

# Towards Identifying the Common Social Emotions in Spoken te reo Māori: A Community-Oriented Approach

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## Abstract

Emotion-based studies, including speech emotion recognition, often prioritise well-resourced languages, overlooking low-resource and Indigenous languages like New Zealand's te reo Māori. In these languages, emotions are not even well-defined. This study aims to identify common social emotions in te reo Māori speech. We designed a questionnaire using te reo Māori media recordings and collected feedback from te reo Māori speakers on the emotions. Our analysis yielded 218 emotion terms in te reo Māori and English. The study highlights the need for further categorisation of these emotion terms based on similarity using feedback from experts in te reo Māori.

**Index Terms:** emotions, speech technology, low-resource, Indigenous

## 1. Introduction

Identifying emotions from speech, known as speech emotion recognition (SER), is important in human-computer interaction (HCI) due to the demand for contactless interaction. However, such speech technology development is happening only in 100 out of the over 7,000 world languages, primarily in a few well-resourced languages like American English [1]. Very limited work on SER exists in low-resource and Indigenous languages. For instance, there is no SER system for te reo Māori (the Māori language). This study aims to establish the common social emotions in te reo Māori, which is a prerequisite for any emotion-based study in te reo Māori, including SER.

### 1.1. Te reo Māori

Te reo Māori is the only official Indigenous language of Aotearoa New Zealand. It is a Polynesian language fluently spoken by 71,000 people, which is 1.5% of New Zealand's population [2]. From 1847 until the 1960s, colonial practices actively discouraged the use of te reo Māori, promoting the use of English instead. These efforts resulted in a significant decline in te reo Māori-speaking community. Even today, only 7.9% of the Māori population are fluent speakers of te reo Māori [3], while most Māori remain bilingual, speaking both English and te reo Māori [2]. In the 1980s, the revitalisation of te reo Māori began. As a result, te reo Māori gained its official status by the Māori Language Act 1987. The government also started supporting te reo Māori in various areas. Te reo Māori education was supported by establishing te reo Māori schools and tertiary institutions [4]. Moreover, organisations like Te Reo Irirangi o Te Hiku o te Ika (Te Hiku Media), a Māori community communication hub for radio, online TV and other media services,

were established [5]<sup>1</sup>. Such organisations have collections of te reo Māori speech data, which can be valuable resources for any study involving te reo Māori.

### 1.2. Emotions in cross-cultural contexts

Defining an emotion is challenging, and there is no universally agreed definition of an emotion [6]. However, it is generally agreed that emotions include cognitive processes, physiological adjustments, behavioural changes, and affective experiences such as arousal and pleasure [6, 7]. Another commonly discussed characteristic of emotions is their universality [8, 9]. Ekman's studies are well-known for verifying the universality of emotions between different cultures, including Brazil, the United States, Argentina, Chile, Japan, and the Indigenous population of Papua New Guinea [8]. In those studies, people were asked to match a story with facial expressions representing a few emotions. Due to the similarity in responses, Ekman concluded that emotions are universal and categorised emotions into six categories, which are defined in English: anger, disgust, fear, happiness, sadness, and surprise [8, 9].

Current emotion-based studies, including SER, classify emotions into the same set of basic emotions with a few additional categories (e.g., [10], [11], [12]) or their direct translations into the languages in which the technology is being developed (e.g., [13]). Several studies have identified limitations in the first approach, which relies on emotions defined in English, due to flaws in the design of Ekman's study. These flaws include the selection being forced on the set of facial expressions provided and the study being designed without any cultural knowledge or local community involvement [14, 15, 16]. There has been an ongoing debate that emotions can differ between languages due to cultural variation [14, 17, 18]. Hence, using emotions defined for English may not adequately represent emotions in all languages. Additionally, these studies were based on facial expressions, and there has been no verification that the same emotions exist in speech. The second approach, which uses the translations of emotions in target languages, also has limitations when applied to Indigenous languages like te reo Māori. A study has found that Māori and Pākehā (European) have different patterns of emotions for different social situations [19]. Scholars have even suggested that nuances of Māori emotions can be lost when referenced in English [20]. Further, te reo Māori contains a wide vocabulary of emotions which do not have a direct English translation [21]. Therefore, using emo-

<sup>1</sup>Te Hiku media has been leading the preservation of te reo Māori through artificial intelligence (<https://time.com/collection/time100-ai-2024>) and leading the principles of data sovereignty for Indigenous data.

tions defined in English or the closest translations of English emotion terms might be inadequate for te reo Māori. Thus, it is crucial to identify the common social emotions in te reo Māori before proceeding with any technology development.

Community engagement is crucial in any study focusing on Indigenous languages. The studies developed without community engagement fail to represent the Indigenous perspectives accurately and are biased against Indigenous communities [22]. Hence, this study was conducted in close collaboration with the community to ensure it benefits the community. Further details on community collaboration will be presented in Section 3.5.

To address the need for emotion identification for te reo Māori through a community-oriented approach, this study aims to identify the common social emotions in te reo Māori speech through feedback from te reo Māori speakers. The results of this study will indicate whether Ekman’s emotion model effectively captures te reo Māori emotions or if there is a need for additional or alternative emotion categories. This study will be the first research of its kind into Indigenous emotions-based studies.

## 2. Methodology

This section outlines the methodology followed in identifying common social emotions in spoken te reo Māori. Given the lack of prior studies with a similar focus, we developed a novel methodology for this study based on an online questionnaire. We used the questionnaire to collect feedback from te reo Māori speakers who know how emotions are categorised in their culture. We gave them different te reo Māori speech recordings as stimuli and asked them to comment on the emotions in the recordings.

### 2.1. Emotional speech collection

Since there are no emotional speech databases for te reo Māori, we used 100 te reo Māori recordings from the University of Auckland (UoA) library (50 hours of data) [23] and another 120 recordings (20 hours of data) shared by Te Hiku Media for research purposes [5].

UoA library resources include te reo Māori speech from various te reo Māori TV shows, as shown in Figure 1. Here, the Spongebob and Penguins of Madagascar versions were te reo Māori dubbed versions. The various topics included in Te Hiku Media recordings are shown in Figure 2.

The raw recordings from both sources contained some time durations with no notable emotions and some with only music and no speech. Hence, two research assistants who were schooled in New Zealand listened to the recordings and marked the durations with any notable emotion. These durations will be referred to as audio clips in this paper. They marked 745 audio clips (8 hours) to have some notable emotions. Since getting feedback for all 745 audio clips from te reo Māori speakers is not practical, we randomly picked 100 audio clips. We trimmed each audio clip to be 10-30 seconds in duration. Two of the authors, who are both Māori and fluent te reo Māori speakers, further checked and adjusted the audio clips to ensure that no clip ends in the middle of a phrase.

### 2.2. Questionnaire design

We then designed the questionnaire to obtain the feedback of te reo Māori speakers regarding emotions conveyed in te reo Māori speech. The test was bilingual, provided in both English and te reo Māori, allowing participants to choose their

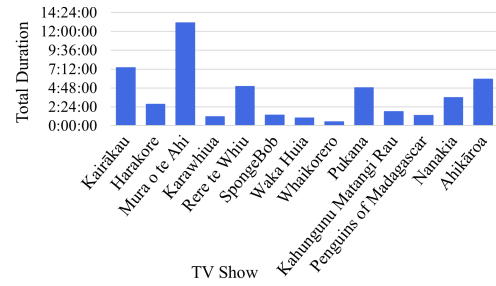


Figure 1: UoA recordings - duration vs TV show

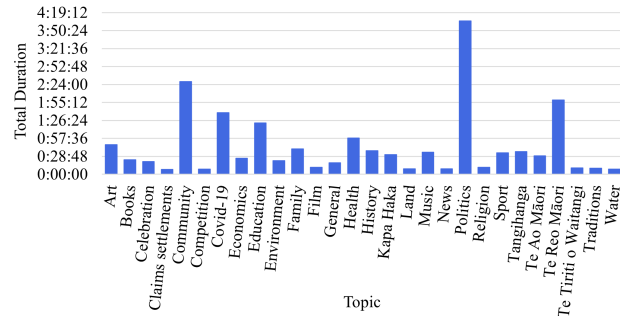


Figure 2: Te Hiku Media recordings - duration vs topic

preferred language. We decided to make the questionnaire bilingual mainly due to te reo Māori being a revitalised language; even native te reo Māori speakers might have difficulty in coming up with te reo Māori emotion vocabulary. Moreover, Māori people may use English to express emotions while still conveying an emotional framework that is culturally Māori. As the literature suggests, English emotion terms might not be sufficient to describe Māori emotions; hence, the questionnaire will try to collect emotions conveyed in te reo Māori speech regardless of the language. The questionnaire consisted of the following questions.

1. Demographic questions - First, we asked for demographic information to understand the participants’ background, including age, gender, Māori language ability, exposure to the Māori language, and hearing difficulties.
2. Emotion perception questions - We divided the selected 100 audio clips into five sets, assigning one randomly chosen set to each participant. We then asked the participants to listen to the audio clips and write down any emotions they could identify. The participants could respond in English or te reo Māori; the answers were free responses and could be descriptive.
3. Feedback questions - Finally, we asked the participants to write down the speech features that helped them identify the emotions in the given audio clips and the difficulties they faced in identifying emotions.

### 2.3. Participant recruitment and ethical considerations

The Māori researchers in the team advertised the questionnaire via email and social media to potential participants. Any fluent te reo Māori speaker with normal hearing ability and over 18 years old could participate in the questionnaire.

We obtained the ethics approval (Reference No. 25668) for the study from the UoA Human Participants Ethics Committee and obtained informed consent from all participants to

ensure that ethical standards and cultural appropriateness are maintained.

### 2.4. Emotion terms filtering

Since the emotion perception questions allowed free responses, participants could provide more descriptive answers than a list of emotion terms. Therefore, the first author manually marked the key terms that describe the emotions in all the responses. These markings were then cross-checked by the Māori researchers involved in the study. Further, we converted all the terms into their adjective form and removed duplicates. Then, we removed the intensity words which describe emotions. For example, we removed terms like *very* and *āhua* (*somewhat*) if used with emotions (e.g., very angry, āhua pukuriri (somewhat angry)). Some terms from the questionnaire responses described actions (what the speakers of the recordings were doing) or the qualities of speakers instead of internal emotions. Hence, we removed such terms. For example, we removed terms such as blaming, laughing, akiaki (encouraging someone else), and whaikōrero (formal speech).

## 3. Results and discussion

### 3.1. Participant demographic information

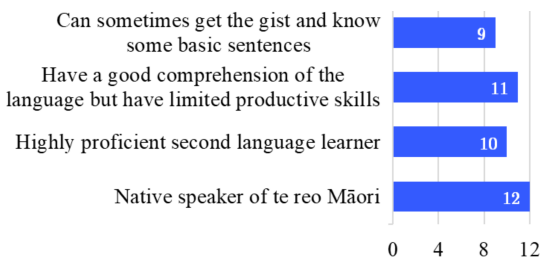


Figure 3: Māori language ability of the participants.



Figure 4: Ability of the participants to speak and understand spoken te reo Māori in day-to-day conversation.

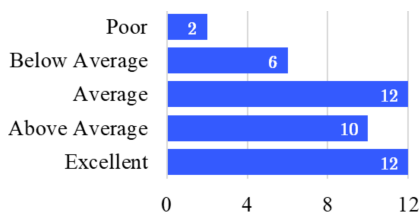


Figure 5: Self-rated confidence of identifying emotions in spoken te reo Māori.

Table 1. Examples of responses received for emotional questions of the questionnaire (Te reo Māori emotion terms are marked in red, and English ones are marked in blue.)

Response	English Translation
1. <span style="color: blue;">sadness, pōuri, crying,</span> <span style="color: red;">anger, riri, sorrow</span>	sadness, sad, crying, anger, angry, sorrow
2. <span style="color: red;">Hōhā</span> ana te tāne. <span style="color: red;">Tau</span> ana te wahine.	The man is annoyed. The woman is calm.
3. Started <span style="color: blue;">excited / encouraging</span> leading up to the bit, ka tahi ka <span style="color: red;">hōhā</span> te kaikōrero o tērā bit	Started excited / encouraging leading up to the bit, and then the speaker got annoyed
4. He <span style="color: red;">pukuriri</span> he <span style="color: red;">hōhā</span> hoki nō te wahine nei i te kore mauranga atu o ngā tamariki kia werohia hei ārai mate, māuiui anō hoki.	The woman is angry and annoyed that the children aren't being taken to get vaccines to protect them from death and illness.

Forty-two participants completed the questionnaire from late 2023 to early 2024. Among them, 28 identified as female, 12 as male, and two identified as gender diverse. The participants were between the ages of 22 and 73. One participant reported having inflamed eardrums.

Thirty participants reported English as their first language, whereas 10 participants reported their first language as te reo Māori. The other two participants reported English and te reo Māori as their first language. As Māori are bilingual speakers of English, this language distribution is expected in New Zealand.

The participants described their Māori language ability as shown in Figure 3. The figure shows that 12 participants identified themselves as native te reo Māori speakers, and 10 identified as highly proficient te reo Māori speakers. Further, participants rated their ability to understand spoken te reo Māori in day-to-day conversation, as shown in Figure 4.

Figure 5 shows participants' self-reported confidence in identifying emotions in spoken te reo Māori. Overall, the majority of the participants demonstrated significant confidence in identifying emotions.

### 3.2. Emotion terms identified from questionnaire responses

A few examples of responses received for emotion questions of the questionnaire are given in Table 1. The table provides the closest English translation of each response, which may not fully capture the nuances of the Māori emotions but is given to provide a general sense of the examples.

After removing duplicates and non-emotional terms, as detailed in Section 2.4, a total of 218 terms remained: 105 in te reo Māori and 113 in English. Figure 6 gives a word cloud of remaining emotion terms. The font size of each emotion term represents its frequency of appearance within the questionnaire responses. The word cloud illustrates the diversity of emotion terms in each language. In particular, we can find various emotion terms in te reo Māori that correspond to the same English emotion. For instance, terms like harikoa, hari, koa, koakoa, and hākoakoa all refer to the happy emotion. However, this prompts the question of whether these terms are exactly similar.

### 3.3. Participant feedback

The participants mentioned various factors that helped them identify emotions from the given speech, such as the speed,





## 5. Acknowledgements

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