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Replication and extension of an empirical study about foreign language formulaic familiarity database: Reliability and emotionality¹

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L'émotion, la familiarité et les séquences de formules (expressions préfabriquées / phrases à plusieurs mots) sont des aspects importants de la recherche en linguistique appliquée (acquisition d'une langue distante, par exemple: l'anglais pour les Japonais); mais ces aspects sont rarement liés les uns aux autres dans une étude quantitative. Les objectifs de la présente étude étaient les suivants: (n° 1) enrichir la base de données sur la familiarité avec des formules pour les étudiant-e-s des universités japonaises (Isobe et al. 2016) avec des données émotionnelles numériques pour poursuivre la recherche et créer des applications pédagogiques; et (n° 2) vérifier la fiabilité des données de familiarité en reproduisant une étude. Les étudiant-e-s d'anglais d'une université au Japon ont été invité-e-s à remplir une série de questionnaires en ligne dans lesquels elles et ils ont évalué chaque formule dans la liste PHRASE (Martinez et Schmitt 2012) en termes du sens positif ou négatif de sa signification (la valence émotionnelle - un facteur affectif digital / numérique; voir Kanazawa 2016) et la fréquence subjective / ressentie vue ou entendue (la familiarité - un facteur lexical important) sur une échelle de Likert à sept points. Les réponses ont été collectées avec succès et une liste de formules avec des données émotionnelles numériques a donc été produite. L'analyse corrélacionnelle a d'abord démontré que la valeur de valence émotionnelle n'était corrélée ni à la familiarité ni à la fréquence dans le corpus, indiquant son indépendance comme facteur. Il a également été indiqué que les éléments chargés d'émotion - qu'ils soient positifs ou négatifs - donnent des valeurs de familiarité plus élevées. Ensuite, l'étude de réplication a vérifié la fiabilité de la base de données en termes de familiarité des formules. Les résultats contribuent au développement de bases de données similaires pour les étudiants de langues étrangères.

Mots-clés:

valence émotionnelle, séquence de formules, familiarité, fiabilité d'une base de données de formules, langues éloignées, apprenants japonais d'anglais, EmAL.

Keywords:

emotional valence, formulaic sequence, familiarity, reliability of a formulaic database, distant languages, Japanese learners of English, EmAL.

1. Introduction

1.1 Lexical/Formulaic familiarity

Multiple lexical/formulaic attributes are known to play essential roles in foreign language vocabulary acquisition (FLVA). Namely, FLVA and processing are known to be influenced by such factors as the number of letters, the number of

¹ This paper is based partly on Kanazawa (2020a; 2020b).

syllables, phonetic characteristics, the (non)existence of homonyms, homophones, neighboring words, and *frequency* (Jiang 2018). Frequency can be defined as the number of occurrences of the target lexical/formulaic item in a given linguistic input (Conklin 2020). A plethora of empirical studies show that high frequency items are processed faster, remembered more easily, and are more likely to be acquired (Ellis 2002; Nation 2016). Methodologically, frequency is one of the inevitable variables that is to be controlled when conducting a quantitative lexical/formulaic study (Divjak 2019).

On the other hand, the prevailing overreliance on lexical frequency has recently been criticized (Hashimoto & Egbert 2019). Furthermore, it was theoretically proposed that lexical/formulaic frequency – an objective measure – and the actual degree of *familiarity* of the target item – a subjective measure – are similar but different constructs that should not be confused (Yokokawa 2006). Familiarity can be defined in terms of how often language users feel they see or hear each specific lexical/formulaic item (Amano et al. 2008). Lexical/formulaic familiarity is calculated by the mean scores of familiarity ratings, in which a large number of participants are asked to rate each word in a Likert scale ranging from "never seen or heard it" to "very frequently seen or heard it."

It is true that some applied linguists doubt the validity of the construct of subjective familiarity and propose that examining objective frequency suffices. This view, however, is rejected by many empirical studies. For example, Gernsbacher (1984) showed that subjective familiarity is diversely different among low-frequency words and it is familiarity that reliably affects word recognition, criticizing the confusion between familiarity and frequency. Kreuz's (1987) experimental study of homophonic word processing targeted to university students showed that rated familiarity could far better predict lexical decision task performance than word frequency. Connine et al.'s (1990) lexical access experimental results failed to find consistent frequency effects while showing solid familiarity effects for all the tasks: visual lexical decision, auditory lexical decision, cued naming. Lewellen et al. (1993) experimentally demonstrated that lexical familiarity affects processing efficiency in terms of naming, lexical decision, and semantic categorization. Cordier & Ny (2005) conducted a series of experiments, successfully achieving the goal of "disentangl[ing] familiarity from frequency (pp. 530-531)."

In relation to Japanese speakers, Amano et al. (1999) empirically showed that lexical recognition in the Japanese language is affected by lexical familiarity – broadening the scope of familiarity research in another language. There is even a large database of Japanese words solely dedicated to lexical familiarity, indicating the significance of familiarity (Amano et al. 2008). Based on an extensive survey, Yokokawa (2006; 2009) produced the English Lexical Familiarity Database for Japanese EFL (English as a foreign language) learners, which is available electronically and widely used in FLVA studies and

pedagogical practices. In sum, familiarity and frequency may well be separate entities not to be confused. Moreover, many studies show not only the discrepancy between the two but also the higher impact of familiarity effects compared to frequency effects on language processing.

Meanwhile, recent FLVA studies suggest that studying single word lexical items is insufficient, calling for more studies on formulaic sequences (Siyanova-Chanturia & Pellicer-Sánchez 2019; Webb 2020). Formulaic sequences (or formulae) can be defined as multi-word units perceived to have an identity as a single lexical unit (Wray 2019). Previous studies have shown that language recognition is affected by familiarity not only at the lexical level but also at the formulaic level (Moon 1998; Isobe 2011), validating the construct of formulaic familiarity – which is an underinvestigated topic despite its importance.

1.2 Formulaic database for English for distant language learners

In view of the lack of a formulaic familiarity database for distant language learners,² Isobe et al. (2016) conducted a large-scale study to produce the English formulaic familiarity database for Japanese learners of English. Participants were more than a thousand Japanese-speaking students learning English in 11 different universities in Japan. The target English formulae (n = 501) were selected from the PHRASE List tailored to EFL needs (Martinez & Schmitt 2012; 505 items) while deleting the overlapping items (n = 4) and subdividing the entire list into 5 subsets with 100-101 formulaic items. Online questionnaires created via SurveyMonkey were used to collect the data. Participants rated the subjective familiarity of each formula randomly presented on the screen on a seven-point Likert scale. After a pilot study, the data were successfully collected to produce the formulaic familiarity database. The exploratory analysis showed only weak correlation between formulaic familiarity ratings and the lexical familiarity ratings of the words composing the formulae, suggesting the discreteness of lexical familiarity and formulaic familiarity and the need to dissociate them (Fig. 1).

² A distant language can be defined as a language with linguistic distance far from your first language. Linguistic distance is an indicator of how similar or different the two languages are in terms of structural closeness and difficulty of learning (see Chiswick & Miller 2005). In comparison with learning a language with closer linguistic distance (e.g., English for French speakers), a distant language is usually more difficult to acquire and needs special effort – such as English for Japanese speakers and vice versa (Nishikawa-Van Eester 2016).

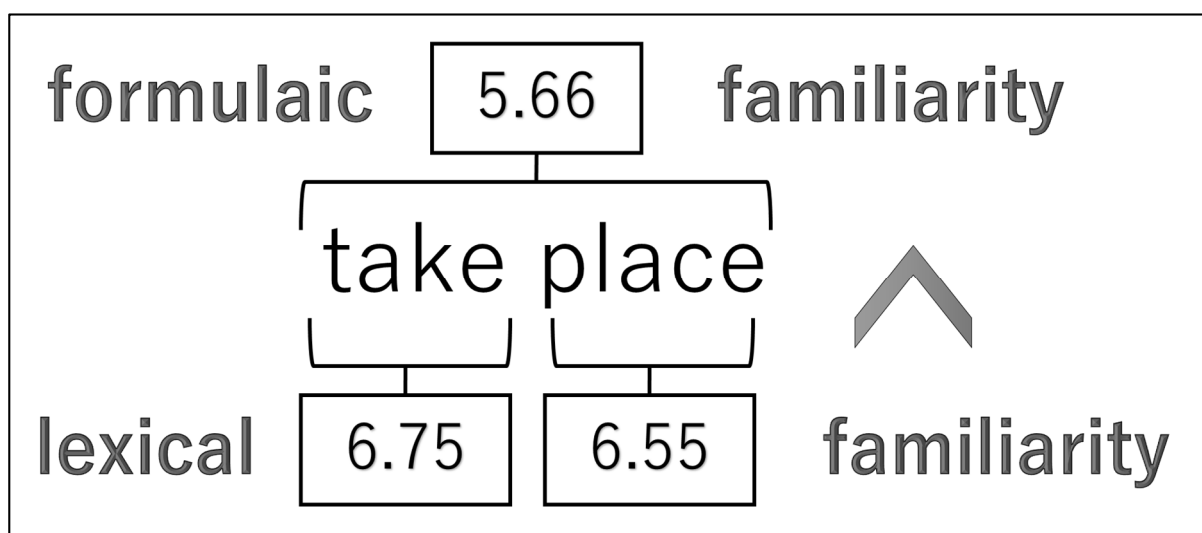


Fig. 1: Formulaic familiarity is dissociable from lexical familiarity – the familiarity of the formulaic unit (*take place*) is lower than that of individual composing words (*take* and *place*), reflecting their semantic inequivalence (cf. the sum is more than the whole of its parts).

Although Isobe et al.'s (2016) study paved the way for studying and developing pedagogical materials of formulae in a distant language, it has a limitation – each item in the list was rated only by one-fifth of the participants with potentially different individual profiles. If the aim of the research had been to compare various conditions allocated to different participant groups, the between-subject design would have been appropriate. In reality, however, the major aim was to formulate a database with no subsets as the final product. Since the participant groups were not controlled in terms of various individual factors (e.g., English proficiency, gender, age of acquisition), there remain possibilities of such factors interfering with the results and thus lowering the reliability of the database. Namely in Isobe et al. (2016), the whole list was subdivided into five sublists for the sake of expediency, and each participant rated only one of the sublists. For example, the item *as for* and the item *apart from* happened to belong to different sublists and were rated by different groups of participants. Therefore, the fact that these two items share the same familiarity score (4.8) can be explained not purely in terms of the equal level of familiarity but also owing potentially to the individual difference factors between the participants who rated *as for* and those who rated *apart from*. Since controlling all those between-subject factors is impossible to achieve, a better solution is to adopt a within-subject design – to have identical raters for all the items by having all the participants rate the whole list (see Charness et al. 2012 for benefits of within-subject design). Additionally, the study – although conducted on a large-scale – did not test the internal consistency (Cronbach α), leaving the inter-rater reliability susceptible to doubt.

The present study was designed to overcome these limitations by conducting a replication study with reliability testing in a within-subject design.

1.3 *Lexical/Formulaic emotionality*

Another pivotal subjective aspect that most previous FLVA studies have tended to fail to incorporate is emotion – another keyword in applied linguistics. Emotion plays fundamental roles in cognition (Barrett 2017); and its importance in foreign language acquisition (FLA) is increasingly being recognized (Dewaele 2015) not only as a social factor but also as a scientific factor in cognitive architecture (Sharwood Smith 2017). This *affective turn* (Pavlenko 2013) – the rise of EmAL (emotion in applied linguistics) – is also affecting the field of FLVA (Schütze 2017). For instance, Kanazawa (2017, 2021) empirically showed that processing which facilitates conscious emotional activation (Emotion-Involved Processing) enhances the retrieval of target words. A similar phenomenon has been reported under different lines of research and names such as emotionally enhanced memory (Talmi et al. 2007) and affective input enhancement (Truscott 2015). In order to study the effect of emotion at the micro-level of vocabulary, it is important to digitize and operationalize emotion as a numerical lexical/formulaic attribute. For example, Hashimoto and Egbert (2019) refer to affective sense as a variable related to word difficulty along with such important lexical/formulaic variables as orthographic similarity, length, polysemy/homonymy, and contextual distinctiveness. An established construct as a digitized emotional attribute in cognitive psychology is *emotional valence* – the subjective ratings about how positive or negative the stimulus is (Bradley & Lang 1999). Emotional valence for each stimulus is identified as the mean score of subjective ratings on a Likert scale collected from a large number of participants.

In the field of FLVA, however, emotional valence has rarely been taken into account as a lexical/formulaic attribute to be controlled and investigated. Kanazawa (2016) and Kanazawa & Lafleur (2019) were pioneering attempts to include emotional valence as a numerical vocabulary attribute by collecting data rated by foreign language learners. One of the limitations of these studies is that the targets were limited to decontextualized individual single words whereas multi-word formulae should also be considered. The insufficient attention to formulae has resulted in the lack of a formulaic list with numerical affective data and pedagogical adaptation. Through the study of lexical familiarity (i.e., the subjective version of word frequency; see above), it has been shown that linguistic databases that have been compiled by using native speakers' responses are not necessarily applicable to foreign language learners with different mental lexicon (Taylor 2012), indicating the need to develop a foreign language (L2, or LX; cf. Dewaele 2018) version of such a database, especially for subjective attributes.

1.4 Research questions of the present study

The present study was designed to produce an affective formulaic list for tertiary EFL learners while overcoming the limitations of Isobe et al. (2016). The research questions were as follows:

- [RQ N° 1]: Can Isobe et al.s' (2016) distant language formulaic database be reliably enriched with formulaic emotional valence data while demonstrating the independency of emotional valence as a formulaic attribute?
- [RQ N° 2]: Is Isobe et al.s' (2016) formulaic familiarity rating reliably replicable while overcoming its limitations?

2. Method

Participants were English learners at a university in Japan (N = 120). They were freshmen and sophomore students with varied proficiency levels of English (n = 10 [CEFR-A1]; n = 20 [CEFR-A2]; n = 67 [CEFR-B1]; n = 21 [CEFR-B2]; n = 2 [CEFR-C1]). The target formulae (501 items) were selected from the PHRASE List (Martinez & Schmitt 2012) since it is tailored to EFL pedagogical needs and it was utilized in Isobe et al. (2016). Participants were asked to complete web-based questionnaires which consisted of the following tasks:

(1) task explanation and consent form to abide by research ethics.³

(2) emotional valence judgment task (Warriner et al. 2013; Kanazawa 2016), in which they were asked to rate each formulaic item in terms of how positive or negative its meaning was on a seven-point Likert scale (1. Very negative ~ 7. Very positive).

(3) familiarity judgment task (Isobe et al. 2016), in which they were asked to rate each formulaic item in terms of how often they had seen or heard it on a seven-point Likert scale (1. Seldom ~ 7. Very frequent).

Fig. 2 and 3 are examples of the two rating tasks.

³ All the data collected and used in this research were from participants who agreed with all of the following statements (Original script was in Japanese): "I have read and understood the explanation." "I understand that the data will be processed and stored anonymously and that it does not affect the grading of the class what you answer in each question." "I agree that the data I provide will be used in further academic studies and material development."

<Valence Judgment Task>
(Translation)

- Please rate each formulaic item on a seven-point scale how positive its meaning is. (seven-point Likert scale: 1.Very negative ~ 7.Very positive)
- Please rate it not by how well you know its meaning but how often you see or hear it

それぞれの定型表現を、意味がポジティブかネガティブかについて7段階で判定しましょう。※1語1語の単語としてでなく、単語が組み合わされた定型表現全体として判定してください。

	1. とても ネガティブ ☹☹☹	2. ネガテ ィブ☹☹	3. ややネ ガティブ☹	4. どちら でもない	5. ややポ ジティブ 😊	6. ポジテ ィブ😊😊	7. とても ポジティ ブ😊😊😊
go away	☐	☐	☐	☐	☐	☐	☐
such that	☐	☐	☐	☐	☐	☐	☐
once again	☐	☐	☐	☐	☐	☐	☐
switch on	☐	☐	☐	☐	☐	☐	☐
afford to	☐	☐	☐	☐	☐	☐	☐
just about	☐	☐	☐	☐	☐	☐	☐

Fig. 2: Emotional valence judgment task screen

<Familiarity Judgment Task>
(Translation)

- Please rate each formulaic item in terms of how often you see or hear it in seven-point.
- Please rate it not by how well you know its meaning but how often you see or hear it
- Please focus on the formula as a whole instead of its composing words

それぞれの定型表現を、見聞きする程度によって7段階で判定しましょう。※「意味を知っているかどうか」ではなく、「どの程度見聞きするか」で判定しましょう。※1語1語の単語としてでなく、単語が組み合わされた定型表現全体としての親密度を判定してください。

	1. まった く見聞き しない	2. 見聞き しない	3. あまり 見聞きし ない	4. どちら でもない	5. 少し見 聞きする	6. よく見 聞きする	7. とても よく見聞 きする
end up	☐	☐	☐	☐	☐	☐	☐
point of view	☐	☐	☐	☐	☐	☐	☐
but then	☐	☐	☐	☐	☐	☐	☐
in so far as	☐	☐	☐	☐	☐	☐	☐
hand over	☐	☐	☐	☐	☐	☐	☐
in the way	☐	☐	☐	☐	☐	☐	☐

Fig. 3: Familiarity judgment task screen

To decrease fatigue, the number of formulae for rating was limited to 50-51 items per week. Overall, it thus took ten weeks for students to finish rating all the items. The items were randomized using the random option on Google Forms. Participants accessed the questionnaire either via a smartphone or on a computer. It was ensured that participants rated all the formulae to overcome the limitations of Isobe et al. (2016), in which each participant rated only one-fifth of the whole list. In analysis, only the data with a high familiarity rating (5-7) were used while other data was omitted to ensure the valid semantic processing of each formulaic item. Statistical analyses were performed using SPSS software v.25.

3. Results

As a result, responses were successfully collected to produce a formulaic list with numerical emotional and familiarity attributes. The descriptive statistics are presented in Tab. 1. The number of component words in each formula means

how many words there are in each formula (e.g., *as well* = 2, *at the expense of* = 4). The number of syllables in each formula means how many syllables there are in each formula (e.g., *over time* = /óv·və·təɪm/ = 3, *on the other hand* = /ən·ðə·ðə·ər·hænd/ = 5). Formula frequency is based on British National Corpus and was calculated based on Martinez & Schmitt (2012). For formula familiarity ratings and formula valence ratings, see the previous section.

Description	N	Mean	SD
Mean <u>number of component words in each formula</u>	501	2.33	.56
Mean <u>number of syllables in each formula</u>	501	2.67	.79
Mean <u>formula frequency</u> (/100 M)	501	3,961.60	6,223.86
Mean <u>formula familiarity</u> ratings (Isobe et al., 2016)	501	4.78	.96
Mean <u>formula familiarity</u> ratings (this study)	501	4.97	.61
Mean <u>formula valence</u> ratings (this study)	501	4.28	.46

Tab. 1: The descriptive statistics

3.1 Formulaic emotional valence

The prerequisite for further inferential statistical analysis is to ensure the reliability of the collected data. The results of the reliability testing for subsets in terms of emotional valence are shown in Tab. 2. Because reliability (internal consistency) surpassing the acceptable level of .70-.80 was shown across all subsets (Larson-Hall 2010), it can legitimately be concluded that the data are nearly free from noise or measurement error, needing no data re-collection nor omission.

Reliability testing through Cronbach α			
Subset 1 (#1-50)	$\alpha=.982$	Subset 6 (#251-300)	$\alpha=.944$
Subset 2 (#51-100)	$\alpha=.973$	Subset 7 (#301-350)	$\alpha=.971$
Subset 3 (#101-150)	$\alpha=.952$	Subset 8 (#351-400)	$\alpha=.978$
Subset 4 (#151-200)	$\alpha=.981$	Subset 9 (#401-450)	$\alpha=.969$
Subset 5 (#201-250)	$\alpha=.966$	Subset 10 (#451-501)	$\alpha=.960$

Tab. 2: The internal consistency of emotional valence ratings

The correlational analysis demonstrated that emotional valence correlated with neither familiarity ($r = .11$; $p < .05$) nor frequency ($r = -.03$; $p = .48$). Although the correlation between emotional valence and familiarity was statistically significant, the fact that the Pearson r was .11 suggests there is no meaningful correlation (Patten & Newhart 2018: 231), as is also graphed in Fig. 4.

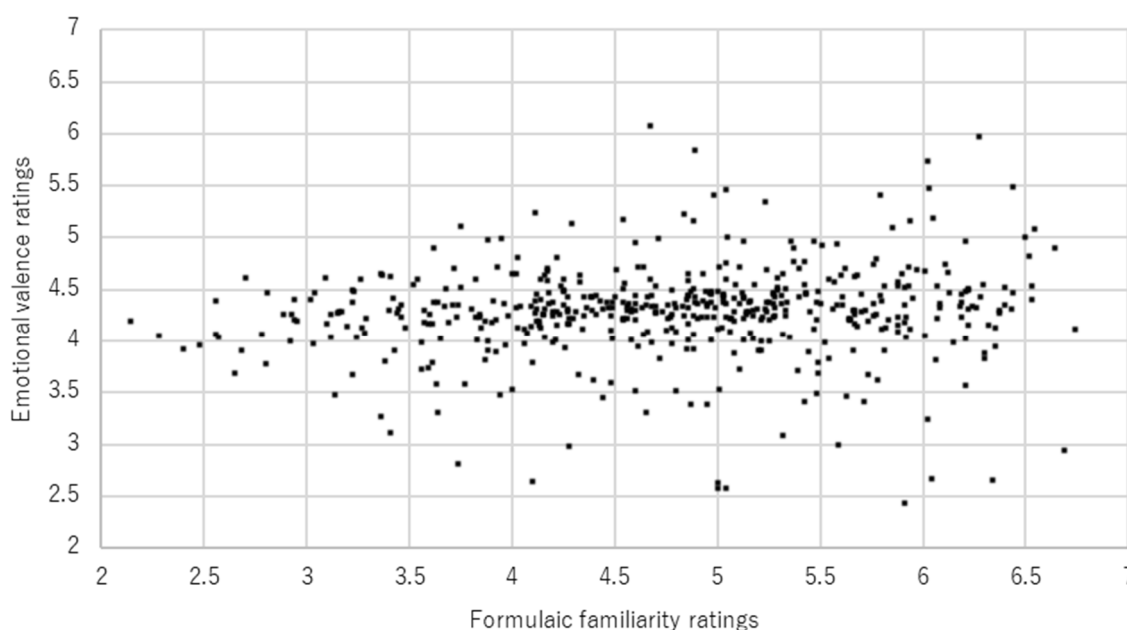


Fig. 4: Scatterplot showing the lack of correlation between emotional valence and familiarity

Although the correlation was not significant, Fig. 4 could also be interpreted to show the tendency that emotionally positive items and negative items are located more on the right side of the graph (familiarity > 4.5). To investigate further, the extremity of valence (the deviation from the midpoint of the valence scale; Rocklage et al. 2018) was calculated via the following equation: $\text{extremity} = |4 - (\text{valence score})|$. The higher the extremity of valence score is, the more emotional the item is – be it positively or negatively. It was found that the extremity of valence weakly yet significantly correlated with formulaic familiarity ($r = .21$; $p < .01$), which is graphed in Fig. 5. The result indicates that emotionally charged items – either positive or negative – yield higher familiarity values.

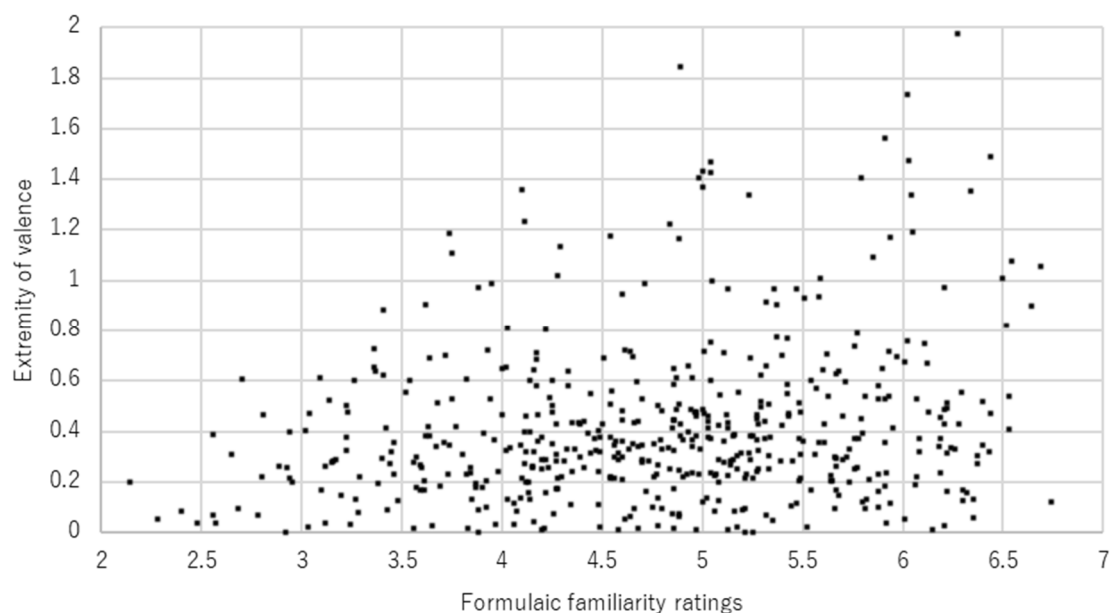


Fig. 5: Scatterplot showing the correlation between extremity of valence and familiarity

3.2 Reliability of formulaic familiarity scores

The reliability testing was implemented for subsets also in terms of familiarity (Tab. 3). High scale reliability (internal consistency) surpassing the acceptable level of .70-.80 was shown across all subsets), indicating that no data re-collection nor omission would be required.

Reliability testing through Cronbach α			
Subset 1 (#1-50)	$\alpha=.982$	Subset 6 (#251-300)	$\alpha=.976$
Subset 2 (#51-100)	$\alpha=.978$	Subset 7 (#301-350)	$\alpha=.965$
Subset 3 (#101-150)	$\alpha=.983$	Subset 8 (#351-400)	$\alpha=.961$
Subset 4 (#151-200)	$\alpha=.972$	Subset 9 (#401-450)	$\alpha=.970$
Subset 5 (#201-250)	$\alpha=.966$	Subset 10 (#451-501)	$\alpha=.974$

Tab. 3: The internal consistency of familiarity ratings

It was revealed that there is a statistically significant strong positive correlation ($r = .92$; $p = .00$) between the mean scores of formulaic familiarity produced in this study and the ones in Isobe et al. (2016). The result indicates that Isobe et al.'s (2016) formulaic familiarity rating is replicable, showing its solid reliability and generalizability (cf. Fig. 6).

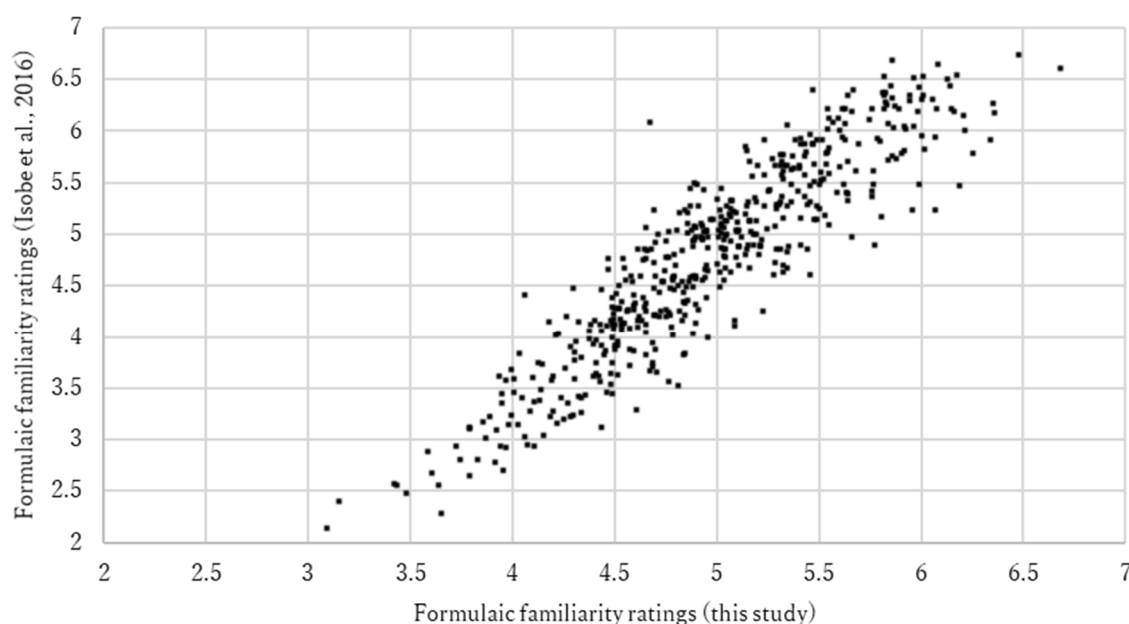


Fig. 6: Scatterplot showing the relationship between the familiarity ratings of English formulae in the present study (X-axis) and in Isobe et al. (2016) (Y-axis)

4. Discussion and implication

The results in §3.1 indicated the independency of formulaic valence as a formulaic attribute, being discrete from frequency, the major formulaic attribute. It was also indicated that the extremity of emotion could be one of the underlying factors of the phenomenon of familiarity, calling for further investigations. Although there have been emotional databases of lexical items in both L1 (Bradley & Lang 1999; Warriner et al. 2013) and L2 (Kanazawa 2016), no database has extended the scope to emotionality of formulaic sequences. The present study paves the way for future quantitative studies of formulaic emotionality in a distant language and material development more mindful of the findings in the psychology of emotion, and EmAL. A promising next step forward would be to utilize the emotionality database to investigate or control the attribute for future formulaic studies. For instance, Kanazawa (2017) revealed that emotionality of lexical items and processing modes have a facilitatory impact on distant language vocabulary memorization under a more naturalistic (semi-)incidental learning condition. It is implied that such a cognitive advantage of making use of emotionality of the target stimuli would also be seen in learning formulaic language.

In addition, the strong positive correlation in §3.2 revealed that foreign language formulaic familiarity ratings – despite being a subjective measure – can be replicated with high reliability. The finding extended the robustness of lexical familiarity ratings (Amano et al. 2007) to formulaic familiarity ratings of a distant language. Isobe et al.'s (2016) large-scale database is now credited with higher

reliability as well as validity, making its use in future studies and pedagogical implementations more legitimate. As an example of pedagogical implications, formulaic items with disparity between familiarity ratings and objective frequency deserve more attention from teachers and learners. Teachers should encourage learners to learn and use formulaic items rated not familiar when they are actually frequent (e.g., *entitled to, on behalf of, prior to*); whereas learners should be aware that the items they tend to feel are familiar and which they use frequently can actually be relatively infrequent and should not be overused (e.g., *make up one's mind, look to, as good as*), a finding echoing with Hasselgren (1994).

Another important implication is in view of developing an L2/LX formulaic database for distant language learners. The present findings suggest the English database for Japanese speakers – an extreme case of learning a distant language – is reliably replicable. If the language distance was closer between the mother tongue and the target language (such as a French speaker learning German or vice versa), the result could also be reliable. Subjective ratings by a foreign language speaker – such as emotional valence and familiarity – may well be regarded as reliable data to be collected and used in multilingual applied linguistic investigations.

5. Limitations and further study

The present study successfully enriched Isobe et al.'s (2016) distant language formulaic database with formulaic emotional valence data and demonstrated its independency as a formulaic attribute. Furthermore, it replicated Isobe et al.'s (2016) familiarity study, successfully proving its robust reliability via strongly positive and significant correlation between their study and the present study. Although the aims of the study were achieved, it has several limitations.

First, the multifacetedness of formulae was not fully investigated. Classification of formulae is a controversial topic with different researchers defining and classifying formulae differently. For example, Lewis (1993) categorizes collocations, polywords, fixed expressions, and semi-fixed expressions, when Moon (1998) classifies different kinds of formulae such as compounds, phrasal verbs, and idioms. Moreover, Myles and Cordier (2017) distinguish learner-external formulaic sequences (linguistic clusters) from learner-internal formulaic sequences (processing units). As Wood (2020) succinctly notes, formulae are certainly not monolithic and many items defy strict and ready classification (Wood 2020: 42). This study took a detour to avoid this conundrum by utilizing an established formulaic list for foreign language learners (Martinez & Schmitt 2012). A future study could face this topic by investigating the variety of formulae separately.

Second, although the reliability of distant language formulaic familiarity was shown by the replicating part of the present study, reliability of the present

formulaic emotional valence list has not yet been investigated. Future research should replicate the survey to ensure the reliability of the emotional ratings.

Third, each formulaic item was displayed with no context in the present study whereas effects of context play an important role in vocabulary/formula acquisition (Webb & Nation 2017). In addition, contextual emotionality is known to affect acquisition (Kanazawa & Lafleur 2019; Kanazawa 2021a, 2021b). The present study was a preliminary study to pave the way for future investigations by providing a database, so the original aims were achieved. Future studies should investigate how different contexts in which the formulaic sequences are embedded affect differently how formulaic sequences are processed and learned.

Fourth, the formulaic list should be utilized with pedagogical applications. One ongoing attempt is a project to develop an electronic formulaic learning system for tertiary EFL learners, in which students utilise the Indirect Spaced Repetition Software (Lafleur 2016) – a special and original spaced repetition learning platform that enables learners to study the items repeatedly with optimal interval and task diversity. Moreover, educational activities utilising varied levels of processing (viz., perception as well as semantics) may well be adopted for foreign language formulaic learning (Kanazawa 2020c). In planning those, the foreign language formulaic database of the present study with enriched formulaic data and carefully selected items will cater for the educators' needs to plan such activities and to develop materials.

Fifth, the present attempt, which relied only on cognitive and psycholinguistic quantitative approaches, should be compensated with other approaches in multidisciplinary fields, including not only pragmatics and corpus-based approaches (Siyanova-Chanturia & Pellicer-Sánchez 2019) but also social and qualitative approaches that are popular in EmAL studies. Already in the domain of motivation studies – a big aspect of EmAL – researchers of formulae and motivation have collaborated, producing pioneering research investigating the role of motivation strategies in formulaic acquisition (Le-Thi et al. 2020). Such collaborative works with multiple research methodologies will produce fruitful outcomes beneficial to applied linguistics both theoretically and empirically.

Finally, the present findings should be extended and applied to other languages with different degrees of linguistic distance (Chiswick & Miller 2005) which can bring about a digital/numerical methodological advancement in emotion research in applied linguistics in different countries – and ultimately a better understanding and learning of foreign languages, including a distant language.

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