



## Investigating the vocabulary used by electric guitar players to speak about touch

Paul Cambourian, Arthur Paté, Caroline Cance, Benoît Navarret, Jerome O. Vasseur

### ► To cite this version:

Paul Cambourian, Arthur Paté, Caroline Cance, Benoît Navarret, Jerome O. Vasseur. Investigating the vocabulary used by electric guitar players to speak about touch. Forum Acusticum, Dec 2020, Lyon, France. pp.1029-1036, 10.48465/fa.2020.0484 . hal-03234056

**HAL Id: hal-03234056**

**<https://hal.science/hal-03234056>**

Submitted on 13 Jun 2021

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# INVESTIGATING THE VOCABULARY USED BY ELECTRIC GUITAR PLAYERS TO SPEAK ABOUT TOUCH

Paul CAMBOURIAN<sup>1</sup>, Arthur PATÉ<sup>1</sup>, Caroline CANCE<sup>2</sup>

Benoît NAVARRET<sup>3</sup>, Jérôme VASSEUR<sup>1</sup>

<sup>1</sup> Univ. Lille, CNRS, Centrale Lille, Junia/ISEN, Univ. Polytechnique Hauts-de-France, IEMN UMR 8520, Lille, 41 Boulevard Vauban, 59046 Lille Cedex, France

<sup>2</sup> Laboratoire Ligérien de Linguistique (LLL) UMR 7270, 10 rue de Tours, BP 46527, Site d'Orléans, 45065 Orléans Cedex 2, France

<sup>3</sup> Institut de Recherche en Musicologie (IReMus) UMR 8223, 2 Rue de Louvois, 75002 Paris, France  
paul.cambourian@junia.com

## ABSTRACT

The understanding of how musicians evaluate the quality of their instruments is a topic of interest to the community of music perception. Playing an instrument is a cross-modal experience, but previous studies have used criteria mainly focusing on the auditory experience. The present work is based on the linguistic analysis of words identified as potentially falling within the lexical field of touch, in order to investigate how these words are used by musicians while interviewed in situ, and to assess whether or not they indeed primarily relate to the sense of touch. The data used comes from transcriptions of interviews with professional electric guitarists involved in a free playing task. We focus our analysis on six words “comfort”, “dynamics”, “response”, “feeling”, “touch” and “vibration”, chosen through a literature review of criteria classically used when the tactile perception of musical instruments is involved. The analysis consists in studying these words in their context of use. Taking into account the morphosyntactic context of each of these words’ occurrences, their semantic association with guitar elements or human body parts, etc., enables to assess the relationship of the criteria with vibrotactile perception (in the context of utterance). It is shown that “comfort”, “touch” and “vibration” mostly refer to the sense of touch, contrary to “feeling” and “response”. “Dynamics” is implicitly linked to the interaction between the musician and the instrument, and doesn’t present an explicit relationship with the sense of touch. These results on criteria and their relationship to touch can be used to conduct perceptual tests in a musical playing context when targeting the sense of touch.

## 1. INTRODUCTION

From the choice of an instrument to purchase, to live performances, through their everyday musical training and practice, musicians are constantly evaluating their instruments. Scientists have aimed for decades at understanding how this expert evaluation is performed. The field of perception of musical instruments is dominated by psychophysical studies, for example to evaluate piano touch qual-

ity [1], or physical differences between two trumpets [2]. In the psychophysical paradigm, the description of the world as given by physics (in our case, acoustics) is assumed as the starting point, in order to test the human perception of, or sensitivity to, physical parameters. The implicit underlying assumption is that the physical parameters correspond to a psychological reality, i.e. that they are meaningful to the participants; an assumption which may or may not be true (see e.g. [3, p. 701]). While targeting the same objectives, our approach goes in the opposite direction. We try to identify what is relevant for the participants in their everyday, expert practice, in order to eventually perform physical and acoustical studies. For this reason, we consider as important to ask first for the musicians’ point of view. Fritz and Dubois reviewed the methodology of perceptual evaluation of musical instruments in [4], and highlighted the value of playing tests combined with production of verbal data. In the same way, Fritz et al. [5], and Wollman et al. [6] conducted interviews with violinists in a playing situation.

It seems that, during perceptual tests, musicians talk more spontaneously about the sound of the instruments. If the lexical field of sound is privileged, this may be due to the situation of listening test rather than playing experiences:

“By playing, violinists can experience a wider range of performance effects than the very short phrases or single notes often used in listening tests, and in this way assess any particular attribute of the instrument based on multi-modal sensory data (i.e., based on auditory and tactile feedback).” [7]

However, the criteria observed even in the playing tasks of studies [6–10] focus to a great extent on the perception of sound and sound terms.

Music experience is indeed a cross-modal experience. It involves in particular the sense of touch and the interaction between the musician and the instrument, which is at the core of the action of playing an instrument [11]. The sense of touch is so important for a musician that new interfaces for music, although they are often virtual or dematerialized, need to include vibrotactile feedback for more realistic sensations [12]. In this work, we are therefore in-

terested more particularly in the sense of touch as a part of the cross-modal experience of playing a musical instrument.

We can wonder if the criteria on which the musicians are questioned, for example in the work of Wollman et al. [6, 13], are relevant when the researchers target responses about touch. But the work of Verine shows that there exists a specific lexical field of touch [14]. Following this idea, the goal of this paper is to identify terms referring to touch, in order to orient future tests on the sense of touch. This work is based on the linguistic analysis of words that are a priori semantically related to touch, but commonly used without checking if this assumption holds within situated discourses<sup>1</sup>. In order to analyze the words used by musicians, we used transcriptions of previous free playing and verbalization tasks involving professional electric guitar players. This work on criteria and their relationship to touch can be used to conduct perceptual tests in a musical playing context when targeting the sense of touch.

First, section 2 presents the material and methods used in this study: choice of criteria (words for touch), verbal data available, and analysis method. Then, section 3 presents the results of the analysis, assessing whether the criteria chosen in section 2 are actually used by guitar players, then assessing if they refer to the sense of touch or not.

## 2. METHOD

The aim is to check how the words commonly considered as relating to touch are used by musicians in situ. Section 2.1 describes the corpus (transcriptions of guitarists' interviews) that was analyzed for this article. Section 2.2 then reviews and summarizes previous literature on musical instrument perception to identify the criteria assumed to relate to touch, and justify our choice of the criteria.

### 2.1 Corpus interviews

The data used in this article comes from transcriptions from two previous studies [8, 9], made with French native speakers. Both studies consisted in a free playing and oral verbalization task that was transcribed. The analysis presented here is made on these written transcriptions. For each study, the players were presented with several guitars with slight modifications in the construction: either the neck-to-body junction [8, 15], or the fingerboard wood was changed [9]. The modifications were made unnoticeable to the eye and the guitarists weren't told about any existing difference between the instruments. The guitarists were free to take and play any of the guitars they were presented, and to spend as much time as they want on each guitar. The guitarists were also instructed to freely express their feelings about the guitars they were playing :

*Nous allons vous demander de tester ces guitares comme si vous étiez dans un magasin en vue d'un achat ou d'un*

<sup>1</sup> Considering the musical experience of a player, we speak about situated discourse when the participant is placed in a usual situation of playing the instrument and expressing freely his sensations.

*concert par exemple. Vous pouvez jouer librement chacune des guitares, ainsi que modifier les réglages de la pédale et de l'amplificateur. Nous allons simplement vous demander d'exprimer librement vos ressentis et impressions durant le jeu de ces guitares. Le test précédent a fait émerger certains critères comme importants pour les guitaristes, il s'agit de la brillance, du sustain<sup>2</sup>, du confort de jeu, de l'attaque et de l'équilibre.<sup>3</sup> Si ces critères se rapportent à quelque chose qui vous parle, vous pourrez les utiliser.<sup>4</sup>*

"We are going to ask you to test these guitars as if you were in a shop for a purchase or preparing a concert for example. You can play each guitar freely, as well as change the pedal and amplifier settings. We will simply ask you to freely express your feelings and impressions while playing these guitars. In the previous test, some criteria emerged as important for guitarists, such as brightness, sustain, playing comfort, attack and balance. If these criteria relate to something that is meaningful to you, you can use them."

### 2.2 Choice of criteria

The perceptual tests with electric guitarists in [8] and [9] are made with French native speakers, so we deal with criteria in French:

- CONFORT<sup>5</sup> / "comfort",
- DYNAMIQUE / "dynamics",
- RÉPONSE / "response",
- RESENTI / "feeling",
- TOUCHER / "touch" as noun<sup>6</sup>, and
- VIBRATION / "vibration"

are chosen as the criteria for this study. Table Tab. 1 shows some references in literature which support the choice of these 6 criteria.

	[6]	[7]	[8]	[10]	[14]	[9]
Confort	.	X	X	.	.	X
Dynamique	X	.	X	X	.	.
Réponse	X	X	.	X	.	.
Ressenti	.	X	X	.	.	X
Toucher	.	.	X	.	X	.
Vibration	X	.	.	.	X	.

**Table 1.** Articles in which the chosen criteria can be found.

#### 2.2.1 CONFORT / "comfort"

The work of Paté et al. [9] provided a synthesis of the criteria chosen by guitarists in [8], in order to describe and

<sup>2</sup> Electric guitar players use the word "sustain" to refer to the quality and length of the sound after being plucked. French guitar players tend to use the English word, this explains why we don't provide any translation.

<sup>3</sup> These specific words came from previous studies, and aimed to help the conversation getting started.

<sup>4</sup> In this paper, the quotes appear in italic for the original utterance in French, and between quotation marks for the translation in English. Also, bold font is used for the questions from the researchers, and some words are underlined for highlighting the occurrences of the criteria.

<sup>5</sup> In this article, the chosen criteria appear in small capitals. Criterion is a concept referring to a category of words detailed in Tab. 2. Words, in italic in French and between quote marks in English, correspond to the lexical form found in speech.

<sup>6</sup> In French as in English, *toucher* originally is a verb ("to touch") than can be used as a noun (nominalization). In our corpora, almost all occurrences of the verbal form referred to an action of the musician on the electronic settings, and not to the sense of touch or to the sense of hearing, so they were discarded from the analysis.

evaluate electric guitars. As the choice was completely free for the participants, it is a reflection of the criteria chosen by the guitarists themselves. *Confort* appears in this list. Moreover, Saitis et al. [7] class violin attributes used by musicians, and “comfort” appears among the attributes describing the interaction between the player and the instrument.

### 2.2.2 DYNAMIQUE/“dynamics”

The word *dynamique* is also present in the list of [8]. Moreover, in [10], semantic categories are found through discourse analysis. In this work, words within the category labeled “attack” relate to the interaction between the guitar and the musician, while words in the other categories relate to the sound directly. This category includes the word *dynamique*. “Dynamics” relate to both auditory and tactile modalities as demonstrated in [6].

### 2.2.3 RÉPONSE/“response”

The “attack” category in [10] includes the word *réponse*. “Responsiveness” is one of the selected criteria assumed in [6] to be “evaluable through one or both sensory modalities under study.” In the classification of violin attributes in [7], “response” is one of the most used to evaluate violin. According to Saitis, “response” offers the capability to describe the interaction between musician and instrument.

### 2.2.4 RESSENTI/“feeling”

The instruction in the perceptual test of [8, 9] included the word *ressenti*/“feeling”, and therefore seems to be a general word to describe the sensory experience of the musician. According to Saitis, “feel” offers the capability to describe the interaction between musician and instrument. We can legitimately question the specific relationship to touch in the semantics of this word.

### 2.2.5 TOUCHER/“touch”

The word *toucher*/“touch” makes sense as we work on the sense of touch. The word *toucher* is presented in the list in [8].

### 2.2.6 VIBRATION/“vibration”

The word *vibration*/“vibration” is chosen as common way to provoke verbal utterances about the sense of touch, as shown in experiences by Wollman et al. [6]. Moreover, verb forms for *vibrer*/“vibrate” and noun forms *vibration*/“vibration” are exploited and commented in [14], to illustrate the diversity of tactile representations. *Vibration* is an integral part of the vocabulary associated to the sense of touch.

## 2.3 Construction of the corpus

We made a semi-automatic search of the strings of characters corresponding to the different forms each criterion may take. For example, for the criterion COMFORT, occurrences of “comfort”, “comfortable”, “uncomfortable” were sought; for the criterion VIBRATION, the different forms

“vibrate”, “vibration”, “vibrating”, “vibrato”, etc. were sought by automatically scanning the written transcription with e.g. the string “vibr”. In this search, we don’t take into account the occurrences produced by the researchers. Our corpus contains 229 utterances<sup>7</sup>. After identifying the utterances where each criterion was used, they were analyzed with linguistic methods, with the objective of determining whether the sentence was related to touch.

## 2.4 Analysis

The present work focuses on studying whether the selected criteria relate (or not) to touch in guitarists’ discourses. In order to do so, we paid attention to several linguistic features characterizing the context of use of each word under study:

- Nature of the criterion: the word category of the criterion found in the utterance. For COMFORT/“comfort”, it can be *confort*/“comfort” (noun), *inconfort*/“discomfort” (noun), *confortable*/“comfortable” (adjective). Details are reported in Tab. 2 for each criterion.
- Function: the grammatical function of the criterion in a utterance, e.g. subject, attribute, direct object.
- Morphosyntactic context: instead of a simple noun, a criterion can be referred in discourse by a noun phrase, composed of a head noun and one or various other words (adjective, noun, verb ...), such as in *confort de jeu*/“playing comfort”, *dynamique de la guitare*/“guitar’s dynamics”, *sensation de vibrations*/“feeling of vibration”.
- Personal marks: it concerns personal pronouns *je, tu, etc.*/“I, you, etc.” and possessive pronouns *mon, moi, te, etc.*/“my, me, you, etc.”
- Co-occurrences of reference to guitar elements: each guitar part mentioned by guitarist, even global indications like brand, model and when the instrument being played is itself mentioned (*guitare*/“guitar”, *instrument*/“instrument”, etc.)
- Co-occurrences of reference to body parts: each part of the human body, like finger or hand, that are mentioned in the discourse of the musicians. There may be details on the area of feeling.

Let’s consider the following utterance as an example, which was extracted from the corpus by searching for the lexical form *vibrer* of VIBRATION:

*C’est pour cela que je déteste les grosses frettes où en réalité le doigt est toujours sur la corde, en l’air<sup>8</sup>, et je n’ai jamais le doigt qui se pose sur la touche, et donc, je ne sens pas la touche vibrer, sans parler des problèmes de justesse que cela pose puisque la corde s’enfonce.*

<sup>7</sup> The word “utterance” is used here for the context sentences of at least one occurrence of criterion. A utterance can include several occurrences. The word “occurrence” shows the use of criterion in a utterance. Three occurrences of a criterion show that the criterion is used 3 times in the utterance.

<sup>8</sup> When fretting a note, the guitarist’s left hand is expected to be in contact with the fingerboard. With high frets, the guitarist may press the string without touching the fingerboard.

Criterion	Words in corpus	Category
CONFORT “comfort”	<i>confort(s)</i> /“comfort(s)”, <i>confortable(s)</i> /“comfortable”, <i>inconfort</i> /“discomfort”	noun, adjective, noun
DYNAMIQUE “dynamics”	<i>dynamique</i> /“dynamic(s)”	noun, adjective
RÉPONSE “response”	<i>réponse(s)</i> /“response(s)”	noun
RESSENTI “feeling”	<i>ressentir</i> /“feel”, <i>ressenti(s)</i> /“feeling(s)”	verb, noun
TOUCHER “touch”	<i>toucher</i> /“touch”	noun
VIBRATION “vibration”	<i>vibrer</i> /“vibrate”, <i>vibration(s)</i> /“vibration(s)”, <i>vibrato</i> /“vibrato”, <i>vibré</i> /“vibrato”	verb, noun, noun, noun

**Table 2.** Nature of the 6 criteria, with the words found in the corpus (in French). For each criterion in first column, second column presents the words found in the corpus with semi-automatic search, and third column presents their word category.

“That’s why I hate big frets where in reality the finger is always on the string in the air, and I never have the finger on the fingerboard, so I don’t feel the fingerboard vibrate, not to mention the problems of accuracy that this poses since the string is sinking.”

(C1P8, VIBRATION)<sup>9</sup>

Tab. 3 shows a summary of the linguistic analysis of this utterance. The nature of VIBRATION in this utterance is the verb *vibrer*/“vibrate”. As for its function, the criterion is here part of a direct object *la touche vibrer*. Regarding the morphosyntactic context *je ne sens pas la touche vibrer*, the criterion is used in association with the *toucher*/“fingerboard”, the object which vibrates, and the criterion is linked to the musician (personal marks *je*/“I”).

Linguistic features	Example
Nature of criterion	verb ( <i>vibrer</i> )
Function	part of direct object <i>la touche vibrer</i>
Morphosyntactic context	<i>je ne sens pas la touche vibrer</i>
Personal marks	<i>je</i> (*3)
Guitar elements	<i>grosses frettes</i> , <i>corde</i> (*2), <i>toucher</i> (*2)
Body parts	<i>doigt</i> (*2)

**Table 3.** Analysis example of a utterance for the VIBRATION criterion (C1P8, VIBRATION). \*2 or \*3 describe the number of occurrences of one word

For each utterance containing at least one occurrence of a criterion, the same linguistic analyses are processed. They are used for assessing if the different criteria are used in the guitarists’ discourse, and whether, in each utterance,

<sup>9</sup> There are 2 corpora of interviews (Navarret [8, 15], and Paté [10]), respectively named C1 and C2, and respectively 13 and 10 guitarists/participants, named from P1 to P13. C1P8 therefore corresponds to an extract of the corpus C1 with the participant number 8.

the criteria refers to the sense of touch. In the example above, the linguistic features show that the guitarist deals clearly with the sense of touch. The guitarist explains his feeling on digital<sup>10</sup> sensations, with several occurrences of *doigt*/“finger”. For him, the vibrations of the fingerboard are important in his guitar’s feeling, and digital sensations, and it’s illustrated by human body parts.

Section 3 presents the results obtained through the linguistic analysis of all identified utterances.

### 3. RESULTS

First, a quantification of the presence of each criterion in the corpus is presented, in order to confirm or not the relevance of our criteria. Then, the actual relationship of the utterances to the sense of touch is presented.

#### 3.1 Presence of criteria in the corpus

Tab. 4 shows the number of occurrences of each criterion in the corpora, produced by the guitarists. Only the utterances made by the participants are considered, not the researchers’ ones. We found at least 25 utterances for each criterion and 35 occurrences<sup>11</sup> of each criterion by the guitarists (See details in Tab. 4).

With the exception of DYNAMIQUE (30%), words referring to criteria are used at least once by more than half of the 23 guitarists. The criteria are also used by most guitarists. The two criteria used by most guitarists are RÉPONSE (69% of the guitarists) and RESSENTI (78%). RÉPONSE and VIBRATION are the most used criteria (64 occurrences), and CONFORT and DYNAMIQUE are the less used criteria (respectively 35 and 38 occurrences). It’s interesting to note that one of the guitarists was responsible for 40% of the occurrences of VIBRATION in the corpus. The use of these criteria shows inter-individual variability between participants (see appendix A).

Criterion	# utter.	# occ.	# part. (%)	Max. # occ. by part.
CONFORT	31	35	56 %	7
DYNAMIQUE	25	38	30 %	13
RÉPONSE	49	64	69 %	10
RESSENTI	46	53	78 %	11
TOUCHER	33	41	56 %	9
VIBRATION	45	64	52 %	26

**Table 4.** Number of utterances (abbreviated # utter.) including each criterion, number of occurrences (abbr. # occ.) of the criterion, percentage of participants having used the criterion (%), (abbr. # part.), and maximum number of occurrences for a single participant (abbr. Max. # occ./part.).

#### 3.2 Criteria and their relationship to touch

This part summarizes the ratio of utterances including the selected criteria, that actually refer to the sense of touch,

<sup>10</sup> Throughout this article, we use the adjective “digital” in order to refer to the fingers, not as the opposite of “analog”.

<sup>11</sup> See footnote 7 for the meanings of “utterances” and “occurrences”.

and details how the linguistic features examined allow us to conclude. The present section is divided according to linguistic features considered, and how they are useful to specify the reference to touch. They are three possibilities: first the utterances may refer to the sense of touch (“yes” in Fig. 1). The second case is when the guitarist clearly doesn’t speak about touch (“no”), and the last one appears when the context doesn’t permit to establish a clear link with the sense of touch (“undefined”).

### 3.2.1 Morphosyntactic context

Often, the words under study are head nouns of noun phrases, e.g. *confort de jeu, vibrations de la table* “playing comfort, soundboard’s vibrations”. In the quotation below, *confort de jeu* “playing comfort” refers to the relationship between the guitarist and his instrument. The word *confortable* “comfortable” in this utterance is linked to the tactile perception of the neck and the ease to play these guitars.

*Sinon en terme de confort de jeu, elles sont toutes les quatre, j’ai pas senti euh... elles sont toutes les quatre, elles me semblent toutes les quatre confortables. Je sais pas si c’est exactement les mêmes manches, si ?*

“Otherwise in terms of playing comfort, they are all four, I didn’t feel uh... they are all four, they all seem comfortable to me. I don’t know if they’re exactly the same necks, are they?”

(C2P1, CONFORT)

Instead of taking only account of isolated words, taking into account their morphosyntactic context can provide details on the kind of vibration described, here string vibration or soundboard’s vibration. The soundboard’s vibration is felt through the contact of the upper body of the guitarist. An interest on soundboard’s vibration implies the sense of touch like in the following example.

*Il y avait pour moi une différence flagrante entre la guitare verte et les deux autres, (...) je me concentrais plus sur la vibration de la table.*

“There was for me a glaring difference between the green guitar and the other two, (...) I was more focused on the vibration of the soundboard.”

(C1P7, VIBRATION)

Analysing the morphosyntactic context is the first way to find information on the object qualified in the guitarist’s discourse. In previous quotes it shows a strong link with the sense of touch. But in some other cases, it shows that there is no reference to touch, e.g. in *courbe de réponse* “response curve” (C1P10) which is focused on frequency response and sound perception, or *harmoniques ressenties* “felt harmonic” which concerns the timbre of the instrument and also the perception of sound (C1P12). It also permits efficient distinction between utterances to assess if there is a reference to touch or not.

### 3.2.2 Global utterance context

In the global context of an utterance, a criterion can refer to the sense of touch, in opposition with the sense of hearing. CONFORT can be used in opposition to sound, and confirm that CONFORT is linked to tactile perception and interactions:

*J’ai pas vraiment fait attention au confort de la guitare, etc, j’m suis vraiment concentré plutôt sur le son et sur le... tu vois, sur le son de la guitare.*

“I didn’t really pay attention to the comfort of the guitar, etc. I really focused more on the sound and the... you know, the sound of the guitar.”

(C2P1, CONFORT)

In contrast, the criterion can refer to sound more than touch; in association with words referring to sound (“bass”, “treble”, “medium”, “hear”, etc.) :

*Il faut qu’il y ait du grave, il faut qu’il y ait du medium, il faut qu’il y ait des aigus, et cet équilibre, c’est un ressenti. Mais j’entends bien s’ils sont là où s’ils ne sont pas là.*

“There has to be bass, there has to be medium, there has to be treble, and this balance is a feeling. But I can hear if they are here or if they are not here.”

(C1P10, RESENTI)

Associated with the word “dynamics”, we can find information on touch through the mention of human body parts like fingers, or the use of action verbs such as “to attack” (see the example below for the use of action verbs), showing physical interaction between the player and his instrument. This attack is controlled by the right hand, and the guitarist can decide to attack more or less through a gestural change, and observe the instrument feedback. It can be described and interpreted as a sound feedback or a vibrotactile feedback. These two kinds of feedback are strongly linked. The relation between musician and instrument induces different dynamics.

*Alors la dynamique d’une guitare, et la dynamique en général, pour moi, c’est le fait qu’il y a une différence énorme entre quand j’attaque et quand j’attaque pas. Y a un truc que j’aime pas trop c’est les guitares actives qui justement n’ont pas de dynamique. (...) C’est-à-dire que si j’attaque j’ai beaucoup de son, si j’attaque pas, j’ai très peu de son. La reine, pour ça, c’est encore une fois la Telecaster.*

“So the dynamics of a guitar, and the dynamics in general, for me is the fact that there’s a huge difference between when I attack and when I don’t attack. One thing I don’t like too much is active guitars that just don’t have dynamics. (...) That is to say that if I attack I have a lot of sound, if I don’t attack, I have very little sound. The queen, for that, is once again the Telecaster.”

(C2P4, DYNAMIQUE)

By paying attention to the global context of each occurrence, we can find words associated especially with touch or sound. The criterion may be used in opposition or not to the vocabulary of sound and description of timbre and resonance.

### 3.2.3 Association with body parts

There are few occurrences of parts of human body (only 27 utterances out of 229), but they provide information on the relation to touch, especially on the digital interaction. The body of the guitarist, where skin is the vector of touch, is in contact with the instrument (hands and fingers with neck and strings, upper human body with the guitar's body). It's illustrated with this utterance mentioning the criterion CONFORT.

*La touche, euh, c'est pas si mal fait qu'ça, ça ne fait pas trop mal aux doigts. Certaines guitares neuves, euh, ils oublient de limer les barres de frettes, donc ça fait souvent très mal aux doigts. Là ça va encore, c'est assez confortable, assez facile à jouer. L'action des cordes est... pour moi me convient parfaitement.*

"The fingerboard, uh, it's not that badly done, it doesn't hurt the fingers too much. Some new guitars, uh, they forget to sand the fret bars, so it often hurts the fingers a lot. That's okay again, it's quite comfortable, quite easy to play. The string action is... for me it's a perfect fit."

(C2P6, CONFORT)

This example shows that the use of body parts like "hands" and "fingers" often refers to touch. In the following example, the use of "fingers" and "hands" allows to state that the feeling of vibration is described, with no interest to the sound description but rather to the tactile effect on the guitarist. The personal mark *je/'I* shows the link with the guitarist's immediate sensory experience and feelings.

*Tu as parlé des vibrations pour les graves, pour le ressenti des graves. Là, je sens la guitare qui vibre, dans les doigts, dans mes mains. Même si on ne l'entend plus à l'oreille, je sens que cela continue à vibrer.*

"**You talked about the vibrations for the lows, for the feeling of the lows.** There, I feel the guitar that vibrates, in the fingers, in my hands. Even if one can't hear it in your ear anymore, I feel that it continues to vibrate."

(C1P10, VIBRATION)

The use of human body parts implies a relationship to the sense of touch, in particular when the "fingers" or "hands" are involved.

### 3.2.4 Association with guitar parts

Guitarists mention different parts of the guitar in the description of their sensations. They describe parts of guitar in contact with their hands and fingers, like frets and neck. The criterion CONFORT is often linked with guitar parts, as words to speak about tactile sensations.

*Le manche me semble légèrement différent. Plus en... plus en V, peut-être. On sent plus l'arête au milieu. Un peu moins confortable, je trouve, que la précédente. Maintenant, le... peut-être c'est l'action... il me semble que le tirant de corde n'est pas... n'est pas identique non plus.*

"The neck looks slightly different to me. More in... more V shaped, maybe. You can feel the edge more in the middle. A bit less comfortable, I find, than the previous one. Now, the... maybe it's the action... it seems to me that the string pull is not... is not the same either."

(C2P10, CONFORT)

Talking about TOUCHER implies a lot of occurrences of different guitar parts (frets, wood, fingerboard, neck...), which help to assess that there is a relationship to the sense of touch. Guitarist P5 associates the sense of touch with the finger sensation.

*Ca dépend ce qu'on met derrière le toucher, après c'est vraiment la sensation physique au niveau des doigts, et euh il y a plein de choses qui rentrent là-dedans, voilà le type de cordes utilisées, l'action, les frettes, dans une moindre mesure le bois de la touche, mais ça je ne suis pas très sensible à ça. Enfin sinon c'est entre une touche vernie et une touche non vernie. La sensation est différente.*

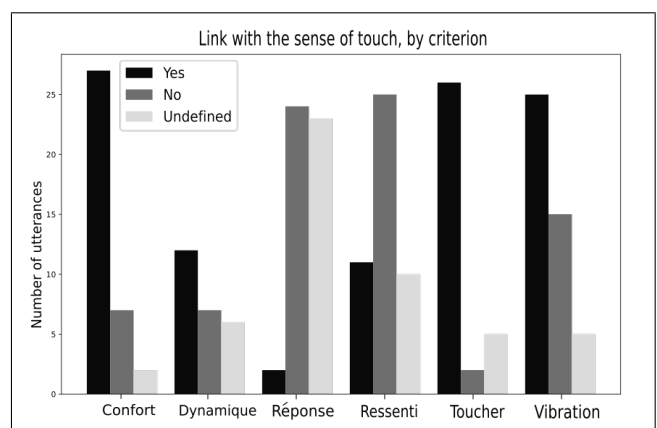
"It depends on what you put behind the touch, then it's really the physical feeling in the fingers, and uh there's a lot of things that go into it, like the type of strings used, the action, the frets, to a lesser extent the wood of the fingerboard, but I'm not very sensitive to that. Otherwise it's between a varnished and an unvarnished fingerboard. The feeling is different."

(C2P5, TOUCHER)

The description of sensations with guitar parts helps to assess the link with touch, as the guitar part is in contact with the player.

### 3.2.5 Synthesis

Fig. 1 shows the number of utterances which refer to touch for each criterion. For VIBRATION, 25 utterances refer to touch, while 15 do not. On the contrary, considering the RÉPONSE criterion, only 2 utterances relate to touch, 24 do not relate to it and 23 are not explicit enough to determine if they relate to it.



**Figure 1.** Number of utterances by criteria with its relationship to touch (yes, no, undefined).

It appears clearly that the criteria CONFORT, TOUCHER and VIBRATION refer mainly to the sense of touch in the

discourse of electric guitarists, for respectively 75%, 79% and 55.6% of the utterances. On the contrary the criteria RÉPONSE and RESENTI appear to be more general and most of the time do not refer specifically to the sense of touch, with respectively only 4% and 24% of the utterances. In a majority of cases, DYNAMIQUE refers to touch (48%), but some of the utterances with dynamics do not mention it (28%), and some are relatively ambiguous or do not provide details (24%).

The linguistic analysis of the selected utterances of our sub-corpus allows us to determine if our 6 criteria refer to touch or not, and shows what kind of linguistic features are relevant for it.

#### 4. DISCUSSION

Within this sub-corpus of interviews with electric guitarists, the criteria CONFORT, TOUCHER and VIBRATION are mostly related to the sense of touch. These 3 criteria are unambiguous, and the relationship to touch is generally strong. The proportion of utterances in which the reference to the sense of touch is undefined is 5% for CONFORT, 15% for TOUCHER and 11% for VIBRATION. The utterances whose relationship to touch were undefined will be further investigated, for they may well prove to refer to the interaction between touch and hearing.

For DYNAMIQUE, the relationship with the sense of touch depends on the context. The word *dynamique* can be used by guitar players with or without relation to touch, and it is not always easy to detect this relation. However it remains mostly related to touch (48% yes, 28% no, 24% undefined). RÉPONSE and RESENTI are mostly unrelated to touch (respectively 49% and 54% no), so are words that may be too ambiguous, too general, generic or all-encompassing term, contrary to our initial hypothesis (that the 6 selected criteria refer to the sense of touch). For RÉPONSE, the link with touch is never obvious. Many utterances may have a connection with the sense of touch, but it is never or almost never explicit. As expected, TOUCHER almost always refers to the sense of touch (79%), and has relatively little uncertainty as to whether or not it is related to this sense (15%).

These results on criteria and their relationship to touch can be used to conduct perceptual tests in a musical playing context when targeting the sense of touch. The use of words like “comfort”, “touch” or “vibration” in the researcher’s questions can orient the discourse on touch during interviews with musicians. The words “feeling” and “response” should be avoided if the aim is to refer to the sense of touch mainly, because of their general meanings. Instead, the words “comfort” and “vibration” (or rather, their French translation) should be preferred, because they focus on tactile perception. “Touch” can be used obviously, being wary of the meaning in which it is used, i.e. as a mode of perception like sight and hearing, or just as a way of interacting with the instrument. The work presented here can facilitate the guitarists’ speech analysis, when the aim is to determine the relationship with the sense of touch. “Comfort”, “touch” and “vibration” may

be used as keywords to search when musicians speak about their haptic feeling.

This corpus of verbalization obtained via interviewing professional guitarists in situ enables other analyses, e.g. to explore the inter-individual variability partially observed in section 3.1 (all guitarists don’t use all criteria, and guitarists produce very different numbers of occurrences of the same criterion), to investigate the link between personal implication in discourse with the reference to touch. This exploration should explain some ambiguities : depending on the participants, one criterion or another (or a combination of criteria) may potentially be used to account for the tactile dimension. The guitarists can talk about the guitar they have for the test, they can refer to another personal experience or use common knowledge arguments that are not at all related to their immediate experience, but more to acquired and shared knowledge among the community of electric guitar players.

#### 5. REFERENCES

- [1] W. Goebel, R. Bresin, and I. Fujinaga, “Perception of touch quality in piano tones,” *The Journal of the Acoustical Society of America*, vol. 136, no. 5, pp. 2839–2850, 2014.
- [2] A. Mamou-Mani, L. Placido, and D. Sharp, “Physical and perceptual differences between two trumpets of the same model type,” in *Acoustics 2012*, (Nantes, France), pp. 2689–2694, 2012.
- [3] J. J. Gibson, “The concept of the stimulus in psychology,” *American Psychologist*, vol. 15, no. 11, pp. 694–701, 1960.
- [4] C. Fritz and D. Dubois, “Perceptual Evaluation of Musical Instruments: State of the Art and Methodology,” *Acta Acustica united with Acustica*, vol. 101, no. 2, pp. 369–381, 2015.
- [5] C. Fritz, A. Muslewski, and D. Dubois, “A situated and cognitive approach of violin quality,” in *ISMA 2010*, (Australia), 2010.
- [6] I. Wollman, C. Fritz, J. Poitevineau, and S. McAdams, “Investigating the Role of Auditory and Tactile Modalities in Violin Quality Evaluation,” *PLoS ONE*, vol. 9, no. 12, 2014.
- [7] C. Saitis, B. L. Giordano, C. Fritz, and G. P. Scavone, “Perceptual evaluation of violins: A quantitative analysis of preference judgments by experienced players,” *The Journal of the Acoustical Society of America*, vol. 132, no. 6, pp. 4002–4012, 2012.
- [8] B. Navarret, “Caractériser la guitare électrique : définitions, organologie et analyse de données verbales,” 2013. PhD Thesis, Univ. Paris 8.
- [9] A. Paté, “Lutherie de la guitare électrique solid body: aspects mécaniques et perceptifs,” 2014. PhD Thesis, UPMC.



- [10] A. Paté, J.-L. L. Le Carrou, B. Navarret, D. Dubois, and B. Fabre, "Influence of the Electric Guitar's Fingerboard Wood on Guitarists' Perception," *Acta Acustica united with Acustica*, vol. 101, no. 2, pp. 347–359, 2015.
- [11] C. Saitis, H. Järveläinen, and C. Fritz, "The role of haptic cues in musical instrument quality perception," in *Musical Haptics* (S. Papetti and C. Saitis, eds.), pp. 73–93, Cham: Springer International Publishing, 2018.
- [12] M. T. Marshall and M. M. Wanderley, "Vibrotactile Feedback in Digital Musical Instruments," in *NIME 06*, (Paris, France), 2006.
- [13] I. Wollman, C. Fritz, and J. Poitevineau, "Influence of vibrotactile feedback on some perceptual features of violins," *The Journal of the Acoustical Society of America*, vol. 136, no. 2, pp. 910–921, 2014.
- [14] B. Verine, "Le vocabulaire tactile existe, je l'ai entendu," in *Sensorialité et handicap : Toucher pour apprendre, toucher pour communiquer*, (Paris, France), 2016.
- [15] A. Paté, J.-L. Le Carrou, B. Navarret, D. Dubois, and B. Fabre, "A vibro-acoustical and perceptive Study of the neck-to-body Junction of a solid-body electric Guitar," in *Acoustics 2012*, (Nantes, France), 2012.

#### A. USE OF THE CRITERIA BY THE GUITARISTS

This section gives the detailed information about the number of occurrences of each criterion. Fig. 2 shows the total number of occurrences for each criterion in the corpus, and figures 3 through 8 give details on each criterion, with the number of occurrences by each guitarist.

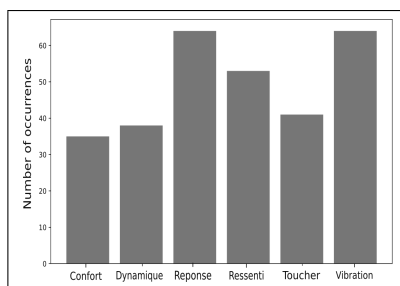


Figure 2. Number of occurrences of each criterion.

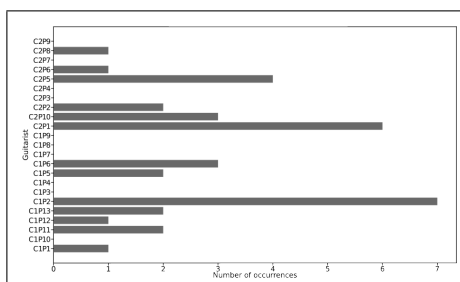


Figure 3. Individual occurrences of CONFORT.

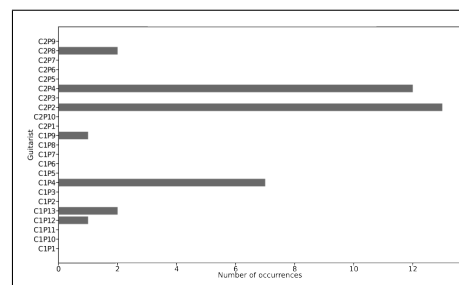


Figure 4. Individual occurrences of DYNAMIQUE.

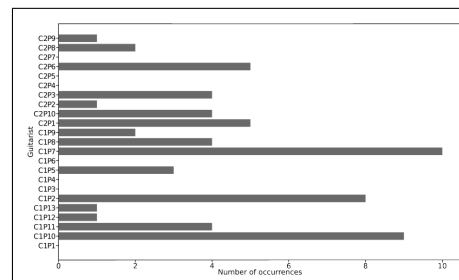


Figure 5. Individual occurrences of RÉPONSE.

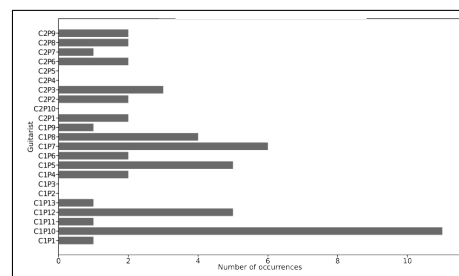


Figure 6. Individual occurrences of RESENTI.

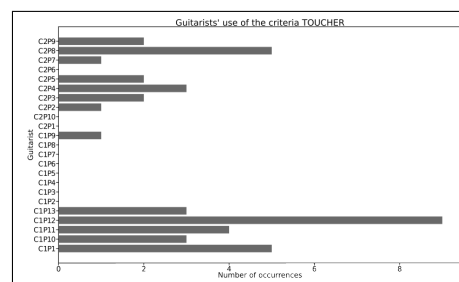


Figure 7. Individual occurrences of TOUCHER.

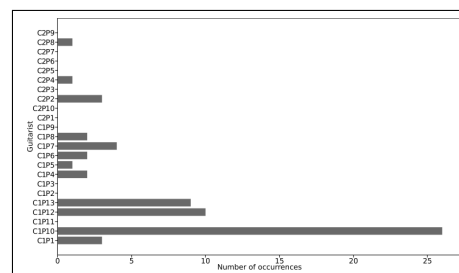


Figure 8. Individual occurrences of VIBRATION.