003). However, language is not a perfect tool to describe people’s

experience. The current study did not examine awe experience where the “awe” label was *not* explicitly used. Since awe is an emotion where people perceive need for accommodation of their mental framework, (strong) awe experience might be rare and the appropriate labelling of such experiences may not be common knowledge. Indeed, 30 % of contemporary college students did not know the meaning of the word “*ifu*” and “*ikeri*” (Muto, 2014). Future research should also examine the meaning of awe in Japanese (and other cultural) context in terms of neuro-physiological responses (e.g., Stellar et al., 2015) and action tendency (e.g., Piff et al., 2015) with experimental induction of awe.

### Conclusion

The current study utilized text analysis to examine Japanese meanings of awe. The analysis demonstrated that the meaning of awe was dissociable from that of fear and respect, suggesting that awe is beyond mere fear and respect, requiring an accommodation of one’s mental framework. The dissociating components contained religiosity/spirituality-, power/authority-, and nature-related meanings, suggesting perception of vastness. The current study provide evidence for the theoretical framework of awe in Japan (Keltner & Haidt, 2003), that conceptualize awe as an emotion evoked by appraised vastness and need for accommodation.

### AUTHOR’S CONTRIBUTION

M.N. conceived the original idea and performed the analysis. M.N. and Y.U. wrote and revised the draft. All authors approved the final version of the manuscript.

### CONFLICT OF INTEREST

The authors declare no conflict of interest.

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