

Modalpartikeln: Can Sentiments Survive Translation with Emojis?

Decoding Sentiments from German 'Modal Particles' to Korean Using Emojis

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Abstract:

This study investigates the use of emoticons for translating the emotional connotations conveyed by German modal particles into other languages. German modal particles play a crucial role in adding subtlety and expressive emojis to speech, posing challenges for non-German speakers in grasping nuanced meanings. The research aims to facilitate intercultural communication and advance multilingual translation by exploring the capacity of emojis to capture the emotional nuances inherent in modal particles. Through a survey involving proficient speakers of German and Korean, significant similarities were observed between the emotional scores associated with modal particles and expressive emojis. These findings underscore the potential of emojis in preserving emotional expressions across diverse linguistic contexts.

1. Introduction

The aim of this research is to investigate whether the sentiments conveyed by German modal particles can be translated into other languages using emojis. If this research indicates that emojis can adequately represent modal particles' sentiments, further investigation into utilizing emojis for multilingual translation may be considered.

2. Background

2.1 Modal Particles in German

Modal particles are the particles which are used in German language to add some nuances or convey sentiments and emotions. The differences in emotions and nuances contained in modal particles are used quite often in actual German speech and often play an important role.

However, it is not easy to understand those modal particles in German for non-German speakers. Mollering, M. (2001) suggests that acquiring modal particles can be a challenge for non-native speakers due to the multiple homonyms for particles and their versatility for various functions.

Here are some examples:

- "**doch**" - expresses contradiction or emphasis, e.g. "Ich habe das **doch** gesagt" (I did say that)
- "**mal**" - expresses suggestion or softening, e.g. "Kannst du mir **mal** helfen?" (Can you help me?)

In these examples we can see that the sentence which includes German modal particle 'doch' is translated by using 'did(do)' which is used for emphasis in English. However, this is difficult to be convey when translated into Korean. The modal particle 'mal' in the second sentence is not reflected in the English translation because it cannot be directly translated into English. Even in Korean, this is difficult to translate the nuance of 'mal'.

It is also unclear how much emphasis 'doch' give in the first sentence. For example, modal particle 'schon' can also be used for emphasis, thus it would be difficult for non-German speakers to understand the subtle differences in nuance.

2.2 Limitations in DE-KR Translation

In this research, Korean is selected as the target language for translation due to the challenge of finding an expression in Korean that perfectly aligns with the role of modal particles in German within the sentence structure.

Original/Source Language:

German DE Indo-European

Target Language:

Korean KR Koreanic(Isolated)

Nuances in Korean can often be adjusted through suffixes, but since they do not correspond one-to-one to German, there are certain limitations in translations. For example:

- [DEU Source] *Der Bus kommt nicht.*
- [KOR Target] 버스가 안 와요. (The Bus is not coming.)
- [DEU Source] *Der Bus kommt **halt** nicht.*
- [KOR Target] 버스가 안 와요. (The Bus is not coming.)

In this regard, the translation between German and Korean has limitations on delivering sentiments. Particularly, Korean speakers who don't have any linguistic background in German may encounter some difficulty in understanding German due to these differences.

2.3 Expressive Emojis

Valeria A. et al. (2022) suggested that “emojis can carry different qualities of emotional information.” Therefore, it makes sense to use emojis to translate sentiments from the modal particles in German, because they basically carry subtle emotional information. However, there are some emojis that are difficult to consider as conveying emotions. Grosz et al. (2023) argues that there are special emojis which serve as a medium for conveying emotions and feelings independently without using additional words, which named as expressive emojis.

The characteristics of expressive emojis include (1) capturing complex emotions, (2) being repeatable for emphasis, (3) reflecting the sentiments of the sender.

Here are some examples of expressive emojis suggested by Grosz et al. (2023):

- 😊 Smiling face emoji
- 😍 Smiling face with heart eyes emoji
- 😠 Angry face emoji
- 😐 Neutral face emoji
- 😑 Expressionless face emoji
- 😯 Hushed face emoji
- 😁 Grinning face emoji
- 😴 Weary face emoji

In this research, some of the emojis, which can be categorized as expressive emojis, will be added to translated sentences into the target language (KR) to deliver the sentiments of modal particles in the source language (DE).

2.4 Cultural Differences and Linguistic Fluency

Ekman (1999) posited that certain emotions, such as fear, anger, and joy, are biologically innate and universally expressed across cultures. In contrast, Feldman Barrett (2006) argued that language plays a crucial role in shaping our perception and categorization of emotions. According to Jackson et al. (2019), while there is considerable variation in how emotions are understood across different regions, there are also universal aspects to emotion semantics that are shared by all humans. Although there is significant diversity in how emotion concepts are associated within language families, there is evidence of a common underlying structure in the meaning of emotion concepts across languages. Thus, in this study, survey participants will be asked about their fluency in the source/target language and their cultural background.

2.5 Research Questions

Two surveys were planned. First, the sentiments that modal particles deliver through a survey of fluent German speakers are investigated, and secondly, a survey of fluent Korean speakers is conducted to compare the emotions of translations that added emojis and those that did not. This experiment will show whether the sentiments of modal particles can be effectively replaced by emojis.

- What kind and degree of sentiment do modal particles convey?
- Are there any differences in the intensity of emotions or sentiments conveyed by modal particles that perform similar functions?
- When modal particles are replaced with emojis, can the intended sentiments be conveyed as is?
- To what extent can modal particles in German be replaced by emojis when translated into other languages?

3. Survey 1

To compare the similarity between emojis and modal particles, I used the emoji sentiment score from the paper "Sentiment of Emojis" by Kralj Novak P. et al. (2015)¹. This is because This approach was chosen because (1) the sheer number of emojis makes it impractical to inquire about all of them in the survey, (2) asking about random emojis might introduce bias, and (3) conducting the survey in two rounds may not guarantee the participation of the same individuals in both surveys. The emoji sentiment scores, ranging from -1 to 1 as outlined in the cited paper, indicate negativity at -1, neutrality at 0, and positivity at 1.

3.1. Method of Survey 1

¹ Emoticon sentiment analysis relies on vocabulary-based approaches, where the positive or negative sentiment of emoticons is determined by associating them with words and phrases expressing similar sentiments. For instance: in the sentence 'Today's weather is great! :)', the positive sentiment of ':' is calculated based on the positive connotation of the word 'great.'

3.1.1 Sentence Creation (Interview with German native speakers, 2024. 01.24 ~ 31, N=3)

10 modal particles which are commonly used are selected.

- mal, ruhig, doch, halt, eben, nun einmal, eigentlich, wirklich, ja, schon

Two modal particles were paired each according to similarity or opposition, to measure the strength of the sentiments they deliver.

- halt – eben: Impatience / Frustration
- eigentlich – wirklich: Skepticism / Doubt / Surprise / Disbelief
- mal – ja: Acceptance / Permission / Politeness
- ruhig – nun einmal: Permission vs. Obligation
- doch – schon: Impatience vs. Permission

Afterwards, 10 sentences were written with the help of 3 native German speakers.

Original Sentences (German):	Sentences without modal particles (German):
-Der Bus kommt halt nicht. (The bus isn't coming + frustration)	-Der Bus kommt nicht. (The bus isn't coming.)
-Dann gehen wir eben nicht ins Kino. (Then we won't go to the cinema + frustration)	-Dann gehen wir nicht ins Kino. (Then we won't go to the cinema.)
- Eigentlich wollte ich heute früher nach Hause gehen. (I actually wanted to go home earlier today. + emphasis for unexpected fact)	-Ich wollte heute früher nach Hause gehen. (I wanted to go home earlier today.)
-Du hast das wirklich getan? Bist du dumm? (You really did that? Are you stupid? + emphasis for unexpected fact)	-Du hast das getan? Bist du dumm? (You did that? Are you stupid?)
-Darf ich mal deinen Kuli benutzen? (May I use your pen? + permission)	-Darf ich deinen Kuli benutzen? (May I use your pen?)
-Das kannst du ja probieren. (You can try that. + permission)	-Das kannst du probieren. (You can try that. + permission)
-Du kannst ruhig gehen. (You can go + permission)	-Du kannst gehen. (You can go.)
-Wir müssen nun einmal die Prüfung schreiben. (We must write the exam + obligation)	-Wir müssen die Prüfung schreiben. (We have to write the exam.)
-Aber das haben wir doch gelesen. (But we read that + impatience or emphasis)	-Aber das haben wir gelesen. (But we read that.)
-Das weißt du schon . (You already know that + impatience or emphasis)	-Das weißt du. (You know that.)

Table 1. Sentences for Survey 1

3.1.2 Structure of Survey Questions

In the first survey, which is aimed at fluent German users, can be divided into 3 parts:

- 1) questions evaluating sentiment of a single modal particle.
- 2) questions for comparing a modal particle pair.
- 3) questions for demographic, cultural and linguistic background.

An example question for 1) is as follows:

<p>Bitte schauen Sie sich die folgenden zwei Sätze an und antworten.</p> <p>- Der Bus kommt nicht. - Der Bus kommt halt nicht.</p> <p>Welche Stimmung vermittelt Ihrer Meinung nach der folgende Modalpartikel dem Satz? halt</p> <p>1=sehr negativ, 3=neutral (beeinflusst nicht), 5=sehr positiv</p>	<p>Please look at the following two sentences and answer.</p> <p>- The bus isn't coming. - The bus isn't coming. (+frustration)</p> <p>What mood do you think the following modal particle conveys to the sentence? halt</p> <p>1=very negative, 3=neutral (does not influence), 5=very positive</p>
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Example question for 2):

<p>Diese Frage dient dazu, die Stimmung zweier Modalpartikel zu vergleichen: halt, eben</p> <p>halt hat als eben</p> <p>1= viel schwächere Bedeutung 3= keine Unterschied, 5= viel stärkere Bedeutung</p>	<p>This question is intended to compare the tuning of two modal particles: halt, eben</p> <p>halt has more ... than eben.</p> <p>1=much weaker significance, 3=no difference, 5=much stronger significance</p>
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Questions for 3):

<p>Wie gut sind Ihre Deutschkenntnisse?</p> <p>1: Fremdsprachler (~C1) 2: Fließende Fremdsprachler (C1-C2) 3: Sehr fließende Fremdsprachler (C2+) 4: Muttersprachler 5: Sehr fließende Muttersprachler</p> <p>Bitte erzählen Sie uns von Ihrem kulturellen Hintergrund.</p> <p>1: Ich habe einen deutschen kulturellen Hintergrund. 2: Ich habe einen multikulturellen Hintergrund. 3: Ich habe einen kulturellen Hintergrund außerhalb Deutschlands im EU-Kulturraum. 4: Ich habe einen Hintergrund außerhalb des kulturellen Bereichs der EU.</p> <p>Bitte antworten Sie, wenn Sie [Ich habe einen deutschen kulturellen Hintergrund.] nicht ausgewählt haben.</p> <p>Bitte nennen Sie das Land, aus dem Sie Ihrer Meinung nach kulturell geprägt sind.</p> <p>Bitte teilen Sie uns Ihr Geschlecht mit.</p> <p>1: Männlich 2: Weiblich 3: Diverse</p>	<p>How good are your German skills?</p> <p>1: Foreign language speaker (~C1) 2: Fluent foreign language speakers (C1-C2) 3: Very fluent foreign language speakers (C2+) 4: Native speaker 5: Very fluent native speakers</p> <p>Please tell us about your cultural background.</p> <p>1: I have a German cultural background. 2: I have a multicultural background. 3: I have a cultural background outside of Germany in the EU cultural area. 4: I have a background outside the EU cultural area.</p> <p>Please reply if you have not selected [I have a German cultural background].</p> <p>Please name the country from which you believe your culture comes.</p> <p>Please tell us your gender.</p> <p>1: Male 2: Female 3: Various</p>
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Bitte wählen Sie Ihre Altersgruppe aus. 1: unter 19 2: 20-29 3: 30-39 4: 40-49 5: 50-59 6: 60+	Please select your age group. 1: under 19 2: 20-29 3: 30-39 4: 40-49 5: 50-59 6: 60+
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3.1.3. Variable Names and Score Calculation

The name of the modal particle was used as the variable name (type 1), and for variables for comparison (type 2), the names of the two modal particles were connected using an underscore. The variable names for comparison are as follows:

halt_eben, eigentlich_wirklich, mal_ja, ruhig_nuneinmal, doch_schon

The questions for background checks on survey participants have the following variable names:

- kenntnis: for linguistic fluency, scale 1 to 5.
- culturalbg: for cultural background, germany / multi / eu / outofeu
- name_cult: for the country names by which the participants are influenced culturally.
- gender: m / f / d
- age: u19, 20s, 30s, 40s, 50s, 60a

The scores for the question type 1) and 2) were given on a 1-5 scale.

Type 1) Assigning Scores to Modal Particles:

Let S_i be the original sentiment score of modal particle i based on the scale from -1 to 1.

Calculate the average sentiment score for each modal particle based on the responses.

$$S_i = (\text{very negative}) \times (-2) + (\text{negative}) \times (-1) + (\text{neutral}) \times 0 + (\text{positive}) \times (1) + (\text{very positive}) \times 2$$

Type 2) Comparing Modal Particles:

For each pair of modal particles i and j , let C_{ij} be the comparison score indicating if particle i is perceived as stronger or weaker compared to particle j .

$$C_{ij} \rightarrow -2, \quad \text{weak} \rightarrow -1, \quad \text{no difference} \rightarrow 0, \quad \text{strong} \rightarrow 1, \quad \text{very strong} \rightarrow 2$$

$$C_{ij} = (\text{very weak}) \times (-2) + (\text{weak}) \times (-1) + (\text{no difference}) \times 0 + (\text{strong}) \times (1) + (\text{very strong}) \times 2$$

Calculate the average comparison score for each pair.

Adjusting Scores:

To adjust the scores based on the comparison questions, the difference between two modal particles in one pair will be calculated first.

$$S_{ij} = S_i - S_j$$

Then it will be compared with the Comparison scores. Ideally, the two numbers should match.

$$S_{ij} \approx C_{ij}$$

However, in practice there may be a difference between the two numbers. To compensate for this, the error calculated in this process was divided into half. The first half is added to the first modal particle of one pair, the second half is subtracted from the second modal particle in the same pair, because there is a difference between the two values, the sign must be different.

Error Score:

$$E_{ij} = S_{ij} - C_{ij}$$

Adjusted Score:

$$A_{ij} = S_{ij} \pm E_{ij} \cdot \frac{1}{2}$$

Normalization:

To ensure the adjusted scores fall within the -1 to 1 range, the scores will be normalized using a normalization formula:

$$S''_i = \frac{S'_i - \min(S)}{\max(S) - \min(S)}$$

S''_i is the final normalized score for modal particle i, and $\min(S)$ and $\max(S)$ are -1 and 1.

Validation:

Validate the adjusted and normalized scores by comparing them with the original sentiment scores and ensuring they align with the perceived strength and sentiment of the modal particles.

By applying these mathematical formulas to adjust and normalize the scores of modal particles based on the comparison questions in the first survey, the scores will be finalized similar to the emoji sentiment ranking in the referenced paper by Kralj Novak P. et al. (2015).

3.2 Result for Survey 1 (2024. 2. 7 ~ 2.13, N=35)

According to the steps which written in the methodology part, the scores each modal particles get are:

- halt: -0.05714286
- eben: 0.08571429
- eigentlich: -0.02142857
- wirklich: 0.29285714
- ruhig: 0.70714286

- nun einmal: 0.73571429

Also, an interviewee who participated in this survey suggested that “*for ‘Das kannst du ja probieren’ and ‘Das weißt du schon’, these are a little ambiguous depending on context, so I’d agree there’s a primary reading that is friendly or encouraging, but there’s also one where the speaker is annoyed or fed up with the situation/the hearer.*” Thus, the scores for ja and schon are calculated in two ways: positive or negative. Here are the scores for them:

- ja when positive: 0.97098214
- mal when ja positive: 0.81473214
- **ja when negative: 0.87321429**
- mal when ja negative: 0.49821429
- schon when positive: 0.25873016
- doch when schon positive: 0.59206349
- **schon when negative: 0.02500000**
- doch when schon negative: 0.27500000

However, this score was calculated too large. For example, in the case of a modal particle containing a negative emotion, the emotion should be calculated as a negative number. However, the results all contain positive values. Thus, these scores should be readjusted to the left.

When examining each score for readjustment, the rounded value of each negative score was set as the reference point to minimize the adjustment value.

For ja and mal, 0.9 was subtracted, and for schon and doch, 0.03 was subtracted. Because each question is independent and only modal particle pairs are related, the overall score was not adjusted.

The adjusted scores are as follows:

- **ja when negative: -0.02678571**
- mal when ja negative: -0.40178571
- **schon when negative: -0.00500000**
- doch when schon negative: 0.24500000

Additionally, contrary to what these sentences were intended to mean in the pre-interview(n=3), modal particles that should have been evaluated negatively received overly positive scores. Therefore, the sentiment scores generally need some adjustment. The types of particles intended to be judged negatively are as follows:

- halt, eben, wirklich

Halt and eben show appropriate negative values, but wirklich has positive values. Therefore, the scores of modal particles need to be adjusted again. However, in the case of halt and eben, the intended negative emotions were well reflected, so the performance was 2/3. Therefore, score of wirklich, which is 0.29285714, was rounded to 0.3 and then divided by 1/3, resulting in 0.1.

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Since this adjustment must apply to all survey questions, 0.1 was subtracted from the scores for all responses. Here are the scores obtained:

- halt: -0.15714286
- eben: -0.01428571
- eigentlich: -0.12142857
- wirklich: 0.19285714
- ruhig: 0.60714286
- nun einmal: 0.63571429
- ja when positive: 0.87098214
- mal when ja positive: 0.71473214
- ja when negative: -0.12678571
- mal when ja negative: -0.50178571
- schon when positive: 0.15873016
- doch when schon positive: 0.49206349
- schon when negative: -0.10500000
- doch when schon negative: 0.14500000

Below is the graph for the final scores.

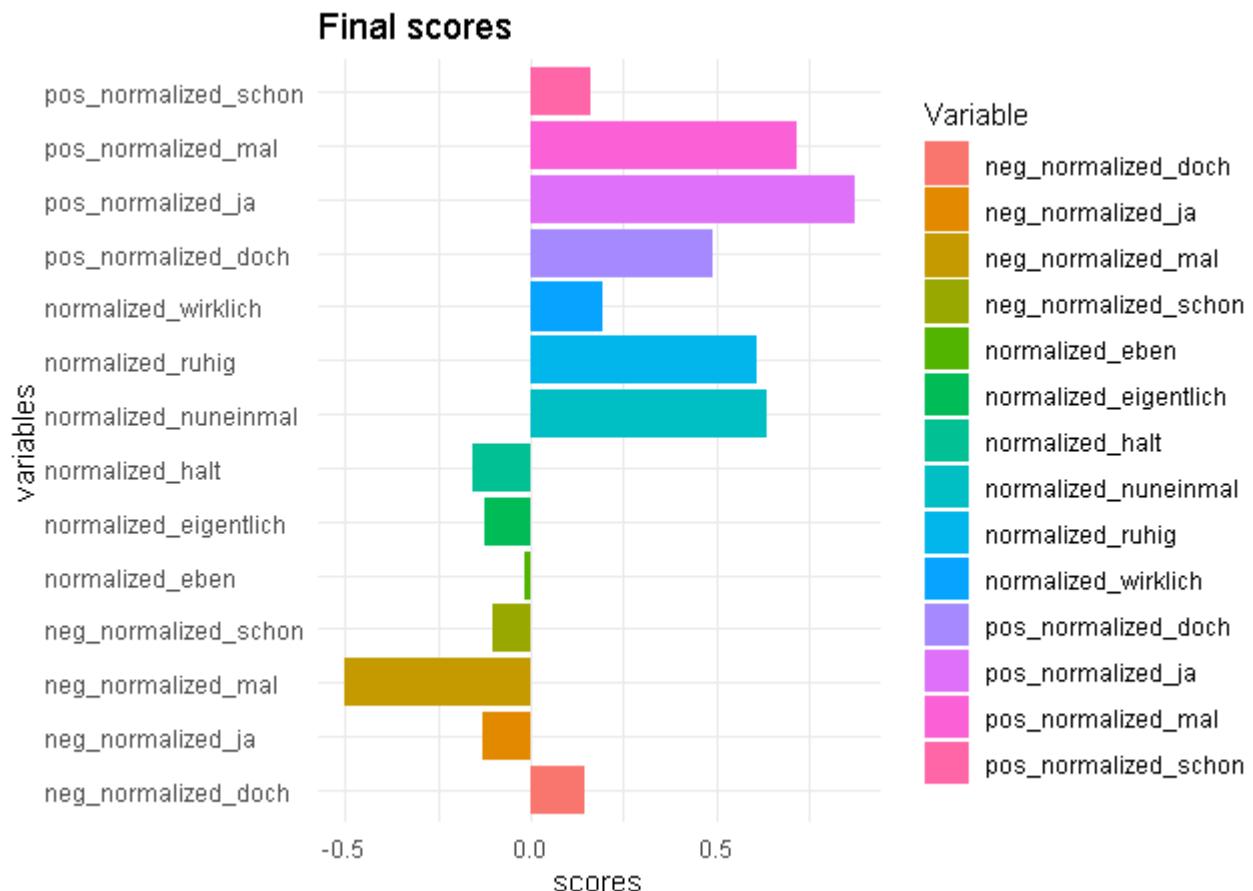


Figure 1. Final Sentiment Score for Modal Particles

Through this graph it is revealed that positive scores tend to be farther from 0 than negative scores. This indicates that the modal particles which are used in the survey are generally used for transmitting positive sentiments.

4. Survey 2

4.1 Method of Survey 2

4.1.1 Sentence Translation

First, given German sentences with modal particles were translated into Korean as follows:

Original Sentences (German):	Translated Sentences (Korean)
-Der Bus kommt halt nicht. (The bus isn't coming + frustration)	-버스가 안 와. (The bus isn't coming.)
-Dann gehen wir eben nicht ins Kino. (Then we won't go to the cinema + frustration)	-우리는 그럼 영화관 안 가. (Then we won't go to the cinema.)
- Eigentlich wollte ich heute früher nach Hause gehen. (I actually wanted to go home earlier today. + emphasis for unexpected fact)	- 사실 오늘은 집에 일찍 들어가려고 했어. (I actually wanted to go home earlier today.)

-Du hast das wirklich getan? Bist du dumm? (You really did that? Are you stupid? + emphasis for unexpected fact-negative)	-진짜 그랬다고? 너 바보야? (You really did that? Are you stupid?)
-Darf ich mal deinen Kuli benutzen? (May I use your pen? + permission)	-네 펜 좀 빌려 써도 돼? (May I use your pen?)
-Das kannst du ja probieren. (You can try that. + permission)	-네가 한 번 해 볼 수도 있어. (You can try that.)
-Du kannst ruhig gehen. (You can go + permission)	-가도 돼. (You can go.)
-Wir müssen nun einmal die Prüfung schreiben. (We must write the exam + obligation)	-우리는 시험을 쳐야 해. (We have to write the exam.)
-Aber das haben wir doch gelesen. (But we read that + impatience or emphasis)	-하지만 이미 읽었잖아. (But we read that already.)
-Das weißt du schon . (You already know that + impatience or emphasis)	-이미 알잖아. (You know that.)

Table 2. Translated Sentences for Survey 2

- It is difficult to think of *eigentlich* and *wirklich*, which are translated as '사실/진짜' (really/actually), showing a significant difference in Korean in their sentiments.
- Doch and schon are translated identically as '이미' in that context, unlike in the German original where different words were used for the two sentences.

As with the modal particle survey, two sentences were paired in sequence. The translations aimed to minimize differences in nuance compared to their respective counterparts. Additionally, to these translated sentences, another group of sentences was formed by incorporating expressive emojis, which serve the purpose of (1) capturing complex emotions, (2) providing emphasis when repeated, and (3) reflecting the sender's sentiments. These sentiments align with the modal particles obtained in Survey 1, which have similar sentiment scores.

4.1.2. Adding Expressive Emojis

Based on the Emoji Sentiment Ranking scores, emojis were selected to represent the sentiments conveyed by the German modal particles. The list of emojis used is as follows:

Char	Unicode	Sentiment score	Unicode name	Used instead	Variable name
困惑的表情符号	0x1f616	-0.155	CONFOUNDED FACE	halt: -0.15714286	conf
汗表情符号	0x1f630	-0.02	FACE WITH	eben: -0.01428571	sweat

			OPEN MOUTH AND COLD SWEAT		
💔	0x1f494	-0.121	BROKEN HEART	eigentlich: - 0.12142857	broken
😬	0x1f62c	0.194	GRIMACING FACE	wirklich: 0.19285714	grim
😘	0x1f617	0.611	KISSING FACE	ruhig: 0.60714286	kiss
💕	0x1f495	0.632	TWO HEARTS	nun einmal: 0.63571429	twoh
😘	0x1f61a	0.71	KISSING FACE WITH CLOSED EYES	mal when ja positive: 0.71473214	kisscl
😘	0x1f619	0.778	KISSING FACE WITH SMILING EYES	ja when positive: 0.87098214	kisssm
😎	0x1f60e	0.491	SMILING FACE WITH SUNGGLASSES	doch when schon positive: 0.49206349	sungl
😜	0x1f605	0.178	SMILING FACE WITH OPEN MOUTH AND COLD SWEAT	schon when positive: 0.15873016	smile
😈	0x1f47f	-0.534	IMP	mal when ja negative: -0.50178571	imp
😱	0x1f628	-0.14	FEARFUL FACE	ja when negative: - 0.12678571	fear
😺	0x1f639	0.141	CAT FACE WITH TEARS OF JOY	doch when schon negative: 0.14500000	joycat
😢	0x1f61e	-0.118	DISAPPOINTED FACE	schon when negative: -0.10500000	disa

Table 3. Expressive Emojis List for Survey 2

Only the expressive emojis that were numerically closest were selected. They were selected with more emphasis on matching the ranking of modal particles rather than exactly matching the number.

Below is the list of translated sentences created for survey 2:

Translated Sentences (Korean)	Translated Sentences with Emojis (Korean)	German modal particle
-버스가 안 와. (The bus isn't coming.)	-버스가 안 와 😵 (The bus isn't coming.)	halt
-우리는 그럼 영화관 안 가. (Then we won't go to the cinema.)	-우리는 그럼 영화관 안 가 🎬 (Then we won't go to the cinema.)	eben
-사실 오늘은 집에 일찍 들어가려고 했어. (I actually wanted to go home earlier today.)	-사실 오늘은 집에 일찍 들어가려고 했어 💔 (I actually wanted to go home earlier today.)	eigentlich
-진짜 그랬다고? 너 바보야? (You really did that? Are you stupid?)	-진짜 그랬다고? 너 바보야? 😳 (You really did that? Are you stupid?)	wirklich
-네 펜 좀 빌려 써도 돼? (May I use your pen?)	-네 펜 좀 빌려 써도 돼? 😊 / 😷 (May I use your pen?)	mal
-네가 한 번 해 볼 수 있어. (You can try that.)	-네가 한 번 해 볼 수 있어 😊 / 🎯 (You can try that.)	ja
-가도 돼. (You can go.)	-가도 돼 😊 (You can go.)	ruhig
-우리는 시험을 쳐야 해. (We have to write the exam.)	-우리는 시험을 쳐야 해 ❤️ (We have to write the exam.)	nun einmal
-하지만 이미 읽었잖아. (But we already read that.)	-하지만 이미 읽었잖아 😊 / 😷 (But we already read that.)	doch
-이미 알잖아. (You already know that.)	-이미 알잖아 😅 / 😞 (You already know that.)	schon

Table 4. Final Sentences for Survey 2

The emoji pairs to compare are:

Char 1	Char 2	Used instead	Variable name
骺	😅	halt vs. eben	conf_sweat
💔	😁	eigentlich vs. wirklich	broken_grim
😊	😉	mal vs. ja when ja positive	kisscl_kissm
😈	😱	mal vs. ja when ja negative	imp_fear
😌	❤️	ruhig vs. nun einmal	kiss_twoh
😍	🤩	doch vs. schon when schon positive	sungl_smile
😿	😞	doch vs. schon when schon negative	joycat_disa

Table 5. Emoji Pairs to Compare in Survey 2

4.1.3. Structure of Survey Questions

Since sentences with and without modal particles were compared in Survey 1, sentences with and without emojis were also compared in Survey 2.

Just as for modal particle pairs, questions asking how they are relative by grouping emoji pairs are added.

Questions about the respondent's background, such as the language and cultural background of the survey respondent, gender and age are added.

Thus, the structure of the survey 2 is basically the same as Survey 1's :

- 1) questions evaluating sentiment of a single modal particle.
- 2) questions for comparing a modal particle pair.
- 3) questions for demographic, cultural and linguistic background.

An example question for 1) is as follows:

다음 두 문장을 보고 응답해 주십시오. – 버스가 안 와. – 버스가 안 와. 😞	Please look at the following two sentences and answer. - The bus isn't coming. - The bus isn't coming. 😞
다음 이모지가 문장에 어떤 감정을 전달한다고 생각하시나요? 😞	What mood do you think the following emoji conveys to the sentence? 😞 1=매우 부정적인 감정, 3=보통(영향을 주지 않음), 5=매우 긍정적인 감정

Example question for 2):

이 질문은 두 이모지 간의 감정을 비교하기 위한 것입니다. 😞 😢	This question is intended to compare the tuning of two emojis: 😞 😢 😊 has more ... than 😢
😊 는 😢에 비해서... 1=의미가 훨씬 약함, 3=차이 없음, 5=의미가 훨씬 강함	1=much weaker significance, 3=no difference, 5=much stronger significance

Questions for 3):

Since Koreans don't use CEFR levels, several options are written in different words.

본인의 한국어 능력에 대해 말씀해 주십시오. 1: 자유로운 의사소통이 가능하며 논리적으로 자신의 의견을 전개시키는 것이 가능한 외국어로서의 한국어 구사 2: 학문적이거나 전문적인 견해도 다룰 수 있는 수준의 외국어로서의 한국어 구사 3: 고급 어휘를 모두 이해하며, 어려운 낱말도 추론	How good are your Korean skills? 1: Proficiency in Korean as a foreign language that allows free communication and the ability to logically develop one's opinions 2: Proficiency in Korean as a foreign language at a level that can handle academic or professional opinions 3: Speak Korean as a foreign language, understanding all advanced vocabulary and
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가능한 외국어로서의 한국어 구사 4: 일반적인 한국어 원어민 5: 고급 어휘, 비즈니스 용어 및 학술용어까지 전부 이해할 수 있는 높은 수준의 한국어 원어민	being able to deduce even difficult words. 4: Typical Korean native speaker 5: High-level native speaker of Korean who can understand advanced vocabulary, business terms, and academic terms.
귀하의 문화적 배경에 대해 말씀해 주십시오. - 나의 문화적 배경은 한국입니다. - 나는 여러 가지 문화적 배경을 가지고 있습니다. - 나는 EU 문화 지역에 대한 문화적 배경을 가지고 있습니다. - 나는 아시아 문화 지역에 대한 문화적 배경을 가지고 있습니다. - 기타	Please tell us about your cultural background. - My cultural background is Korean. - I come from multi-cultural backgrounds. - I have a cultural background in the EU cultural area. - I have a cultural background in the Asian cultural region. - etc.
[나의 문화적 배경은 한국입니다.]를 선택하지 않으신 경우 응답해 주십시오. 문화적 배경이 되는 국가를 입력해주세요.	Please reply if you have not selected [My cultural background is Korean]. Please name the country from which you believe your culture comes.
성별 - 남 - 여 - 기타/밝히고 싶지 않음	Please tell us your gender. - Male - Female - Various/ Don't want to respond
귀하의 연령대를 선택해 주세요. 1: ~19 2: 20-29 3: 30-39 4: 40-49 5: 50-59 6: 60+	Please select your age group. 1: ~ 19 2: 20-29 3: 30-39 4: 40-49 5: 50-59 6: 60+

4.1.4. Variable Names and Score Calculation

Since the question types are just the same as Survey 1, Survey 2 is analyzed using the same method as Survey 1. Please refer to 3.1.3 for details.

Here are the variable names for the participant background questions:

- fluency: for linguistic fluency, scale 1-5.
- culturalbg: for cultural background, KR, EU, Multi, Asia, Etc
- name_cult: for the country names by which the participants are influenced culturally.
- gender: M/F/D
- age: u19, 20s, 30s, 40s, 50s, 60a

Adjusted Score after Normalization:

Due to differences between the Emojis Sentiment scores and the modal particles scores, adjustments were made to the scores obtained in Survey 2. The difference between the score for the modal particles and the emojis scores, as indicated in the Emoji Sentiment Ranking, was subtracted from the Korean survey emojis scores.

$$S_{adj} = S''_i - S_{EmojisRanking} - S_{Modalparticles}$$

4.2. Result for Survey 2 (2024.02.25 ~ 2024.02.26, N=116)

116 Korean speakers responded to Survey 2. However, Responses with NA existed. These were excluded from analysis. Thus, the number of analyzed responses is 112 (n=112).

Below are the emoji scores obtained before final adjustment:

- conf: 0.1986607
- sweat: 0.2388393
- broken: 0.3950893
- grim: 0.2075893
- kisscl: 0.9553571
- kissm: 0.7723214
- imp: 0.3794643
- fear: 0.1473214
- kiss: 0.7700893
- twoh: 0.8415179
- sungl: 0.6562500
- smile: 0.6205357
- joycat: 0.4598214
- disa: 0.3705357

However, these scores had to be adjusted once because the emojis in this survey had score differences from the actual modal particle scores. Thus, the scores are adjusted after normalization as mentioned in 4.1.4. The final adjusted scores are:

- conf: 0.1965179
- sweat: 0.2445536
- broken: 0.3946607
- grim: 0.2064464
- kiss: 0.7662321
- twoh: 0.8452321
- kisscl: 0.9600893
- kissm: 0.8653036
- sungl: 0.6573135
- smile: 0.6012659
- imp: 0.7866786
- fear: 0.1605357
- joycat: 0.4638214

- disa: 0.3835357

Two data frames were created from the two surveys. Since Survey 1 and Survey 2 were conducted in different cultural backgrounds, it seemed appropriate to analyze similarity rather than correlation. Accordingly, cosine similarity analysis was performed. The cosine similarity analysis result is 0.6586884, indicating that the scores of the two responses have a similarity of approximately 65.8%. This suggests that the emojis succeeded in reflecting the emotional scores of the modal particles by approximately 65.8%.

Following is the graph displaying the scores obtained from the two surveys, accompanied by tables presenting the scores for each emoji, modal particle, and their respective scores.

Comparison of Scores

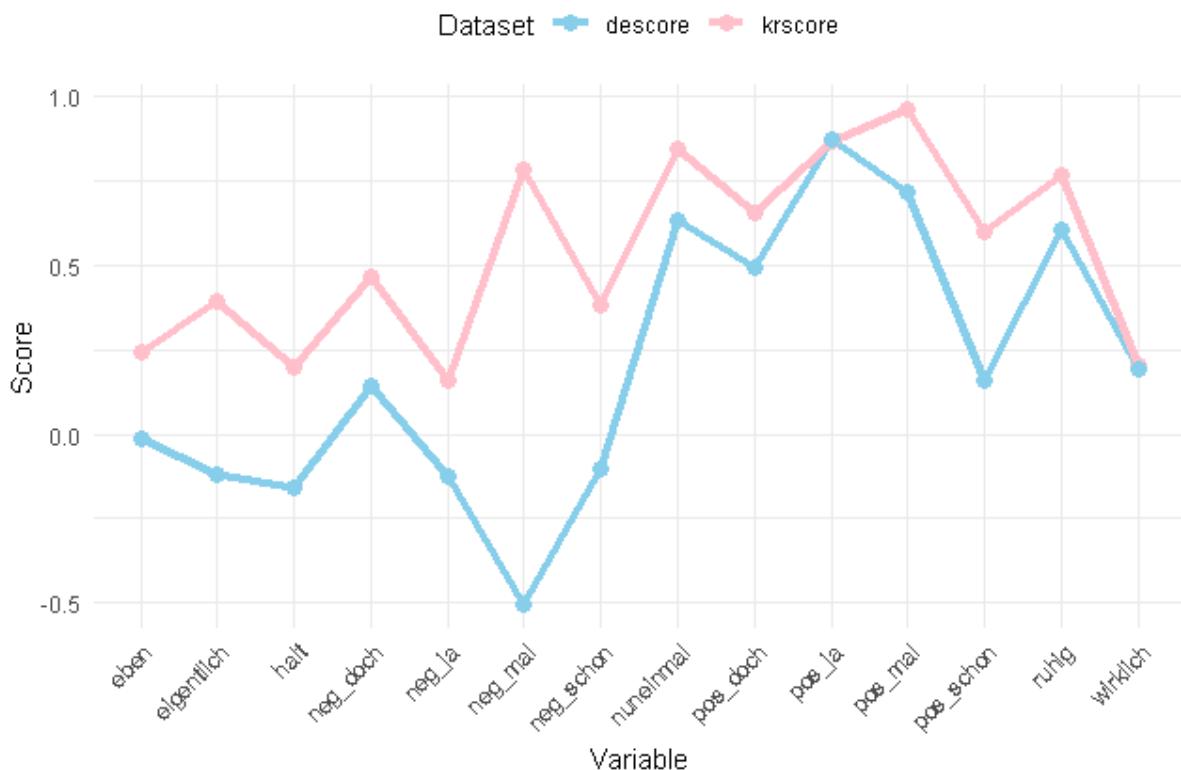


Figure 2. Comparison of Scores between Modal Particles and Emojis

Sentiment Ranking Score	Char	Variable name	Survey 2 Score	Modal Particles	Survey 1 Score
-0.155	😅	conf	0.1965179	halt	-0.15714286
-0.02	😅	sweat	0.2445536	eben	-0.01428571
-0.121	💔	broken	0.3946607	eigentlich	-0.12142857
0.194	🙄	grim	0.2064464	wirklich	0.19285714
0.611	😘	kiss	0.7662321	ruhig	0.60714286
0.632	😍	twoh	0.8452321	nun einmal	0.63571429
0.778	😘	kissm	0.8653036	ja positive	0.87098214
0.71	😘	kisscl	0.9600893	mal when ja positive	0.71473214

-0.14		fear	0.1605357	ja negative	-0.12678571
-0.534		imp	0.7866786	mal when ja negative	-0.50178571
0.178		smile	0.6012659	schon positive	0.15873016
0.491		sungl	0.6573135	doch when schon positive	0.49206349
-0.118		disa	0.3835357	schon negative	-0.105
0.141		joycat	0.4638214	doch when schon negative	0.145

Table 6. Scores for Emojis and Modal Particles

Additionally, a Welch Two Sample t-test was performed on the two score datasets, revealing a significant difference between the mean scores of the two groups. The following is a table of results from a t-test performed on the two score data sets.

Welch Two Sample t-test	
data:	descore_vector and krscore_vector
$t = -2.5756$, $df = 23.109$, $p\text{-value} = 0.01687$	
alternative hypothesis:	true difference in means is not equal to 0.
95 percent confidence interval:	
-0.61061339	-0.06672845
sample estimates:	
mean of x	mean of y
0.1993424	0.5380133

Table 7. T-Test Result for Data Sets

The obtained p-value of 0.01687, which is below the significance level of 0.05, provides sufficient evidence to reject the null hypothesis. Hence, the difference in mean scores between the two groups is statistically significant. Notably, the KR scores were found to be higher than the DE scores.

5. Discussion

5.1. Cultural background

5.1.1. Modal Particles by Different Cultural Backgrounds

According to Caroline Lehr (2022), the context in which a translation is situated influences the perception of emotion. Based on this, respondents were segmented into different cultural background groups, and a correlation test was performed. The following table presents the results obtained from Survey 1, derived directly from raw responses.

Modal Particles	Correlation	P-Values
halt_score	-0.09751493	0.577332434
eben_score	-0.09552494	0.585162221
eigentlich_score	0.16672135	0.338447184
wirklich_score	0.04760239	0.785971304
mal_score	0.5107072	0.001719694 ***
ja_score	0.0960406	0.583128812
ruhig_score	-0.17389389	0.317772357
nuneinmal_score	-0.04020783	0.818615215

doch_score	0.45209709	0.006399838 ***
schon_score	0.02723876	0.876566782
halt_eben_score	0.1855104	0.286002773
eigentlich_wirklich_score	-0.0340861	0.845871491
mal_ja_score	-0.26421178	0.125095909
ruhig_nuneinmal_score	-0.26059794	0.130536479
doch_schon_score	-0.04145202	0.813100023

Table 8. Correlation Table for Modal Particles and Cultural Backgrounds

According to this result, 'mal' and 'doch' has statistically significant correlations with cultural backgrounds. Both variables show a positive correlation with cultural backgrounds, suggesting that cultural background may influence the values of "mal" and "doch". Specifically, when respondents are farther from the German cultural sphere (coded as 1 for 'Germany', 2 for 'Multi', and 3 for 'outofeu'), these modal particles tend to be rated more positively.

Below is a graph showing the average score for modal particles by each cultural group.

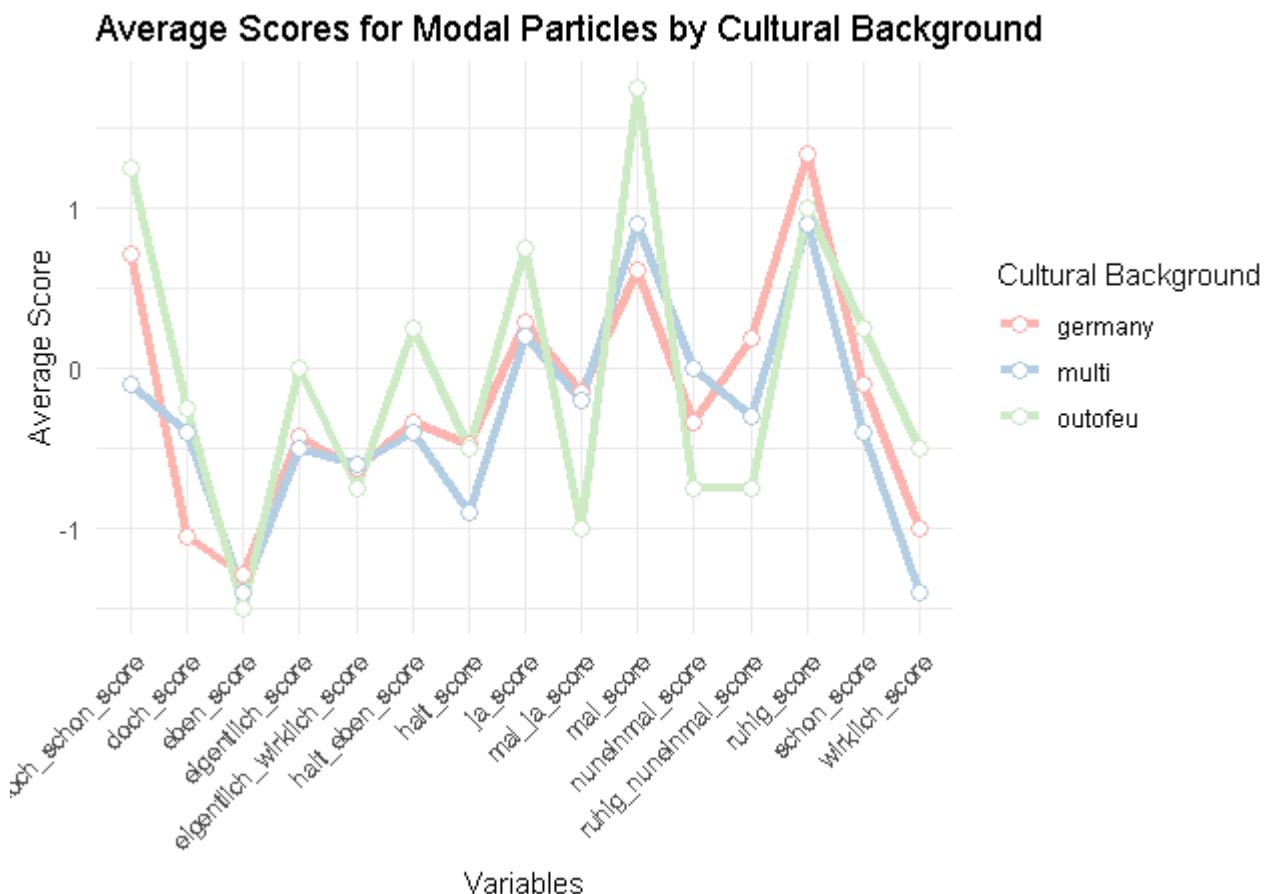


Figure 3. Average Scores for Modal Particles by Different Cultural Groups

germany	multi	outofeu
21	10	4

Table 9. Number of Participants in Different Cultural Background Groups

Looking at this graph, people with multicultural backgrounds showed average scores that were much more similar to respondents from the actual German culture compared to people from outside the

European culture. However, it is challenging to ascertain the accuracy of this result due to the relatively small sample size of only 35 participants.

5.1.2 Emojis by Different Cultural Backgrounds

Guntuku et al. (2019) argued that emojis related to positive emotions generally show similar patterns in the East and West, but emojis related to negative emotions show significant differences between the East and the West. Drawing from this premise, a correlation analysis was performed in Survey 2 to explore the relationship between emoji responses and cultural background.

Char	Emojis	Correlation	P-Values
😂	conf_score	0.17935023	0.058471832
😅	sweat_score	0.20153393	0.033103783**
💔	broken_score	0.17154906	0.070517889
😱	grim_score	0.15629654	0.099833534
😘	kiss_score	-0.13830957	0.145860508
❤️	twoh_score	-0.06796489	0.47644771
😘	kisscl_score	-0.24858333	0.008220749***
😊	kissm_score	-0.11091648	0.244319668
😎	sungl_score	-0.09424055	0.322975734
🤩	smile_score	0.04945173	0.604602158
😴	imp_score	0.11957037	0.209214489
😱	fear_score	0.25666034	0.006301161***
😺	joycat_score	0.08280487	0.385402396
😩	disa_score	0.30680531	0.001001078***
😂😅	conf_sweat_score	0.02061272	0.829205877
💔😱	broken_grim_score	0.03186112	0.738765643
😍❤️	kiss_twoh_score	0.13852309	0.1452333
😘😊	kisscl_kissm_score	-0.11969716	0.208728448
😎🤩	sungl_smile_score	0.03000204	0.753505518
😴😱	imp_fear_score	-0.08022148	0.400450849
😺😩	joycat_disa_score	0.24187451	0.010190069**

Table 10. Correlation for Emojis and Cultural Backgrounds

The analysis of Survey 2 reveals that respondents tend to assess emojis associated with negative emotions, such as sweat(😅), fear(😱), and disa(😩), more positively as the influence of Korean culture diminishes. Conversely, the evaluation of kisscl(😘) tends to be negative. This suggests that the perception of emotions conveyed by emojis varies across different cultural backgrounds.

In particular, the findings regarding sweat(😅), fear(😱), and disa(😩) align with Guntuku et al.'s (2019) observations on the evaluation of emojis representing negative emotions. The negative assessment of kisscl(😘) is consistent with Guntuku et al.'s findings, where Eastern cultures favored a similar emoji, 😊. When these results are considered collectively, significant similarities with the Guntuku et al.'s study become apparent.

However, it's important to exercise caution in interpreting these findings, considering the relatively small sample size, which may undermine the robustness of the results. The table below illustrates the distribution of participants across different cultural groups:

Korea	Multi	Asia(except Korea)	EU
101	3	4	4

Table 11. Number of Participants in Each Cultural Backgrounds Group

Following graph shows the scores obtained by different cultural groups.

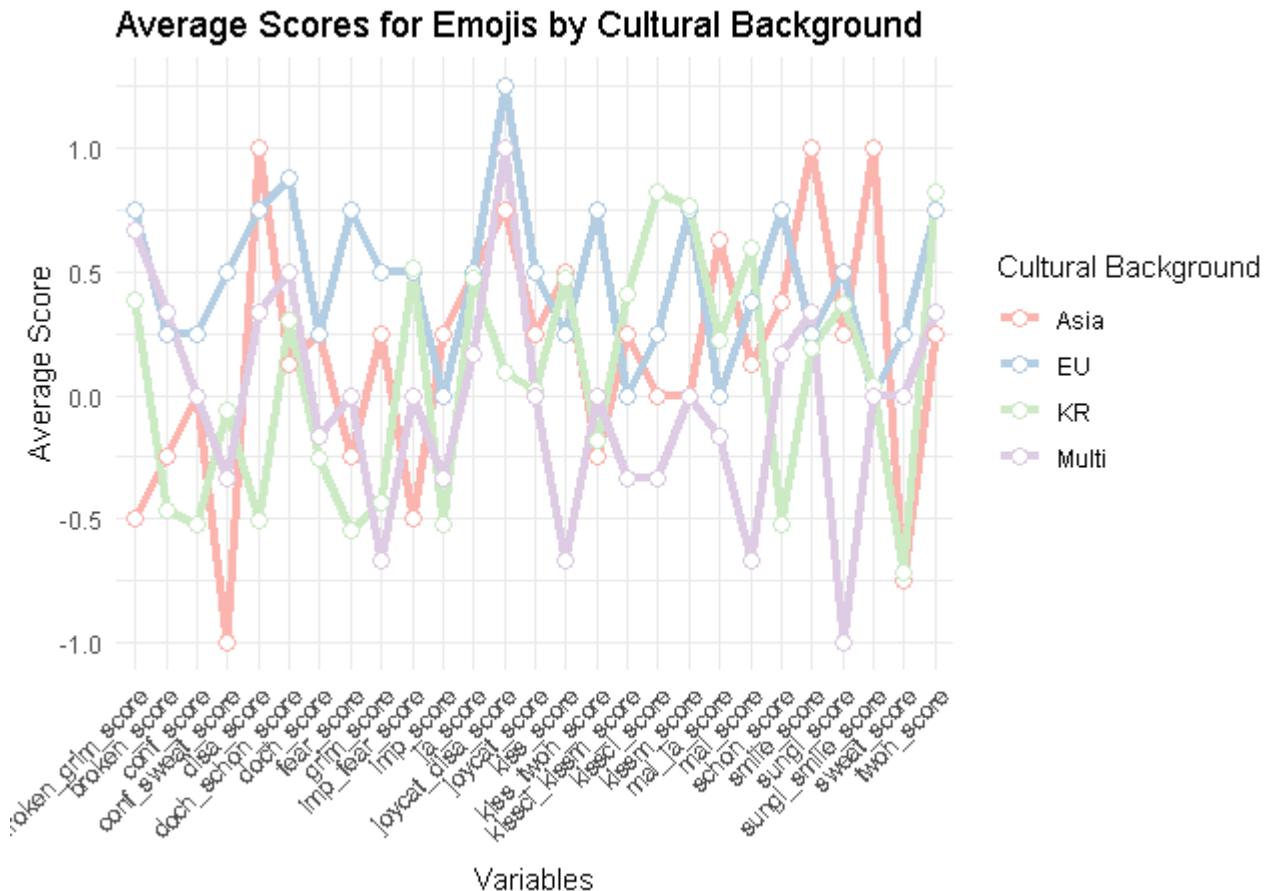


Figure 4. Scores for Emojis by Different Cultural Backgrounds

5.2. Linguistic Fluency

Since both surveys primarily inquire about sentences composed in the respective languages, it is plausible that the respondents' language fluency levels could influence their answers. Therefore, a correlation analysis was undertaken to ascertain whether the scores obtained from the two questionnaires varied based on the respondents' fluency levels. The following is the correlation analysis result for the first survey:

Variable name	Correlation	P-value
halt_score	0.143518558	0.4107912038
eben_score	-0.139229905	0.4250577794

eigentlich_score	-0.011684467	0.9468858736
wirklich_score	0.187566147	0.280601817
mal_score	0.037562947	0.8303675424
ja_score	-0.155302984	0.3730154098
ruhig_score	0.598107594	0.0001478616***
nuneinmal_score	0.08265892	0.6368795052
doch_score	-0.001262795	0.9942557037
schon_score	0.115494237	0.5088208484
halt_eben_score	-0.169016564	0.3317435518
eigentlich_wirklich_score	0.146717244	0.4003295259
mal_ja_score	0.252441407	0.1434562675
ruhig_nuneinmal_score	0.157696201	0.3656028902
doch_schon_score	0.085216709	0.6264521628

Table 12. Correlation Table for Modal Particles and Fluency

Examining the table, it is evident that "ruhig_score" exhibits statistically significant correlations with fluency. Consequently, it can be inferred that as fluency level increases, the evaluation of "ruhig_score" tends to become more positive.

Below is the table for the numbers of participants in each groups. The larger the number, the higher the fluency.

1	2	3	4	5
1	1	1	4	28

Table 13. Number of Participants in Each Fluency Group

Following is the graph illustrating modal particle scores by fluency (Kenntnisse for fluency level).

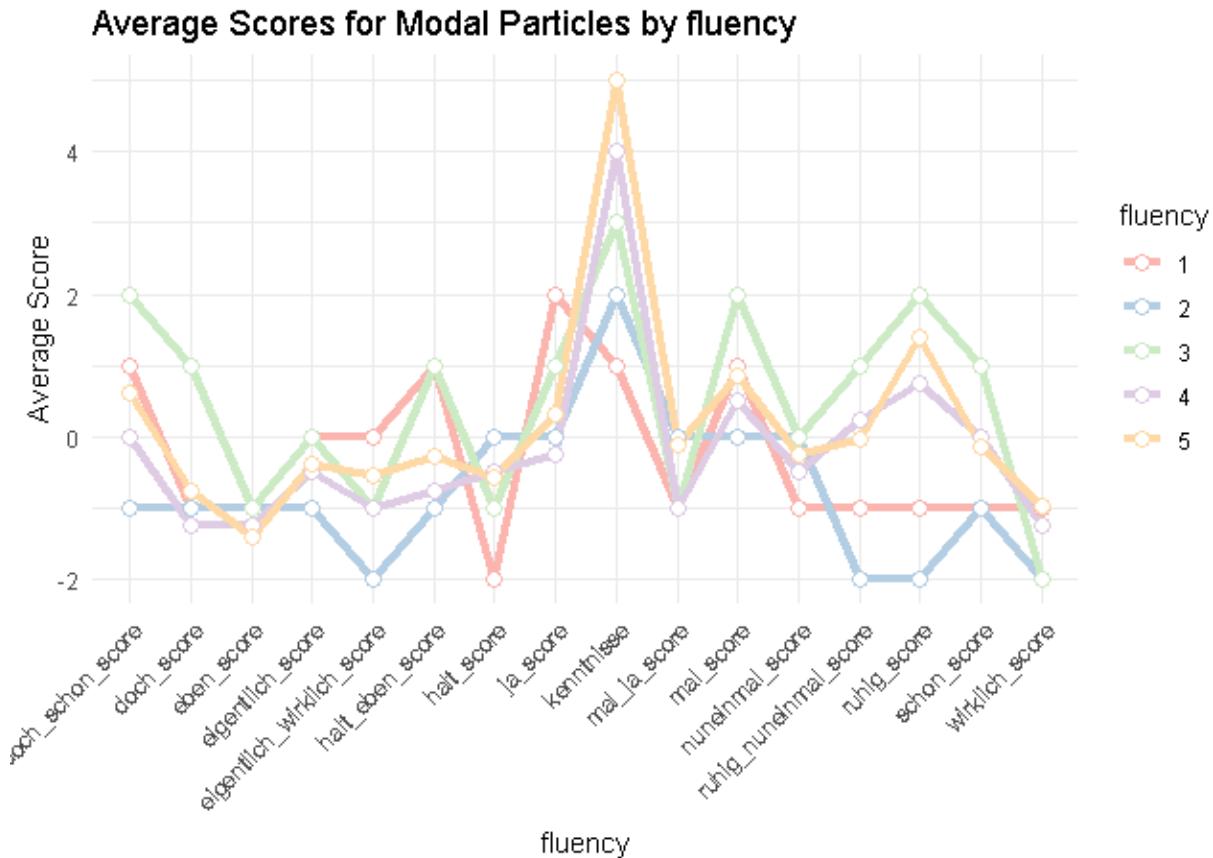


Figure 5. Average Scores for Modal Particles by German Fluency

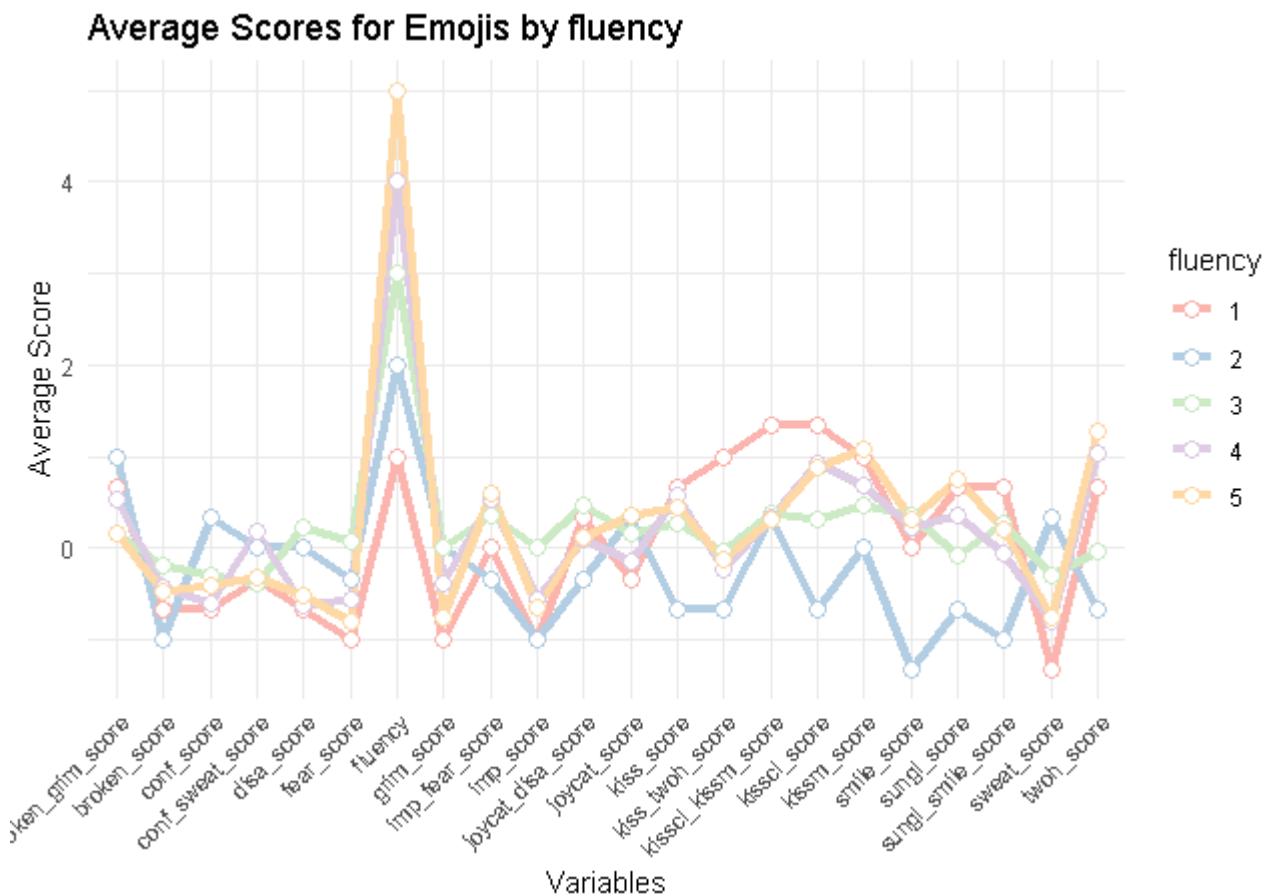
In the case of emojis, it is reasonable to assume that there is no correlation with language ability. However, in this survey targeting Korean users, all emojis were used with Korean sentences, raising uncertainty about whether there is a correlation depending on language ability. For that reason, a correlation analysis between Korean language proficiency and emoji scores was also conducted. The following table presents the results:

Char	Variable name	Correlation	P-value
🧐	conf_score	-0.054321312	5.694554E-01
😅	sweat_score	-0.118283787	2.141921E-01
💔	broken_score	-0.015246656	8.732320E-01
😱	grim_score	-0.162512290	8.690139E-02
😘	kiss_score	0.106405011	2.641546E-01
❤️	twoh_score	0.413056224	6.006951E-06 ***
😘	kisscl_score	0.213854125	2.356861E-02 **
😍	kissm_score	0.212267990	2.464629E-02 **
😎	sungl_score	0.269213017	4.100674E-03 ***
🤣	smile_score	0.094252786	3.229126E-01
😈	imp_score	-0.080293546	4.000264E-01
😅	fear_score	-0.190879767	4.380044E-02 **

🐱	joycat_score	0.068114610	4.754747E-01
😩	disa_score	-0.184679792	5.125442E-02
😓 😅	conf_sweat_score	0.031929333	7.382266E-01
💔 😢	broken_grim_score	-0.051251440	5.915009E-01
😘 💋	kiss_twoh_score	-0.085107409	3.722815E-01
😍 😊	kisscl_kissm_score	-0.098866845	2.996828E-01
😎 😃	sungl_smile_score	-0.007806916	9.348893E-01
😱 😨	imp_fear_score	0.146842448	1.223491E-01
🐱 😩	joycat_disa_score	-0.063461487	5.062108E-01

Table 14. Correlation Table for Emojis and Fluency

Upon reviewing this table, the assessment of some emojis undergoes a shift with increasing levels of language fluency. Except for the fear score, there is a notable trend towards more positive evaluations of positive emojis such as ❤️, 😊, 😃, and 😘. While the decrease in the 😩 score aligns with the pattern observed where negative emojis are rated more negatively as the influence of Korean culture intensifies, it is intriguing to observe that higher levels of Korean fluency accentuate the positive appraisal of positive emoji usage. This observation highlights the nuanced interplay between language fluency and emoji interpretation. Following is the graph that illustrates the scores for emojis by fluency and the number of participants in each group.

**Figure 6. Average Scores for Emojis by Korean Fluency**

1	2	3	4	5
3	3	26	55	25

Table 15. Number of Participants in each Fluency Group

5.3. Another Potential Variables

As per the insights of Rega and Magris (2008), effectively translating emotional impact extends beyond mere word selection, encompassing nuanced expressions through rhetorical emphasis and semantic prosody. Consequently, the incorporation of linguistic and rhetorical devices remains crucial in the translation of emotions, even when emojis are employed.

It's also important to consider dialect usage as well. Braber (2005) highlighted how speakers' preference for a particular dialect can impact the occurrence of specific modal particles or tags in their language use. The variability in modal particle usage across regions or dialect preferences implies that the expression of emotions among German speakers may differ depending on regional or dialectal influences. Consequently, the selection of modal particles in German speech can mirror the speaker's emotional engagement or attitude, with this variability being shaped by regional disparities in language usage.

6. Conclusion

In summary, this analysis revealed a significant level of similarity between the emoji scores and modal particle scores obtained from surveys conducted in Korea and Germany. Cosine similarity analysis indicated an approximately 65.8% similarity between the two respondent groups, underscoring the capacity of emojis to capture the nuanced emotional nuances conveyed by modal particles. These findings suggest the potential effectiveness of enhancing intercultural communication by preserving emotional expressions across different languages through the incorporation of emoticons to mitigate the loss of emotional depth during translation. However, when translating emotions, it is essential to not only recognize the observed differences in mean scores between the two groups but also consider the various variables that may influence emotions.

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8. Appendix

emojis.xlsx : Emoji Sentiment Ranking data, which shows the sentiment score for each emojis

Modalpartikeln_and_Emojis.R: Source Code.

[Survey 1]

Modalpartikeln.csv: Dataset of Survey 1.

Modalpartikeln_Survey1: Questions for Survey 1 (in German).

[Survey 2]

KoreanSurvey.csv: Dataset of Survey 2.

Emojis_for_Translation_Survey2: Questions for Survey 2 (in Korean).