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# A multilingual online survey on noise sensitivity : development of the method and data analysis

Romane Strebel

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pour le diplôme d'ingénieur de l'École nationale des travaux publics de l'État

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Devant le jury composé de :

- Président du Jury : Mathieu Lavandier
- Maître de TFE [ou Tuteur] : Catherine Marquis Favre
- Co-encadrants : Eunsung Song, Wolfgang Ellermeier, Karin Zimmer
- Expert : Laure-Anne Chamboredon

Par

**Romane Strebel**

## **A Multilingual Online Survey on Noise Sensitivity: Development of the Method and Data Analysis**

**LTDS, ENTPE**

# Notice analytique

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ANALYSE DU TFE			
Titre (français)	Enquête en ligne multilingue sur la sensibilité au bruit : Développement de la méthode et analyse des données		
Titre (anglais)	A Multilingual Online Survey on Noise Sensitivity: Development of the Method and Data Analysis		
Résumé (français)	<p>Le stage se déroule dans le cadre d'une étude globale portant sur la sensibilité au bruit. Le stage débute au cours de la deuxième année du programme de recherche et consiste à comparer empiriquement les principales échelles de sensibilité au bruit existantes en ce qui concerne leur qualité psychométrique (fiabilité, validité et structure) tout en tenant compte des aspects culturels et linguistiques. Afin de comparer les échelles, une enquête en ligne sera développée par l'équipe de recherche dans différentes langues, calibrée par un test pilote. Les données du test pilote ainsi que les données britanniques (issues de l'enquête en ligne) seront ensuite analysées et comparées, d'abord entre elles puis avec de précédents résultats issus de la littérature. Le rapport de stage résumera certains des résultats de cette recherche ainsi que la contribution du stagiaire.</p>		
Résumé (anglais)	<p>The internship is part of an overall study of noise sensitivity. The internship begins during the second year of the research program and consists of an empirical comparison of the main existing noise-sensitivity scales in terms of their psychometric quality (reliability, validity and structure), while taking cultural and linguistic aspects into account. In order to compare the scales, an online survey will be developed by the research team in different languages, calibrated by a pilot test. The data from the pilot test and the UK data (from the online survey) will then be analyzed and compared, first with each other and then with previous results from the literature. The internship report will summarize some of the results of this research and the intern's contribution.</p>		
Mots-clés (français, 5 maxi)	Sensibilité au bruit, enquête en ligne, analyse statistique		
Mots-clés (anglais, 5 maxi)	Noise sensitivity, online survey, statistical analysis		
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# Déclaration de travail personnel

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Je déclare que ce rapport constitue l'aboutissement d'un travail personnel et ne peut être suspecté de plagiat.

Le travail présenté distingue explicitement ce que j'ai produit de ce que j'ai emprunté à d'autres. A ce titre, les citations sont clairement identifiables et les sources (écrits, images) qui ont alimenté ma réflexion sont référencées.

## Abstract

The internship takes place in a global study that tackles sensitivity to noise. Noise sensitivity is a major factor influencing noise annoyance and is considered in various studies, such as modeling noise annoyance or assessing the impact of environmental noise on human health. The internship will begin during the second year of the research program. It will consist in the empirical comparison of the most important existing noise-sensitivity scales with respect to their psychometric quality (reliability, validity, and structure) while including cultural and linguistic aspects. The scales studied are the result of a preliminary systematic review focusing on the definitions and dimensions of noise sensitivity and the different ways of measuring it, carried out as part of the research study prior to the start of the internship. In order to compare the scales, an online survey will be developed by the research team in different languages: French, English, German and Korean. In order to calibrated the development of the online survey, a pilot test will be launched in French (in Lyon) and German (in Darmstadt). The pilot test will be completed by around 70 French and German people, constituting a set of data that will be analyzed and studied. The online questionnaire will then be filled out by approximately 300 English-speaking participants living in the UK. These 300 people constitute a representative sample of the UK population, which will be examined using descriptive statistical analyses and correlations of noise sensitivity scores between questionnaires. The pilot test and the UK data will then be compared with each other and with the literature findings. This study will lead to some interesting conclusions, particularly with regard to the wording and the scale used for the one-item scale, but also with regard to hyperacusis and annoyance, which were found to be correlated with noise sensitivity. Furthermore, in this study, no cultural or linguistic differences were found between the French, German and English data, yet, this conclusion should be taken with caution. Finally, to assess noise sensitivity, the Benfield questionnaire appears to be a useful and robust tool. The internship report will sum-up some of the result of this research and the intern contribution.

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## Introduction

In recent years, noise has become a major public health concern. The way society is organized favors people's exposure to noise, through the densification of housing and the multiplication of noise sources in the environment, to such an extent that the European Environment agency revealed in 2023 that “at least one in five people in the EU are exposed to long-term noise levels considered harmful to their health” [1]. Indeed, noise had important health-related short-term and long-term outcomes, such as cardiovascular diseases, sleep disturbance, hearing loss, tinnitus, or noise annoyance [2]. Defined as “a psychological concept which describes a relation between an acoustic situation and a person who is forced by noise to do things he/she does not want to do, who cognitively and emotionally evaluates this situation and feels partly helpless” by Guski et al in 1999 [3], noise annoyance is seen as one of the most significant non-auditory effects on health for non-critical sound pressure level [4]. That is why noise annoyance is widely used and studied by researchers to examine health impact of noise and noise in general. However, noise annoyance is a concept, influenced by several factors, acoustic and otherwise [4]. “Dose response” relationship have been established between noise exposure level ( $L_{den}$ ) and noise annoyance by European commission in 2002 but explained only 30% to 40% of the expressed noise annoyance [4]. Consequently, annoyance due to one noise source varies from one individual to another depending from both psychological and physiological perspectives. Among them, noise sensitivity defined as “a trait describing attitudes towards noise and predicting noise annoyance” by Kliuchko et al [5] or “a stable personality trait affecting the reactivity towards noise sources” by Schütte et al [6], has been reported as a significant non-acoustic factor affecting noise annoyance [7]. Several studies concluded that noise sensitivity alters the effect of noise exposure on annoyance [8] and concerns different types of environmental noises such as traffic noise, aircraft noise or motorcycle noise [9], [10] but also indoor noise as noise from neighbors [7].

Thus, as noise sensitivity is an important factor to consider when studying noise annoyance and therefore public health, some researchers have developed noise sensitivity questionnaires and scales. The first researcher to show interest in it was Weinstein in 1978, who analyzed noise sensitivity of college freshmen in a dormitory. This led to other works about noise sensitivity and the development of new scales in different languages, some of the better-known are described later in this report. Despite the many existing questionnaires, the scientific community has never reached a consensus on a standard for assessing noise sensitivity. Consequently, researchers focusing on this subject employ a variety of questionnaires, making comparisons between studies challenging.

What is more, as questionnaires rely on verbal descriptors, researchers often struggle to translate them in other languages. Some articles propose translation of different scales [11], [12], but the translation methods are not always clearly explicit or properly validated. This is all the more true given that most of the time, researchers take care of the translations themselves. In addition, conventional questionnaires such as Weinstein's or the NoiSeQ are often lengthy and therefore impractical for large-scale surveys. To remedy this issue, a study, on which this report is based, is currently underway to create a new scale for measuring noise sensitivity in different languages (English, German, French and Korean). This new scale will be notably developed through a survey involving carefully selected existing questionnaires, administered to a sample of around 1,000 participants who are fluent in English, German, French or Korean. Before launching the full survey, a pilot test was carried out with approximately seventy French and German speakers.

Thus, since noise sensitivity does not yet benefit from an assessment standard, this question needs to be addressed. Nevertheless, this is a vast and complex task, requiring more time and thought than a five-month internship would allow. This report will therefore examine the extent to which the assessment of noise sensitivity depends on factors such as noise annoyance or hyperacusis, but also on language and culture. In particular, does this call into question the search for a universal method of assessment?

This question will be addressed through the participation in the development of the online survey, as well as analysis of the data collected. Furthermore, this report will also aim to compile all the choices and decisions taken regarding the construction of the survey, in order to constitute a working document for the project research team.

The report will begin with a state-of-the-art review of current studies on noise sensitivity (I), providing an overview of the key issues and concepts. Thereafter, the preparation of the pilot test will be presented (II), followed by a detailed account of the methodology used and results of this pilot test (III). The next section will focus on the first wave of an online survey (IV), elaborated on the basis of the pilot test, and will provide a data analysis of an  $N=311$  sample of UK residents. The results of the entire study will then be examined and compared together and with previous studies in order to answer to the guiding research questions of the internship (V). Finally, the report will conclude with a critical analysis and explore further perspectives in light of the study's findings and current research on the subject (VI).

## I) State of art on noise sensitivity

The harmful effects of noise on health have been proven on several occasions [1]. However, noise sensitivity remains a subject little addressed by researchers, even though its link with noise annoyance, a more studied concept, has been established [8]. Thus, the following section provides a contextualization of the study in which the internship is taking place, and proposes definitions of the various characteristics attributed to noise sensitivity and the various notions related to it.

### A) Context and definitions:

#### 1) Noise impacts

As some researchers are investigating the link between noise exposure and noise annoyance, and therefore noise sensitivity, the various impacts of noise will be discussed in the next section.

##### *a) Health impact*

Noise, defined as a sound or set of sounds perceived as disturbing, has a number of impacts on health. Notably highlighted by the WHO [2], they identified five different health impacts associated with noise exposure: cardiovascular disease, sleep disorders, hearing loss, tinnitus and noise annoyance. These five health impacts will be addressed successively in this section of the report.

Several researchers have elucidated a correlation between noise exposure and cardiovascular disease. Sobota et al [13] demonstrated the link between noise annoyance, caused by road traffic, and increased cardiovascular risk in a young and healthy population. Other studies corroborate this, indeed, according to Basner et al [14], the negative impact of prolonged exposure to noise on the cardiovascular system includes pathologies such as hypertension, ischemic heart disease and stroke. Moreover, acute exposure to noise activates stress reactions, increasing blood pressure, heart rate and stress hormones. Chronic noise disrupts homeostasis, increasing cardiovascular risk factors and the likelihood of serious illness. Both occupational [15], [16], [17] and epidemiological studies [18], [19], [20], [21] show higher rates of cardiovascular disease in groups of individuals with high noise exposure, with occupational noise presenting greater risks than environmental noise, defined as noise emitted from all sources except industrial workplaces [22]. Meta-analyses showed a 7-17% increased risk of hypertension and heart disease per 10 dB increase in noise, independent of other risk factors, and the combined effects of noise and air pollution on health are mostly independent [14].

Sleep disorders are also a serious and widespread health consequence of noise exposure. Indeed, in 2020, the European Environment Agency reported that 6.5 million people in Europe suffered from chronic sleep disorders [23]. Moreover, in their review on the health effects of noise exposure, Basner et al. [14] highlighted sleep disorders, noting that these are regarded as the most deleterious non-auditory consequence of environmental noise exposure. Indeed, an undisturbed sleep with a sufficient length is crucial for health and daily functioning. Yet, even low noise levels ( $L_{Amax}$  of 33 dB(A)) can cause physiological reactions during sleep, such as autonomic, motor, and cortical arousals. The risk of noise-induced stimulation depends on noise characteristics, sleep stage, and individual susceptibility, with the elderly, children, shift workers, and those with sleep disorders being particularly vulnerable. Repeated disturbances degrade sleep quality, leading to mood impairment, increased daytime sleepiness, and reduced cognitive performance. Therefore, in 2009 [24], the WHO recommends keeping average night-time noise levels below  $L_{Aeq}$ , outside 55 dB(A), aiming for 40 dB(A) in the long term to prevent health impacts.

In addition, noise also has effects on auditory health, such as hearing loss, which can be caused by both intense one-off exposure and regular long-term exposure to sound pressure levels above  $L_A$  of 75-85 dB(A). At these high sound pressure levels, hearing loss is irreversible [14]. Sometimes overlooked, hearing loss has social consequences, including the inability to understand speech in everyday situations, and can also affect cognitive performance, as reported by Basner et al [14]. Moreover, undiagnosed hearing loss increases the risk of accidents and falls, leading to a 10-20% increase in mortality over 20 years. Hearing loss is therefore a matter of concern for the WHO, which estimates that 10% of the world's population is exposed to sound pressure levels likely to cause noise-induced hearing loss [14]. Usually defined by high audiometric thresholds between 125 and 8000 Hz, recent advances have broadened the definition of hearing loss, with the discovery of "hidden hearing losses" involving reduced auditory nerve activity [25].

Another significant effect of noise exposure on hearing health is tinnitus. Defined by Zeng [25] as "a phantom perception of sound in the absence of external sounds," tinnitus affects 15% of the general population and is typically perceived as "a ringing sensation in the ear or head". Tinnitus is closely associated with hearing loss. Indeed, according to Zeng [25], hearing loss is a common and primary risk factor for tinnitus. Tinnitus results from compensatory responses by the central auditory system to reduced peripheral input caused by overt or covert hearing loss. To date, there is no treatment for tinnitus, although they can affect many aspects of health, causing sleep disturbance, depression or an inability to sustain attention [14].

The last of the five health impacts of noise identified by the WHO is noise annoyance. As this concept is closely linked to noise sensitivity, an entire section of the report (see I.A.2.a) is devoted to it.

### *b) Social impact*

Noise is a worrying public health issue, of increasing concern to the general public and political decision-makers in Europe. Several studies have been carried out to assess the health and social impacts of noise exposure. Among them, a systematic review of social inequalities in environmental noise exposure in the WHO European region was conducted by Dreger et al [26]. This work covers different studies with very heterogeneous methods and social indicators. Although they concluded that this field of study is not sufficiently covered to draw general conclusions, noise remains a source of inequality and therefore has very diverse social repercussions. However, social impact has proved difficult to measure because of the different indicators used. According to Peris et al [27], the clearest links between noise exposure and social inequality were found not with socio-economic indicators, but with ethnicity-related indicators. Indeed, it has been shown that certain social groups, notably ethnic minorities, live in areas more affected by road or rail traffic noise and therefore suffer the associated harmful effects more than other social groups [27]. Furthermore, the EEA pointed out in 2020 [28] that poorer people may have fewer means of protecting themselves from environmental noise. For example, people living in deprived neighborhoods may not be able to afford double-glazing or other building insulation equipment. In addition, they may hold jobs that require them to sleep during the day when noise levels are higher, or have health problems likely to exacerbate the effects of noise.

Moreover, several studies have reported on the effects of noise on children's learning. Various researchers have shown that ambient noise, such as traffic noise [29] or aircraft noise [30], affects the development of children's cognitive abilities, particularly reading and learning. In addition, Xie et al. [31] have demonstrated an inverse relationship between noise exposure and academic performances in elementary school children.

Thus, noise exposure leads to various social impacts that are notably health-related, such as effects on cognitive abilities, but also certain links with economic issues.

### *c) Economic impact*

Noise exposure does not only lead to negative social and health repercussions for individuals, it also represents a significant economic impact. As indicated in a press release based on an ADEME report published in July 2023, noise represents a considerable social cost, amounting to €147 billion every year in France. [32] This paragraph is essentially based on the ADEME report cited in the press release. [33] This summarizes the results of a study carried out by ADEME in 2021. According to this study, the social cost of noise in France is mainly generated by the health effects of noise, such as compensation for occupational illnesses and accidents, hospitalization and



medication, and loss of years of life. This cost also includes non-health effects, such as lost productivity and property depreciation linked to noise exposure. Transportation, mainly road traffic, is the main source of noise, accounting for 66.5% of costs. Next come the costs generated by neighborhood noise, 18% of the total, followed by those attributable to noise in the workplace, around 14% of costs, and finally the costs caused by monitoring and R&D expenditure. The consequences of noise impact on a wide range of areas, both professional and private. This high cost does not only reflect the economic impact, but also the numerous health and social repercussions associated with noise. The report also outlines a number of measures that could be taken to reduce French people's exposure to noise, and hence the cost of noise in France. These include reducing the speed limit on expressways by 10 km/h, introducing low-emission zones and improving the acoustic quality of school buildings. These measures offer a particularly attractive cost-benefit ratio, and are based on different types of levers: regulatory, technical and organizational.

## 2) Noise annoyance, noise sensitivity definition and difficulties to measure

### *a) Noise annoyance*

Constituting the most prevalent community response to exposure to environmental noise [14], European Environment Agency estimated in 2020 that 22 million people suffer from high noise annoyance in the European Union [23]. Resulting from a series of stress-related fight or struggle reactions in the human body, noise annoyance is typically defined as a feeling of irritation, anxiety, anger, frustration, provocation, dissatisfaction or disturbance due to noise [34]. This reaction may result from different situations and stimuli, such as noise interference with daily activities, feelings, thoughts, falling asleep [14]. This specific combination of emotional, attitudinal, cognitive and behavioral responses to environmental noise is the result of a variety of acoustic and non-acoustic factors.

Among the acoustic factors that trigger noise annoyance, the main ones are the mean sound intensity, the number of noisy events, the spectral content, as well as the temporal content of noise, residual noise but also situations of combined noise sources. Indeed, annoyance can also be due to combined noise source situations, which can lead to higher noise intensity, thus reinforcing annoyance [35]. In addition, the relationship between noise exposure, sound pressure level and annoyance also depends on the time of day [36]. Indeed, people tend to be more bothered by noise at night or in the evening. The measurement of noise annoyance therefore takes this consideration into account, by measuring noise annoyance according to the time of day (day, evening or night) [35].

There are also non-acoustic factors, that can influence noise annoyance. Among them, one can mention fear of danger, attitude towards the sound source, activity during exposure, overall perception of the environment, culture, time spent at home, sound exposure over time, type of occupation (owned or rented), soundproofing of windows, time of year or time of day as the main ones. Certain, such as age, sex or level of education, are controversial, with some studies showing their influence on annoyance and others proving the opposite [35].

These factors are multiple, both acoustical and non-acoustical, and thus sometimes difficult to identify. However, it has been established that noise sensitivity (a non-acoustical factor), certain personality traits and general stress levels play an important role in noise annoyance [34].

In its most severe form, noise annoyance can have a variety of consequences for health and well-being [14]. In particular, it is linked to increased cardiovascular risk and sleep disturbance, while being inversely correlated with cognitive and psychological function, as well as quality of life [34]. Due to the large number of people affected, annoyance contributes substantially to the burden of disease caused by environmental noise [14].

The measurement of noise annoyance has been standardized internationally in accordance with ISO/TS 15666 [37]. In this standard, the noise annoyance question must relate to a specific noise, such as road traffic noise or aircraft noise. Thanks to this standardization, noise annoyance benefits from a common international measure. Studies on noise annoyance can therefore be compared via meta-analyses, a statistical combination of the results of several studies on a similar research question [38], which helps the WHO to estimate the impact of noise on health.

#### *b) Noise sensitivity and its link with noise annoyance*

According to Kliuchko et al., noise sensitivity is defined as 'a trait describing attitudes towards noise and predicting noise annoyance' [5], while Schütte et al. describe it as 'a stable personality trait affecting reactivity towards noise sources' [6]. Therefore, noise sensitivity tends to influence a person's reactions and attitudes toward noise. Especially, it involves negative emotional responses to noise, the formation of negative attitudes to the noise source and can even lead to psychological distress [39]. Noise sensitivity has a prevalence estimated between 20% and 40% [39]. As it varies from one individual to another, researchers have explored the parameters likely to impact. They found some link between individual characteristic and noise sensitivity level. They have notably shown that it is conceptually distinct from extraversion or neuroticism, uncorrelated with noise exposure, and largely independent of auditory acuity or function (Ellermeier, Eigenstetter, & Zimmer, 2001 [40]; Job, 1988 [41]; Miedema & Vos, 2003 [42]; Stansfeld, Clark, Turpion, Jenkins, & Tarnopolsky, 1985 [43]). According notably to Shepherd et al [39] noise

sensitivity has not been linked to auditory acuity, nor is it equivalent to hyperacusis. The influence of age or gender on sensitivity to noise is a subject of debate, with some studies suggesting a correlation [44] while others do not [6] [45].

Noise sensitivity plays a crucial role in how individuals experience noise annoyance, irrespective of the actual level of noise exposure. According to Zhong et al [34], noise sensitivity involves individual differences in noise perception and tolerance, which significantly influence how people react to ambient noise. People who are more sensitive to noise often perceive noise as more threatening and beyond their control, making adaptation more difficult and slower, resulting in increased annoyance. Furthermore, noise sensitivity is considered as an independent factor contributing not only to noise annoyance, but also to health deterioration. For example, a cross-sectional study showed that adult residents living near airports, who are more sensitive to noise, suffer more sleep disturbances and are more likely to suffer from conditions such as hypertension and chest pain. In addition, laboratory studies show that people with high noise sensitivity perform less well on cognitive tasks, being more easily distracted by noise, highlighting the wider impact of noise sensitivity on general well-being and cognitive function [34].

Furthermore, physiological attributes are linked to noise sensitivity. Indeed, Higher noise sensitivity is related to higher skin conductance responses in the presence of noise [46], greater reported annoyance [47], elevated heart rate [48], sleep loss [49], psychiatric disturbance [43], and slower habituation in the presence of noise [46]. Recent functional brain imaging studies have shown that noise sensitivity is associated with neuroanatomical changes (e.g. greater grey matter volume in certain areas of the auditory and limbic brain), leading noise-sensitive individuals to evaluate auditory stimuli in an aversive manner [5].

To assess noise sensitivity, questionnaires and scales have been developed. They are mainly based on verbal descriptor such as sentences or questions and the respondent must answers following a Linkert scale. The first questionnaire was conceived by Weinstein in 1978 [45] in English. Therefore, to be used on non-English speakers, it must be translated. However, Tarlao and al [11] explained that word-for-word translation do not transcribe the good meaning of words. Scientists have noted the same observation for all existing noise sensitivity scales (LEF, NoiseQ, one item), different translations had been then established in recent years in several languages such as French [12], German [50], English [51]. The second part of this report describes some of the best-know questionnaires notably their psychometric characteristics and their eventual French translations.

Although many questionnaires have been developed over the years, there is no standard for measuring noise sensitivity. In fact, no single questionnaire is universally accepted for socio-

acoustic surveys and epidemiological studies on the health effects of noise, as many are too long. As field studies are costly, they cannot integrate questionnaires with 21 questions or more just to measure one factor.

*c) Other concepts: hyperacusis, misophonia*

Other concepts, less discussed in the current literature, are thought to be linked to noise sensitivity or annoyance, and therefore to noise sensitivity. Among them, hyperacusis and misophonia are the most frequently cited.

Hyperacusis can be defined as a “reduced tolerance to sound(s) that are perceived as normal to the majority of the population or were perceived as normal to the person before their onset of hyperacusis” [12]. People with hyperacusis may tend to isolate themselves by avoiding noisy environments or by using hearing protection, which can lead to distress or functional impairment [12]. Furthermore, hyperacusis is often correlated with other hearing impairment such as tinnitus [12]. Hyperacusis is measured using various questionnaires, including the Khalifa et al (2002) questionnaire. This 14-item questionnaire assesses attentional, emotional and social factors using a 4-point self-assessment scale ranging from “No” (0) to “Yes, a lot” (3). The total score is determined by the sum of all the points obtained for the 14 items, so scores range from 0 to 42, with the degree of hyperacusis increasing with the participant's score. Although hyperacusis is linked to noise sensitivity, they remain two different concepts. Indeed, hyperacusis is considered an auditory pathology mainly related to the intensity of the sound, not a personality trait that affects each individual to some degree, as does noise sensitivity [12]. Hyperacusis is sometime conflated with other pathologies such as misophonia or phonophobia.

Misophonia is defined as an “abnormally intense reaction to breathing, coughing, throat clearing, food chewing, crunching, swallowing, lip-smacking, spitting and similar sounds” [52]. People affected by misophonia can be triggered by different kind of noise, such as sounds produced by human respiratory and digestive organs, but also other provoking sounds, including finger tapping, nail clipping, footsteps, and kissing. In some cases, misophonia is even caused by pen clicking, keyboard typing, glasses clinking, paper or plastic rustling, by loud human voices, babies crying, noisy neighbors, by traffic, household appliances, and even animals (dogs barking, cat walking, claws clicking). However, people with misophonia are generally unbothered when producing these sounds themselves [52]. Misophonia has been identified by Paunović et al [53] as related to noise annoyance, in a small-scale study of 531 participants. Indeed, they noted that, in their study, participants with high perceived misophonia were more likely to report high noise annoyance from environmental sources, but also from human and animal sound sources. This

association was not related to the age, gender, perceived anxiety or perceived depression of the participants.

## B) Existing questionnaires and scales: their advantages, weakness, and translations

Since the aim of the project is to find the best question to assess noise sensitivity, and therefore to establish a reliable and usable scale, the existing instruments to measure noise sensitivity must be examined. That was achieved by conducting 'systematic review' in the initial stage of the project. This section will provide a summary of the most common noise-sensitivity questionnaires and scales, their advantages, and shortcomings. French translations will also be mentioned, as the pilot test will be launched in French. All the questionnaires mentioned are available in full in Appendix 1, in their original form.

### 1) Weinstein Noise Sensitivity Scale (WNSS)

#### *a) Original questionnaire*

Developed in 1978 by Weinstein [45], this scale was destined to evaluate noise sensitivity of student in a dormitory. It includes 21 items concerning relation to noise in the daily life of participants. The answers to the questions are a categorical scale from 1 (strongly disagree) to 6 (strongly agree), and for some questions, the polarity is reverse.

The questionnaire was created in the frame of a study which aimed to "investigated differences among individuals in their initial reactions to noise and in their ability to adapt to noise over a longer period of time" [45]. The researchers worked with freshmen living a college dormitory. The researchers asked the first-year students about their noise sensitivity before they lived in the dormitory and after they started living there via a questionnaire. This questionnaire, regrouping 21 questions, used a Likert format and was developed to assess self-reported sensitivity to noise [45]. It has been chosen to rely upon student self-reports of noise disturbances because researchers admitted that behavioral manifestations of noise distress were too influenced by extraneous factors to be an accurate indication of the issues an individual is experiencing. The questions "emphasize affective reactions and avoid general inquiries about noise as an environmental problem" [45]. They tackle different daily-life student situations, included studying. According to Weinstein (1978), the Kuder-Richardson reliability of the scale, tested during a previous work, has ranged from 0,84 to 0,87 in three samples of students and adults. The

scale includes questions about behavioral disruptions and negative affective reactions produced by the dormitory noise. A principal-components factor analysis led on the results of the survey conducted before the freshmen arrived in the dormitory, had highlighted a unrotated principal factor general: dormitory noise disturbance. Thus, the 15 open-ended and fixed-choice questions that loaded most highly on this factor were combined with equal weights to form the noise disturbance scale. Nine additional questions, addressing topics as privacy or roommate relations, were included to the questionnaire to measure general non-noise dissatisfaction. Kuder-Richardson reliability of the noise-sensitivity questionnaire of the full sample of student (155) was 0,83. The cross-correlation analysis of survey's results showed that wide variety of noise-sensitivity scale items were significantly correlated with dormitory noise disturbance.

In this questionnaire, the answer to each question represents a number of points ranging from 0 for "strongly agree" to 6 for "strongly disagree", with some questions having opposite polarity. To determine the participants' total score, the points obtained in the 21 items are added together. As Bigras et al noted in their article [12], there is no established threshold for diagnosing "noise-sensitive" individuals. In some studies, the extremes of the score distribution have been used to classify participants into groups with high or low sensitivity to noise [39].

This scale is the most widely used in studies aimed at assessing noise sensitivity. For example, Park et al [7] used it in 2018 to examine subjects' experience of and attitude towards ground impact noise in Korea.

According to the reference [54], the main critic about the Weinstein scale is that, as it was created for students, some questions do not suit for the rest of the population. Moreover, a study of 2006 conducted by Kishikawa et al. pointed the fact that some questions of the survey are highly correlated to noise level [55]. Besides, Kishikawa et al. showed that the answer scale may introduce errors and therefore, these authors rather chose a binary answer scale: agree/ not agree [56]. However, the Weinstein's scale is a very good way of assessing an individual's sensitivity to noise. Thanks to its 21 questions, it is precise and accurate, but it is also difficult to use in a large-scale survey. Indeed, the longer a survey takes to complete, the more difficult is it to recruit participants, and the more participants will have to be paid. This means that more funds will have to be made available for the study. Furthermore, noise sensitivity is not the only factor to be measured in large scale studies assessing noise effects on health. Thus, the development of a shorter scale is important.

### *b) Short version*

In 2014, Benfield et al [57] developed a shorter version of the WNSS called NSS-SH, that focused on 5-items of the original questionnaire. They studied the reliability of their questionnaire, and it appears to be highly correlated with the original NSS and associated with constructs such as extraversion and neuroticism. The results showed that the NSS-SH is consistent and reliable. Individual NSS-SF scores were internally consistent ( $\alpha = 0,79$  and  $0,81$ ) and temporally stable ( $r = 0,83$ ). The authors precise that the use of the NSS-SH or the WNSS or other scale depends on the context, as NSS-SH is shorter so may be useful in some cases. The NSS-SH scale can be invaluable for large-scale surveys because it is much quicker to complete than the original Weinstein scale, while remaining accurate and reliable.

### *c) French translation*

Bigras et al [12] proposed a French translation of the 21 item Weinstein questionnaire, in order to study the correlation between noise sensitivity and hyperacusis. As there was no pre-existing validated French version, the bilingual authors of the article, located in Montreal (Quebec, Canada), translated the 21 English NSS items into French while maintaining their original meaning. Their translation process is based on guidelines outlined in Hall et al. (2018) guide [58]. During the translation process, they notably compare their translation with the one proposed by Tarlao et al. (2016) [11]. The latter achieved a translation for 5 items of the Weinstein questionnaire. The Bigras et al. (2024) [12] translated questions 7 and 21 are identical to the Tarlao et al., (2016) [11] ones while questions 8, 18 and 19 differ by one or two words that the team judged to be more adequate (e.g. “détendre” was favored instead of “relaxer” in question 18). As a starting point, the authors used an English version of the Weinstein questionnaire available freely with permission in the book by Worthington and Bodie (2017), [59]. It differs from the Weinstein 1978 questionnaire by question 3, that was not gender-neutral, and question 9, which has been rewritten to be answered on a Likert scale.

Their translation presents limits as even if the authors followed the Hall et al. (2018) [58] guide, some of the guidance could not be respected. For instance, they did not contact the source-language questionnaire developer, thus involving some risk of misinterpreting concepts and items. Moreover, they did not establish a formal template document for their questionnaire so this might have limited the efficiency and transparency of the translation process. Another limitation is the lack of consultation with a professional translator during the translation process. Their translator, who was bilingual with a high level of fluency in French and English, may have had difficulty considering linguistic and cultural subtleties, especially since there was no second translator.

Furthermore, according to the article's authors, this lack of second translator also leads to risk that translation reflects an individual personal style and a non-transparent process.

Once their translation was done, the questionnaire was tested on a small sample of patient from its target population. After this pilot phase, the questionnaire did not require any change as "All items were understood by the pilot participants". The questionnaire was then formatting and used for the experimentation of the article. A similar method will be used by our research team when developing the survey.

## 2) Fragebogen zur Erfassung der individuellen Lärmempfindlichkeit (LEF)

### *a) Original questionnaire*

Zimmer and Ellermeier [54] developed the LEF scale in 1998. It includes 52 items that tackles different kind of environmental noises. They cover 7 fields: Daily life, leisure, health, sleep, communication, work, and noise in general. Participants evaluate their own affective, cognitive, and behavioral reaction through noise on a scale from 0 (not agree at all) to 4 (highly agree). The intern consistency coefficient is very good ( $\alpha = 0,922$ ). A shorter version of this scale exists, based on 9 items (LEF-K).

Nevertheless, the analysis of the factorial structure of the LEF led to a multidimensional solution indicating that separate measurements for different areas of everyday life might be more appropriate when determining the level of noise sensitivity.

As this scale is very long, it has rarely been used to assess noise sensitivity in large surveys.

### *b) Short version: LEF-K*

A shorter version of the LEF questionnaire has been developed by Zimmer & Ellermeier [60] in 1998. It consists into 9 items extracted from the original LEF questionnaire. According to tests carried out on a sample of 117 students and a representative population sample of 117 people, the psychometric properties of this shorter version are acceptable [61]. The LEF-K showed average internal consistency ( $\alpha_{\text{student}} = 0,66$  and  $\alpha = 0,69$ ) and good retest reliability. The LEF-K is therefore an economical alternative to the original LEF for the study of noise sensitivity, particularly in the context of large surveys [60]. The abbreviated version, discussed in the next section, was used by Lechner et al [10] to study the effects of motorcycle noise on annoyance in the Alps.



### *c) French translation*

A French translation of the 52-item LEF questionnaire, - including its short version LEF-K – was produced in the present project, but has not yet been published.

## 3) NoiSeQ

### *a) Original questionnaire*

The Noise-Sensitivity-Questionnaire (NoiSeQ) is a questionnaire developed by Schütte et al (2007) that is based on the LEF model. It considers 5 fields: leisure, work, habitation, communication, and sleep. Some items are selected from both the WNSS and the LEF, with some being reformulated, and other newly created. Items were assigned to the 5 fields considered by 5 judges. At the end of the classification, only the items placed in a unique and same category by all the judges were kept for the final questionnaire [6], [61]. Finally, it was constituted of 35 items. Participants of the survey must answer the item by following a 0 (not agree at all) to 3 (highly agree) scale. The NoiSeQ passed the reliability test of the ISO 10075-3 norm and presents extremely small time-dependent variation [6]. Furthermore, does not depend on the age and gender of the respondents because the measurements are not influenced by these facets [6].

As with the LEF, the NoiSeQ is very long and seems to have never been used in a large-scale survey in its full form.

### *b) Short version: NoiSeQ-R*

The abbreviated form (NoiSeQ-R), in 2019, was used by Brink et al to investigate the differences between continuous and intermittent noise in the study of exposure-response relationships for annoyance due to road, train and aircraft noise [62]. This shorter version of the NoiSeQ was created in 2007 by Griefahn et al [63]. It includes 13 questions that tackles sleep, habitation and work and the answer system is the based on the same scale as the classical NoiSeQ (from 0 to 3). This questionnaire is available in 10 languages and presents a good intern consistency, such as the original one. This form could be useful in large survey, thanks to is short duration.

### *c) French translation*

A French translation has been established by Barbara Griefahn and her colleagues. To respect gender neutrality, a slightly modified version has been produced by the research team.

#### 4) 1 item scale

##### *a) Original questionnaire*

One-item scales have been developed to measure noise sensitivity using a single question. There are several different formulations, in different languages. This type of scale is frequently used in surveys, as it is very short [64]. This scale requires participants to estimate their overall sensitivity to noise. Despite its economic advantage, the one-item scale has certain shortcomings, according to Zimmer et al [64]. These researchers compared four different noise sensitivity scales: a German translation of the Weinstein questionnaire, the LEF and two one-item scales [64]. Firstly, they observed that the one-item scale was less accurate and had lower retest reliability than the other scales studied in Zimmer's article [64]. Secondly, according to their study, one-item scales do not consider the increase in noise sensitivity with age and show undesirable correlations with the respondent's (estimated) noise exposure.

Lee et al 2016 [65] notably used a one-item scale to study impact noise in buildings. They conducted a survey on residents of apartment buildings that have heard floor impact sounds from their upstairs neighbors. It was conducted in Korea and 527 questionnaires (505 online and 22 on paper) were completed and collected. The one-item scale was worded as follows: "How sensitive are you to noise in general?". They found that noise sensitivity positively affected disturbance ( $\beta = 0,511, p < 0.001$ ), indicating that those who were sensitive to noise were more easily disturbed by floor impact noise.

In another study, Öhrström et al. (2006) [66] used a one-item scale in their research. Their objective was to assess the effects of road traffic noise and the benefits of access to quiet environments in dwelling within residential areas. This study was part of a comprehensive research program on well-being conducted in Sweden. The authors specifically investigated how access to quiet indoor and outdoor spaces in residences influenced residents' levels of annoyance, interference with activities, sleep disturbances, and overall well-being. Additionally, they aimed to establish criteria for characterizing residential acoustic environments conducive to health and well-being. Their ultimate goal was to examine the relationship between self-reported noise sensitivity and general annoyance. In particular, they found a relatively high correlation between noise sensitivity and the various annoyance scales they used. Furthermore, road traffic noise levels did not seem to correlate with noise sensitivity. These results are in line with previous findings, notably those reported by Ellermeier et al [40].

## *b) French translation*

Kodji et al [67] used a French version of the one-item scale in their research on aircraft noise annoyance. The wording of their question differs from the usual question, employing a comparison method: “Regarding noise in general, compared to people around you, do you think that you are much less sensitive than, or less sensitive than, or as sensitive as, or more sensitive or much more sensitive than people around you?”.

## C) Context of the study

### 1) Aim and tasks of the internship

As clarified before, considering noise sensitivity is crucial in understanding how individuals respond to noise. Hence, a research program, subsidized by the Fondation pour l’Audition (FPA, Paris, France), was initiated to explore the impact of noise on daily life and determine the best way to assess noise sensitivity. The project funds were granted to C. Marquis-Favre (ENTPE), W. Ellermeier (TU Darmstadt, Germany) and K. Zimmer (U Vechta, Germany), and the structure of the project is described in Marquis-Favre et al (2024) [68]. Eunsung Song (ENTPE) is the doctoral student employed full-time at ENTPE and working towards his Ph.D. in the framework of the project. This constitutes the ‘context’ in which the internship was carried out.

The internship takes place in this global study that tackles sensitivity to noise, divided in several task. The first task of the project consists of a systematic review, focused on the different ways of measuring noise sensitivity, across various domains of investigation, and across different languages and cultures. This review included searches of publications, grey literature, or unpublished material in French, German, English, and Korean.

The internship began during the second task defined for the project. In this task, the most important existing noise-sensitivity scales resulting from the systematic review are compared with respect to their psychometric quality (reliability, validity, and structure) while including cultural and linguistic aspects. Subsequently, an online survey, coded on “Sosci Survey” (<https://www.socisurvey.de/>) was created by the team. It includes questionnaires described in the second part of this report. The survey will be completed by 250 to 300 participants fluent in four different languages (French, English, German and Korean) and coming from five different countries (France, the UK, the U.S.A., Germany and South Korea). These samples set up an approximately representative samples from French, English, German and South Korean-speaking populations. The data collected during the survey will be analyzed to assess the psychometric

properties of the questionnaires, any cultural or linguistic variations, and the extent to which the scales capture the different facets of noise sensitivity. In addition, the study will examine the correlation between noise sensitivity and annoyance levels, for each measure of noise sensitivity. A pilot test will first be carried out to validate participants' understanding of the survey and to identify any problems of the construction using Sosci Survey. The process used for the pilot test is explained in the third part of this report.

The intern's task was to participate in the creation of the pilot test and the actual survey, and to analyze the resulting data of (a) the pilot test and (b) the UK sample. Using different statistical software than that employed by the principal investigators, the present data analysis served both as (1) an initial summary of key results, and (2) a completely independent double-check against the statistical analyses performed by other project members.

This, was done with the goal of studying noise sensitivity and the factors that influence it. Also, to examine whether the assessment of noise sensitivity differs from one language to another, and whether this calls into question the search for a universal method to assess it.

## 2) Choice of the questionnaires

The online survey will include carefully selected questionnaires, each designed to address three key areas: noise sensitivity, noise annoyance and hyperacusis. The inclusion of the latter domain was mandated by the scientific board of the sponsor: the Fondation pour l'Audition, who commissioned the research team to explore relationships between hyperacusis and noise sensitivity.

The first choice of questionnaires concerned the pilot test, which was carried out first. As the purpose of this test was to ensure that the survey would run smoothly, it was not necessary to include all the questionnaires that will constitute the real test. However, all three concepts had to be covered. The choice of questionnaires was based on the work carried out in Task 1 of the project, and relied on the consistency and reliability of the questionnaires. Thus, to assess noise sensitivity, the Weinstein questionnaire and a single-item scale, formulated as follows: "Are you sensitive to noise?" with a continuous slider evaluation option, were chosen. The Weinstein questionnaire is the most widely used and particularly reliable. In addition, the one-item scale has the advantage of being short and offering a comparison scale for the Weinstein score. To measure annoyance due to noise, the research team used the standards [37] and chose to ask participants about annoyance due to road traffic. Finally, for hyperacusis, the choice fell on the questionnaires of Aazh et al, HIQ and SSSQ [69]. Developed by Aazh et al [69], the Hyperacusis Impact

Questionnaire (HIQ) and the Sound Sensitivity Symptom Questionnaire (SSSQ) are tools designed to assess the impact of symptoms of hyperacusis and sound intolerance, respectively. The HIQ, which consists of eight items, estimated the frequency of situations over the past two weeks in which environmental sounds have seemed intolerably loud to the patient, compared with other people. The five-item SSSQ focuses on symptoms such as loudness-induced hyperacusis and misophonia. Both questionnaires have high internal consistency and use a scoring method based on the number of days during which symptoms are experienced. [69] According to Aazh et al [69], gender has a slight influence and age a negligible impact on HIQ scores, while SSSQ scores do not appear to be affected by gender or age.

In view of the project's objective, the actual survey, conducted on a larger scale, with several hundred online participants, must include more questionnaires on noise sensitivity. Indeed, in order to find the best questionnaire or method for assessing noise sensitivity, all the best-known questionnaires need to be studied and compared. Thus, the LEF, the NoiSeQ and a one item question, formulated like that of Kodji et al [67], were added to the actual survey, following the pilot version. The present data analysis will focus (a) on the pilot test, and (b) on the first sample collected for the actual survey: A 'representative' sample of 311 fluent speakers of English from the United Kingdom (UK), acquired via Prolific Academic (<https://www.prolific.com>).

## II) Preparation of the pilot test

As the study is based on an online survey, its construction is a crucial part of the research. Prior to its launch among the survey participants, a pilot test was established and submitted to approximately 70 participants. The method of the pilot test is described in the following section. In addition, screenshots of the English and French pilot test and the actual survey, as presented to participants, are available in the appendices (Appendices 2, 3, 4, 5).

### A) Content and translation process

#### 1) Building the pilot test in Sosci Survey

Before launching the survey, a pilot test was necessary to ensure that participants had a good understanding of the survey. This pilot test, carried out on approximately 70 people, was to identify the survey's weaknesses.

For practical reasons, this pilot test was carried out exclusively with French- and German-speaking participants. The pilot test consisted of an online survey lasting around 10 minutes. The questionnaire was developed by Eunsung Song using the 'Sosci survey' website.

The pilot test was conducted to assess the questionnaire's reliability and participants' comprehension of the questions. The pilot test successively encompassed demographic inquiries, the Weinstein Noise Sensitivity Scale, a one-item scale, questions on noise annoyance, and hyperacusis-related questions, see Appendices 2 and 3.

Demographic inquiries covered usual demographics (age, gender), details about participants' residential environment and its noise levels, and a question about potential hearing impairments. The Weinstein Noise Sensitivity Scale was selected for the pilot test due to its widespread usage and recognition. The one-item scale was designed from existing versions of the one item scale (e.g. Amman et al., Internoise 2007 [70]): A visual analog rating scale with the endpoints labelled "not sensitive at all" and "extremely sensitive", see Figure 2. Furthermore, a single noise annoyance query (regarding road-traffic noise) adhered to ISO/TS 15666 standards [37]. For the hyperacusis questionnaire, the one devised by Aazh et al [69] was chosen for its robust validity, reliability, and concise duration. Initially available in English, the team produced French and German translations, see next part of this report (II.A.2).

The order of the questions was the subject of debate within the research team. To avoid order effects, the team explored several options, including the Latin square layout. In this way, the order of the questions is counterbalanced. However, some additional conditions made the use of the Latin square more complex. Especially, the question on annoyance was not to be followed by the single-item noise-sensitivity scale. This would induce a response bias for the participants, notably because of potential differential carry-over effects. Indeed, in our case, if the 1-item NS rating was just preceded by an annoyance question, participants might use the slider still being in an annoyance frame of mind, rather than thinking about noise sensitivity. In the other direction, there might be no carry-over, since the annoyance question present a totally different format and content compared to the remainder of the questionnaire.

The final decision was to keep the questions in a fixed order for the pilot test, with the exception of the noise sensitivity questionnaires (i.e. the Weinstein noise sensitivity scale and the one-item scale), which will be presented in a different order. Half of the participants will answer the Weinstein questionnaire first, followed by the one-item scale, while the other half will answer the one-item scale first, followed by the Weinstein questionnaire. This will allow us to test whether presenting the one-item scale after the 21 Weinstein questions may lead to a different use of the scale, for example, if subjects use the full range of values more.

Another interrogation concerned the one-item scale itself. Indeed, the question of this scale may have different wording, notably in French and in English. The two most common wording are: "Are you sensitive to noise?" ("Êtes-vous sensible au bruit ?") and "Are you sensitive to noise in general?" ("Êtes-vous sensible au bruit en général ?". The first wording is extracted from the Weinstein scale [45] and the second one is frequently used in research work dealing with noise annoyance, sometimes with small differences in the wording, as in Park et al [51], who worded the question as followed "How sensitive are you to noise in general?". Actually, the "in general" formulation is generally used in studies dealing with noise annoyance, particularly when the study is about specific noise sources, like neighbor noise or aircraft noise. The use of "in general" therefore contextualizes the question to a more general perspective.

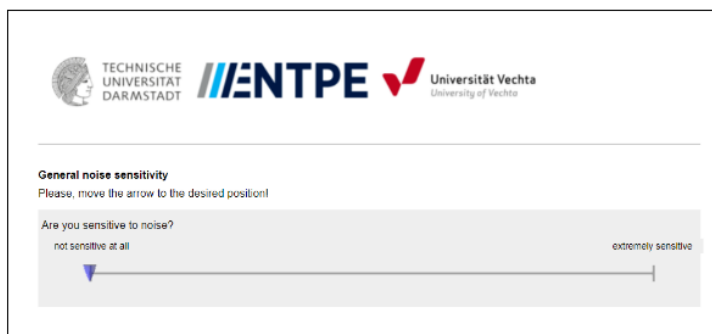
As the team was unable to reach a consensus on which formulation to use, it was decided to ask 9 participants what potential differences they perceived between the two formulations, and whether one was clearer to them. Three of them preferred the question with "en general", three preferred the sentence without "en general", and three mentioned that the meaning of these two questions was the same. Thus, once again, opinions on the meaning differed. Two questionnaires were therefore drawn up, each containing one of the two formulations. Half the participants of the pilot test received one of the two formulations, and half the other half the other. In addition, to help choose the wording to be used for the actual survey, a question was added at the end of the

survey (see figure 2), before the question visible in figure 1 (showing the section, dedicated to the understanding of the questions, that was placed at the end of the survey (see figure 1)). Thanks to this space dedicated to comments on the understanding of this question, the research team will be able to better understand and apprehend the reflections leading up to the evaluation of the one-item scale. In particular, whether the addition of "in general" in the question in the test helps people to understand the research team's expectations, or whether, on the contrary, it confused them.

\*You are helping us to further develop this questionnaire in a pretest. We'd like to know:

- Did you notice any errors?
- Were any of the questions ambiguous or hard to understand?
- Is there anything you are missing in this questionnaire?

**Figure 1 - Extract of the end of the survey**



\*Feedback

You completed this question earlier: Would you mind telling us in a few words how you arrived at your judgment?

**Figure 2 - Feedback question**

## 2) Translation process

The French translation used in the pilot questionnaire comes from an article by Bigras et al [12], which presents a French translation of the gender-neutral Weinstein noise sensitivity scale adjusted by Worthington et al [59]. This translation has been slightly modified to better suit French, as Bigras and her colleagues are Canadian. Indeed, as they speak Canadian French, one wording seemed unusual to the French part of our research team. This change concerned item 14



of the questionnaire that was changed from "Je suis bon-ne pour me concentrer peu importe ce qui se passe autour de moi" to "Je peux me concentrer, peu importe ce qui se passe autour de moi", in order to better match the French language. However, the changes remain very limited, as it was important that the questionnaire should be as faithful as possible to that of Bigras et al [12].

As it was decided to study hyperacusis, two hyperacusis questionnaires were added to the pilot trial. However, as these questionnaires were written in English, translation into French and German was necessary. To achieve these translations, translation and back-translation techniques were used, as in the article by Zhong et al [34]. Their aim was to translate the Weinstein noise sensitivity scale into Chinese. Our project research team followed the same translation process as Zhong et al. For the French translation, two members of the research team, both native speakers of French, first independently translated the original hyperacusis questionnaire into French. They then compared their respective translations and reached a consensus in the event of differences in wording. Following this reconciliation, three native French speakers were consulted to check the comprehensibility of the French translation of the hyperacusis questionnaire. Their assessment was that the translated scale was well understandable, and no suggestions were made for further adjustment. The translation of the hyperacusis questionnaire was therefore finalized for further use in the pilot test.

The two German members of the research team followed the same method for translating the hyperacusis questionnaire into German.

## B) Pre-pilot

### 1) Method of the pre-pilot test

Before launching the pilot test, the formulation of the various items and questions was tested on four native French speakers of different ages and levels of education, constituting: Two women, aged 58 and 20, and two men, aged 25 and 23.

The testing method was as follows: Participants access the survey via a link. The survey begins with an introductory page, briefly explaining the aims and context of the study. Before starting the survey, participants must accept a confidentiality agreement. Next, a page is devoted to demographic information, such as gender, age, the size of the city where participants live and the noise level of the place where they live. After these demographic questions, participants have access to the Weinstein noise sensitivity questionnaire and then to the one-item questionnaire. Participants then answer the hyperacusis questionnaires (HIQ and SSSQ) and, finally, the question

on road traffic annoyance. Last is the feedback section on the one-item questionnaire, followed by the general feedback section.

Throughout the test, participants were able to make comments or criticisms, which were noted. At the end of the test, they were asked for their general opinion of the test and their understanding of it.

## 2) Results

The possibility of rewording certain items in the French translation of the Weinstein questionnaire was raised after the pre-pilot test. Indeed, some participants reported difficulties in understanding certain items, particularly items 1 and 3. On reconsidering the translation of item 3, the research team noticed that the word used for the translation of "mind" was "s'inquiéter", meaning "worry". This was considered a slight exaggeration by the French team. Thus, the possibility of carrying out a new cross-translation into French, as had been done for the hyperacusis questionnaire, was considered, as the French team was concerned about a possible mistranslation, the team behind Bigras' article [12] being Canadian. However, this idea was abandoned as it would have led to difficulties in comparing our results with those of Bigras et al [12]. What is more, this remark was made by only one participant in the pre-pilot, and the other test subjects did not raise any problems of understanding regarding this item. The participant also complained about the imprecision of the rating on the visual analog scale for the one-item question. As it concerned only one participant, no modification was made.

Other comments from the pre-pilot test concerned the meaning of certain items in Weinstein's questionnaire, not their translations. For example, question 2, entitled "I am more aware of noise than before", was questioned as to the period to which the wording "than before" referred. The pre-pilot participant asked if it was a year ago, 10 years ago... Similarly, item 13 "When I want to be alone, it bothers me to hear outside noises" was raised and questioned. In fact, the participant explained that the reasons why he wants to be alone influenced his tolerance to noise and therefore his answer to this question. Item 19 "I get angry at people who make noise and prevent me from falling asleep or working" was also mentioned. The participant asked whether "getting angry" meant expressing anger or simply getting upset. (see the feedback example, in Appendix 6) As these unclear elements were not due to the translation or presentation of the survey, but solely to Weinstein's questionnaire itself, the research team decided to keep the questionnaire as it was.

Finally, the pilot test was ready to be launched in French and German.

### III) Study 1: Pilot test of the survey method

The pilot test was carried out independently in German and French. The two datasets will first be analyzed separately (parts B and Appendix 7), then compared to check whether they can be studied as a single dataset (part C).

#### A) Method of the pilot test

##### 1) Hypothesis

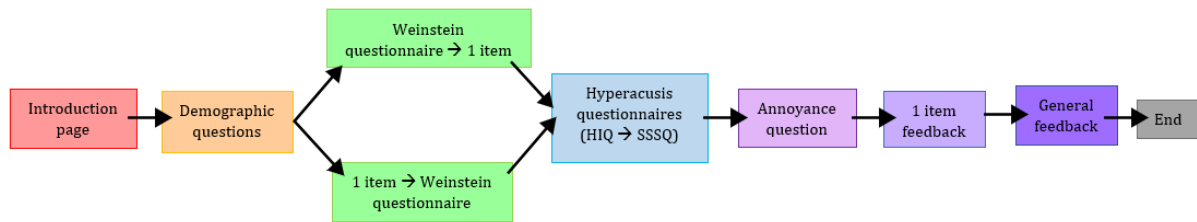
The aims of the pilot test were not only to check that the survey was working properly, but also to test two hypotheses. Firstly, whether the order of the two noise-sensitivity questionnaires had an impact on participants' assessment. Secondly, whether the presence of the expression "en général" in the one-item question of the French survey has an influence on the participants' evaluation. As there was no consensus on the wording to be used for this question within the research team and among the pre-pilot participants, it was chosen to address this issue during the pilot test. In order to identify whether or not the use of "en général" in the one-item question has an influence on participants' evaluation, a certain number of participants were asked the question with "en général" and the rest without. The two samples obtained will then be compared and studied to identify the influence (or otherwise) of "in general". The same method will be used to study the impact of questionnaire order on noise sensitivity.

##### 2) Method

The method of the pilot test was the same as that of the pre-pilot test, described in part II)B)1). Screenshots of the survey, as presented to participants, are available in the appendices 2, 3, 4 and 5. Participants for the Lyon sample were found by means of an e-mail request, sent to acquaintances, and all students and permanent employees of ENTPE (Lyon, France). The German participants were recruited by an advertisement posted to the TU Darmstadt human sciences 'subject pool' which comprises all undergraduate students of psychology, cognitive science, education, and sports science. The pilot test duration was about 10 minutes. Data collection took around a week.

As far as the pilot test method is concerned, it is described in part II.A.2.a. of this report, and the test order is summarized in figure 3. Half of the participants in each sample (i.e., French and

German) did the Weinstein's questionnaire first, and then the 1-item question. Half of each sample did the reverse. For the French participant sample, two different one-item questions were coded in the survey, one with "in general" and one without.



**Figure 3 - Structure of the pilot test survey**

Thus, in order to test the two hypotheses mentioned above, the French pilot test was divided into four different links, representing four different combinations of presentation:

- Weinstein noise-sensitivity questionnaire presented before the single-item question, including "in general"
- Weinstein Noise Sensitivity Questionnaire presented before the single-item question, without including "in general".
- One-item question, including "in general", presented before Weinstein questionnaire
- One-item question, not including "in general", presented before Weinstein questionnaire

These four links were randomly distributed among the French participants.

### 3) Participants

#### *a) French participants*

The data collection resulted from 40 participants. However, not all responses were retained. In fact, when the pilot test was first circulated, participants were given the option of going back to their previous answers via a "back button". This option was quickly removed, to avoid people changing their previous answer because of the next question. However, by this time, four French participants had already completed the test. It was therefore decided to remove their answers from the final data set, in order to have only the results of pilot test carried out under the same conditions. Moreover, when the data were studied, two cases, completed one after the other, were very similar (same age, same sex, same comments and similar answers to the questionnaires). It was therefore assumed that one of the participants had completed the questionnaire twice. As the reason for this double participation was not known, and his answers were not exactly the same, it

was decided to delete both participations. Thus, the final French data set contained 34 cases, with questionnaires completed under the same conditions.

The sample comprised 19 women and 15 men, from 19 to 63 years old. The mean age was 39,47 years, with a standard error of 16,07.

Thanks to the four links (cf. the method previously presented III.A.2), 18 participants answered Weinstein's noise sensitivity questionnaire first and then the one-item question, and 16 in reverse order. 20 participants answered the one-item question with "in general" and 14 without. Twenty participants, recruited via an e-mail sent to ENTPE students and permanent staff, were awarded a €10 voucher. Relatives were not compensated.

#### *b) German participants*

For the German participants, no cases had to be removed from the final sample, which therefore comprises 24 women and 10 men, for a total of 34 participants. The average age is significantly younger than for the French participants, with a mean age of 23,35 and a standard error of 3,42, from 19 to 37 years old.

Once again, in order to test the hypothesis, the Weinstein questionnaire and the one-item question were presented to the participants in random order. Eighteen participants answered the Weinstein noise sensitivity questionnaire first and then the one-item question, and 16 in reverse order. For the German pilot test, the question was formulated in the same way for all participants (i.e. "Are you sensitive to noise?").

#### *c) All participants*

If allowed by results of the data analysis, the aggregate data would consist of a sample of 68 people, 34 of them French-speaking and 34 German-speaking. The average age was 31,41, with a standard error of 14,10. The sample comprised 43 women and 25 men. 36 participants answered the Weinstein noise sensitivity questionnaire first, then the one-item question, and 32 participants in reverse order.

## B) French data analysis

### 1) Qualitative analysis (verbatim)

For the French data, the first analysis consisted of a qualitative analysis of the participants' feedbacks on the one item question and to the overall impression of the survey.

#### *a) One item: feedback on the phrasing*

Responses from the feedback section concerning the one item question (available in figure 2) were analyzed first. The page of the pilot test devoted to this section recalled the one-item question with a screenshot of it, and a free response space, that was introduced as follows: "Feedback - You answered this question earlier: Would you mind telling us in a few words how you arrived at your judgment?" and in French: "Complément d'information – Vous avez répondu à la question ci-dessus. Veuillez nous expliquer en quelques mots ce qui vous a conduit à donner cette réponse.". The aim of this feedback question was to assess how people rated their own sensitivity to noise, and whether the use of "in general" influenced their answers.

The 34 responses to this section were analyzed. They were divided into two columns, one with participants who answered the one-item question with "en général", and the other with participants who answered the question without "en général". In each comment, references to specific noise sources (such as aircraft noise, traffic noise and others), to specific contexts or situations and to noise from a general point of view were noted, thus constituting an analysis of the verbatims. These references were then summed by column and collated in the table below (Table 1).

With "en général"	Without "en général"
Specific sources	
21%	35%
Specific contexts/situations	
29%	30%
A general perspective	
29%	20%

**Table 1 - Recap table of the verbatim analysis of the one item feedback section**

Slight differences can be observed between the two groups. Indeed, participants who answered the one item question containing "en général" tended to cite fewer sources or specific contexts and situations than those who answered the question without "en général". They also tend to refer more to a general perspective than other participants. This observation suggests that with the use

of "in general" in the one-item question, participants are more likely to think from a general perspective rather than focusing on a specific noise source. However, as the number of observations is very small and the trend is not strongly marked, it is difficult to conclude. Quantitative analysis will then be important in concluding whether or not the use of "in general" influences people's response to the one item question in this test.

### *b) General feedback section*

The last page of the survey was devoted to general comments, as shown in Figure 1. All participants' comments were read out, and remarks made several times were noted. The main criticisms concerned the hyperacusis questionnaires. Indeed, seven participants mentioned difficulties in expressing their results in terms of number of days, or in remembering when events occurred. The type of noise addressed in the questionnaire was also a source of comment. Four participants mentioned that certain types of noise were not covered by the questionnaire (aircraft noise, construction noise). In addition, one participant complained that noise was not clearly defined in the questionnaire, and two asked to clarify the difference between the type of noise, such as repetitive noise and ambient noise (one participant), or to specify when noise is emitted during the day (one participant). One complained that a context was missing. Thus, it seems that no mention of a specific source (following the deliberate choice from the research team) led, as a consequence, to an unclear context of the test felt by the participants. Another participant mentioned the imprecision of using the visual analog scale for the one-item question.

As this feedback section was added to improve the survey, these comments were considered when creating the survey itself. Some of these comments have already been taken into account in the final survey through modifications planned by the research team. Indeed, the team had planned to add questions on annoyance caused by other sources of noise in the real survey, such as aircraft noise or noise from neighbors. The one-item scale will be changed in order to facilitate its use by participants. However, the hyperacusis questionnaire will remain unchanged, so that it can be easily compared with the original questionnaire, devised by Aazh et al [69].

## 2) Quantitative analysis on "Statistica"

"Statistica" software was used for quantitative data analysis. Two types of analysis were performed: correlation analysis and comparison tests. Histograms of the main measurable data (Weinstein score, item score, annoyance, and hyperacusis) were also produced with Statistica and are available in appendix 8.

*a) Influence of certain factors (Boxplot) – comparison tests*

*i) Impact of the order of one item question and Weinstein questionnaire*

To investigate the influence of the order of the noise-sensitivity questionnaires in the survey, comparison tests were carried out between the noise-sensitivity scores of the two French samples: one sample of participants who first answered the one-item question and then the Weinstein questionnaire (16 people), and the other sample of participants who answered the questionnaires in reverse order (18 people). The scores compared were the noise sensitivity scores, i.e. the scores of the one-item question and the noise sensitivity scores of the Weinstein questionnaire.

For one-item scores, comparison tests were performed on the means of the two samples. The data were presented in the form of a number between 0 and 100, chosen by the participants on a continuous, scale. The data are therefore metric, and it is possible to use a comparison test on the sample means: A Student's t-test. [71].

According to Chanquoy [72], before using Student's t-test, homoscedasticity must be checked. To do this, Hartley's test of homogeneity of variances was used. For each sample comparison, the maximum F was calculated according to the following formula:

$$(1) F_{max} = \frac{\text{highest variance}}{\text{lowest variance}}$$

The value of  $F_{max}$  is then compared with a critical value, defined as a function of the number of groups and the number of degrees of freedom in the group (the values of which are listed in a table entitled "Statistical distribution of  $F_{max}$ ", available in appendix 9). For variances to be considered homogeneous,  $F_{max}$  must be less than the critical value.

For example, for the comparison test carried out on the French samples of the one-item question assessment with the different order of the noise sensitivity questionnaires, the method was as follows. Firstly, two different columns were created, one with the one-item score of participants who first answered the Weinstein questionnaire and then the one-item question ("WO",  $n=18$ ), and a second column with the one-item score of participants who answered the questionnaires in reverse order ("OW",  $n=16$ ). The table with the two columns is available in the appendix 10, (TAB1).

Next,  $F_{max}$  was calculated, according to (1) and gave  $F_{max} = 2,24$ . According to the table found in [68], with an  $n=34$  (rounded to 30) and a number of degrees of freedom of 32 (calculated with Statistica),  $F_{max,critical} = 2,63$  ( $\alpha=0,01$ ). As  $F_{max}$  is lower than  $F_{max,critical}$ , the variances can be considered homogeneous and Student's t-test can be used.



However, before carrying out the T-test itself on the two samples of one-question scores, two T-tests must be carried out. This is because the samples of people who responded first to the Weinstein questionnaire, then to the one-item question and vice versa, are in fact made up of two sub-samples of participants who responded to the one-item question with 'in general' and without. Two T-tests were therefore carried out. The first concerned the sample of participants who first answered the Weinstein questionnaire, then the one-item question with 'in general', and the sample of participants who first answered the Weinstein questionnaire, then the one-item question without 'in general' (see Table 2). The second involved the sample of participants who first answered the one-item question with 'in general', then the Weinstein questionnaire, and the sample of participants who first answered the one-item question without 'in general', then the Weinstein questionnaire (see Table 3). These two Student's t-tests revealed no significant difference between the samples. Thus, the potential difference in noise sensitivity scores induced by the order of the questionnaires cannot be attributed to the wording of the one-item question.

Test t pour des Echantillons Indépendants (Feuille de données2)											
Note : Variables traitées comme des échantillons indépendants											
Groupe1 vs. Groupe2	Moyenne Groupe 1	Moyenne Groupe 2	valeur t	dl	p	N Actifs Groupe 1	N Actifs Groupe 2	Ec-Type Groupe 1	Ec-Type Groupe 2	Ratio F Variances	p Variances
<b>WO_G vs. WO_W</b>	55,12500	63,80000	-1,15950	16	0,263264	8	10	11,98138	18,18302	2,303128	0,284143

**Table 2 - Student's t-test conducted on the two sub-samples of the sample of participants who answered first to the Weinstein questionnaire**

Test t pour des Echantillons Indépendants (Feuille de données2)											
Note : Variables traitées comme des échantillons indépendants											
Groupe1 vs. Groupe2	Moyenne Groupe 1	Moyenne Groupe 2	valeur t	dl	p	N Actifs Groupe 1	N Actifs Groupe 2	Ec-Type Groupe 1	Ec-Type Groupe 2	Ratio F Variances	p Variances
<b>OW_G vs. OW_W</b>	49,16667	63,60000	-1,18693	14	0,255006	6	10	20,83667	24,92745	1,431196	0,723775

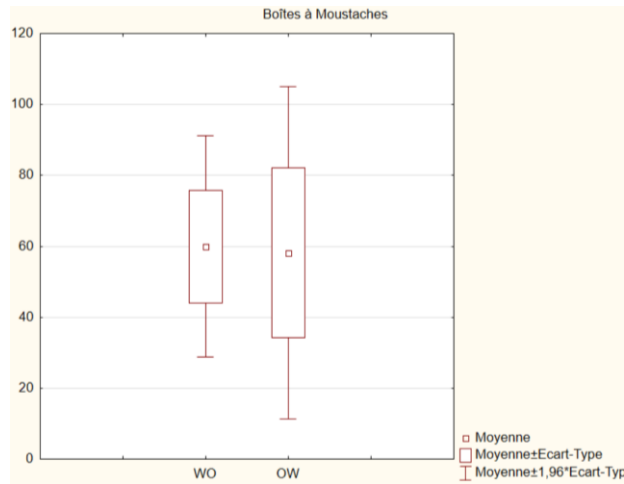
**Table 3 - Student's t-test conducted on the two sub-samples of the sample of participants who answered first to the one-item question**

Thus, the Student's t-test on the aggregate sample could be carried out to study the possible order effect induced by the presence of two questionnaires on noise sensitivity. The Student's t-test of these samples, performed on Statistica, revealed no significant difference between the two samples, see Table 4 ( $T_{obs}(32)=0,26$ ,  $p=0,8$ ).

Test t pour des Echantillons Indépendants (Feuille de données11)											
Note : Variables traitées comme des échantillons indépendants											
Groupe1 vs. Groupe2	Moyenne Groupe 1	Moyenne Groupe 2	valeur t	dl	p	N Actifs Groupe 1	N Actifs Groupe 2	Ec-Type Groupe 1	Ec-Type Groupe 2	Ratio F Variances	p Variances
<b>Var1 vs. Var2</b>	59,94444	58,18750	0,255082	32	0,800292	18	16	15,93174	23,86691	2,244223	0,111535

**Table 4 - Student's t-test conducted on the two orders in which the one-item question was presented**

Nevertheless, the boxplot reveals that the sample of participants who answer the one-item question first has a wider distribution. The difference between means is not significant, however, according to the t-test.



**Figure 4 - Boxplot the two orders of French one-item question rating samples**

Therefore, according to the t-test, the two samples are not significantly different, so the order of the two questionnaires on noise sensitivity does not seem to influence the evaluation of the one-item question.

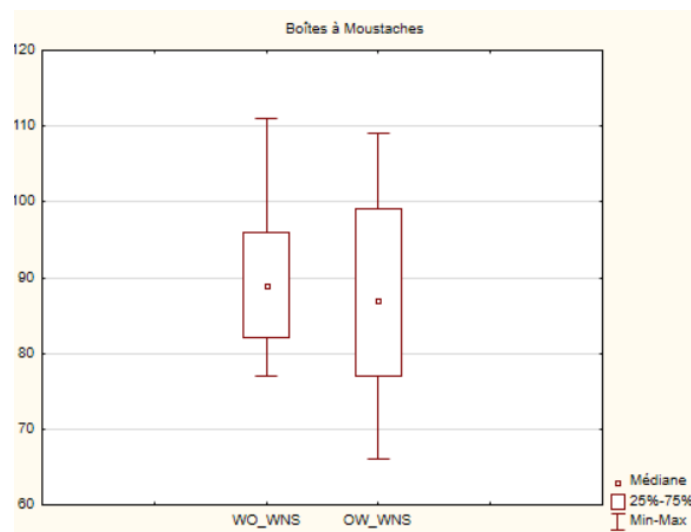
This hypothesis also needs to be tested on the basis of the results of the Weinstein noise sensitivity questionnaire. Unlike the single-item scale data, the Weinstein scores are not continuous metric data. In fact, the Weinstein noise sensitivity score is calculated by adding up the points obtained for the 21 items. Each question represents between 1 and 6 points, so the total score is between 21 and 126. However, due to the nature of the data, the scores cannot be averaged, so the t-test cannot be used. A non-parametric test, based on medians, can nevertheless be used, such as the U test or the Mann-Whitney test. [73] According to C. Howell [73], the non-parametric tests are more sensitive to the median than to the mean, and impose no distribution conditions. The Mann-Whitney test is one of them, and was chosen because it can be run on Statistica.

A Mann-Whitney test was therefore performed on the Weinstein noise sensitivity score. The scores were collected in a column, next to another column describing the order of the noise-sensitivity questionnaires (i.e. "WO" or "OW"). These two columns (table available in appendix 10 (TAB2)) were then added to Statistica to generate a Mann-Whitney test, the result of which is available in figure 6.

Test U de Mann-Whitney (+ correction de continuité (Feuille de données9)										
Par var. Order										
Tests significatifs marqués à p < .05000										
variable	SommeRgs WO	SommeRgs OW	U	Z	valeur p	Z ajusté	valeur p	N Actif WO	N Actif OW	2*(1-p) p exact
<b>WNS</b>	340,0000	255,0000	119,0000	0,845330	0,397927	0,846625	0,397205	18	16	0,402840

**Table 5 - Mann-Whitney U-test conducted on the two samples of Weinstein noise sensitivity scores**

Thus, according to the Mann-Whitney test (see Table 5), the two samples are not significantly different, which means that the order of the two noise sensitivity questionnaires has no impact on the participant's evaluation of the Weinstein questionnaire.



**Figure 5 - Boxplot of the two samples of Weinstein noise sensitivity scores**

In addition, as with the one-item question, the distribution of Weinstein noise sensitivity scores is wider for participants who answered first the one-item question. But, the difference of the medians is not significant.

Thus, according to the comparison tests, the order of the two noise sensitivity questionnaires in the pilot test proved to have no influence on the evaluation of questionnaires by the French participants.

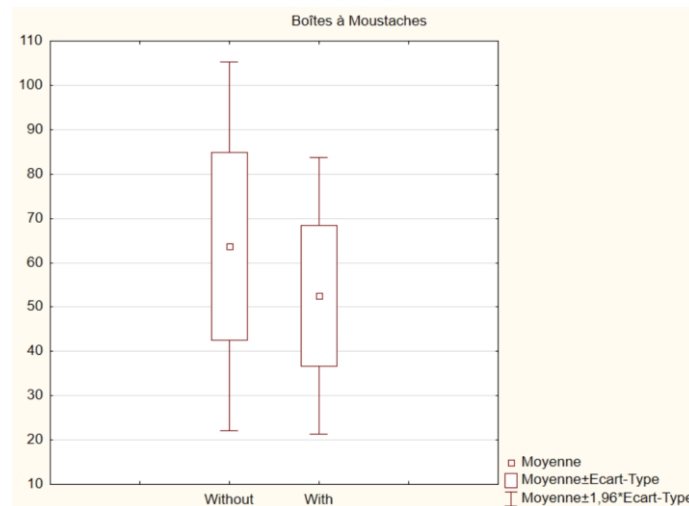
#### ii) Impact of using of “en général” in the one-item question

As there are no differences in the order of the questionnaires, we can test the second hypothesis of the study by considering two bigger sub-samples from the French sample.

The second hypothesis that the pilot test aimed to test was the influence of using “en général” in the French one item question. Thanks to the different surveys containing the two different wording of the one item question: “Are you sensitive to noise?” (in French, “Êtes-vous sensible au bruit ?”) and “Are you sensitive to noise in generally?” (Êtes-vous sensible au bruit en général ?”), two sub-

samples were obtained by aggregating and will be compared to assess whether or not they are significantly different.

As the data studied concern the responses to the one-item question, and are therefore metric, Student's t-test was used to compare the two samples. Variance homogeneity was checked, as detailed in part III)2)a)i).



**Figure 6 - Boxplot of the two samples of one item score**

The boxplot reveals a wider distribution of the response to the question without "in general", but this trend needs to be verified with a comparison test.

Groupe1 vs. Groupe2		Moyenne Groupe 1	Moyenne Groupe 2	valeur t	dl	p	N Actifs Groupe 1	N Actifs Groupe 2	Ec-Type Groupe 1	Ec-Type Groupe 2	Ratio F Variances	p Variances	Moy. 1 - Moy. 2	Confiance -95,000%	Confiance +95,000%
Without vs.	With	63,70000	52,57143	1,658474	32	0,106994	20	14	21,23577	15,92634	1,777886	0,291718	11,12857	-2,53951	24,79666

**Table 6 - T-test conducted on the two samples of one-item score**

According to the t-test (see Table 6), the difference is not significantly different, so the presence of "en général" in the one-item question does not influence participants' evaluation. The formulation "en général" is classically used in studies dealing with annoyance due to a specific noise source, in order to contextualize the question on noise sensitivity from a more general point of view. However, in our study, noise is approached from a general point of view, rather than by pointing to a specific source. The use of "in general" is therefore unnecessary, as confirmed by the t-test results. For the following analyses, these two French sub-samples were thus aggregated to consider only one sample of 34 participants.

### b) Correlations between 1-item, Weinstein and Benfield scores

Various correlations were also performed between noise sensitivity scores and different attributes such as demographics (age, gender), annoyance assessment and hyperacusis score. The noise

sensitivity scores tested are the Weinstein score and the single-item score, as measured directly in the pilot test, but also the Benfield noise sensitivity score can be considered, as it is a shorter version of the Weinstein scale (see I)B)1)b)), calculated by extracting the scores from Weinstein items 21, 18, 19, 7 and 8.

i) Correlation analysis between noise sensitivity scores

Firstly, the correlation between the three noise sensitivity scores was studied using Spearman's correlation. Indeed, L. Chanquoy [74] recommends using Spearman for non-metric variables, which is the case for the Weinstein and Benfield scores.

Coeffs de Corrélations de Rangs de Spearman (F Cellules à VM ignorées Corrélations significatives marquées à p < .05000			
Variable	Weinstein	One item	Benfield
Weinstein	1,000000	0,588163	0,891796
One item	0,588163	1,000000	0,599636
Benfield	0,891796	0,599636	1,000000

**Table 7 - Correlation matrix of noise sensitivity scores**

As the correlation matrix shows, the three noise sensitivity scores are all correlated with each other. The highest correlation is between the Weinstein and Benfield scores. This correlation of  $r=0,89$  is close to that obtained by Benfield et al [57] in their study of their 5-item questionnaire derived from the Weinstein scale ( $r= 0,86$  with  $p < .000$ , obtained on a sample of  $n=390$  college students and  $r= 0,91$  with  $p < ,000$  obtained on a sample of  $n=308$  college students and on a sample of  $n=202$  adults). The correlations between one-item question's scores and the Weinstein and Benfield scores are very similar.

ii) Correlation with age

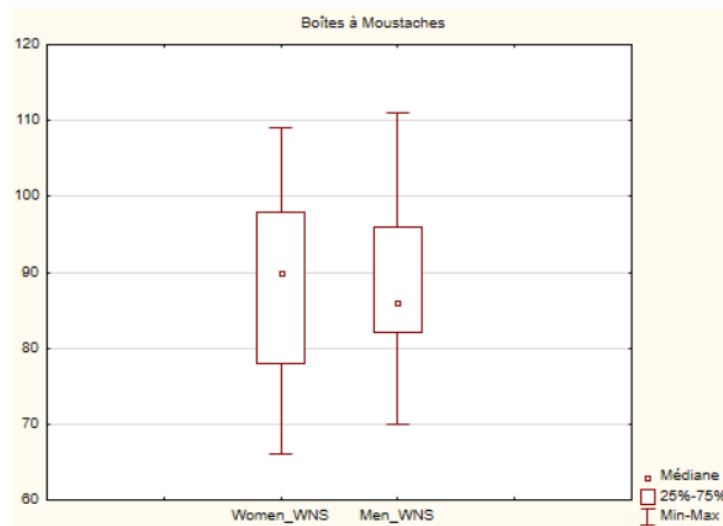
The correlation between age and the various noise sensitivity indicators was investigated, using Spearman correlation (see Table 6). Contrary to some studies (see I)2)b)), no significant correlation was found between age and noise sensitivity scores. However, this may be explained by the size of the sample or the lack of age distribution.

Coeffs de Corrélations de Rangs de Spearman (Feuille Cellules à VM ignorées Corrélations significatives marquées à p <,05000				
Variable	Weinstein	One item	Benfield	Age
Weinstein	1,000000	0,588163	0,891796	-0,037137
One item	0,588163	1,000000	0,599636	0,033195
Benfield	0,891796	0,599636	1,000000	0,064409
Age	-0,037137	0,033195	0,064409	1,000000

**Table 8 - Correlation matrix of noise sensitivity scores and age**

iii) Dependency on the respondent's sex

1) Weinstein



**Figure 7 - Box plot of women's and men's Weinstein scores**

Test U de Mann-Whitney (+ correction de continuité (Feuille de données5) Par var. Sex Tests significatifs marqués à p <,05000										
variable	SommeRgs Groupe 1	SommeRgs Groupe 2	U	Z	valeur p	Z ajusté	valeur p	N Actif Groupe 1	N Actif Groupe 2	2*(1-p) p exact
<b>Weinstein</b>	343,5000	251,5000	131,5000	0,364186	0,715719	0,364744	0,715303	19	15	0,706500

**Table 9 - Mann-Whitney U-test conducted on the two samples of Weinstein noise sensitivity scores**

As shown by the Mann-Whitney test, there is no significant difference between the Weinstein scores of women and men. However, the box plot reveals a wider distribution of the women's Weinstein score. This could be explained by the larger number of female participants (19 women vs. 15 men).

2) One item

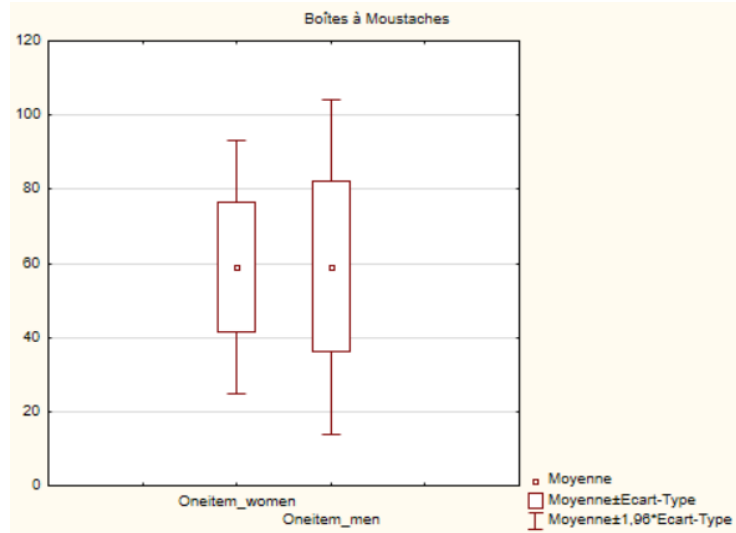


Figure 8 - Box plot of women's and men's One item scores

Test t pour des Echantillons Indépendants (Feuille de données49)											
Note : Variables traitées comme des échantillons indépendants											
Groupe1 vs. Groupe2	Moyenne Groupe 1	Moyenne Groupe 2	valeur t	dl	p	N Actifs Groupe 1	N Actifs Groupe 2	Ec-Type Groupe 1	Ec-Type Groupe 2	Ratio F Variances	p Variances
Oneitem_women vs. Oneitem_men	59,10526	59,13333	-0,004050	32	0,996794	19	15	17,44482	23,00269	1,738699	0,268158

Table 10 - Student's t-test conducted on the two samples of one item scores

Once again, no significant difference is revealed by the comparison test (here t-test), and the means of the two groups are very close (mean=59,10 for women and mean=59,11 for men). This time, it's the men's scores that show a wider distribution than those of the women.

3) Benfield

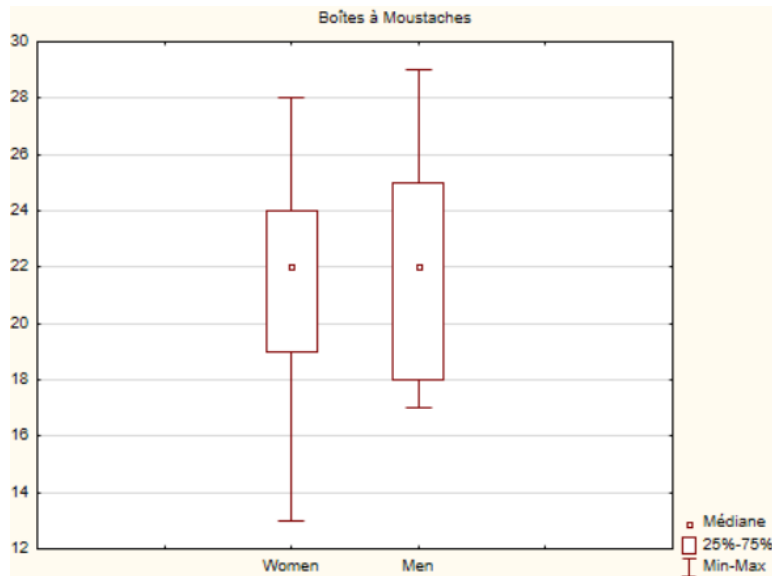


Figure 9 - Box plot of women's and men's Benfield scores

Test U de Mann-Whitney (+ correction de continuité (Feuille de données24))									
Par var. Sex									
Tests significatifs marqués à p <,05000									
variable	SommeRgs Groupe 1	SommeRgs Groupe 2	U	Z	valeur p	Z ajusté	valeur p	N Actif Groupe 1	N Actif Groupe 2
Benfield	318,0000	277,0000	128,0000	-0,485582	0,627264	-0,487748	0,625729	19	15

**Table 11 - Mann-Whitney U-test conducted on the two samples of Benfield scores**

The Mann-Whitney test did not reveal any significant difference. The medians of the two samples are very close.

Thus, gender had revealed no influence on the assessment of noise sensitivity.

iv) Correlation with annoyance

Coeffs de Corrélations de Rangs de Spearman (Feuille d Cellules à VM ignorées Corrélations significatives marquées à p <,05000				
Variable	Weinstein	One item	Benfield	Annoyance
Weinstein	1,000000	0,588163	0,891796	0,420827
One item	0,588163	1,000000	0,599636	0,416304
Benfield	0,891796	0,599636	1,000000	0,394318
Annoyance	0,420827	0,416304	0,394318	1,000000

**Table 12 - Correlation matrix of noise sensitivity scores and annoyance**

The correlation matrix shows that annoyance due to road traffic is correlated with all three noise sensitivity scores. The three correlation coefficients are very close to each other, close to 0,40 ( $r_{\text{Weinstein}}=0,42$ ,  $r_{\text{one\_item}}=0,42$  and  $r_{\text{Benfield}}=0,39$ ). These results confirm the link between noise annoyance and noise sensitivity, already highlighted by several studies [8, 9, 10, 50].

v) Correlation with hyperacusis

Coeffs de Corrélations de Rangs de Spearman (Feuille de données2) Cellules à VM ignorées Corrélations significatives marquées à p <,05000						
Variable	Annoyance	Benfield	One item	Weinstein	HIQ	SSSQ
Annoyance	1,000000	0,394318	0,416304	0,420827	0,125185	0,197123
Benfield	0,394318	1,000000	0,599636	0,891796	0,224907	0,036183
One item	0,416304	0,599636	1,000000	0,588163	0,261766	0,474579
Weinstein	0,420827	0,891796	0,588163	1,000000	0,332133	0,066879
HIQ	0,125185	0,224907	0,261766	0,332133	1,000000	0,361440
SSSQ	0,197123	0,036183	0,474579	0,066879	0,361440	1,000000

**Table 13 - Correlation matrix of noise sensitivity scores and hyperacusis scores**

For hyperacusis scores, the correlation with noise sensitivity is less clear and less obvious. Indeed, HIQ scores are only correlated with the other SSSQ score, which is to be expected, but not with any



noise sensitivity or annoyance scores. As for the SSSQ scores, they are also correlated with the single-item noise sensitivity rating. It is therefore difficult to establish a correlation between noise sensitivity or annoyance and hyperacusis. As the hyperacusis questionnaires will be used in the actual survey as well, it will be possible to study the relationship between hyperacusis and noise sensitivity and annoyance on a larger sample.

### *c) Conclusions*

Thus, the two hypotheses were tested, one concerning the influence of questionnaire order on noise sensitivity, and the other the presence of "en général" in the one-item question. According to the comparison tests, these two variables do not seem to have significant impact on the participants' evaluation. This is why, for the actual survey, it was decided to use the one-item question in all language versions without the suffix "en général"/"in general", in order to elicit the same meaning for all languages. With regard to the influence of the order of noise sensitivity questionnaires, the German data also had to be examined before making a choice. The same analysis was therefore carried out on these data, and is available in the appendix 7. French correlation analysis also showed some interesting results, particularly with regard to hyperacusis scores and annoyance. However, once again, the whole data set needs to be considered to reach a conclusion.

To draw more solid conclusions, the analysis of aggregated data will be more interesting, as it will provide a larger sample, but before doing so, we need to make sure we can combine the French and German samples. This will be verified in the next section.

## **C) Aggregation of French and German data**

### **1) Feasibility of reconciliation**

In order to obtain a larger sample, reconciliation of the data, i.e. considering all German and French data as a single sample, was considered. However, prior to reconciliation, comparison tests (Student and Mann-Whitney tests) were carried out between the German and French samples for each significant information: noise sensitivity scores (Weinstein, one item and Benfield), annoyance and hyperacusis rating (HIQ and SSSQ). The results of these various tests are available in the appendix 11, and show no significant differences in any of these scores between the German and French data. Thus, the two sets of data could be combined, creating a sample of 68 people, whose characteristics are described in part III)A)3)c).

Since the present comparison of the pilot data obtained on two samples did not reveal any significant differences in the assessment of noise sensitivity between French and German participants, this might suggest - bearing in mind the lack of statistical power due to the small sample sizes - that this assessment does not vary according to the languages or countries studied, which would confirm the possibility of finding a standard for the assessment of noise sensitivity. However, this conclusion needs to be examined in depth, particularly in relation to other languages and cultures.

2) Results of the reconciliation

a) Demographics

Thus, the same type of analysis as that carried out on the separate German and French data, was carried out on the sample of 68 people from both France and Germany. As the method remains the same as for the rest of the analysis, only the results will be presented in this section.

The first analysis focused on correlation with demographic data. A correlation was established between the various noise sensitivity scores and age. For the Weinstein and Benfield tests, a Spearman correlation was used, as the data are categorical. For single-item scores, a Bravais-Pearson correlation was established, as the data are metric.

Coeffs de Corrélations de Rangs de Spearman Cellules à VM ignorées Corrélations significatives marquées à p < ,0500			
Variable	Weinstein	Benfield	Age
Weinstein	1,000000	0,836955	0,123235
Benfield	0,836955	1,000000	0,120102
Age	0,123235	0,120102	1,000000

Table 14 - Correlation matrix of Weinstein and Benfield score and age

Corrélations (Feuille de données18) Corrélations significatives marquées à p < ,0500 N=68 (Observations à VM ignorées)		
Variable	Age	Oneitem
Age	1,0000	,0182
	p= ---	p=,883
Oneitem	,0182	1,0000
	p=,883	p= ---

Table 15 - Correlation matrix of one item score and age

None of these analyses revealed a correlation between age and noise sensitivity score, as was the case for the German and French samples separately. The same conclusions were drawn for the

gender variable, for which the Student and Mann Whitney tests are available in the appendix 12. Indeed, as for the German and French samples, no significant difference was found between the noise sensitivity results of women and men (i.e. Weinstein, Benfield and one item).

*b) Hypothesis: potential order effect*

Given the hypothesis concerning the potential order effect created by the use of two noise sensitivity questionnaires, this issue was also addressed by considering the full sample. To this end, the two samples, that of those who responded first to the Weinstein questionnaire ( $n=36$ ) and that of participants who responded first to the single-item question ( $n=32$ ), were compared using comparison tests.

Test t pour des Echantillons Indépendants (Feuille de données80)											
Note : Variables traitées comme des échantillons indépendants											
Groupe1 vs. Groupe2	Moyenne Groupe 1	Moyenne Groupe 2	valeur t	dl	p	N Actifs Groupe 1	N Actifs Groupe 2	Ec-Type Groupe 1	Ec-Type Groupe 2	Ratio F Variances	p Variances
WO_1item vs. OW_1item	60,83333	59,59375	0,245222	66	0,807046	36	32	16,50541	24,78014	2,254005	0,021038

**Table 16 - Student t-test conducted on the two samples of One item score**

Test U de Mann-Whitney (+ correction de continuité (Feuille de données76))										
Par var. Order										
Tests significatifs marqués à $p < ,05000$										
variable	SommeRgs WO	SommeRgs OW	U	Z	valeur p	Z ajusté	valeur p	N Actif WO	N Actif OW	2*(1-p) p exact
WNS	1304,000	1042,000	514,0000	0,755640	0,449866	0,756138	0,449567	36	32	0,452338

**Table 17 - Mann-Whitney U-test conducted on the two samples of Weinstein score**

Once again, no significant differences were found between the two samples, confirming the results obtained for the French and German samples. Thus, showing that there is no order effect induced by the use of two different questionnaires to measure noise sensitivity.

*c) Correlations*

Coeffs de Corrélations de Rangs de Spearman (Feuille de données6)						
Cellules à VM ignorées						
Corrélations significatives marquées à $p < ,05000$						
Variable	One item	Weinstein	Annoyance	HIQ	SSSQ	Benfield
One item	1,000000	0,639662	0,406550	0,461217	0,533542	0,686278
Weinstein	0,639662	1,000000	0,405104	0,497188	0,235788	0,836955
Annoyance	0,406550	0,405104	1,000000	0,232013	0,235576	0,371969
HIQ	0,461217	0,497188	0,232013	1,000000	0,537687	0,409226
SSSQ	0,533542	0,235788	0,235576	0,537687	1,000000	0,214336
Benfield	0,686278	0,836955	0,371969	0,409226	0,214336	1,000000

**Table 18 - Summarizing correlation matrix**

Finally, to study the various correlations with the other aspects (hyperacusis, annoyance) studied in the survey, a synthetic correlation matrix was created. Firstly, it confirms the results obtained with the German and French samples concerning the correlation between noise sensitivity scores

and annoyance. Indeed, these two notions appear to be correlated, albeit with a fairly low correlation coefficient. More surprising, however, are the results for hyperacusis. Unlike the French sample, the full sample reveals a correlation between the HIQ score and all noise sensitivity scores. The SSSQ score, on the other hand, remains correlated only with the score of one item and the HIQ.

### 3) Conclusion and discussions

Finally, the analysis of the full sample confirms the results of the analyses of the French and German samples. Most of the results are fairly consistent with previous studies, particularly with regard to noise annoyance, which confirms the link between noise annoyance and noise sensitivity, already highlighted by several studies [8], [9], [10], [50]. Furthermore, even though the samples studied are small, the correlation coefficients obtained are of the same order of magnitude as those obtained by previous studies carried out on larger samples. For example, Marquis-Favre et al. obtained an  $r=0.37$  coefficient for the correlation between annoyance due to road traffic and sensitivity to noise in a study conducted on 702 participants [75]. However, the correlation with hyperacusis is more difficult to conclude, as the two hyperacusis questionnaires are not correlated with the noise sensitivity score. Indeed, while the HIQ score showed a fairly good correlation with the noise sensitivity scores, the SSSQ score correlated only with the scores of a single item. On the other hand, with regard to the noise sensitivity scores obtained from the three scales considered (Weinstein, Benfield and one item), they all appear valid and consistent, since they correlate well with each other. Correlation with demographic data revealed no significant trends. However, the influence of age or gender on noise sensitivity is a matter of debate, with some studies suggesting a correlation [44], others not [6] [45]. The results based on the pilot trial data are therefore not inconsistent.

As the aim of the pilot test was primarily to check that the online survey worked well, and to test the two hypotheses, let's see what changes and conclusions result from analysis of the pilot test data.

First of all, the online survey, coded on the Sosci survey, worked very well. As far as the feedback section is concerned, no participant mentioned any major bugs or comprehension problems. As a result, no changes were made to the layout of the survey. The survey used for the pilot test was kept as a working basis, and was then supplemented by other questionnaires and noise sensitivity scales. However, no questionnaires or questions were removed from the pilot test survey for the real survey.

With regard to the two hypotheses studied, two different conclusions were drawn. Firstly, concerning the wording of the French one-item question, it was decided to keep a single wording for all participants, without "en général". In fact, as the responses did not differ significantly regardless of the wording, and as the German and English questions were asked without "en général", the choice was to keep common wording for all future data collections during the survey. Based on the feedback from participants, the visual analog scale used for the one-item scale would be slightly modified, with the addition of gradations leading to an interval scale in order to help the participants for a better usability. On the other hand, for the other hypothesis, i.e. the search for the existence of an order effect induced by the presence of two noise sensitivity questionnaires, the result was different. Although no order effect was detected for the two questionnaires in the pilot test, the addition of new noise-sensitivity questionnaires in the actual survey could amplify the order effect. In addition, as the added questionnaires (NoiSeQ and LEF) are particularly long, a fatigue effect could also be observed. This is why, as in the pilot test, a Latin square should have to be considered in the actual survey to randomize the order of the noise sensitivity questionnaires.

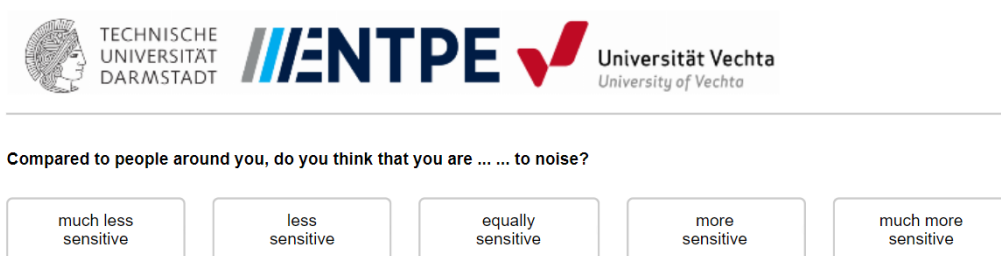
Thereby, the pilot test achieved its main objectives and enabled the survey to be improved and to be launched with several successive 'waves' of samples totaling approximately 1000 participants from the UK, France, Germany and South Korea. This analysis of the initial data from the UK sample results is presented below.

## IV) Study 2: Online survey with 311 UK participants

### A) Presentation of the survey

#### 1) Method

The structure of the survey remained the same as for the pilot test, with the exception of the addition of four noise sensitivity questionnaires and five noise annoyance questions relating to other sources than road-traffic noise (as in the pilot). The noise sensitivity questionnaires added are the LEF (see I)B)2)), the NoiSeQ (see I)B)3)) and a one-item scaled question by Kodji et al. (2023) [67], asking participants to compare their own sensitivity to noise with that of people around them (the question, as worded in the survey, is available in Figure 19). The other one-item scale has been slightly modified, with the addition of gradations in the rating scale for better usability. Regarding NoiSeQ questionnaire, the version used in the survey included only 35 items, as in the original. Since item 17 (“I am sensitive to noise”) of the NoiSeQ questionnaire (which is included in some versions of the NoiSeQ circulated) was the same as Weinstein's item 21, it was chosen to delete it in order to avoid repetition. However, after studying the NoiSeQ questionnaire, it was found that 19 items were nearly identical to the corresponding LEF items by which they were inspired. These items will be used to clean up the participants' data, as discussed in the next section.



The image shows a survey question with a header and five response options. The header includes logos for Technische Universität Darmstadt, ENTPE, and Universität Vechta. The question text is: "Compared to people around you, do you think that you are ... to noise?". Below the question are five buttons with the following labels: "much less sensitive", "less sensitive", "equally sensitive", "more sensitive", and "much more sensitive".

TECHNISCHE UNIVERSITÄT DARMSTADT    ENTPE    Universität Vechta  
University of Vechta

Compared to people around you, do you think that you are ... to noise?

much less sensitive    less sensitive    equally sensitive    more sensitive    much more sensitive

**Figure 10 - One item question taken from Kodji et al, (2023)**

For the French translation of the added scales, the French translation of the NoiSeQ, made available to us by Mark Brink, was used. To respect gender neutrality, a slightly modified version was produced by the research team. For the new one-item scale, the formulation of Kodji et al [67] was used, see Fig. 19. For the LEF, in the same way as for the translation of the HIQ and SSSQ, the method of Zhong et al [34] was employed. Two bilingual French-German speakers realized two separate translations which they then reconciled. Their translation was then modified by the two French members of the research team to make it gender-neutral. The questionnaires used in the actual survey, and the changes made to them, are available in the appendices.

Following the pilot test method, the noise sensitivity questionnaires, with the exception of the question by Kodji et al [67] which was always presented as the last noise-sensitivity instrument, were presented to participants in random order, using the Latin square balancing method. The six annoyance questions relating to six different noise sources (road traffic, railroads, aircraft, industrial noise, construction noise and neighborhood noise) were also randomized by a Latin square set up by Eunsung Song. By combining the 4x4 with the 6x6 Latin square, the final survey consisted of 24 different possible orders, depicted in Figure 11.

1	Dem	Weinstein	LEF	NoiseQ	One item	COMP	HIQ	SSSQ	AN01	Road-traffic	Railway	Aircraft	Industrial	Construction	Neighborhood
2									AN02	Railway	Industrial	Road-traffic	Neighborhood	Aircraft	Construction
3									AN03	Industrial	Neighborhood	Railway	Construction	Road-traffic	Aircraft
4									AN04	Neighborhood	Construction	Industrial	Aircraft	Railway	Road-traffic
5									AN05	Construction	Aircraft	Neighborhood	Road-traffic	Industrial	Railway
6									AN06	Aircraft	Road-traffic	Construction	Railway	Neighborhood	Industrial
7	Dem	LEF	One item	Weinstein	NoiseQ	COMP	HIQ	SSSQ	AN01	Road-traffic	Railway	Aircraft	Industrial	Construction	Neighborhood
8									AN02	Railway	Industrial	Road-traffic	Neighborhood	Aircraft	Construction
9									AN03	Industrial	Neighborhood	Railway	Construction	Road-traffic	Aircraft
10									AN04	Neighborhood	Construction	Industrial	Aircraft	Railway	Road-traffic
11									AN05	Construction	Aircraft	Neighborhood	Road-traffic	Industrial	Railway
12									AN06	Aircraft	Road-traffic	Construction	Railway	Neighborhood	Industrial
13	Dem	One item	NoiseQ	LEF	Weinstein	COMP	HIQ	SSSQ	AN01	Road-traffic	Railway	Aircraft	Industrial	Construction	Neighborhood
14									AN02	Railway	Industrial	Road-traffic	Neighborhood	Aircraft	Construction
15									AN03	Industrial	Neighborhood	Railway	Construction	Road-traffic	Aircraft
16									AN04	Neighborhood	Construction	Industrial	Aircraft	Railway	Road-traffic
17									AN05	Construction	Aircraft	Neighborhood	Road-traffic	Industrial	Railway
18									AN06	Aircraft	Road-traffic	Construction	Railway	Neighborhood	Industrial
19	Dem	NoiseQ	Weinstein	One item	LEF	COMP	HIQ	SSSQ	AN01	Road-traffic	Railway	Aircraft	Industrial	Construction	Neighborhood
20									AN02	Railway	Industrial	Road-traffic	Neighborhood	Aircraft	Construction
21									AN03	Industrial	Neighborhood	Railway	Construction	Road-traffic	Aircraft
22									AN04	Neighborhood	Construction	Industrial	Aircraft	Railway	Road-traffic
23									AN05	Construction	Aircraft	Neighborhood	Road-traffic	Industrial	Railway
24									AN06	Aircraft	Road-traffic	Construction	Railway	Neighborhood	Industrial

Figure 11 – Sequence of tasks in the survey

This section will focus solely on the data collection carried out on English speakers living in the UK, which was the first to be carried out. This data collection has been realized on Prolific, a web survey platform. The survey, as presented to participants, is available in appendices 4 and 5. The French translations of the questionnaires, including the changes made to the original questionnaires, are also available in Appendix 13. The survey takes between 15 and 30 minutes to complete.

## 2) Participants

The survey was carried out on a sample of 311 English speakers living in the UK. The participants were paid. The data cleaning (detailed in the next part) resulted in a sample of 305 people, including 158 women, 146 men and 1 non-binary person. The average age is 46,30, with a standard deviation of 13,22. The ages of participants were distributed as follow.

Age category	
18-24	34
25-34	53
35-44	51
45-54	53
55-100	120
<b>Total</b>	<b>311</b>

*Table 19 - Age distribution of the UK sample (before 'data cleaning')*

The survey was presented in 24 different orders, randomly assigned to participants. The randomization implemented on Sosci Survey led to a good overall distribution of the 24 orders, with surveys presented between 11 and 14 times to participants (as noticeable in Table 20). This will enable us to study the potential order effect, as was done with the pilot test, but this time with more and longer questionnaires.

<b>Case</b>	1	2	3	4	5	6	7	8	9	10	11	12	<b>Mean</b>
<b>Number</b>	12	13	13	14	12	12	13	13	13	14	11	13	<b>12,96</b>
<b>Case</b>	13	14	15	16	17	18	19	20	21	22	23	24	<b>Theoretical mean</b>
<b>Number</b>	14	14	13	13	14	13	13	13	12	14	13	12	<b>12,96</b>

*Table 20 - Number of occurrences of the 24 orders of questionnaires*

## B) Results

### 1) Data cleaning

Data collection was carried out on a sample of 311 English-speaking people living in the United Kingdom. Prolific provided a representative sample of the English population in terms of age and gender. However, before starting correlation and comparison analyses, as data collection was carried out online, data cleaning was necessary. Indeed, as mentioned by Leiner [76], while data collection over the Internet is very useful as it allows a large and inexpensive sample of participants to be obtained, it also leads to a greater number of invalid responses, which are also more difficult to detect. Although invalid responses are not specific to online surveys, they are more likely to occur on the Internet. A web page can give respondents a lower sense of responsibility than a printed questionnaire, and submitting an online questionnaire requires much less effort than submitting a printed questionnaire in the form of a letter. In order to remove unreliable results from our sample, several criteria were examined. Firstly, as recommended by Leiner [76] the time taken by participants to complete the survey was studied. Indeed, a response time that is too short may be considered suspect. For instance, our Case 2083, which had the



shortest response time of around 5min30s (328s), was removed from the UK sample. The research team felt that it was not possible to read all questions and complete the entire questionnaire in such a short time. However, as the other short times were around 7 minutes, it was difficult to determine whether the participants were simply quick and used to this type of survey, or whether they had cheated. Following a recommendation by Leiner [76], two participants were excluded based on unrealistically short completion times. In addition, a second exclusion method was used.

Actually, the answers to the 19 nearly identical NoiSeQ and LEF items, mentioned before, were compared to determine which cases should be deleted from the data set. Pearson correlation coefficients between each participant's LEF and NoiSeQ responses to the 19 items were calculated, to determine whether they responded in a similar manner to repeated questions. It was then decided that only those yielding negative correlation coefficient for these 19 items would be deleted from the dataset. This, concerned 5 participants (the values are available in appendix 14), one of whom also had very low response times (as case 2083). For these 5 participants, Kendall tests and Spearman correlation coefficient were also carried out (available in appendix 15), which also revealed no significant correlation between the 19 items. Thus, the data of 2+5-1=6 participants were excluded from further analysis.

This data cleaning leaves a sample of 305 people, described in section VI)A)2).

## 2) Correlation analysis

### a) Between questionnaires

Correlation analyses, using Spearman's correlation, were carried out on the sample of 305 people, and on the various questionnaires included in the survey. The summary matrix is available in table 21. This matrix shows the existence of a correlation relationship between all the noise sensitivity questionnaires tested (Weinstein, one-item scale referred hereafter to as "Slider", NoiSeQ, LEF, Benfield and the Kodji et al scale, referred to as "COMP" in the table), the hyperacusis questionnaire (HIQ and SSSQ) and the road traffic annoyance question.

Coeffs de Corrélations de Rangs de Spearman (Feuille de données20)									
Cellules à VM ignorées									
Corrélations significatives marquées à p <.05000									
Variable	WNS	SLIDER	NOISEQ	LEF	COMP	HIQ	SSSQ	ANN_ROAD	Benfield
WNS	1,000000	0,645072	0,867536	0,827549	0,637855	0,474043	0,396163	0,321975	0,940052
SLIDER	0,645072	1,000000	0,624072	0,619417	0,703899	0,420333	0,396288	0,253488	0,663035
NOISEQ	0,867536	0,624072	1,000000	0,928295	0,593262	0,484789	0,383179	0,295478	0,829494
LEF	0,827549	0,619417	0,928295	1,000000	0,586046	0,488995	0,379628	0,288554	0,795022
COMP	0,637855	0,703899	0,593262	0,586046	1,000000	0,468152	0,421629	0,247632	0,654583
HIQ	0,474043	0,420333	0,484789	0,488995	0,468152	1,000000	0,731431	0,417985	0,485398
SSSQ	0,396163	0,396288	0,383179	0,379628	0,421629	0,731431	1,000000	0,400216	0,394094
ANN_ROAD	0,321975	0,253488	0,295478	0,288554	0,247632	0,417985	0,400216	1,000000	0,299321
Benfield	0,940052	0,663035	0,829494	0,795022	0,654583	0,485398	0,394094	0,299321	1,000000

**Table 21 - Summarizing correlation matrix for the UK sample**

The Weinstein, Benfield and NoiSeQ scores show the highest correlations with the rest of the variables tested (other noise-sensitivity questionnaires, hyperacusis and road traffic annoyance). They are closely followed by the LEF questionnaire, which shows a very good correlation with the NoiSeQ score (0,928,  $p < 0,05000$ ), probably due to the 19 LEF items that have been included in the construction of the NoiSeQ. Next come the two one-item questions, the slider and the comparison question, which have lower correlation coefficients. Next, the hyperacusis questionnaires (HIQ and SSSQ) show a lower correlation, particularly with the one-item scale (slider and comparison). Finally, the road traffic annoyance assessment is the variable with the lowest correlation with the rest of the measured data.

Indeed, in terms of questionnaire length and correlation with other indicators, the Benfield questionnaire seems to be one of the best solutions for measuring noise sensitivity, as it is highly correlated with the scores of the rest of the noise sensitivity questionnaires. The Weinstein questionnaire is also reliable, but longer than the Benfield one. However, this depends on the variable being studied. Indeed, for hyperacusis, the LEF and NoiseQ are the most sensitive scales to the HIQ, while the comparison scale of Kodji et al (2023) shows the best correlation of all noise sensitivity questionnaires with the SSSQ. On the other hand, for annoyance due to road traffic, the Weinstein questionnaire appears to be the most correlated, with a Spearman correlation coefficient of 0,322 ( $p < 0,0500$ ).

Interesting results are emphasized by this data analysis. Indeed, all the questionnaires and scales used in the survey reveal strengths and weaknesses, depending on the characteristic under study (noise sensitivity, hyperacusis or annoyance). None of the questionnaires is therefore better than the others, although the Benfield questionnaire appears to be a very suitable and reliable solution for measuring noise sensitivity, since it has a high Pearson correlation coefficient with the other noise sensitivity questionnaires, and a good correlation with annoyance. Moreover, this questionnaire is very short, containing just 5 questions.

### *b) Demographics*

In addition, correlations between demographics inquiries (sex and age) and the other variables (noise sensitivity, hyperacusis and traffic annoyance) were established.

Variable	SEX	AGE
SEX	1,000000	-0,004074
AGE	-0,004074	1,000000
WNS	-0,107707	0,062745
Slider	-0,157886	0,079759
HIQ	-0,094287	-0,188193
SSSQ	-0,056609	-0,161429
ANN	0,013015	-0,234734
Benfield	-0,101693	0,047149
NoiseQ	-0,122132	0,169044
LEF	-0,107283	0,140861
COMP	-0,077132	0,015126

**Table 22 - Extract of the correlation matrix of noise sensitivity score, hyperacusis scores and annoyance rating with age**

Gender showed a small but significant influence on noise sensitivity scores calculated with the one-item Slider scale and the NoiseQ. To confirm this correlation, Mann-Whitney tests were performed on the Slider and NoiseQ scores, to detect whether the male and female samples were significantly different. For both scores, the Mann-Whitney tests revealed the existence of a significant difference between men and women. However, as the correlation analysis shows, the correlation remains fairly weak.

Test U de Mann-Whitney (+ correction de continuité (Feuille de données17)) Par var. SEX Tests significatifs marqués à p <,05000									
variable	SommeRgs Groupe 1	SommeRgs Groupe 2	U	Z	valeur p	Z ajusté	valeur p	N Actif Groupe 1	N Actif Groupe 2
Slider	20192,00	26168,00	9461,000	-2,70664	0,006797	-2,71139	0,006700	146	158

**Table 23 - Mann-Whitney U-test conducted on the two samples of slider score**

Test U de Mann-Whitney (+ correction de continuité (Feuille de données17)) Par var. SEX Tests significatifs marqués à p <,05000									
variable	SommeRgs Groupe 1	SommeRgs Groupe 2	U	Z	valeur p	Z ajusté	valeur p	N Actif Groupe 1	N Actif Groupe 2
NoiseQ	20639,00	25721,00	9908,000	-2,12287	0,033766	-2,12334	0,033726	146	158

**Table 24 - Mann-Whitney U-test conducted on the two samples of NoiSeQ score**

As in the pilot test, neither the Weinstein score nor any one-item score correlated with age. Nevertheless, the NoiSeQ and LEF scores do significantly correlate with age, although the correlation coefficients are quite low ( $r=0,17$  and  $r=0,14$  respectively,  $p<0,05000$ ). Hyperacusis scores and annoyance assessment also show a significant but weak inverse correlation with age. This means that hyperacusis and annoyance scores tend to decrease with age. However, as the correlations are very weak (but significant) and the graphs (available in the appendix 16) do not reveal any clear correlation either, this conclusion cannot be drawn with certainty and requires further research.

*c) Other aspects*

As the survey questions also cover topics such as hearing impairment, hearing difficulties, and the size and noise level of the city where the participants live, these data will be examined in this section. This part will also examine the potential order effect induced by the numerous questionnaires.

Firstly, with regard to hearing impairment and tinnitus, in their study on aspects influencing noise annoyance, Nie et al [62] found that annoyance due to noise decreases in the 18-30 age bracket, then after the age of 30, annoyance decreases steadily with age [62]. This reduction in annoyance may be due to the decrease in sensory acuity with aging, however, some forms of hearing loss may increase perceived loudness and thus increase noise sensitivity and annoyance [62]. In order to further investigate the relationship between hearing loss and noise annoyance or sensitivity, the other data collected in the survey were studied, especially since questions on hearing disorders and tinnitus were asked during the survey. In fact, three questions on possible hearing problems of the participants were asked during the survey, formulated as follows: "Do you have tinnitus/ringing in the ears?", "Do you currently have hearing difficulties?", "Has a hearing impairment been medically diagnosed?". Their answers (yes or no), along with information about the size and noise level of the city where the participant lives, were studied using correlation analysis. Spearman's correlation between annoyance, noise sensitivity scores (Weinstein and one item), hearing data and information about city size and noise was calculated.

Coeffs de Corrélations de Rangs de Spearman (Feuille de données4)  
Cellules à VM ignorées  
Corrélations significatives marquées à p < .05000

Variable	Tinnitus_UK	City_size_UK	City_noise_UK	WNS	One item	Annoyance	Hear_dif_UK	Hear_med_UK
Tinnitus_UK	1,000000	0,085429	0,080936	-0,046580	-0,094283	-0,097846	0,282897	0,221279
City_size_UK	0,085429	1,000000	-0,480868	-0,149682	-0,089151	0,158257	0,051231	-0,009930
City_noise_UK	0,080936	-0,480868	1,000000	0,053740	-0,024412	-0,459813	0,082985	0,061935
WNS	-0,046580	-0,149682	0,053740	1,000000	0,645072	0,321975	-0,008762	0,026343
One item	-0,094283	-0,089151	-0,024412	0,645072	1,000000	0,253488	-0,056783	-0,020410
Annoyance	-0,097846	0,158257	-0,459813	0,321975	0,253488	1,000000	-0,090938	-0,060770
Hear_dif_UK	0,282897	0,051231	0,082985	-0,008762	-0,056783	-0,090938	1,000000	0,569841
Hear_med_UK	0,221279	-0,009930	0,061935	0,026343	-0,020410	-0,060770	0,569841	1,000000

**Table 25 – Summarizing correlation matrix of the UK sample with other parameters**

The analysis revealed a moderate correlation ( $r_{UK}=-0,46$ ,  $p<0,05$ ) between annoyance and the noise level of the city where participants live. The rating of the question was as follow: the minimal score “1” corresponded to “very noisy” and the maximal score “5” to “very calm”. Thus, the correlation showed that the more the participants considered the place where they live noisy, the more they tend to be annoyed by road traffic noise. This observation can appear rather logical as, when rating the noise level of their living area, people will probably consider indoor and outdoor noise, such as road traffic noise.

For noise sensitivity, only tinnitus showed an influence on the one-item score: tinnitus sufferers tended to have a higher noise-sensitivity score on the one-item scale. Other hearing items (hearing impairment and hearing diagnosed difficulties) had no impact on noise sensitivity scores.

Finally, the impact of questionnaire order was examined. The only aspect that seems to be affected by the order of the questionnaires is the Benfield score (see Table 26). However, this correlation is not really relevant because the Benfield questionnaire was not taken into account in the Latin square as it is an extract from the Weinstein questionnaire.

Coeffs de Corrélations de Rangs de Spearman (Feuille de données17)												
Cellules à VM ignorées												
Corrélations significatives marquées à p < .05000												
Variable	SEX	ORDER	AGE	WNS	Slider	HIQ	SSSQ	ANN	Benfield	NoiseQ	LEF	COMP
SEX	1,000000	0,004019	-0,004074	-0,107707	-0,157886	-0,094287	-0,056609	0,013015	-0,101693	-0,122132	-0,107283	-0,077132
ORDER	0,004019	1,000000	-0,057262	-0,083025	-0,104725	-0,080012	-0,096503	-0,054064	-0,129288	-0,088683	-0,110066	-0,032210
AGE	-0,004074	-0,057262	1,000000	0,062745	0,079759	-0,188193	-0,161429	-0,234734	0,047149	0,169044	0,140861	0,015126
WNS	-0,107707	-0,083025	0,062745	1,000000	0,645072	0,474043	0,396163	0,321975	0,940052	0,867536	0,827549	0,637855
Slider	-0,157886	-0,104725	0,079759	0,645072	1,000000	0,420333	0,396288	0,253488	0,663035	0,624072	0,619417	0,703899
HIQ	-0,094287	-0,080012	-0,188193	0,474043	0,420333	1,000000	0,731431	0,417985	0,485398	0,484789	0,488995	0,468152
SSSQ	-0,056609	-0,096503	-0,161429	0,396163	0,396288	0,731431	1,000000	0,400216	0,394094	0,383179	0,379628	0,421629
ANN	0,013015	-0,054064	-0,234734	0,321975	0,253488	0,417985	0,400216	1,000000	0,299321	0,295478	0,288554	0,247632
Benfield	-0,101693	-0,129288	0,047149	0,940052	0,663035	0,485398	0,394094	0,299321	1,000000	0,829494	0,795022	0,654583
NoiseQ	-0,122132	-0,088683	0,169044	0,867536	0,624072	0,484789	0,383179	0,295478	0,829494	1,000000	0,928295	0,593262
LEF	-0,107283	-0,110066	0,140861	0,827549	0,619417	0,488995	0,379628	0,288554	0,795022	0,928295	1,000000	0,586046
COMP	-0,077132	-0,032210	0,015126	0,637855	0,703899	0,468152	0,421629	0,247632	0,654583	0,593262	0,586046	1,000000

**Table 26 - Summarizing correlation matrix of the UK sample**

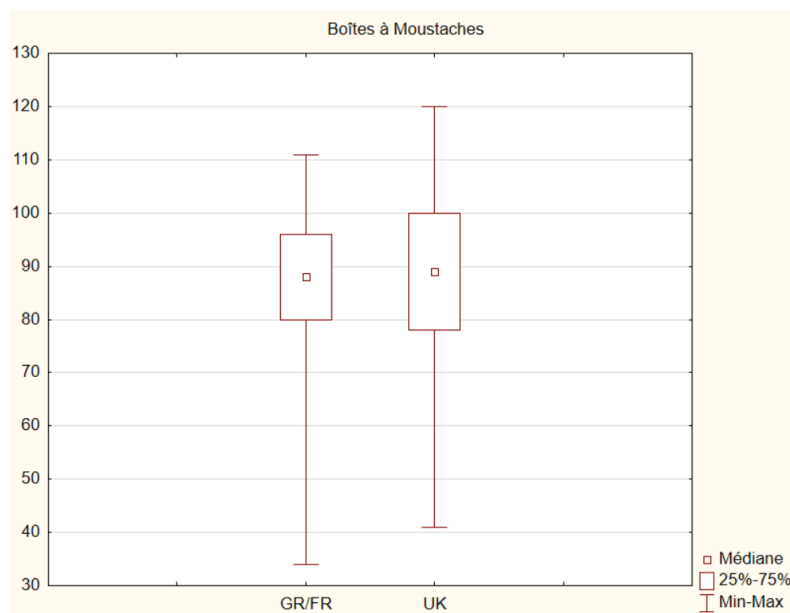
Thus, some of the aspects studied, such as age, gender or hearing city noises, seem to have an influence on certain scores. In addition, the correlation between the different noise sensitivity questionnaires (Weinstein, single-item scale, Benfield, LEF, NoiSeQ, comparison scale) allows us to draw interesting conclusions about the context of use of these different scales.

### 3) Comparison with pilot test results

This section will compare the results obtained for British participants with those obtained for German and French participants. The two samples compared were the sample of 305 people from the UK and the sample of 68 people from France and Germany. The difference in sample size is not considered a problem for the comparison method used. According to [74] and [73], the Mann-Whitney test and the Student test do not require the same sample size. However, they do require a normal distribution, which is the case for all the variables tested, as shown by the histograms in the appendix 17. Comparison tests were therefore carried out on the variables that were measured in both the pilot test and the actual survey, namely the Weinstein noise sensitivity questionnaire, the single-item question, the Benfield questionnaire, the HIQ and SSSQ questionnaires and the annoyance assessment. As specified in part III)B)2)a)i), the Mann Whitney test was used to compare non-metric values such as the Weinstein and Benfield noise sensitivity score, the HIQ and

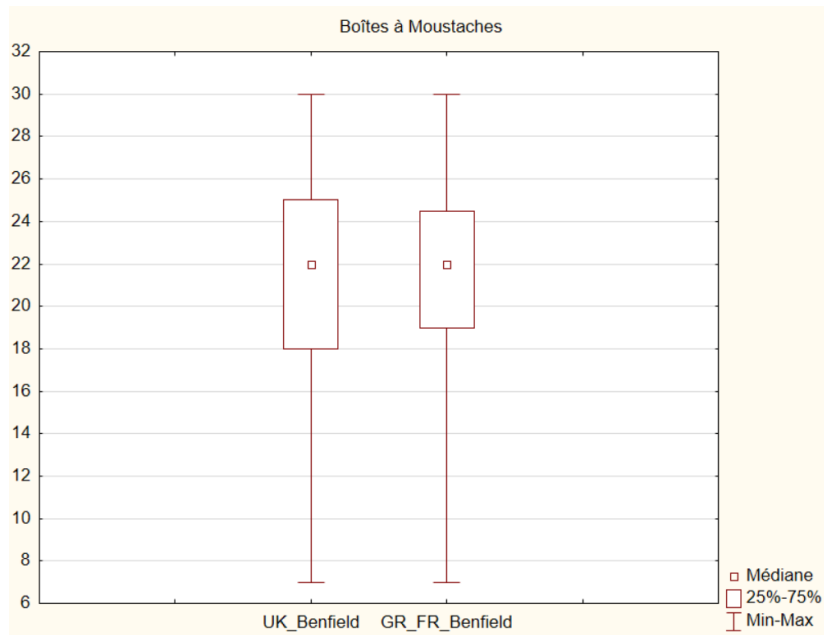
SSSQ score, and the annoyance assessment. For single-item assessment, Student's t-test was performed, as the scores are metric.

First, noise sensitivity scores were compared. As the pilot test presented only the Weinstein questionnaire and the single-item slider question, these scores were the only ones to be checked, as well as the Benfield questionnaire, which is extracted from the Weinstein questionnaire. Mann-Whitney tests were carried out for the Weinstein and Benfield questionnaires, revealing no significant difference between the French and German sample and the UK sample.



**Figure 12 - Boxplot of the two samples (French/German and UK) of Weinstein noise sensitivity scores**

As Figure 12 shows, the medians of the Weinstein noise sensitivity scores of the two samples are very close. The distributions are not exactly the same, but remains fairly similar.



**Figure 13 - Boxplot of the two samples (French/German and UK) of Benfield noise sensitivity scores**

Here again, for the Benfield scores, the medians are very close. Moreover, the distributions are very similar: this similarity is probably due to the lowest possible score variability. In fact, the Benfield questionnaire can range from 5 to 30, as it only includes five items, and therefore provides fewer possible results, whereas the Weinstein score can range from 21 to 126, with many more possible values.

Test U de Mann-Whitney (+ correction de continuité (Feuille de données79))									
Par var. Nationality									
Tests significatifs marqués à p <,05000									
variable	SommeRgs UK	SommeRgs GR/FR	U	Z	valeur p	Z ajusté	valeur p	N Actif UK	N Actif GR/FR
<b>WNS</b>	57312,00	12439,00	10093,00	0,343911	0,730914	0,344000	0,730847	305	68

**Table 27 - Mann-Whitney U-test conducted on the two samples of Weinstein score**

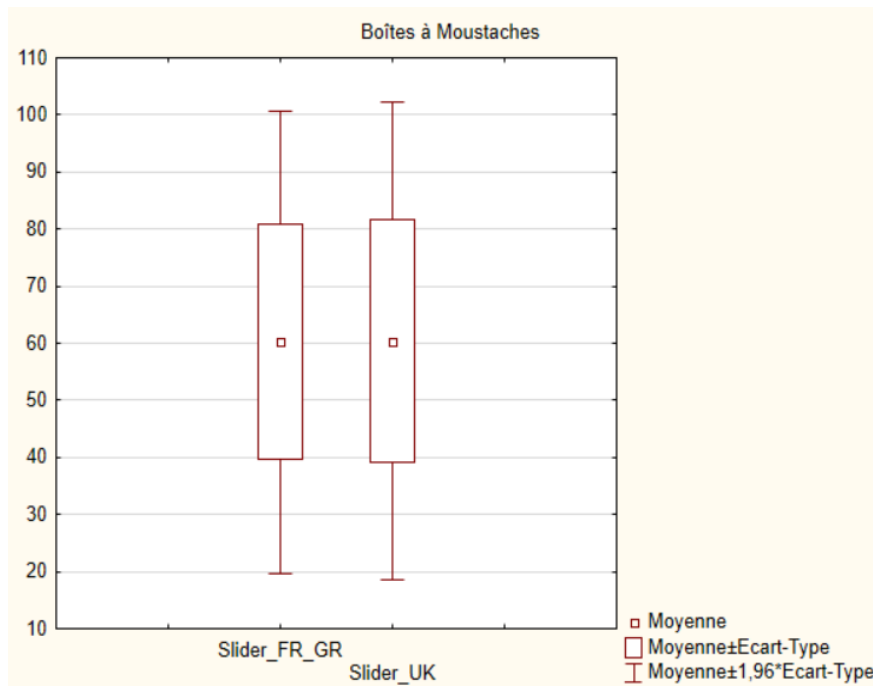
Test U de Mann-Whitney (+ correction de continuité (Feuille de données84))									
Par var. Nationality									
Tests significatifs marqués à p <,05000									
variable	SommeRgs UK	SommeRgs GR/FR	U	Z	valeur p	Z ajusté	valeur p	N Actif UK	N Actif GR/FR
<b>Benfield</b>	56977,00	12774,00	10312,00	-0,071518	0,942985	-0,071682	0,942855	305	68

**Table 28 - Mann-Whitney U-test conducted on the two samples of Benfield score**

Mann Whitney tests (available in Tables 27 and 28), agree with the boxplots and show no significant difference between the two samples, for both scores.

In addition, a comparison test was also carried out on the one-item scores of the two samples. Prior to testing, the homogeneity of variance was checked by Hartley's test (already mentioned in

part III)B)2)a)i)). As the Hartley test passed, the Student's t test was performed and the box plot of the mean was drawn.



**Figure 14 - Boxplot of the two samples of one item scores**

The boxplot reveals a very similar distribution of scores for the two samples. The averages are very close ( $m_{UK} = 60.40$  and  $m_{FR/GR} = 60.25$ ). Moreover, the distributions are almost identical, with a slightly greater use of the full dynamic range of the scale for the graduated continuous scale (UK sample).

Test t pour des Echantillons Indépendants (Feuille de données2)											
Note : Variables traitées comme des échantillons indépendants											
Groupe1 vs. Groupe2	Moyenne Groupe 1	Moyenne Groupe 2	valeur t	df	p	N Actifs Groupe 1	N Actifs Groupe 2	Ec-Type Groupe 1	Ec-Type Groupe 2	Ratio F Variances	p Variances
Slider_FR_GR vs. Slider_UK	60,25000	60,39672	-0,051519	371	0,958940	68	305	20,65955	21,36132	1,069090	0,759425

**Table 29 - Student T-test conducted on the two samples of one item score**

The Student's t test confirmed the boxplot's impression that there was no significant difference between the two samples. However, in the UK survey, the scale was slightly modified compared with the pilot test (see Figure 15). This modification was made to take into account feedbacks from the pre-pilot and pilot tests to help some participants using the continuous scale. The addition of these gradations therefore appears to have no significant influence on participants' evaluation, according to the T-test.



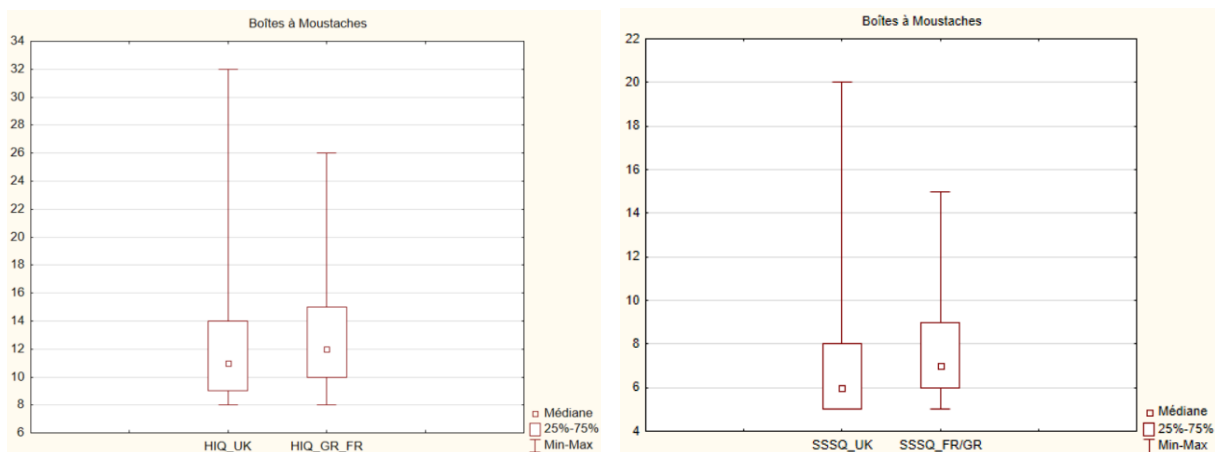
**General noise sensitivity**

Please move the arrow to the desired position; you may choose intermediate values.



**Figure 15 - One-item scale used in the final survey**

When it comes to measuring hyperacusis, the conclusions are not the same. Boxplots for HIQ scores reveal more differences between the French and German samples and the UK sample than for noise sensitivity scales. Indeed, the distribution of HIQ scores in the UK is more spread out than in the French and German sample, even if the median is a little smaller. As for the SSSQ, the UK distribution is also wider, in particular reaching higher values.



**Figure 16 - Boxplot of the two samples of HIQ scores (left) and SSSQ scores (right)**

Test U de Mann-Whitney (+ correction de continuité (Feuille de données84)  
 Par var. Nationality  
 Tests significatifs marqués à  $p < .05000$

variable	SommeRgs UK	SommeRgs GR/FR	U	Z	valeur p	Z ajusté	valeur p	N Actif UK	N Actif GR/FR
HIQ	55343,00	14408,00	8678,000	-2,10389	0,035389	-2,11857	0,034128	305	68

**Table 30 - Mann Whitney test conducted on the two samples of HIQ score**

This wider distribution, particularly in the higher HIQ values, may be explained by the difference in the average age of the participants. Indeed, the average age of the UK sample is 46,30, whereas it is 31,41 for the French and German samples. Furthermore, the French and German sample had a higher proportion of women (63%) than the UK sample (51.8%). This difference in the male/female ratio may explain the significant difference, detected by the Mann Whitney test,

between the HIQ scores of the French and German samples and those of the UK sample. The median of the French and German sample is indeed higher than that of the UK sample, even if the distribution is wider for the latter.

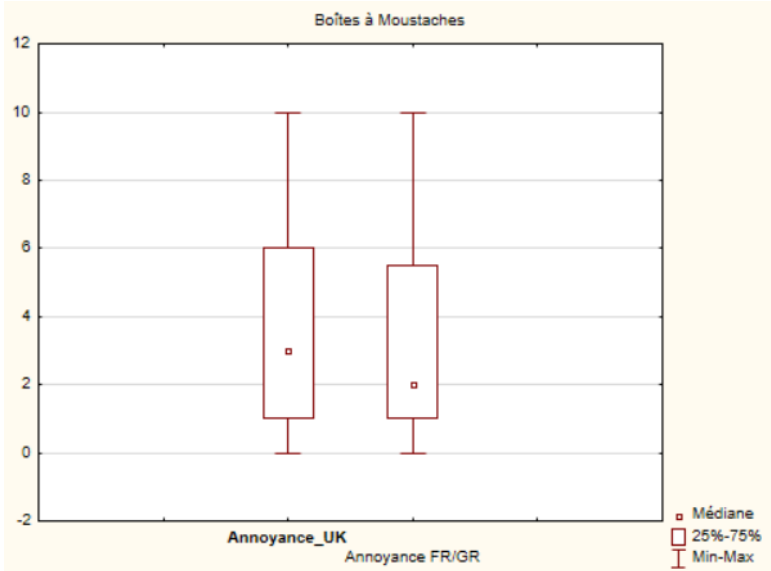
Test U de Mann-Whitney (+ correction de continuité (Feuille de données84)  
 Par var. Nationality  
 Tests significatifs marqués à  $p < ,05000$

variable	SommeRgs UK	SommeRgs GR/FR	U	Z	valeur p	Z ajusté	valeur p	N Actif UK	N Actif GR/FR
SSSQ	58219,00	11532,00	9186,000	1,472037	0,141012	1,500097	0,133590	305	68

**Table 31 – Mann Whitney test conducted on the two samples of SSSQ score**

With regard to SSSQ scores, a significant difference was revealed by the Mann-Whitney test.

Finally, both samples were compared with respect to their annoyance by road-traffic noise. As the boxplots (figures 33) show, the median for the UK is higher than for France and Germany. The first hypothesis that may explain this difference is the average age gap between the two samples ( $mean_{UK}=46,30$  and  $mean_{FR/GR}=31,41$ ). As indicated in part IV)A)2)c), annoyance seems to be correlated in particular with the noise level of the city where the participant lives, but also with his sensitivity to noise. Thus, noise annoyance is determined by a variety of factors and mechanisms, both physiological and psychological, making it difficult to identify any particular factor that might explain the slight difference between the two medians.



**Figure 17 - Boxplot of the two samples of annoyance score**

Test U de Mann-Whitney (+ correction de continuité (Feuille de données4) Par var. Nationality Tests significatifs marqués à p <,05000									
variable	SommeRgs UK	SommeRgs FR/GR	U	Z	valeur p	Z ajusté	valeur p	N Actif UK	N Actif FR/GR
<b>Annoyance</b>	57120,50	12630,50	10284,50	0,105723	0,915802	0,106666	0,915054	305	68

**Table 32 - Mann Whitney test on the two samples of annoyance score**

However, as revealed by the Mann-Whitney test, there is no significant difference between the two samples.

Thus, with the exception of HIQ, the British and the French and German samples show no significant difference in their evaluations of noise sensitivity and noise annoyance.

## V) General discussion

### A) Summary of the main results

In order to bring together the different results obtained through the various analyses, two summary tables have been produced based on the UK data. Indeed, this sample appeared to be the most exploitable, as it is demographically representative of the population and sufficiently large to further evaluate all the questionnaires regarding their psychometric properties. Indeed, as the longest scale, the LEF, contains 52 items, at least 260 participants are needed to examine it properly, e.g. in by means of a factor analysis (5 times as many participants as items). The two tables, summarizing the correlation between the six noise-sensitivity questionnaires studied and the correlation of the noise-sensitivity scales with different parameters, are available in Tables 31 and 32 respectively.

	WNS	ONE ITEM	NOISEQ	LEF	COMP	Benfield
WNS	1,00000	0,64507	0,86754	0,82755	0,63786	0,940052
ONE ITEM	0,64507	1,00000	0,62407	0,61942	0,70390	0,663035
NOISEQ	0,86754	0,62407	1,00000	0,92830	0,59326	0,829494
LEF	0,82755	0,61942	0,92830	1,00000	0,58605	0,795022
COMP	0,63786	0,70390	0,59326	0,58605	1,00000	0,654583
Benfield	0,940052	0,663035	0,829494	0,795022	0,654583	1,00000

**Table 33 - Correlation coefficients between the noise sensitivity questionnaires, based on the UK sample**

As far as the correlation between noise sensitivity is concerned, the Benfield questionnaire (extracted from the Weinstein questionnaire) shows the best correlation with the other questionnaires. Thus, in view of the study's objectives, it may appear to be a very good solution for a universal assessment of noise sensitivity.

Factors studied	Noise sensitivity questionnaires					
	Weinstein	One-item slider	Benfield	One-item comparison	NoiseQ	LEF
Age					0,169044	0,140861
Sex		-0,157886			-0,122132	
Road traffic annoyance	0,321975	0,253488	0,299321	0,247632	0,295478	0,288554
HIQ	0,474043	0,420333	0,485398	0,468152	0,484789	0,488995
SSSQ	0,396163	0,396288	0,394094	0,421629	0,383179	0,379628
Tinnitus			NA	NA	NA	NA
City size	-0,149682		NA	NA	NA	NA
City noise			NA	NA	NA	NA
Hearing difficultie			NA	NA	NA	NA
Diagnosed hearing difficulties			NA	NA	NA	NA

**Table 34 - Correlation coefficients between the noise sensitivity questionnaires and the other parameters, based on the UK sample**

The correlation with all parameters was not studied for all questionnaires, which is why some cases are marked “NA” (not analyzed). An empty box in the table means that the analysis of the correlation between the two factors was not significant, so the only values reported in the table are those for which the correlation was significant. We can therefore conclude that noise sensitivity may influence the rating of, regardless of the scale used, annoyance due to road traffic, HIQ and SSSQ.

Finally, with regard to the linguistic and cultural parameter, as explained in part IV)B)3), the comparative analysis revealed no difference in noise sensitivity ratings between French, German and English participants. As the French and German sample are not demographically representative, this conclusion should be treated with caution.

## B) Comparison with the research literature

In order to provide comparative references, our results will be analyzed in relation to previous findings.

Firstly, with regard to Benfield's and Weinstein's noise sensitivity score, the UK sample can be compared with the results obtained by Benfield et al [57] in 2014. In particular, they tested their five-item scale on a sample of 202 people, using an online survey. The average age of respondents was 36.11 years, with a standard error of 13.65, the sample included 138 women and 64 men. In their article, Benfield et al did not specify whether their sample consisted of British or American participants. They found a correlation coefficient  $r=0,91$  ( $p<0,000$ ) between the Benfield scale and the 21 Weinstein noise sensitivity scale. This correlation coefficient is very close to the Spearman coefficient we found with our data ( $r=0,94$ ,  $p<0,050$ ), collected using a similar method.

Regarding the French sample, it is more difficult to find data to compare. Few articles use French translations of long noise sensitivity questionnaires. However, among them, Bigras et al [12] and Tarlao et al [11] respectively used the Weinstein and Benfield questionnaires translated into French. Bigras et al [12] studied the correlation between the Weinstein noise sensitivity questionnaire and hyperacusis scores. However, they did not use the questionnaire of Aazh et al [69], but that of Khalfa et al, 2002. The comparison must therefore be treated with caution. With their sample of 103 French Canadians, made up of 52 women and 51 men, with a mean age of 27,5 years (standard error=6,2), they found a Pearson correlation coefficient of  $r=0,74$  ( $p<0,001$ ) between the Weinstein noise sensitivity scale and the hyperacusis score. However, for the French sample, collected during the pilot test, the Spearman coefficients were only  $r=0.332$  ( $p<0,05$ ) for the HIQ and  $r= 0.067$  ( $p<0,05$ ) for the SSSQ, both not being statistically significant. This significant

difference is probably due to the use of two different hyperacusis questionnaires. Furthermore, for the UK data, the correlation between hyperacusis scores and the Weinstein Noise Sensitivity questionnaire is closer to the results of Bigras et al [12], since they are both significant. Indeed, for the HIQ, Pearson's correlation coefficient is  $r=0,474$  ( $p<0,050$ ) and for the SSSQ,  $r=0,396$  ( $p<0,050$ ), both correlated with Weinstein's noise sensitivity scale. Once again, the two scales compared, i.e. Aazh et al and Khalfa et al, are not the same, but the conclusions remain similar. Indeed, Bigras et al [12] found a correlation between noise sensitivity and hyperacusis, as was found for the UK sample. The differences in results between the French and British samples may be due to the lack of demographic representativeness of the French sample and its small size for the pilot test. Indeed, although Aazh et al [69] noted that HIQ is slightly affected by age, they considered this effect to be negligible. However, they also highlighted a slight effect of gender, with women tending to present higher HIQ scores than men. This finding may explain the difference between the two samples, given that the French and German sample had a higher proportion of women (63%) than the UK sample (51.8%). This difference in the male/female ratio may explain the significant difference, detected by the Mann Whitney test, between the HIQ scores of the French and German samples and those of the UK sample. The median of the French and German sample is indeed higher than that of the UK sample, even if the distribution is wider for the latter. Furthermore, the significant difference found between the French and German sample and the UK sample cannot be explained by age distribution. Indeed, Aazh et al [69] concluded that the SSSQ score can be considered to be unaffected by gender or age. This observation is therefore not consistent with the Mann-Whitney test performed on the SSSQ score samples. However, the French and German sample is not unusable, but the results need to be verified and compared.

Furthermore, with regard to the link between annoyance due to road traffic and noise sensitivity, a correlation was found for all three samples (British, French and German). In fact, all the noise-sensitivity questionnaires tested (Weinstein, one item slider, Benfield, comparison item, LEF and NoiseQ) showed a positive correlation with annoyance due to road traffic, to a greater or lesser extent. This indicates that the more sensitive a person is to noise, the more likely they are to be bothered by road traffic noise. These results are consistent with lots of findings from the literature. In particular, one has to mention Park et al [7], as they used the same scales to measure annoyance and sensitivity to noise as the ones used in our survey. They used respectively an 11-point scale ranging from 0 to 10 and the Weinstein noise sensitivity questionnaire. They tested noise annoyance and noise sensitivity to examine subjects' attitude and experience to floor impact noise. Their method consisted of an online survey, which brought together 34 participants, 21 women and 13 men. The average age of the sample was 38,8 years (standard error 5,3). The comparison with our samples is therefore fairly consistent. They found that the high noise sensitivity group

reported higher levels of annoyance than the low noise sensitivity group. These findings concur with the results of correlation analysis carried out on the British, French and German samples. The study by Park et al [7] was carried out on a sample of Korean participants. These results therefore seem fairly universal, since they are consistent from one country to another and from one language to another. However, these conclusions need to be confirmed by further research, as our study only covered three languages and three countries (France, Germany and Great Britain). Finally, both French and German and UK samples were compared with respect to their annoyance by road-traffic noise. As the boxplots (figures 33) show, the median for the UK is higher than for France and Germany. A hypothesis that may explain this difference is the average age gap between the two samples ( $\text{mean}_{\text{UK}}=46,30$  and  $\text{mean}_{\text{FR/GR}}=31,41$ ). However, according to Ni et al [62], the relationship between age and noise annoyance is not linear, so the difference cannot be explained solely by the age difference between the two samples.

### C) Response to the issues and objectives of the internship

Thus, the multiple results obtained in our study are consistent with those of previous studies. For the NoiseQ, comparison or LEF scales, it is more difficult to make comparisons, as few studies have used them, and none have calculated correlations with annoyance or other scales. However, the correlation study carried out on the UK sample does offer some interesting results, particularly with regard to the strengths and weaknesses of the different scales. We are therefore in a position to determine to what extent the assessment of noise sensitivity depends on factors such as noise annoyance or hyperacusis, but also on language and culture. Also, does this call into question the search for a universal assessment method?

As mentioned before, the Benfield questionnaire remains a very interesting option, as it correlates well with other noise sensitivity questionnaires and is short. It is therefore particularly suitable for large-scale and low-budget studies. Its short duration reduces the time needed to take part in the survey, which not only cuts costs, but also reduces the loss of concentration of participants in the survey. As other noise sensitivity scales, Benfield questionnaire is linked to road traffic annoyance and hyperacusis. However, demographic data such as age and sex have no influence on its assessment, nor do environmental factors such as noise levels in the place of residence or health problems such as tinnitus.

Besides, this study, including surveys conducted in different countries in different languages, reveals no difference in noise sensitivity scores and annoyance ratings across countries. However,

as the German and French data were collected for piloting the survey, they do not represent the final French and German samples in the project.

Finally, we can conclude that the Benfield questionnaire could be an interesting choice as a universal standard for assessing noise annoyance. However, a certain amount of caution is required, as the research program is not yet complete and not all avenues of research have yet been explored.



## VI) Critical analysis and perspective

Comparing our findings with those of other studies found the key results to largely agree.

Indeed, the general conclusions obtained from the two present datasets are the same as for all the data that have been published. However, for some of our data, it was difficult to find comparisons with previous studies, notably for the NoiSeQ and the LEF, as they have been less widely employed and rarely compared with other questionnaires, as is the case in the present study. Indeed, for the LEF questionnaire, the research team provided the first translation into French and English, as for the hyperacusis questionnaires (HIQ and SSSQ), which were translated and used in a study in French and German for the first time. The comparative analysis carried out on the French and German pilot data and on the British sample thus may be seen as an initial validation of the quality of the translation of the questionnaires used in the survey. Firstly, the comparison tests (Student's t-tests and Mann-Whitney U-tests) showed no significant difference between the noise sensitivity and annoyance scores of the three nationalities studied, and secondly, the correlation trends were the same for all languages. The translations thus proved to be accurate and unbiased and can therefore be reused for further studies.

We thus did not observe any cultural or linguistic effects on the noise sensitivity scores when comparing the samples coming from different European countries in the pilot test and UK survey. However, the study is not yet complete, since data from 250 French, 250 German, 300 Korean, and 300 US American participants are still to be collected and analyzed. Any more definite conclusions regarding cultural or linguistic effects can only be drawn once all the data from the entire survey have been collected and analyzed. In particular, the data collected so far only concern European countries (UK, France and Germany), which have cultural similarities and where English and German have the same linguistic roots. The comparison will therefore be even more relevant and interesting with American or Korean samples, as the cultural differences are more marked. These analyses will be dealt with later in the study and are therefore not covered in this report.

These new samples will provide information on potential cultural and linguistic differences, but will also enable comparisons to be made between samples. For the moment, the only comparisons have been made between the reconciled French and German samples from the pilot test, and the UK sample from the actual, Prolific-recruited data collection. Thus, only the results of a subset of the questionnaires (Weinstein, Benfield, single-item scale, HIQ, SSSQ and road traffic annoyance) could be compared. In addition, the French and German samples were not demographically

representative, unlike the UK sample, so the comparison may be considered less robust. So, when all the complete and representative samples have been collected, comparisons and correlation analysis between other questionnaires, such as LEF and NoiSeQ, will be possible. This analysis will be particularly interesting as it will involve a large number of different questionnaires, but also different languages. Moreover, all languages will have a large number of participants (between 250 and 300 people). In order to assess the psychometric properties of the different questionnaires, the internal consistency and reliability of the questionnaires will also be tested by calculating their Cronbach alpha. This future analysis will provide a wealth of data for future studies, as well as valuable conclusions concerning noise sensitivity, hyperacusis and annoyance.

However, we can already draw interesting conclusion from the data analysis conducted on the French, German and English samples. First, regarding the French wording of the one-item question, (“Êtes-vous sensible au bruit ?”), adding “en général” does not influence participant rating in the online test. Besides, the use of a graduation on the slider also does not seem to change the average result, as we have concluded from the comparison between French and German sample and English sample results. Regarding the correlation analysis of the three samples, there was no evidence sex or age effects on the noise sensitivity scores. They also demonstrated a correlation between noise sensitivity and annoyance and hyperacusis. However, for hyperacusis, the validity of the questionnaires used might be questioned. Indeed, the results obtained with HIQ and SSSQ are not always consistent, even if compared with the same score (Weinstein score or LEF). Furthermore, self-reported hyperacusis is the only variable that does not lead to the same conclusions for the French and German sample (not significant correlation between SSSQ and Weinstein) and UK sample (Weinstein score and SSSQ significantly correlated).

Based on correlation tests carried out on the noise-sensitivity questionnaires, the 5-items Benfield questionnaire derived from Weinstein (1978) appears to be the most practical, while at the same time exhibiting strong convergent validity. As already explained, it correlates very well with other noise-sensitivity questionnaires, and is particularly short (5 items). This means less loss of concentration, but also lower cost. Use of the Benfield questionnaire may therefore be particularly suitable for large-scale or long surveys. Thus, for future studies investigating the links between noise sensitivity and other factors (acoustic or otherwise), the Benfield questionnaire may prove interesting, particularly if the survey includes other questionnaires. Indeed, given the aims of our study (i.e. to compare different noise-sensitivity questionnaires in different languages), the survey was particularly repetitive. This, of course, was difficult to avoid in view of our final objective. However, in the context of subsequent research that does not aim to investigate the same questions, a single noise sensitivity questionnaire will suffice. Its choice depends on the purpose

of the study. Benfield is very practical for the reasons already explicated, but other questionnaires, such as NoiSeQ or LEF, may also be relevant in certain cases, notably due to their various subscales covering 5 or 7 different noise-sensitivity domains. Short versions of other questionnaires (LEF-K, NoiseQ) may also be considered.

Beyond the questionnaires to be used, the form and method of the survey can also be called into question. In our case, an online survey appeared to be most appropriate. However, as we have already mentioned, this method also has its share of disadvantages, particularly when it comes to the necessity of data cleaning due to speeded and careless responding. It does, however, allow us to quickly obtain a large sample of data, which is particularly practical. As with questionnaires, the survey method depends on the objectives of the study. In our case, the use of a pilot test enabled us to resolve presentation problems and check translations before launching the pilot test. Although launching the pilot test and analyzing its data were time-consuming, it proved very useful.

In conclusion, the analysis presented in this report highlights initial findings and challenges encountered in studying noise sensitivity questionnaires across different languages and cultures. While the French and German pilot data, and the preliminary analysis of the British sample did not reveal significant linguistic or cultural biases in total noise sensitivity scores, further data analyses, and the imminent data collections from Korean and American participants will be crucial for a more complete understanding. The preliminary results of this study provide support for both convergent validity (due to correlations with other noise-sensitivity questionnaires) and construct validity (relation to annoyance, age and hyperacusis) of the translated questionnaires and suggest that, despite minor inconsistencies, these tools are effective in measuring noise sensitivity but also annoyance and hyperacusis. Future analyses will further clarify the psychometric properties of these instruments and refine our understanding of noise sensitivity. Ongoing research will thus provide valuable data and conclusions for future studies.

## Conclusion

Thus, the study carried out during this internship produced significant and consistent results, corroborating previous research findings and providing new insights, particularly with regard to the one item question wording and rating scale. This report provides an overview of noise sensitivity, its measurement and the factors that can influence it. Of course, this report is more concerned with noise-sensitivity questionnaires and how to measure noise sensitivity, since its aim was to compare different noise-sensitivity questionnaires. So, regarding the objectives and tasks of the internship, most of them were fulfilled. Indeed, during the course of the internship, I took part in almost every stage of the study: from analyzing overlap between questionnaires to translating most of them to French, by way of coding the survey on SoSci Survey, to providing an independent data analysis using Statistica and Excel. The results of the present analysis (this report) may then be compared with the results obtained by other project members with other statistical packages or procedures.

The diversity of the task gave me a global view of noise sensitivity and its correlates (hyperacusis, noise annoyance), but also of the field of research, its scientific approach and statistical analysis. The initial objective was only to participate in the creation of the pilot test and analyze the results of this first test, but the project timetable also enabled me to join in the construction of the final version of the survey and the analysis of the UK data collected. Although the pilot test had already produced a complete and usable dataset, the actual survey carried out on the UK sample yielded even more data. It also made it possible to study data from an English-speaking country, as well as from other noise sensitivity questionnaires. In addition, the analysis covered several aspects of noise sensitivity, such as links with noise annoyance and hyperacusis, as well as demographic influences. The multiplicity of factors considered led to a very rich analysis, which may be used in future surveys. This report also aims to document and bring together all the methods and stages followed during the construction of the survey and pilot test. In conclusion, while this report provides some conclusions and methodologies that can be reused in future research, it constitutes above all a working basis for the research team with which I worked, thanks to the compilation of all the stages of the construction of our online survey.

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## Appendices

### Appendix 1: Noise sensitivity questionnaires in their original form

#### 1) Original Weinstein noise sensitivity questionnaire

Source: Weinstein, N. D. (1978). Individual differences in reactions to noise: A longitudinal study in a college dormitory. *Journal of Applied Psychology*, 63(4), 458-466

Table 1  
*Items on the Noise-Sensitivity Scale*

- 
1. I wouldn't mind living on a noisy street if the apartment I had was nice.
  2. I am more aware of noise than I used to be.<sup>a</sup>
  3. No one should mind much if someone turns up his stereo full blast once in a while.
  4. At movies, whispering and crinkling candy wrappers disturb me.<sup>a</sup>
  5. I am easily awakened by noise.<sup>a</sup>
  6. If it's noisy where I'm studying, I try to close the door or window or move someplace else.<sup>a</sup>
  7. I get annoyed when my neighbors are noisy.<sup>a</sup>
  8. I get used to most noises without much difficulty.
  9. How much would it matter to you if an apartment you were interested in renting was located across from a fire station?<sup>a</sup>
  10. Sometimes noises get on my nerves and get me irritated.<sup>a</sup>
  11. Even music I normally like will bother me if I'm trying to concentrate.<sup>a</sup>
  12. It wouldn't bother me to hear the sounds of everyday living from neighbors (footsteps, running water, etc).
  13. When I want to be alone, it disturbs me to hear outside noises.<sup>a</sup>
  14. I'm good at concentrating no matter what is going on around me.
  15. In a library, I don't mind if people carry on a conversation if they do it quietly.
  16. There are often times when I want complete silence.<sup>a</sup>
  17. Motorcycles ought to be required to have bigger mufflers.<sup>a</sup>
  18. I find it hard to relax in a place that's noisy.<sup>a</sup>
  19. I get mad at people who make noise that keeps me from falling asleep or getting work done.<sup>a</sup>
  20. I wouldn't mind living in an apartment with thin walls.
  21. I am sensitive to noise.<sup>a</sup>
- 

*Note.* Most items are presented on a 6-point scale ranging from agree strongly (1) to disagree strongly (6).

<sup>a</sup> Item scored in opposite direction before responses are summed.

2) Weinstein noise sensitivity questionnaire – Worthington version

Source: Worthington, D. L., & Bodie, G. (Eds.). (2018). The sourcebook of listening research: methodology and measures. John Wiley & Sons, Inc.

<b>Item</b>	<b>Worthington (2017)'s English version</b>
1	I wouldn't mind living on a noisy street if the apartment I had was nice.
2	I am more aware of noise than I used to be.
3	No one should mind much if someone turns up his or her stereo full blast once in awhile.
4	At movies, whispering and crinkling candy wrappers disturb me.
5	I am easily awakened by noise.
6	If it's noisy where I'm studying, I try to close the door or window or move someplace else.
7	I get annoyed when my neighbors are noisy.
8	I get used to most noises without much difficulty.
9	It would matter to me if an apartment I was interested in renting were located across from a fire station.
10	Sometimes noises get on my nerves and get me irritated.
11	Even music I normally like will bother me if I'm trying to concentrate.
12	It wouldn't bother me to hear the sounds of everyday living from neighbors (footsteps, running water, etc.).
13	When I want to be alone, it disturbs me to hear outside noises.
14	I'm good at concentrating no matter what is going on around me.
15	In a library, I don't mind if people carry on a conversation if they do it quietly.
16	There are often times when I want complete silence.
17	Motorcycles ought to be required to have bigger mufflers.
18	I find it hard to relax in a place that's noisy.
19	I get mad at people who make noise that keeps me from falling asleep or getting work done.
20	I wouldn't mind living in an apartment with thin walls.
21	I am sensitive to noise.

### 3) NoiseQ

Source: Griefahn, B., Marks, A., Gjestland, T., & Preis, A. (2007). Annoyance and noise sensitivity in urban areas. ICA 2007, Madrid.

Annex 1: Items of the German version of the NoiSeQ			
No	Subscale	Reverse values	Item
1	Freizeit	-	Ich kann nicht richtig abschalten, wenn es laut um mich herum ist
2	Arbeit	-	Für anstrengende Arbeiten brauche ich äußerste Ruhe
3	Wohnumgebung	-	Für eine ruhige Wohnlage nehme ich andere Nachteile in Kauf
4	Wohnumgebung	-	Ich bin sehr empfindlich gegenüber Geräuschen aus meiner Nachbarschaft
5	Kommunikation	-	Ich finde es sehr mühsam, sich bei Lärm zu unterhalten
6	Arbeit	Yes	Routineaufgaben kann ich in lauter Umgebung ohne Schwierigkeiten durchführen
7	Schlaf	-	Ich werde sehr unruhig, wenn ich beim Einschlafen jemanden reden höre
8	Kommunikation	Yes	Wenn ich in eine Unterhaltung vertieft bin, fällt es mir nicht auf, ob es um mich herum laut ist
9	Schlaf	Yes	Ich kann einschlafen, obwohl es laut um mich herum ist
10	Arbeit	-	Meine Leistung wird durch eine große Geräuschkulisse stark beeinträchtigt
11	Freizeit	Yes	Nach der Arbeit kann ich mich bei lauter Musik gut entspannen
12	Kommunikation	-	Ich kann mich im Restaurant schlecht auf meine Unterhaltung konzentrieren, wenn am Nebentisch laut gesprochen wird
13	Arbeit	-	Neue Aufgaben kann ich nur in leiser Umgebung bearbeiten
14	Arbeit	-	Wenn Personen um mich herum laut sind, komme ich mit meiner Arbeit nicht voran
15	Schlaf	-	Gesunder Schlaf ist für mich nur in absolut ruhiger Umgebung möglich
16	Schlaf	-	Schon beim leisesten Geräusch kann ich schlecht einschlafen
17	Wohnumgebung	Yes	Ich kann mich schnell an Lärm in meiner Wohnumgebung gewöhnen
18	Freizeit	-	Im Kino stört mich Flüstern und Rascheln von Papier
19	Kommunikation	-	Ich bin der Ansicht, dass Musik ein Gespräch stört
20	Kommunikation	-	Ich finde es sehr schwierig einem Gespräch zu folgen, wenn nebenbei das Radio läuft
21	Arbeit	-	Wenn es an meinem Arbeitsplatz laut ist, dann versuche ich immer Abhilfe für mich zu schaffen
22	Freizeit	Yes	Ich finde, dass beim Tanzen die Musik so laut sein darf, wie sie will
23	Wohnumgebung	Yes	Es würde mir nichts ausmachen, an einer lauten Straße zu wohnen
24	Wohnumgebung	-	Wenn fremde Kinder laut sind, sollten sie nicht unbedingt vor meiner Wohnung spielen
25	Freizeit	-	Am Wochenende bevorzuge ich eine ruhige Umgebung
26	Schlaf	-	Wenn es nachts laut ist, bin ich morgens unausgeschlafen
27	Freizeit	-	Ich finde es unangenehm, wenn Zuhause das Radio im Hintergrund läuft
28	Kommunikation	-	Bei lauter Musik in einem Lokal stelle ich die Unterhaltung ein
29	Arbeit	Yes	Kompliziertere Arbeiten kann ich mit Hintergrundmusik problemlos ausführen
30	Schlaf	-	Ich wache beim geringsten Geräusch auf
31	Freizeit	-	Ich vermeide Freizeitveranstaltungen, wenn es dort laut ist
32	Wohnumgebung	-	Laute Freizeitaktivitäten mag ich in meinem Wohngebiet nicht
33	Wohnumgebung	-	Es würde mich stören, die Alltagsgeräusche meiner Nachbarn (z.B. Schritte, Wasserrauschen) zu hören
34	Schlaf	Yes	Das laute Donnern eines Gewitters kann mich nicht aus dem Schlaf holen
35	Kommunikation	-	Wenn es um mich herum laut ist, verliere ich schnell den Gesprächsfaden

#### 4) LEF

Source: Zimmer K, Ellermeier W, Konstruktion und Evaluation eines Fragebogens zur Erfassung der individuellen Lärmempfindlichkeit. Diagnostica. 1998;44:11–20

#### Die Items der Fragebogen-Endform im Wortlaut

1. Bevor ich mit der Arbeit beginne, versuche ich, alle Geräuschquellen auszuschalten.
2. Wenn ich erschöpft bin, belebt mich laute Musik.
3. Gesunder Schlaf ist nur in absolut ruhiger Umgebung möglich.
4. Zufallende Türen erschrecken mich nicht.
5. Ich finde es rücksichtslos, wenn im Restaurant am Nebentisch laut gesprochen wird.
6. Ich kann beim Zeitunglesen Radio hören.
7. Am Wochenende bin ich gerne an ruhigen Orten.
8. Ich sehne mich oft nach Stille.
9. Wenn es laut ist, schmeckt mir das beste Essen nicht mehr.
10. Ich werde unruhig, wenn ich beim Einschlafen jemanden reden höre.
11. Lärmschutz wird zu wichtig genommen.
12. Ich gehe nicht gerne zu öffentlichen Veranstaltungen, wenn es dort laut ist.
13. Auch beim leisesten Geräusch kann ich nicht richtig einschlafen.
14. Ich bin der Meinung, daß auch eine große Geräuschkulisie meine Leistung nicht beeinträchtigt.
15. Sich unterhalten macht keinen Spaß, wenn nebenbei das Radio läuft.
16. Beim Tanzen darf die Musik so laut sein, wie sie will.
17. Wo es ruhig ist, bin ich entspannter.
18. Auch ein Gewitter kann mich nicht aus dem Schlaf holen.
19. Wenn es um mich herum laut ist, verspreche ich mich oft.
20. Essen in lauter Umgebung schlägt mir auf den Magen.
21. Ich kann nur bei vollkommener Stille einschlafen.
22. Ich mag laute Musik bei der Arbeit im Haushalt.
23. Ich bin der Ansicht, daß laute Musik im Cafe ein Gespräch nicht stört.
24. Arbeitskollegen, die laut sind, machen mich nervös.
25. Dem täglichen Straßelärm versuche ich immer möglichst schnell zu entkommen.
26. Während der Arbeit werde ich durch Hintergrundmusik nicht gestört.
27. Ich bemerke störende Lärmquellen später als andere.
28. Es ist unangenehm, sich bei Lärm zu unterhalten.
29. Lärm macht aggressiv.
30. Ich vermeide laute Freizeitveranstaltungen wie z.B. Fußballspiele oder Jahrmärkte.
31. Geräusche an meinem Arbeitsplatz machen mich aggressiv.
32. Nachbarn müssen so leise sein, als wären sie nicht da.
33. Ich wache beim geringsten Geräusch auf.
34. Ich kann auch in lauter Umgebung schnell und konzentriert arbeiten.
35. Musik muß laut gehört werden.
36. Wenn ich in der Stadt bin und einkaufe, überhöre ich den Straßelärm.
37. Nach einem Abend in einem lauten Lokal fühle ich mich wie ausgelaugt.
38. Wenn ich einschlafen will, stört mich kaum ein Geräusch.
39. Geistig anstrengende Aufgaben brauchen Ruhe.
40. Laute Musik schadet meinem Gehör nicht.
41. Es ärgert mich, wenn unter meinem Fenster ein Hund bellt, während ich Zeitung lese.
42. Ich finde es angenehm, wenn tagsüber Fernseher oder Radio im Hintergrund laufen.
43. Bei lauter Musik in einem Lokal stelle ich die Unterhaltung ein.
44. Ich kann mich auf ein Buch konzentrieren, auch wenn nebenbei Musik läuft.
45. Wenn auf einem Fest die Lautstärke steigt, dann gehe ich.
46. Nach der Arbeit höre ich gerne laute Musik.
47. Ich bin der Ansicht, daß während der Nachtzeit absolute Ruhe herrschen muß.
48. Wenn es laut ist, möchte ich etwas dagegen unternehmen.
49. Es ist klar, daß man bei Lärm nicht arbeiten kann.
50. Wenn ich in eine Unterhaltung vertieft bin, fällt es mir nicht auf, ob es in einem Lokal laut ist.
51. Ich entspanne mich bei lauter Musik.
52. Lärm macht krank.

## Appendix 2: Pilot test screenshots – French

CAUTION! DO NOT USE YOUR SMARTPHONE! Please use your COMPUTER/TABLET	ATTENTION ! N'UTILISER PAS DE SMARTPHONE. Veuillez utiliser votre ORDINATEUR/TABLETTE.	BITTE BEACHTEN! Benutzen Sie KEIN SMARTPHONE! Bitte benutzen Sie Ihr/en COMPUTER/TABLET
<p><b>Please select the language you want to use, preferably your mother tongue.</b></p> <p>This survey is available in three languages: English, French and German.</p> <p>*If your mother tongue is not an option, please choose the language you are most comfortable using from among these.</p> <p><b>Please select the flag!</b></p>	<p><b>Veillez sélectionner la langue que vous souhaitez utiliser, de préférence votre langue maternelle.</b></p> <p>Cette enquête est disponible en trois langues : français, anglais et allemand.</p> <p>*Si votre langue maternelle n'apparaît pas parmi les options, veuillez choisir la langue avec laquelle vous êtes le plus à l'aise.</p> <p><b>Veillez sélectionner le drapeau !</b></p>	<p><b>Welches ist Ihre Muttersprache?</b></p> <p>Diese Umfrage ist in drei Sprachen verfügbar: Deutsch, Englisch und Französisch.</p> <p>*Wenn Ihre Muttersprache nicht darunter ist, wählen Sie bitte die Sprache aus, die Sie am besten beherrschen.</p> <p><b>Bitte wählen Sie die Flagge aus!</b></p>
 <b>English</b>	 <b>Français</b>	 <b>Deutsch</b>

Is English your mother tongue?

- Yes
- No (How long have you spoken English?)  e.g., "5" years

Est-ce que le français est votre langue maternelle ?

- Oui
- Non (Depuis combien de temps parlez-vous français ?)  par ex. << 5 >> ans

Ist Deutsch Ihre Muttersprache?

- Ja
- Nein (Wie lange sprechen Sie schon deutsch?)  z.B. "5" Jahre



Quelle est votre année de naissance ?

1996

Êtes-vous...

- Femme
- Homme
- Autre (par ex. non binaire)
- Je préfère ne pas le dire.

Où habitez-vous ?

Donnez votre estimation la plus proche.

- Un village, hameau ou collectivité rurale (moins de 3,000 habitants).
- Un bourg (de 3,000 à 15,000 habitants environ).
- Une petite ville (de 15,000 à 100,000 habitants environ).
- Une ville (entre 100,000 et un million d'habitants environ).
- Une grande agglomération de plus d'un million d'habitants.

Quel est le niveau de bruit là où vous vivez ?

- Très bruyant
- Bruyant
- Modérément bruyant
- Calme
- Très calme

Souffrez-vous d'acouphènes/de bourdonnements d'oreille ?

- Oui
- Non

Avez-vous actuellement des problèmes d'audition ?

- Oui
- Non

Une déficience auditive vous a-t-elle été médicalement diagnostiquée ?

- Oui
- Non





Pour chaque question, choisissez l'une des options, allant de « tout à fait d'accord » à « pas du tout d'accord ».

(01) Cela ne me dérangerait pas de vivre dans une rue bruyante si l'appartement que j'avais était agréable.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(02) Je suis plus conscient-e du bruit que je ne l'étais auparavant.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(03) Personne ne devrait s'inquiéter si quelqu'un met en marche sa stéréo à plein régime de temps en temps.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(04) Au cinéma, les murmures et les emballages de bonbons froissés me dérangent.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

(05) Je suis facilement réveillé-e par le bruit.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

(06) S'il y a du bruit là où j'étudie, j'essaie de fermer la porte et/ou la fenêtre ou encore je me déplace ailleurs.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

(07) Je m'énerve quand mes voisins sont bruyants.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

(08) Je m'habitue à la plupart des bruits sans trop de difficulté.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

(09) Ça ne me dérangerait pas qu'un appartement que je souhaite louer soit situé en face d'une caserne de pompiers.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(10) Parfois, les bruits me tapent sur les nerfs et m'irritent.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(11) Même la musique que j'aime normalement me dérange si j'essaie de me concentrer.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(12) Cela ne me dérangerait pas d'entendre les bruits de la vie quotidienne des voisins (des pas, eau courante, etc.)

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(13) Quand je veux être seul-e, cela me dérange d'entendre des bruits extérieurs.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(14) Je peux me concentrer, peu importe ce qui se passe autour de moi.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>



(15) Dans une bibliothèque, cela ne me dérange pas que les gens tiennent une conversation s'ils le font calmement.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(16) Il y a souvent des moments où je veux un silence complet.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(17) Les motocyclettes devraient être obligées d'avoir des silencieux plus grands.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(18) Je trouve difficile de me détendre dans un endroit bruyant.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(19) Je m'énerve contre les gens qui font du bruit qui m'empêche de m'endormir ou d'effectuer mon travail.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(20) Cela ne me dérangerait pas de vivre dans un appartement aux murs fins.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

(21) Je suis sensible au bruit.

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

### Sensibilité au bruit en général

Veuillez faire coulisser le curseur à la position souhaitée.

Êtes-vous sensible au bruit ?

Pas du tout sensible

Extrêmement sensible



retour

suivant

Au cours des 2 dernières semaines, combien de fois diriez-vous que chacune de ces situations est arrivée à cause de certains bruits environnementaux qui vous semblaient trop forts mais que les personnes autour de vous pouvaient bien tolérer ?

Veillez répondre à chaque question au mieux de vos capacités, en vous rapprochant le plus possible de votre expérience.

(01) Sentiment d'anxiété en entendant des bruits forts

0-1 jour    2-6 jours    7-10 jours    11-14 jours

(02) Éviter certains endroits parce qu'ils sont trop bruyants

0-1 jour    2-6 jours    7-10 jours    11-14 jours

(03) Manque de concentration dans des endroits bruyants

0-1 jour    2-6 jours    7-10 jours    11-14 jours

(04) Incapacité à se relaxer dans des endroits bruyants

0-1 jour    2-6 jours    7-10 jours    11-14 jours

(05) Difficulté à effectuer certaines activités/tâches quotidiennes dans des endroits bruyants

0-1 jour    2-6 jours    7-10 jours    11-14 jours

(06) Manque de plaisir à pratiquer des activités de loisir dans des endroits bruyants

0-1 jour    2-6 jours    7-10 jours    11-14 jours

(07) Être de mauvaise humeur à cause de votre intolérance au bruit

0-1 jour    2-6 jours    7-10 jours    11-14 jours

(08) Être fatigué.e rapidement dans des endroits bruyants

0-1 jour    2-6 jours    7-10 jours    11-14 jours



**Au cours des 2 dernières semaines, combien de fois avez-vous été dérangé-e par l'un des problèmes suivants ?**

**Veillez répondre à chaque question au mieux de vos capacités, en vous rapprochant le plus possible de votre expérience.**

(01) Vous avez du mal à tolérer les bruits parce qu'ils vous semblent souvent « trop forts » ?

0-1 jour    2-6 jours    7-10 jours    11-14 jours  
           

(02) Douleur aux oreilles quand vous entendez certains bruits forts ? Exemples : Musique forte, sirènes, motos, travaux de construction, tondeuse à gazon, gares ferroviaires.

0-1 jour    2-6 jours    7-10 jours    11-14 jours  
           

(03) Inconfort dans vos oreilles (sensations physiques autres que la douleur aux oreilles) lorsque vous entendez certains bruits forts ?

0-1 jour    2-6 jours    7-10 jours    11-14 jours  
           

(04) Sentiment de colère ou d'anxiété quand vous entendez certains bruits liés à l'alimentation, au claquement des lèvres, au reniflement, à la respiration, aux cliquetis, au tapotement ?

0-1 jour    2-6 jours    7-10 jours    11-14 jours  
           

(05) Vous craignez que certains bruits puissent aggraver votre audition et/ou vos acouphènes ?

0-1 jour    2-6 jours    7-10 jours    11-14 jours  
           

[retour](#)

[suivant](#)

**Maintenant, si vous pensez aux douze derniers mois, quand vous êtes chez vous, quelle note comprise entre zéro et dix exprime le mieux la façon dont le bruit du trafic routier vous gêne ?**

Notez zéro si le bruit ne vous gêne pas du tout et notez dix si le bruit vous gêne extrêmement. Si vous êtes entre ces deux situations, choisissez une note intermédiaire entre zéro et dix.

Pas du tout    0    1    2    3    4    5    6    7    8    9    Extrêmement 10  
                                       

[retour](#)

[suivant](#)



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT

ENTPE



Universität Vechta  
University of Vechta



**Sensibilité au bruit en général**  
Veuillez faire coulisser le curseur à la position souhaitée.

Êtes-vous sensible au bruit en général ?

Pas du tout sensible Extrêmement sensible

**\*Complément d'information**

Vous avez répondu à la question ci-dessus. Veuillez nous expliquer en quelques mots ce qui vous a conduit à donner cette réponse.

ok



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**\*Vous nous aidez à développer ce questionnaire dans le cadre d'un pré-test. Nous aimerions savoir :**

- Avez-vous remarqué des erreurs ?
- Certaines questions étaient-elles ambiguës ou difficiles à comprendre ?
- Y a-t-il quelque chose qui vous manque dans ce questionnaire ?

ok

retour

suivant

## Appendix 3: Pilot test screenshots – English

<b>CAUTION!</b> <b>DO NOT USE YOUR SMARTPHONE!</b> <b>Please use your COMPUTER/TABLET</b>	<b>ATTENTION !</b> <b>N'UTILISER PAS DE SMARTPHONE.</b> <b>Veillez utiliser votre</b> <b>ORDINATEUR/TABLETTE.</b>	<b>BITTE BEACHTEN!</b> <b>Benutzen Sie KEIN SMARTPHONE!</b> <b>Bitte benutzen Sie Ihr/en</b> <b>COMPUTER/TABLET</b>
<p><b>Please select the language you want to use, preferably your mother tongue.</b></p> <p>This survey is available in three languages: English, French and German.</p> <p>*If your mother tongue is not an option, please choose the language you are most comfortable using from among these.</p> <p><b>Please select the flag!</b></p>	<p><b>Veillez sélectionner la langue que vous souhaitez utiliser, de préférence votre langue maternelle.</b></p> <p>Cette enquête est disponible en trois langues : français, anglais et allemand.</p> <p>*Si votre langue maternelle n'apparaît pas parmi les options, veuillez choisir la langue avec laquelle vous êtes le plus à l'aise.</p> <p><b>Veillez sélectionner le drapeau !</b></p>	<p><b>Welches ist Ihre Muttersprache?</b></p> <p>Diese Umfrage ist in drei Sprachen verfügbar: Deutsch, Englisch und Französisch.</p> <p>*Wenn Ihre Muttersprache nicht darunter ist, wählen Sie bitte die Sprache aus, die Sie am besten beherrschen.</p> <p><b>Bitte wählen Sie die Flagge aus!</b></p>
 <b>English</b>	 <b>Français</b>	 <b>Deutsch</b>

Is English your mother tongue?

- Yes
- No (How long have you spoken English?)  e.g., "5" years

Est-ce que le français est votre langue maternelle ?

- Oui
- Non (Depuis combien de temps parlez-vous français ?)  par ex. << 5 >> ans

Ist Deutsch Ihre Muttersprache?

- Ja
- Nein (Wie lange sprechen Sie schon deutsch?)  z.B. "5" Jahre



## INTRODUCTION

The purpose of the present survey is to study how people are affected by noise in everyday life, and how people's reactions to sounds may differ. To that effect we will present you with a number of questions capturing your reaction to noise. The ultimate goal of our study is to find the best questions to assess people's individual response to noise.

Of course, you can withdraw your participation from this research at any time. In that case the data collected so far will be deleted.

The study you are about to participate in is conducted by Technical University of Darmstadt, Germany, in cooperation with ENTPE in France, and the University of Vechta in Germany (see the three logos above).

## HOW TO PARTICIPATE

The survey will take place online and should last less than 15 minutes.

You **DO NOT** need more than your computer to participate. **A smartphone display will NOT render** the graphical layout of some of the questionnaires as desired. So, please use your **PC/notebook/tablet** to take part in this survey.

## CONFIDENTIALITY STATEMENT

Please be assured that the responses you provide in this survey will be used solely for statistical purposes in this study and will not be used for any other purpose. Data processing in the context of this study is performed according to the privacy regulations of the European Union, specifically the General Data Protection Regulation (GDPR) and the Privacy and Freedom of Information law of the State of Hesse, Germany (HDSIG), the state, where the Technical University of Darmstadt received approval for this study.

For question about confidentiality/privacy please contact the data protection officer of TU Darmstadt: Jan Hansen  
Email : [datenschutz@tu-darmstadt.de](mailto:datenschutz@tu-darmstadt.de)

Further information on the way we protect your data/confidentiality may be found [here](#):

## CONTACT

If you have any questions, suggestions or complaints, you are welcome to contact either the responsible head of the study:  
Prof. Wolfgang Ellermeier, Ph.D., TU Darmstadt, Germany  
Email: [ellermeier@psychologie.tu-darmstadt.de](mailto:ellermeier@psychologie.tu-darmstadt.de)

or the responsible administrator of the survey:  
Eunsung Song, Ph.D. student, ENTPE, Lyon, France  
mail: [eunsung.song@entpe.fr](mailto:eunsung.song@entpe.fr)

## DECLARATION OF CONSENT

I have read the explanations regarding the "Survey on noise in everyday life". I hereby agree to participate in the above-named study. I agree that any data which are collected in the course of the study will be analyzed for scientific purposes, will be stored in anonymized form, and potentially published in scientific work, generally in aggregated format of means and trends, without exposing individual results. I am aware that my participation is voluntary and that I can withdraw from participation at any time and without giving reasons.

I agree





What is your year of birth?

[Please choose] ▼

Are you...?

- Female
- Male
- Other (e.g., non-binary)
- Prefer not to say

Where do you currently live?

Make your best guess, if you are not sure.

- A village, hamlet or rural area (fewer than 3,000 people)
- A small town (3,000 to about 15,000 people)
- A town (15,000 to about 100,000 people)
- A city (100,000 to about 1,000,000 people)
- A large city (with over 1,000,000 people)

How noisy is it where you live?

- Very Noisy
- Noisy
- Moderately Noisy
- Quiet
- Very Quiet

Do you have tinnitus/ringing in the ears?

- Yes
- No

Do you currently have any hearing difficulties?

- Yes
- No

Has a hearing impairment been medically diagnosed?

- Yes
- No

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#### GENERAL INSTRUCTION ABOUT QUESTIONNAIRES

You will be presented with different statements about noise and will have to indicate how you feel about them by making marks on various rating scales. In the process, some of these questions may seem to repeat themselves, do not worry about that, they are chosen from various questionnaires and often only vary slightly in wording. Just try to answer one question at a time as best as you can.

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The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

#### General noise sensitivity

Please, move the arrow to the desired position.

Are you sensitive to noise?

not sensitive at all

extremely sensitive



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The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France



For each question, choose an option ranging from 'strongly agree' to 'strongly disagree'.

(01) I wouldn't mind living on a noisy street, if the apartment I had was nice.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(02) I am more aware of noise than I used to be.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(03) No one should mind much if someone turns up their stereo full blast once in a while.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(04) At movies, whispering and crinkling candy wrappers disturb me.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(05) I am easily awakened by noise.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(06) If it's noisy where I'm studying, I try to close the door or window or move someplace else.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(07) I get annoyed when my neighbors are noisy.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France



(08) I get used to most noises without much difficulty.

Agree strongly    Agree    Somewhat agree    Somewhat disagree    Disagree    Disagree strongly

(09) It would matter to me if an apartment I was interested in renting were located across from a fire station

Agree strongly    Agree    Somewhat agree    Somewhat disagree    Disagree    Disagree strongly

(10) Sometimes noises get on my nerves and get me irritated.

Agree strongly    Agree    Somewhat agree    Somewhat disagree    Disagree    Disagree strongly

(11) Even music I normally like will bother me if I'm trying to concentrate.

Agree strongly    Agree    Somewhat agree    Somewhat disagree    Disagree    Disagree strongly

(12) It wouldn't bother me to hear the sounds of everyday living from neighbors (footsteps, running water, etc).

Agree strongly    Agree    Somewhat agree    Somewhat disagree    Disagree    Disagree strongly

(13) When I want to be alone, it disturbs me to hear outside noises.

Agree strongly    Agree    Somewhat agree    Somewhat disagree    Disagree    Disagree strongly

(14) I'm good at concentrating no matter what is going on around me.

Agree strongly    Agree    Somewhat agree    Somewhat disagree    Disagree    Disagree strongly

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The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France



(15) In a library, I don't mind if people carry on a conversation if they do it quietly.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(16) There are often times when I want complete silence.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(17) Motorcycles ought to be required to have bigger mufflers.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(18) I find it hard to relax in a place that's noisy.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(19) I get mad at people who make noise that keeps me from falling asleep or getting work done.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(20) I wouldn't mind living in an apartment with thin walls.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(21) I am sensitive to noise.

Agree strongly	Agree	Somewhat agree	Somewhat disagree	Disagree	Disagree strongly
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France



Over the last 2 weeks, how often would you say each of the following has occurred because of certain environmental sounds that seemed too loud to you but that people around you could tolerate well?

Please answer each item to the best of your ability as close to your experience as possible.

(01) Feeling anxious when hearing loud noises

0-1 day    2-6 days    7-10 days    11-14 days  
           

(02) Avoiding certain places because it is too noisy

0-1 day    2-6 days    7-10 days    11-14 days  
           

(03) Lack of concentration in noisy places

0-1 day    2-6 days    7-10 days    11-14 days  
           

(04) Unable to relax in noisy places

0-1 day    2-6 days    7-10 days    11-14 days  
           

(05) Difficulty in carrying out certain day-to-day activities/tasks in noisy places

0-1 day    2-6 days    7-10 days    11-14 days  
           

(06) Lack of enjoyment from leisure activities in noisy places

0-1 day    2-6 days    7-10 days    11-14 days  
           

(07) Experiencing low mood because of your intolerance to sound

0-1 day    2-6 days    7-10 days    11-14 days  
           

(08) Getting tired quickly in noisy places

0-1 day    2-6 days    7-10 days    11-14 days  
           

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The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

Over the last 2 weeks, how often have you been bothered by any of the following problems?

Please answer each item to the best of your ability as close to your experience as possible.

(01) Having a problem tolerating sounds because they often seem "too loud" to you?

0-1 day      2-6 days      7-10 days      11-14 days

(02) Pain in your ears when hearing certain loud sounds? Examples: loud music, sirens, motorcycles, building work, lawn mower, train stations.

0-1 day      2-6 days      7-10 days      11-14 days

(03) Discomfort (physical sensations other than ear pain) in your ears when hearing certain loud sounds?

0-1 day      2-6 days      7-10 days      11-14 days

(04) Feeling angry or anxious when hearing certain sounds related to eating noises, lip smacking, sniffing, breathing, clicking sounds, tapping?

0-1 day      2-6 days      7-10 days      11-14 days

(05) Fear that certain sounds may make your hearing and/or tinnitus worse?

0-1 day      2-6 days      7-10 days      11-14 days

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The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

Thinking about the last 12 months, when you are at home, what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by road-traffic noise?

If you are not at all annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between, choose a number between 0 and 10.

Not at all      0      1      2      3      4      5      6      7      8      9      10      Extremely

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The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France



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**General noise sensitivity**  
Please, insert the value to the desired position!

Are you sensitive to noise?

not sensitive at all extremely sensitive

**\*Feedback**

You completed this question earlier. Would you mind telling us in a few words how you arrived at your judgment?

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The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France



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**\*You are helping us to further develop this questionnaire in a pretest. We'd like to know:**

- Did you notice any errors?
- Were any of the questions ambiguous or hard to understand?
- Is there anything you are missing in this questionnaire?

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The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France



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## Thank you for completing this questionnaire!

We would like to thank you very much for helping us.

Your answers were transmitted, you may close the browser window or tab now.

The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France



## Appendix 4: Survey screenshots – English



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### SURVEY ON THE ROLE OF NOISE IN EVERYDAY LIFE

The purpose of the present survey is to study how people are affected by noise in everyday life, and how people's reactions to sounds may differ. To that effect we will present you with a number of questions capturing your reaction to noise. The ultimate goal of our study is to find the best questions to assess people's individual response to noise.

Of course, you can withdraw your participation from this research at any time. In that case the data collected so far will be deleted.

The study you are about to participate in is conducted by Technical University of Darmstadt, Germany, in cooperation with ENTPE in France, and the University of Vechta in Germany (see the three logos above).

#### HOW TO PARTICIPATE

The survey will take place online and should last less than 30 minutes.

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Email : [datenschutz@tu-darmstadt.de](mailto:datenschutz@tu-darmstadt.de)

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#### DECLARATION OF CONSENT

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I agree

Next

The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

3% completed



**What is your Prolific ID?**

**Is English your first language?**

Yes

No (How long have you spoken English?)  e.g., "5" years

**How old are you?**

Age:  years

**Are you...?**

Female

Male

Other (e.g., non-binary)

Prefer not to say

**Where do you currently live?**

Make your best guess, if you are not sure.

A village, hamlet or rural area (fewer than 3,000 people)

A small town (3,000 to about 15,000 people)

A town (15,000 to about 100,000 people)

A city (100,000 to about 1,000,000 people)

A large city (with over 1,000,000 people)

**How noisy is it where you live?**

Very Noisy

Noisy

Moderately Noisy

Quiet

Very Quiet

**Do you have tinnitus/ringing in the ears?**

Yes

No

**Do you currently have any hearing difficulties?**

Yes

No

**Has a hearing impairment been medically diagnosed?**

Yes

No

Next



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DARMSTADT



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University of Vechta

---

#### GENERAL INSTRUCTION ABOUT QUESTIONNAIRES

You will be presented with different statements about noise and will have to indicate how you feel about them by making marks on various rating scales. In the process, some of these questions may seem to repeat themselves, and some of them are very similar. Do not worry about that, they are chosen from various questionnaires and often only vary slightly in wording. Just try to answer one question at a time as best as you can.

Next

---

The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

9% completed



For each question, indicate which response option best applies to you, ranging from 'strongly agree' to 'strongly disagree'.

(01) Before I start work, I try to eliminate all sources of noise.

Strongly agree

Agree

Disagree

Strongly disagree

(02) When I am exhausted, loud music has an invigorating effect on me.

Strongly agree

Agree

Disagree

Strongly disagree

(03) Restful sleep is only possible in completely quiet surroundings.

Strongly agree

Agree

Disagree

Strongly disagree

(04) The sound of a door slamming does not startle me.

Strongly agree

Agree

Disagree

Strongly disagree

(05) In a restaurant, I find it inconsiderate if people at nearby tables are talking loudly.

Strongly agree

Agree

Disagree

Strongly disagree

(06) While reading the newspaper, I am able to listen to the radio.

Strongly agree

Agree

Disagree

Strongly disagree

(07) On weekends, I prefer to spend time in quiet places.

Strongly agree

Agree

Disagree

Strongly disagree

Next

The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

13% completed



(08) Quite often I find myself longing for peace and quiet.

Strongly agree

Agree

Disagree

Strongly disagree

(09) No matter how excellent the food, I lose my appetite when a place happens to be noisy.

Strongly agree

Agree

Disagree

Strongly disagree

(10) I get fidgety if I hear somebody talking while I am trying to fall asleep.

Strongly agree

Agree

Disagree

Strongly disagree

(11) The perceived need for noise protection is being taken way too seriously.

Strongly agree

Agree

Disagree

Strongly disagree

(12) I do not like to go to public events if they are likely to be noisy.

Strongly agree

Agree

Disagree

Strongly disagree

(13) I cannot fall asleep, if I can hear even the slightest noise.

Strongly agree

Agree

Disagree

Strongly disagree

(14) I believe that even extreme background noise does not impair my performance.

Strongly agree

Agree

Disagree

Strongly disagree

Next



(15) It is annoying to carry on a conversation while the radio is on.

Strongly agree

Agree

Disagree

Strongly disagree

(16) At a dance, it does not matter how loud the music is; volume is irrelevant.

Strongly agree

Agree

Disagree

Strongly disagree

(17) I am more relaxed in quiet places.

Strongly agree

Agree

Disagree

Strongly disagree

(18) Not even a thunderstorm can wake me.

Strongly agree

Agree

Disagree

Strongly disagree

(19) In noisy surroundings, I often misspeak or mix up my words

Strongly agree

Agree

Disagree

Strongly disagree

(20) Having a meal in a noisy place upsets my stomach.

Strongly agree

Agree

Disagree

Strongly disagree

(21) I am able to fall asleep only if there is complete silence.

Strongly agree

Agree

Disagree

Strongly disagree

Next



(22) I like listening to loud music while doing my household chores.

Strongly agree

Agree

Disagree

Strongly disagree

(23) I am of the opinion that loud music in a café does not interfere with a conversation.

Strongly agree

Agree

Disagree

Strongly disagree

(24) Noisy colleagues irritate me.

Strongly agree

Agree

Disagree

Strongly disagree

(25) I try to get away from everyday street noise as quickly as possible.

Strongly agree

Agree

Disagree

Strongly disagree

(26) While working, background music does not disturb me.

Strongly agree

Agree

Disagree

Strongly disagree

(27) I tend to notice disturbing sounds later than other people do.

Strongly agree

Agree

Disagree

Strongly disagree

(28) A conversation in a noisy place is not enjoyable.

Strongly agree

Agree

Disagree

Strongly disagree

Next



(29) Noise makes people irritable.

Strongly agree

Agree

Disagree

Strongly disagree

(30) I avoid noisy events such as going to soccer matches or fairs.

Strongly agree

Agree

Disagree

Strongly disagree

(31) Background noise at my work place makes me irritable.

Strongly agree

Agree

Disagree

Strongly disagree

(32) Neighbors should be as quiet as if they were not even home.

Strongly agree

Agree

Disagree

Strongly disagree

(33) I wake at the slightest sound.

Strongly agree

Agree

Disagree

Strongly disagree

(34) Even in noisy surroundings, I am able to work efficiently, quickly and to concentrate normally.

Strongly agree

Agree

Disagree

Strongly disagree

(35) Music ought to be listened to at maximum volume.

Strongly agree

Agree

Disagree

Strongly disagree

Next

The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

28% completed





(36) When shopping in the city, I hardly notice the street noise.

Strongly agree

Agree

Disagree

Strongly disagree

(37) After spending an evening in a noisy pub I feel completely drained.

Strongly agree

Agree

Disagree

Strongly disagree

(38) When I want to fall asleep, there is hardly a sound that can disturb me.

Strongly agree

Agree

Disagree

Strongly disagree

(39) Intellectually demanding tasks require peace and quiet.

Strongly agree

Agree

Disagree

Strongly disagree

(40) Loud music will not damage my hearing.

Strongly agree

Agree

Disagree

Strongly disagree

(41) I get annoyed at a dog barking outside my window while I am trying to read the newspaper.

Strongly agree

Agree

Disagree

Strongly disagree

(42) I like to leave the radio or TV on in the background all day long.

Strongly agree

Agree

Disagree

Strongly disagree

Next



(43) Loud music in a pub makes me end the conversation.

Strongly agree

Agree

Disagree

Strongly disagree

(44) I can concentrate on a book even if there is music in the background.

Strongly agree

Agree

Disagree

Strongly disagree

(45) If the noise level at a party goes up, I leave.

Strongly agree

Agree

Disagree

Strongly disagree

(46) After work, I enjoy listening to loud music.

Strongly agree

Agree

Disagree

Strongly disagree

(47) In my opinion, peace and quiet at night must not be disturbed.

Strongly agree

Agree

Disagree

Strongly disagree

(48) Whenever there is loud noise I would like to do something about it.

Strongly agree

Agree

Disagree

Strongly disagree

(49) Clearly, one cannot work in noisy surroundings.

Strongly agree

Agree

Disagree

Strongly disagree

Next



(50) If I am absorbed in a conversation, I do not notice whether a pub is noisy or not.

Strongly agree	Agree	Disagree	Strongly disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(51) Listening to loud music helps me unwind.

Strongly agree	Agree	Disagree	Strongly disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(52) Noise makes people ill.

Strongly agree	Agree	Disagree	Strongly disagree
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Next

The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

39% completed



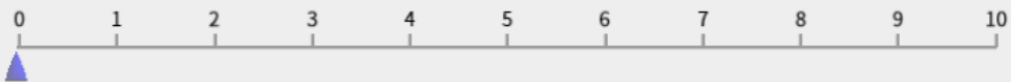
### General noise sensitivity

Please move the arrow to the desired position; you may choose intermediate values.

Are you sensitive to noise?

not sensitive at all

extremely sensitive



Next

The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

43% completed



For each question, choose an option ranging from 'agree strongly' to 'disagree strongly'.

(01) I wouldn't mind living on a noisy street, if the apartment I had was nice.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(02) I am more aware of noise than I used to be.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(03) No one should mind much if someone turns up their stereo full blast once in a while.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(04) At movies, whispering and crinkling candy wrappers disturb me.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(05) I am easily awakened by noise.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(06) If it's noisy where I'm studying, I try to close the door or window or move someplace else.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(07) I get annoyed when my neighbors are noisy.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

Next



(08) I get used to most noises without much difficulty.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(09) It would matter to me if an apartment I was interested in renting were located across from a fire station

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(10) Sometimes noises get on my nerves and get me irritated.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(11) Even music I normally like will bother me if I'm trying to concentrate.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(12) It wouldn't bother me to hear the sounds of everyday living from neighbors (footsteps, running water, etc).

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(13) When I want to be alone, it disturbs me to hear outside noises.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(14) I'm good at concentrating no matter what is going on around me.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

Next



(15) In a library, I don't mind if people carry on a conversation if they do it quietly.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(16) There are often times when I want complete silence.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(17) Motorcycles ought to be required to have bigger mufflers.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(18) I find it hard to relax in a place that's noisy.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(19) I get mad at people who make noise that keeps me from falling asleep or getting work done.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(20) I wouldn't mind living in an apartment with thin walls.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

(21) I am sensitive to noise.

Agree strongly

Agree

Somewhat agree

Somewhat disagree

Disagree

Disagree strongly

Next



For each question, choose an option ranging from 'strongly agree' to 'strongly disagree'.

(01) I find it hard to relax in a noisy environment.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(02) I need peace and quiet to do difficult work.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(03) For a quiet place to live I would accept other disadvantages.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(04) I am very sensitive to neighbourhood noise.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(05) I find it hard to communicate while it is noisy.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(06) I have no problems to do routine work in a noisy environment.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(07) I become very agitated if I can hear someone talking while I am trying to fall asleep.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

Next

The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

58% completed



(08) When I am absorbed in a conversation I do not notice whether it is noisy around me.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(09) I can fall asleep even when it is noisy.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(10) My performance is much worse in noisy places.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(11) Listening to loud music helps me to relax after work.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(12) In a restaurant I cannot concentrate well on my conversation when people are talking loudly at other tables.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(13) I need quiet surroundings to be able to work on new tasks.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(14) When people around me are noisy I don't get on with my work.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

Next





(15) I need an absolutely quiet environment to get a good night's sleep.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(16) Even the slightest noise can prevent me from falling asleep.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(17) When I am at home, I habituate to noise quickly.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(18) In the cinema I am annoyed by other people whispering and by rustling paper.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(19) I think music interferes with conversations.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(20) I find it very hard to follow a conversation when the radio is playing.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(21) If my workplace was noisy I would always try to find a way for me to change this.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

Next



(22) When dancing I don't mind how loud the music is.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(23) It would not bother me to live in a noisy street.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(24) When other peoples' children are noisy I would prefer that they should not play in front of my house.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(25) At weekends I prefer quiet surroundings.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(26) I do not feel well rested if there has been a lot of noise the night before.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(27) When I am at home I find it uncomfortable if the radio or TV is left on in the background.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(28) Loud music in a restaurant makes me stop my conversation.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

Next



(29) I can do complicated work even while background music is playing.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(30) I wake up at the slightest noise.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(31) I avoid leisure activities which are loud.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(32) I don't like noisy activities in my residential area.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(33) Noises from neighbours can be extremely disturbing (e.g. pacing of people).

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(34) The sound of loud thunder does not usually wake me up.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

(35) High noise levels make it hard for me to concentrate on my conversation.

Strongly agree

Slightly agree

Slightly disagree

Strongly disagree

Next



Compared to people around you, do you think that you are ... to noise?

much less  
sensitive

less  
sensitive

equally  
sensitive

more  
sensitive

much more  
sensitive

Next

The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

77% completed



Over the last 2 weeks, how often would you say each of the following has occurred because of certain environmental sounds that seemed too loud to you but that people around you could tolerate well?

Please answer each item to the best of your ability as close to your experience as possible.

(01) Feeling anxious when hearing loud noises.

0-1 day

2-6 days

7-10 days

11-14 days

(02) Avoiding certain places because it is too noisy.

0-1 day

2-6 days

7-10 days

11-14 days

(03) Lack of concentration in noisy places.

0-1 day

2-6 days

7-10 days

11-14 days

(04) Unable to relax in noisy places.

0-1 day

2-6 days

7-10 days

11-14 days

(05) Difficulty in carrying out certain day-to-day activities/tasks in noisy places.

0-1 day

2-6 days

7-10 days

11-14 days

(06) Lack of enjoyment from leisure activities in noisy places.

0-1 day

2-6 days

7-10 days

11-14 days

(07) Experiencing low mood because of your intolerance to sound.

0-1 day

2-6 days

7-10 days

11-14 days

(08) Getting tired quickly in noisy places.

0-1 day

2-6 days

7-10 days

11-14 days

Next



Over the last 2 weeks, how often have you been bothered by any of the following problems?

Please answer each item to the best of your ability as close to your experience as possible.

(01) Having a problem tolerating sounds because they often seem "too loud" to you?

0-1 day

2-6 days

7-10 days

11-14 days

(02) Pain in your ears when hearing certain loud sounds? Examples: loud music, sirens, motorcycles, building work, lawn mower, train stations.

0-1 day

2-6 days

7-10 days

11-14 days

(03) Discomfort (physical sensations other than ear pain) in your ears when hearing certain loud sounds?

0-1 day

2-6 days

7-10 days

11-14 days

(04) Feeling angry or anxious when hearing certain sounds related to eating noises, lip smacking, sniffing, breathing, clicking sounds, tapping?

0-1 day

2-6 days

7-10 days

11-14 days

(05) Fear that certain sounds may make your hearing and/or tinnitus worse?

0-1 day

2-6 days

7-10 days

11-14 days

Next

The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

85% completed



Thinking about the last 12 months, when you are at home, what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by **road-traffic noise**?

If you are not at all annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between, choose a number between 0 and 10.

Not at all											Extremely
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the last 12 months, when you are at home, what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by **railway noise**?

If you are not at all annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between, choose a number between 0 and 10.

Not at all											Extremely
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the last 12 months, when you are at home, what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by **aircraft noise**?

If you are not at all annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between, choose a number between 0 and 10.

Not at all											Extremely
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the last 12 months, when you are at home, what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by **industrial noise**?

If you are not at all annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between, choose a number between 0 and 10.

Not at all											Extremely
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the last 12 months, when you are at home, what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by **construction noise**?

If you are not at all annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between, choose a number between 0 and 10.

Not at all											Extremely
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thinking about the last 12 months, when you are at home, what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by **neighborhood noise**?

If you are not at all annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between, choose a number between 0 and 10.

Not at all											Extremely
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Next



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT



Universität Vechta  
University of Vechta

---

## You have completed our survey! Thank you so much for participating!

When you click NEXT, all your data will have been saved, and you will be redirected to Prolific.

Next

---

The responsible administrator of the survey:  
Ph.D. student Eunsung Song, ENTPE, Lyon, France

92% completed



## Appendix 5: Survey screenshots – French



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT



Universität Vechta  
University of Vechta

### ENQUÊTE SUR LE RÔLE DU BRUIT DANS LA VIE QUOTIDIENNE

L'objectif de cette enquête est d'étudier comment les personnes sont affectées par le bruit dans leur vie quotidienne, et comment les réactions au bruit peuvent différer d'une personne à l'autre. À cet effet, nous vous poserons un certain nombre de questions relatives à votre réaction au bruit. Le but de notre étude est de trouver les meilleures questions pour évaluer la réaction individuelle des personnes au bruit.

Bien entendu, vous pouvez retirer votre participation de cette recherche à n'importe quel moment. Dans ce cas, les données collectées jusqu'à présent seront supprimées.

L'étude à laquelle vous allez participer est menée par l'Université technique de Darmstadt, en Allemagne, en coopération avec l'ENTPE, en France, et l'Université de Vechta, en Allemagne (voir les trois logos ci-dessus).

#### COMMENT PARTICIPER

Cette enquête se déroulera en ligne et devrait durer moins de 30 minutes.

Vous avez seulement besoin d'un ordinateur pour participer. **L'écran d'un smartphone ne permettra pas** la présentation graphique souhaitée de certains questionnaires. Veuillez donc utiliser votre **PC/ordinateur portable/tablette** pour participer à cette enquête.

#### DECLARATION DE CONFIDENTIALITE

Soyez assuré·e que les réponses que vous donnerez au cours de l'enquête seront utilisées uniquement à des fins statistiques dans le cadre de cette étude, et ne seront pas utilisées à d'autres fins. Le traitement des données dans le cadre de cette étude est effectué conformément aux règles de confidentialité de l'Union Européenne, en particulier le règlement général sur la protection des données (RGPD) et la loi sur la confidentialité et la liberté d'information de l'État de Hesse, en Allemagne (HDSIG), état dont dépend l'Université Technique de Darmstadt (TU Darmstadt), responsable de l'enquête.

Pour toute question relative à la confidentialité, veuillez contacter le responsable de la protection des données de la TU Darmstadt : Jan Hansen

Courriel : [datenschutz@tu-darmstadt.de](mailto:datenschutz@tu-darmstadt.de)

De plus amples informations sur la manière dont nous protégeons vos données/la confidentialité sont disponibles [ici](#):

#### CONTACT

Si vous avez des questions, des suggestions ou des plaintes, vous pouvez contacter le responsable de l'étude :

Professeur Wolfgang Ellermeier, Docteur, TU Darmstadt, Allemagne

Courriel : [ellermeier@psychologie.tu-darmstadt.de](mailto:ellermeier@psychologie.tu-darmstadt.de)

ou l'administrateur responsable de l'enquête :

Eunsung Song, doctorant, ENTPE, Lyon, France

Courriel : [eunsung.song@entpe.fr](mailto:eunsung.song@entpe.fr)

#### DECLARATION DE CONSENTEMENT

J'ai pris connaissance des explications concernant l'« Enquête sur le bruit dans la vie quotidienne ». J'accepte de participer à l'étude susnommée. J'accepte que toutes les données collectées au cours de l'étude soient analysées à des fins scientifiques, stockées sous une forme anonyme et éventuellement publiées dans des travaux scientifiques, généralement sous forme agrégée de moyennes et de tendances, sans exposer les résultats individuels. Je suis conscient·e que ma participation est volontaire et que je peux m'en retirer à tout moment et sans donner de raison.

J'accepte

[suivant](#)

L'administrateur responsable de l'enquête :  
doctorant Eunsung Song, ENTPE, Lyon, France

0% rempli



Quel est votre identifiant Prolific ?

Est-ce que le français est votre langue maternelle ?

Oui

Non (Depuis combien d'années parlez-vous français ?)  par ex. «5»

Quel est votre âge ?

Âge  ans

Êtes-vous ?

Femme

Homme

Autre (par ex. non binaire)

Je préfère ne pas le dire.

Où habitez-vous ?

Donnez votre estimation la plus proche.

Un village, hameau ou collectivité rurale (moins de 3 000 habitants).

Un bourg (de 3 000 à 15 000 habitants environ).

Une petite ville (de 15 000 à 100 000 habitants environ).

Une ville (entre 100 000 et un million d'habitants environ).

Une grande agglomération de plus d'un million d'habitants.

Quel est le niveau de bruit là où vous vivez ?

Très bruyant

Bruyant

Modérément bruyant

Calme

Très calme

Souffrez-vous d'acouphènes/de bourdonnements d'oreille ?

Oui

Non

Avez-vous actuellement des problèmes d'audition ?

Oui

Non

Une déficience auditive vous a-t-elle été médicalement diagnostiquée ?

Oui

Non

suivant



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DARMSTADT

ENTPE



Universität Vechta  
University of Vechta

#### INSTRUCTIONS GENERALES SUR LES QUESTIONNAIRES

Différentes affirmations sur le bruit vous seront présentées et vous devrez indiquer ce que vous en pensez en cochant différentes échelles d'évaluation. Durant l'enquête, il se peut que certaines de ces questions semblent répétitives, ou soient très similaires. Ne vous inquiétez pas, elles sont issues de divers questionnaires et leurs formulations ne varient souvent que légèrement. Essayez simplement de répondre à une question à la fois, du mieux que vous pouvez.

[suivant](#)

L'administrateur responsable de l'enquête :  
doctorant Eunsung Song, ENTPE, Lyon, France

6% rempli



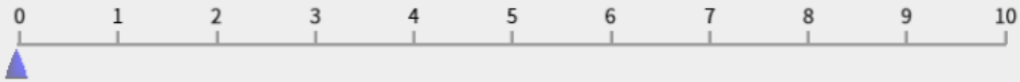
### Sensibilité au bruit en général

Veillez faire coulisser le curseur à la position souhaitée ; vous pouvez choisir des valeurs intermédiaires

#### Êtes-vous sensible au bruit ?

Pas du tout sensible

Extrêmement sensible



suivant

L'administrateur responsable de l'enquête :  
doctorant Eunsung Song, ENTPE, Lyon, France

10% rempli



Pour chaque question, choisissez l'une des options, allant de « tout à fait d'accord » à « pas du tout d'accord ».

(01) J'ai du mal à me reposer dans un environnement bruyant.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(02) J'ai besoin de calme et de tranquillité pour effectuer un travail difficile.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(03) Je suis prêt-e à accepter des inconvénients pour vivre dans un endroit calme.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(04) Je suis très sensible au bruit de voisinage.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(05) Il m'est difficile de communiquer dans un environnement bruyant.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(06) Je n'ai pas de problème pour effectuer une tâche ordinaire dans un environnement bruyant.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(07) Je deviens très agité-e si j'entends quelqu'un parler alors que j'essaie de m'endormir.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

[suivant](#)

L'administrateur responsable de l'enquête :  
doctorant Eunsung Song, ENTPE, Lyon, France

14% rempli



(08) Quand je suis plongé-e dans une discussion, je ne remarque pas si c'est bruyant autour de moi.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(09) Je peux m'endormir même quand c'est bruyant.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(10) Je suis nettement moins performant-e dans les endroits bruyants.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(11) Ecouter la musique fort m'aide à me relaxer après le travail.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(12) Au restaurant, je ne peux me concentrer sur ma conversation lorsqu'à d'autres tables des personnes parlent à voix haute.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(13) J'ai besoin d'un environnement calme pour être capable d'effectuer de nouvelles tâches.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(14) Lorsque les gens autour de moi sont bruyants, j'ai du mal à accomplir mon travail.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

[suivant](#)



(15) J'ai besoin d'un environnement complètement calme pour avoir une bonne nuit de sommeil.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(16) Même le plus petit bruit m'empêche de m'endormir.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(17) Quand je suis à la maison, je m'habitue rapidement au bruit.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(18) Au cinéma, je suis gêné-e par le chuchotement des gens et le froissement des papiers.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(19) Je pense que la musique interfère avec les conversations.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(20) Il m'est très difficile de suivre une conversation quand la radio marche en même temps.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(21) Si mon lieu de travail était bruyant, j'essaierais toujours de trouver des solutions pour y remédier.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

[suivant](#)



(22) Lorsque je danse, je ne fais pas attention au volume sonore de la musique.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(23) Vivre dans une rue bruyante ne me dérangerait pas.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(24) Lorsque les enfants des autres sont bruyants, je préfère ne pas les voir jouer devant chez moi.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(25) Je préfère un endroit calme le week-end.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(26) Je ne me sens pas bien reposé-e lorsque la nuit précédente a été bruyante.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(27) Quand je suis chez moi, je n'aime pas laisser la radio ou la TV allumée juste pour avoir un fond sonore.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(28) Quand la musique est forte dans un restaurant, j'interromps ma conversation.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

suivant





(29) Je peux effectuer des tâches compliquées avec de la musique en fond sonore.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(30) Je me réveille au moindre bruit.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(31) J'évite les activités de loisirs qui sont bruyantes.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(32) Je n'aime pas les activités bruyantes dans mon quartier.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(33) Les bruits de mes voisins peuvent être extrêmement dérangeants (par exemple, le bruit des pas).

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(34) Même lorsqu'il est fort, le bruit du tonnerre ne me réveille habituellement pas.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(36) Il m'est difficile de me concentrer sur une conversation en présence de bruits de niveaux élevés.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

suivant



Pour chaque question, veuillez indiquer la réponse qui vous correspond le mieux, allant de « tout à fait d'accord » à « pas du tout d'accord ».

(01) Avant de commencer à travailler, j'essaie d'éliminer toute source de bruit.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(02) Quand je suis épuisé-e, la musique forte me revigore.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(03) Un sommeil réparateur n'est possible, que dans un environnement absolument calme.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(04) Les portes qui claquent ne m'effraient pas.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(05) Dans un restaurant, je trouve irrespectueux si les gens parlent fort à la table voisine.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(06) Je peux écouter la radio tout en lisant le journal.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(07) Le weekend, j'aime être dans un endroit calme.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

suivant



(08) J'ai souvent envie de silence.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(09) Quand il y a du bruit, même le meilleur des repas ne pourrait me plaire.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(10) Si j'entends quelqu'un parler quand je veux m'endormir, cela m'énerve.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(11) On attache trop de valeur à la protection contre le bruit.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(12) Je n'aime pas aller à des événements s'ils sont bruyants.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(13) Même au moindre bruit, j'ai du mal à m'endormir.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(14) Je pense que même un grand bruit de fond n'affecte pas mes performances.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

[suivant](#)



(15) Il n'y a aucun plaisir à discuter si la radio est allumée en même temps.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(16) En dansant, on peut mettre la musique aussi forte qu'on le souhaite.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(17) Là où c'est calme, je suis plus détendu-e.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(18) Même un orage ne peut pas me sortir du sommeil.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(19) Quand il y a du bruit autour de moi, j'ai du mal à trouver des mots.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(20) Manger dans un environnement bruyant me donne mal à l'estomac.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(21) Je ne peux m'endormir que dans un silence total.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

[suivant](#)



(22) J'aime écouter de la musique forte en faisant le ménage.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(23) Je suis d'avis, que la musique forte dans un café ne perturbe pas une conversation.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(24) Les collègues qui sont bruyants me rendent nerveux-se.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(25) J'essaie toujours d'échapper au plus vite au bruit quotidien de la rue.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(26) Pendant le travail, la musique de fond ne me dérange pas.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(27) Je remarque les bruits gênants plus tard que les autres.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(28) Il est désagréable de discuter dans le bruit.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

suivant



(29) Le bruit rend agressif-ve.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(30) J'évite les événements bruyants comme les matchs de football ou les fêtes foraines.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(31) Le bruit me rend agressif-ve sur mon lieu de travail.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(32) Les voisins doivent être aussi silencieux que s'ils n'étaient pas là.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(33) Je me réveille au moindre bruit.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(34) Je suis capable de travailler vite et de me concentrer dans un environnement bruyant.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(35) La musique doit être écoutée à plein volume.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

[suivant](#)



(36) Lorsque je suis en ville et fais les courses, je ne remarque pas le bruit de la rue.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(37) Après une soirée dans un endroit bruyant, je me sens épuisé·e.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(38) Quand je veux m'endormir, presque aucun bruit ne me dérange.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(39) Les tâches mentalement exigeantes nécessitent du calme.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(40) La musique forte ne nuit pas à mon audition.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(41) Si un chien aboie sous mes fenêtres quand je lis le journal, cela m'énerve.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(42) Je trouve agréable, que la télévision ou la radio soit allumée en fond sonore pendant la journée.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

suivant



(43) Si la musique est forte dans un endroit, je cesse de discuter.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(45) Je suis capable de me concentrer sur un livre même s'il y a de la musique à côté.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(45) Si une fête devient trop bruyante, alors je m'en vais.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(46) Après le travail, j'aime écouter de la musique forte.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(47) A mon avis, le silence doit être total pendant la nuit.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(48) Si c'est bruyant, je désire faire quelque chose pour y remédier.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(49) Il est évident que l'on ne peut pas travailler dans le bruit.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

suivant





(50) Quand je suis plongé-e dans une conversation, je ne remarque pas si le lieu est bruyant.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(51) Je me détends en écoutant de la musique forte.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

(52) Le bruit rend malade.

Tout à fait d'accord

Plutôt d'accord

Plutôt pas d'accord

Pas du tout d'accord

[suivant](#)

L'administrateur responsable de l'enquête :  
doctorant Eunsung Song, ENTPE, Lyon, France

61% rempli



Pour chaque question, choisissez l'une des options, allant de  
« tout à fait d'accord » à « pas du tout d'accord ».

(01) Cela ne me dérangerait pas de vivre dans une rue bruyante si l'appartement que j'avais était agréable.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(02) Je suis plus conscient-e du bruit que je ne l'étais auparavant.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(03) Personne ne devrait s'inquiéter si quelqu'un met en marche sa stéréo à plein régime de temps en temps.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(04) Au cinéma, les murmures et les emballages de bonbons froissés me dérangent.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(05) Je suis facilement réveillé-e par le bruit.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(06) S'il y a du bruit là où j'étudie, j'essaie de fermer la porte et/ou la fenêtre ou encore je me déplace ailleurs.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(07) Je m'énerve quand mes voisins sont bruyants.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

[suivant](#)



(08) Je m'habitue à la plupart des bruits sans trop de difficulté.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(09) Cela me dérangerait qu'un appartement que je souhaite louer soit situé en face d'une caserne de pompiers.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(10) Parfois, les bruits me tapent sur les nerfs et m'irritent.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(11) Même la musique que j'aime normalement me dérange si j'essaie de me concentrer.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(12) Cela ne me dérangerait pas d'entendre les bruits de la vie quotidienne des voisins (des pas, eau courante, etc.)

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(13) Quand je veux être seul-e, cela me dérange d'entendre des bruits extérieurs.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(14) Je peux me concentrer, peu importe ce qui se passe autour de moi.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

[suivant](#)



(15) Dans une bibliothèque, cela ne me dérange pas que les gens tiennent une conversation s'ils le font calmement.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(16) Il y a souvent des moments où je veux un silence complet.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(17) Les motocyclettes devraient être obligées d'avoir des silencieux plus grands.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(18) Je trouve difficile de me détendre dans un endroit bruyant.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(19) Je m'énerve contre les gens qui font du bruit qui m'empêche de m'endormir ou d'effectuer mon travail.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(20) Cela ne me dérangerait pas de vivre dans un appartement aux murs fins.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

(21) Je suis sensible au bruit.

Tout à fait d'accord  D'accord  Plutôt d'accord  Plutôt pas d'accord  Pas d'accord  Pas du tout d'accord

suivant



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT

ENTPE

Universität Vechta  
University of Vechta

Par rapport aux personnes de votre entourage, estimez-vous que vous êtes ... au bruit ?

beaucoup moins  
sensible

moins  
sensible

aussi  
sensible

un peu plus  
sensible

beaucoup plus  
sensible

suivant

L'administrateur responsable de l'enquête :  
doctorant Eunsung Song, ENTPE, Lyon, France

77% rempli



Au cours des 2 dernières semaines, combien de fois diriez-vous que chacune de ces situations est arrivée à cause de certains bruits environnementaux qui vous semblaient trop forts mais que les personnes autour de vous pouvaient bien tolérer ?

Veuillez répondre à chaque question au mieux de vos capacités, en vous rapprochant le plus possible de votre expérience.

(01) Sentiment d'anxiété en entendant des bruits forts.

0-1 jour

2-6 jours

7-10 jours

11-14 jours

(02) Éviter certains endroits parce qu'ils sont trop bruyants.

0-1 jour

2-6 jours

7-10 jours

11-14 jours

(03) Manque de concentration dans des endroits bruyants.

0-1 jour

2-6 jours

7-10 jours

11-14 jours

(04) Incapacité à se relaxer dans des endroits bruyants.

0-1 jour

2-6 jours

7-10 jours

11-14 jours

(05) Difficulté à effectuer certaines activités/tâches quotidiennes dans des endroits bruyants.

0-1 jour

2-6 jours

7-10 jours

11-14 jours

(06) Manque de plaisir à pratiquer des activités de loisir dans des endroits bruyants.

0-1 jour

2-6 jours

7-10 jours

11-14 jours

(07) Être de mauvaise humeur à cause de votre intolérance au bruit.

0-1 jour

2-6 jours

7-10 jours

11-14 jours

(08) Être fatigué-e rapidement dans des endroits bruyants.

0-1 jour

2-6 jours

7-10 jours

11-14 jours

suivant



**Au cours des 2 dernières semaines, combien de fois avez-vous été dérangé.e par l'un des problèmes suivants ?**

Veuillez répondre à chaque question au mieux de vos capacités, en vous rapprochant le plus possible de votre expérience.

(01) Vous avez du mal à tolérer les bruits parce qu'ils vous semblent souvent « trop forts » ?

0-1 jour

2-6 jours

7-10 jours

11-14 jours

(02) Douleur aux oreilles quand vous entendez certains bruits forts ? Exemples : Musique forte, sirènes, motos, travaux de construction, tondeuse à gazon, gares ferroviaires.

0-1 jour

2-6 jours

7-10 jours

11-14 jours

(03) Inconfort dans vos oreilles (sensations physiques autres que la douleur aux oreilles) lorsque vous entendez certains bruits forts ?

0-1 jour

2-6 jours

7-10 jours

11-14 jours

(04) Sentiment de colère ou d'anxiété quand vous entendez certains bruits liés à l'alimentation, au claquement des lèvres, au reniflement, à la respiration, aux cliquetis, au tapotement ?

0-1 jour

2-6 jours

7-10 jours

11-14 jours

(05) Vous craignez que certains bruits puissent aggraver votre audition et/ou vos acouphènes ?

0-1 jour

2-6 jours

7-10 jours

11-14 jours

[suivant](#)

L'administrateur responsable de l'enquête :  
doctorant Eunsung Song, ENTPE, Lyon, France

84% rempli



**Maintenant, si vous pensez aux douze derniers mois, quand vous êtes chez vous, quelle note comprise entre zéro et dix exprime le mieux la façon dont le bruit du trafic routier vous gêne ?**

Notez zéro si le bruit ne vous gêne pas du tout et notez dix si le bruit vous gêne extrêmement. Si vous êtes entre ces deux situations, choisissez une note intermédiaire entre zéro et dix.

Pas du tout											Extrêmement
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Maintenant, si vous pensez aux douze derniers mois, quand vous êtes chez vous, quelle note comprise entre zéro et dix exprime le mieux la façon dont le bruit ferroviaire vous gêne ?**

Notez zéro si le bruit ne vous gêne pas du tout et notez dix si le bruit vous gêne extrêmement. Si vous êtes entre ces deux situations, choisissez une note intermédiaire entre zéro et dix.

Pas du tout											Extrêmement
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Maintenant, si vous pensez aux douze derniers mois, quand vous êtes chez vous, quelle note comprise entre zéro et dix exprime le mieux la façon dont le bruit des avions vous gêne ?**

Notez zéro si le bruit ne vous gêne pas du tout et notez dix si le bruit vous gêne extrêmement. Si vous êtes entre ces deux situations, choisissez une note intermédiaire entre zéro et dix.

Pas du tout											Extrêmement
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Maintenant, si vous pensez aux douze derniers mois, quand vous êtes chez vous, quelle note comprise entre zéro et dix exprime le mieux la façon dont le bruit industriel vous gêne ?**

Notez zéro si le bruit ne vous gêne pas du tout et notez dix si le bruit vous gêne extrêmement. Si vous êtes entre ces deux situations, choisissez une note intermédiaire entre zéro et dix.

Pas du tout											Extrêmement
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Maintenant, si vous pensez aux douze derniers mois, quand vous êtes chez vous, quelle note comprise entre zéro et dix exprime le mieux la façon dont le bruit des travaux de construction vous gêne ?**

Notez zéro si le bruit ne vous gêne pas du tout et notez dix si le bruit vous gêne extrêmement. Si vous êtes entre ces deux situations, choisissez une note intermédiaire entre zéro et dix.

Pas du tout											Extrêmement
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Maintenant, si vous pensez aux douze derniers mois, quand vous êtes chez vous, quelle note comprise entre zéro et dix exprime le mieux la façon dont le bruit du voléinage vous gêne ?**

Notez zéro si le bruit ne vous gêne pas du tout et notez dix si le bruit vous gêne extrêmement. Si vous êtes entre ces deux situations, choisissez une note intermédiaire entre zéro et dix.

Pas du tout											Extrêmement
0	1	2	3	4	5	6	7	8	9	10	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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## Vous avez terminé ! Merci d'avoir participé à notre enquête !

En cliquant sur SUIVANT, vous serez redirigé-e vers Prolific.

suivant

L'administrateur responsable de l'enquête :  
doctorant Eunsung Song, ENTPE, Lyon, France

92% rempli

## Appendix 6: Feedback example

### Interview No. 756 - NS\_WOG

21.05.2024, 09:54

Page 03

WN43

Page 06

Dans le WN01 à la question 2 on ne sait pas ce à quoi se référé le auparavant, covid ? année dernière ? enfance ?

A la question 13 on ne sait pas à quoi correspond l'e'vie d'être seul, selon la raison de cette recherche de solitude la tolérance au bruit change

A la question 19, je m'énerve contre signifie se lever et signifier son mécontentement au personne ou simplement s'enerver dans son coin ?

Page 10

WN72 : je ne suis pas sur de quelle question il est question

### *Feedback of the pre-pilot test*

## Appendix 7: German data analysis

### 1) Influence of the order of one item question and Weinstein questionnaire

Two different comparison tests (Student and Mann-Whitney) were carried out on one-item scores and Weinstein scores as a function of data type (metric and categorical respectively). The results of these tests (Student and Mann-Whitney) do not indicate the existence of an order effect in the German samples. In fact, the sample of responses from participants who answered the Weinstein questionnaire first showed no significant difference from that of people who answered the one-item question first, either for one-item score or for the Weinstein score.

Test t pour des Echantillons Indépendants (Feuille de données70)											
Note : Variables traitées comme des échantillons indépendants											
Groupe1 vs. Groupe2	Moyenne Groupe 1	Moyenne Groupe 2	valeur t	dl	p	N Actifs Groupe 1	N Actifs Groupe 2	Ec-Type Groupe 1	Ec-Type Groupe 2	Ratio F Variances	p Variances
WO_1item vs. OW_1item	61,72222	61,00000	0,095141	32	0,924796	18	16	17,47538	26,36665	2,276442	0,105511

Figure 1: Student t-test conducted on the two samples of One item score

Test U de Mann-Whitney (+ correction de continuité (Feuille de données2))										
Par var. Order										
Tests significatifs marqués à p <.05000										
variable	SommeRgs NS_WOS	SommeRgs NS_OWS	U	Z	valeur p	Z ajusté	valeur p	N Actif NS_WOS	N Actif NS_OWS	2*(1-p) p exact
<b>WNS</b>	320,5000	274,5000	138,5000	0,172516	0,863032	0,172648	0,862928	18	16	0,851471

Figure 2: Mann-Whitney U-test conducted on the two samples of Weinstein score

## 2) Correlations with 1 item and Weinstein scores + Benfield

### a) Correlation analysis between noise sensitivity scores

Coeffs de Corrélations de Rangs de Spearman (F)			
Cellules à VM ignorées			
Corrélations significatives marquées à p <.05000			
Variable	Weinstein	Oneitem	Benfield
<b>Weinstein</b>	1,000000	0,676255	0,780073
Oneitem	0,676255	1,000000	0,755564
Benfield	0,780073	0,755564	1,000000

Figure 3: Correlation matrix of noise sensitivity scores

As with the French data, all three noise sensitivity scores (Weinstein, one-item and Benfield) are correlated. The correlations with the German single-item scores are stronger than for the French samples ( $r_{\text{oneitem}/\text{Weinstein\_German}}=0.68$  and  $r_{\text{oneitem}/\text{Weinstein\_French}}=0.59$  and  $r_{\text{oneitem}/\text{Benfield\_German}}=0,76$  and  $r_{\text{oneitem}/\text{Benfield\_French}}=0.60$ ) but the correlation between Benfield and Weinstein scores is weaker for the German sample ( $r_{\text{Weinstein}/\text{Benfield\_German}}=0.78$  and  $r_{\text{Weinstein}/\text{Benfield\_French}}=0.89$ ).

### b) Correlation with age

Coeffs de Corrélations de Rangs de Spearman (Feuill)				
Cellules à VM ignorées				
Corrélations significatives marquées à p <.05000				
Variable	Weinstein	One item	Benfield	Age
<b>Weinstein</b>	1,000000	0,676255	0,780073	0,288658
One item	0,676255	1,000000	0,755564	0,374046
Benfield	0,780073	0,755564	1,000000	0,247934
Age	0,288658	0,374046	0,247934	1,000000

Figure 4: Correlation matrix of noise sensitivity scores and age

Unlike the French data, which show no correlation between age and noise sensitivity scores, the German one-item question scores appear to be correlated with age. However, this correlation remains weak and, as the graph shows, the data are highly concentrated around a single value. This can be explained by the low age distribution among the German participants. Indeed, the average age is significantly younger than for the French participants, with a mean age of 23.35 and a standard error of 3.42.

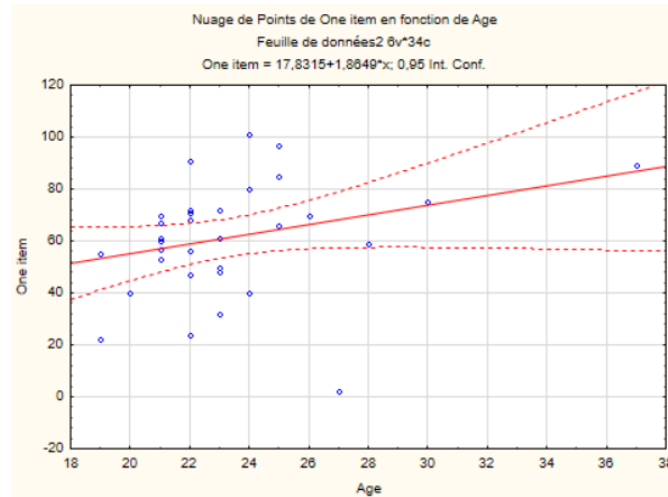


Figure 5: Graph of linear regression of one item score as a function of age

**c) Correlation with sex**  
**i) Weinstein**

Test U de Mann-Whitney (+ correction de continuité (Feuille de données114) Par var. Sex Tests significatifs marqués à p <,05000										
variable	SommeRgs Groupe 1	SommeRgs Groupe 2	U	Z	valeur p	Z ajusté	valeur p	N Actif Groupe 1	N Actif Groupe 2	2*(1-p) p exact
<b>WNS</b>	160,5000	434,5000	105,5000	-0,529150	0,596702	-0,529555	0,596421	10	24	0,589480

Figure 6: Mann-Whitney U-test conducted on the two samples of Weinstein score

As with the French data, no significant difference was found between the Weinstein noise sensitivity scores of women and men.

**ii) One item**

Test t pour des Echantillons Indépendants (Feuille de données66) Note : Variables traitées comme des échantillons indépendants											
Groupe1 vs. Groupe2	Moyenne Groupe 1	Moyenne Groupe 2	valeur t	dl	p	N Actifs Groupe 1	N Actifs Groupe 2	Ec-Type Groupe 1	Ec-Type Groupe 2	Ratio F Variances	p Variances
<b>Oneitem_women vs. Oneitem_men</b>	60,12500	64,40000	-0,516156	32	0,609294	24	10	23,29455	18,30118	1,620131	0,459600

Figure 7: Student t-test conducted on the two samples of One item score

As with the French data, no significant difference was found between the one item scores of women and men.

**iii) Benfield**

Test U de Mann-Whitney (+ correction de continuité (Feuille de données47) Par var. Sex Tests significatifs marqués à p <,05000										
variable	SommeRgs Groupe 1	SommeRgs Groupe 2	U	Z	valeur p	Z ajusté	valeur p	N Actif Groupe 1	N Actif Groupe 2	2*(1-p) p exact
<b>Benfield</b>	169,0000	426,0000	114,0000	-0,207880	0,835322	-0,208583	0,834774	10	24	0,838053

Figure 8: Mann-Whitney U-test conducted on the two samples of Benfield score

As with the French data, no significant difference was found between the Benfield scores of women and men.

**d) Correlation with annoyance**

Coeffs de Corrélations de Rangs de Spearman (Feuille de données) Cellules à VM ignorées Corrélations significatives marquées à p <,05000				
Variable	Weinstein	Oneitem	Benfield	Annoyance
Weinstein	1,000000	0,676255	0,780073	0,425049
Oneitem	0,676255	1,000000	0,755564	0,442837
Benfield	0,780073	0,755564	1,000000	0,390898
Annoyance	0,425049	0,442837	0,390898	1,000000

Figure 9: Correlation matrix of noise sensitivity scores and annoyance

As with the French data, significant correlations were found between noise sensitivity scores (Weinstein, one item and Benfield) and annoyance rating. The German correlations are particularly close to the French ones ( $r_{\text{Weinstein/ann\_German}}=0.43$  and  $r_{\text{Weinstein/ann\_French}}=0.42$ ;  $r_{\text{One\_item/ann\_German}}=0.44$  and  $r_{\text{One\_item/ann\_French}}=0.42$ ;  $r_{\text{Benfield/ann\_German}}=0.39$  and  $r_{\text{Benfield/ann\_French}}=0.39$ ).

#### e) Correlation with hyperacusis

Coeffs de Corrélations de Rangs de Spearman (Feuille de données) Cellules à VM ignorées Corrélations significatives marquées à p <,05000					
Variable	Weinstein	One item	Benfield	HIQ	SSSQ
Weinstein	1,000000	0,676255	0,780073	0,671355	0,378989
One item	0,676255	1,000000	0,755564	0,666400	0,598908
Benfield	0,780073	0,755564	1,000000	0,601364	0,387521
HIQ	0,671355	0,666400	0,601364	1,000000	0,730753
SSSQ	0,378989	0,598908	0,387521	0,730753	1,000000

Figure 10: Correlation matrix of noise sensitivity and hyperacusis scores

The German data show a much better correlation between noise sensitivity scores and hyperacusis scores than the French data. Indeed, for the German data, all noise sensitivity and hyperacusis scores are correlated, and with a good correlation index.

#### f) Correlation with item 21 of Weinstein

Coeffs de Corrélations de Rangs de Spearman (Feuille de données) Cellules à VM ignorées Corrélations significatives marquées à p <,05000				
Variable	Weinstein	One item	Benfield	WNS 21
Weinstein	1,000000	0,676255	0,780073	0,597482
One item	0,676255	1,000000	0,755564	0,745755
Benfield	0,780073	0,755564	1,000000	0,792576
WNS 21	0,597482	0,745755	0,792576	1,000000

Figure 11: Correlation matrix of noise sensitivity and hyperacusis scores

As with the French data, significant correlations were found between noise sensitivity scores (Weinstein, one item and Benfield) and annoyance rating.

## Appendix 8: Histograms of the pilot test data

### I) Weinstein

- A) General
- B) Order
- C) Sex

### II) One item

- A) General
- B) Order
- C) Wording
- D) Sex

### III) Annoyance

### IV) Hyperacusis

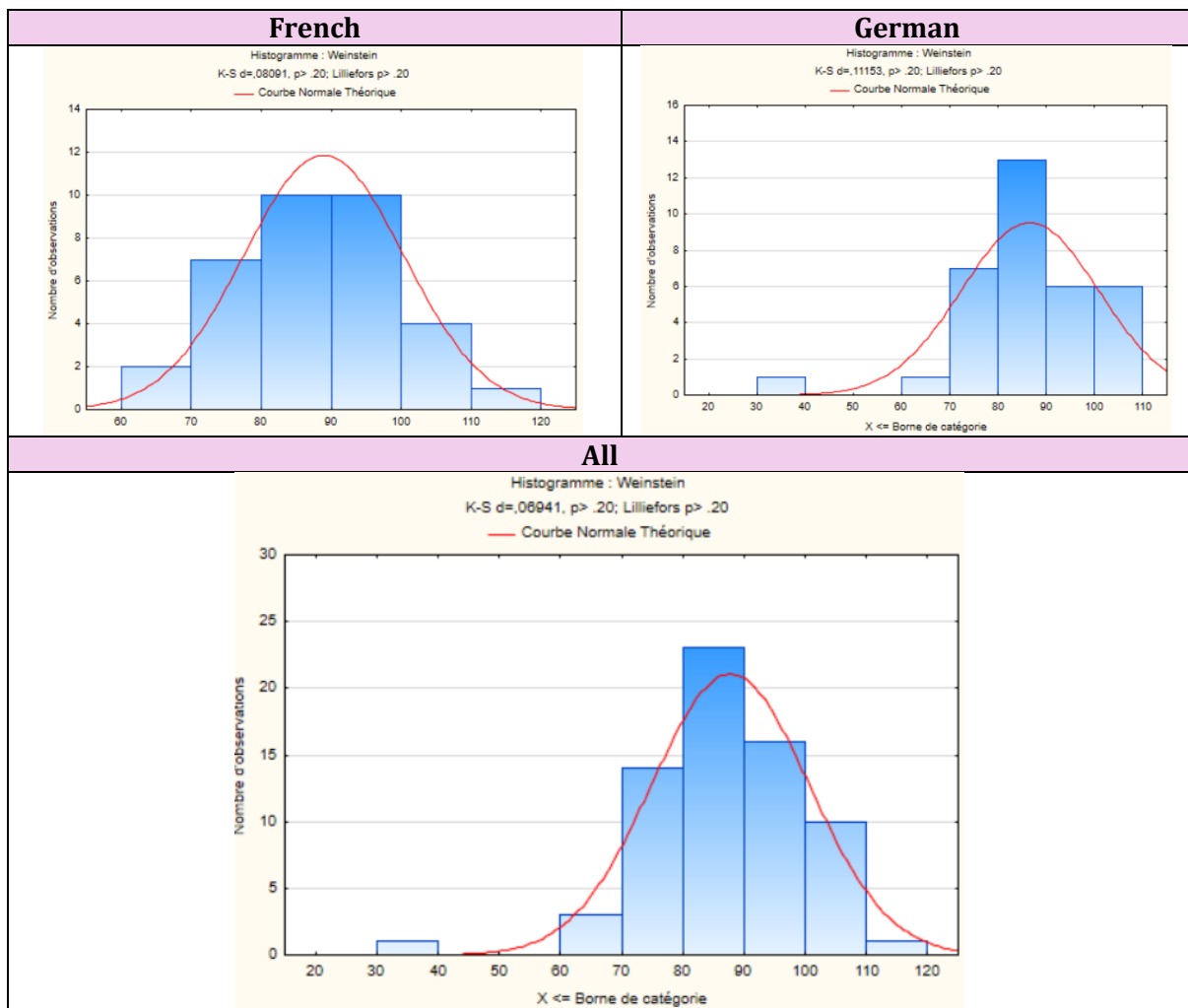
- A) HIQ
- B) SSSQ

### V) Benfield

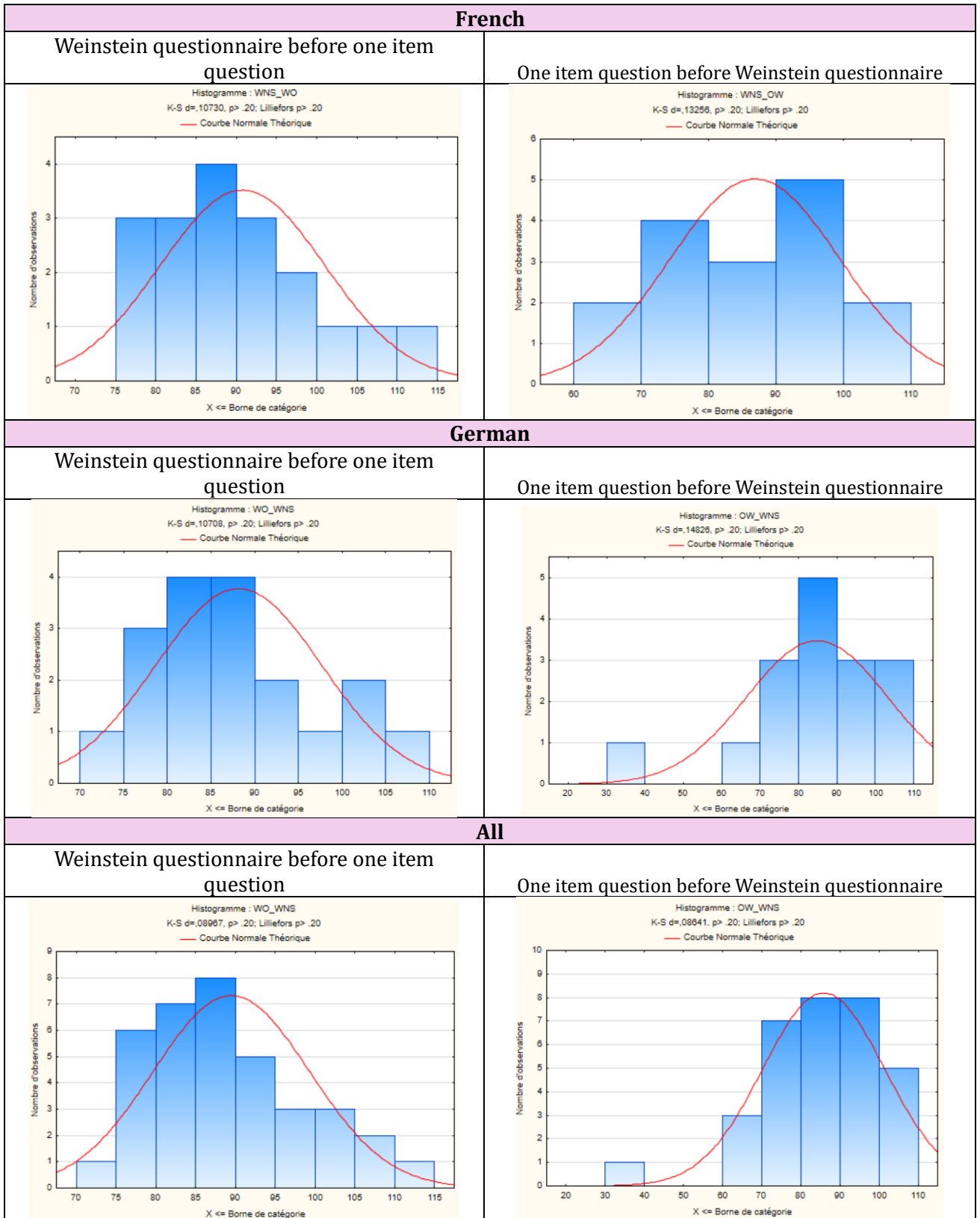
Each part includes histograms of the three sets of data: French, German and combined data.

### I) Weinstein

#### 1) General



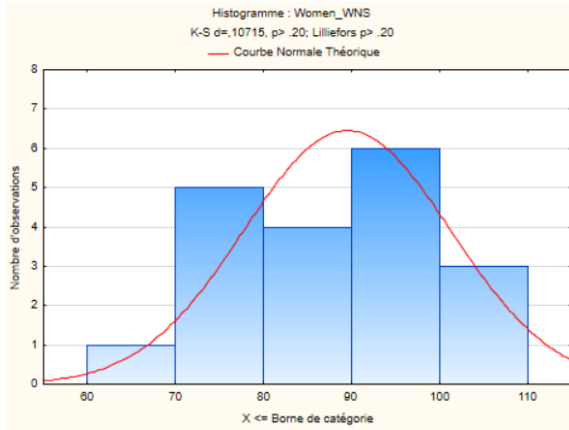
## 2) Order



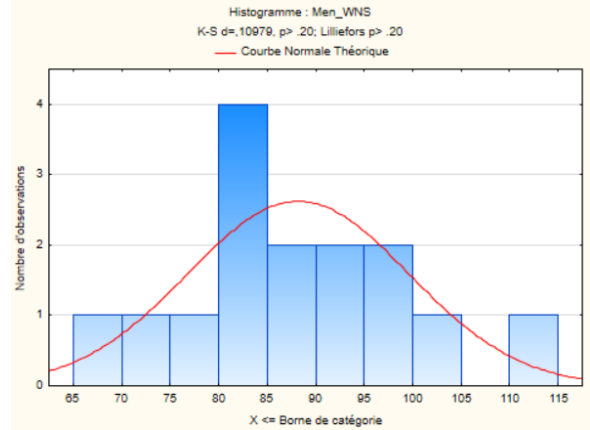
## 3) Sex

**French**

**Women**

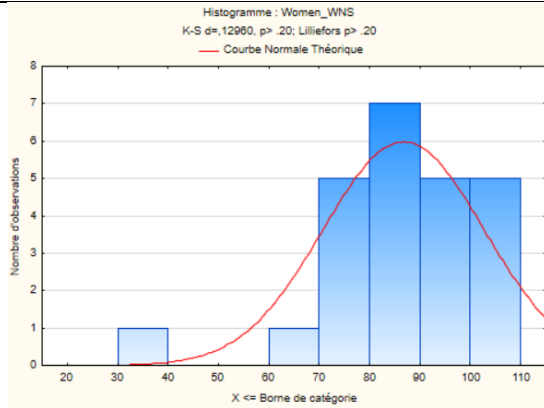


**Men**

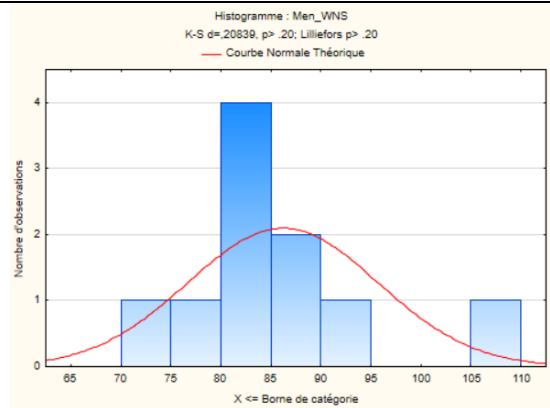


**German**

**Women**

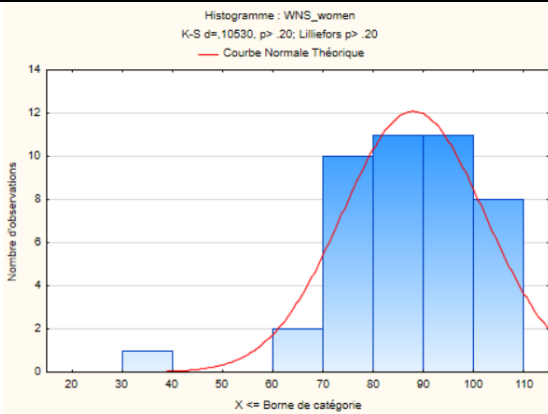


**Men**

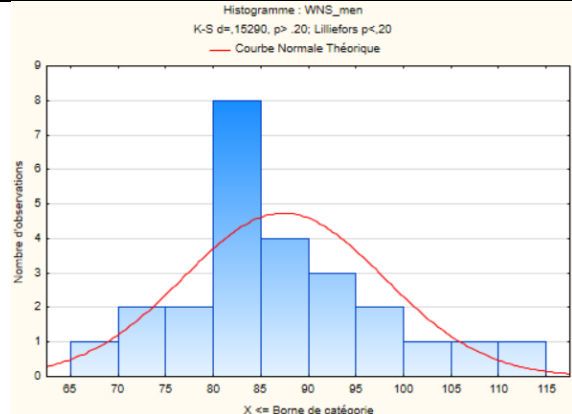


**All**

**Women**

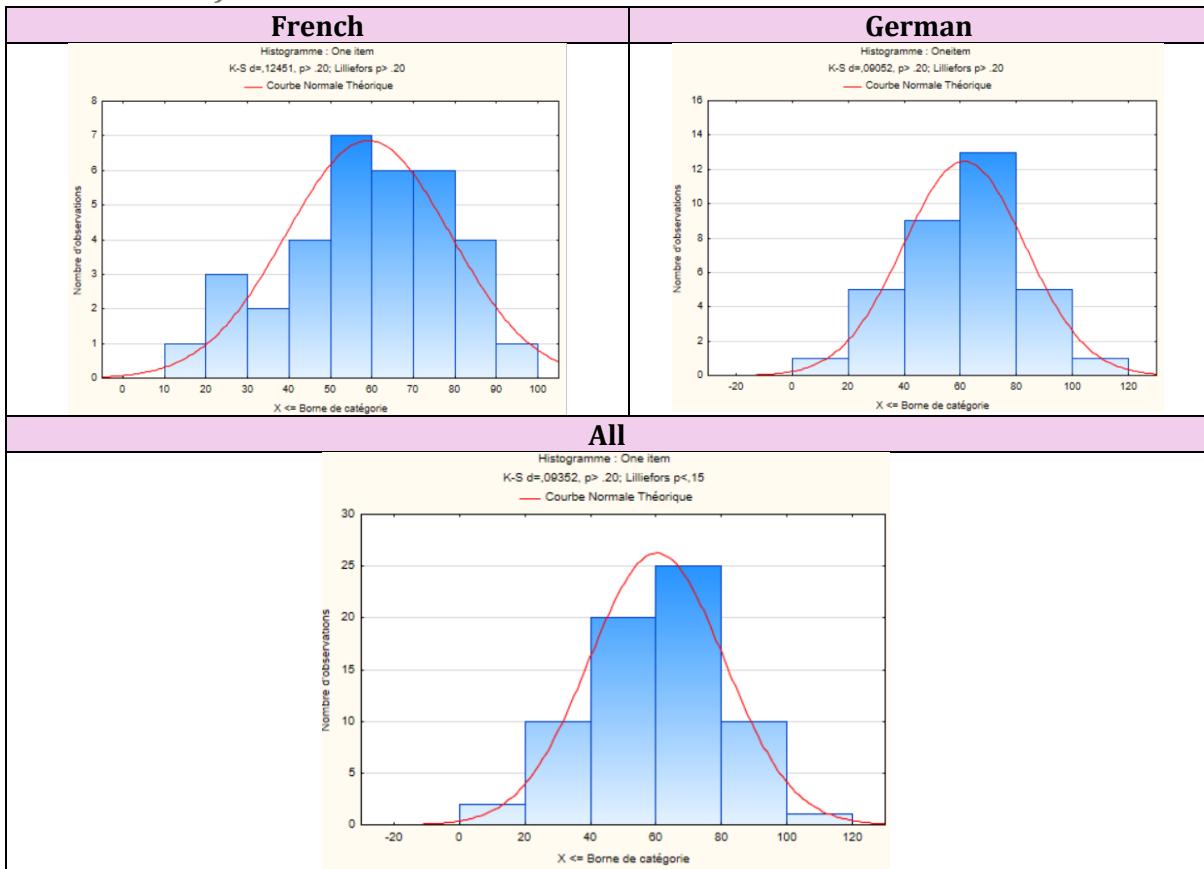


**Men**

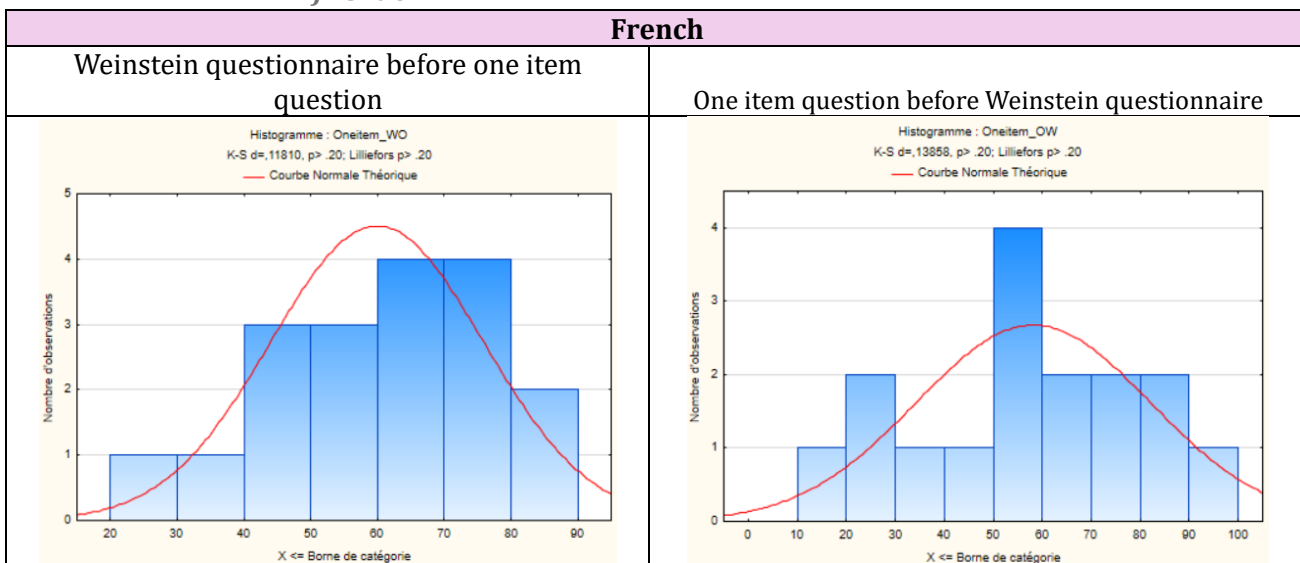


## A) One item

### 1) All



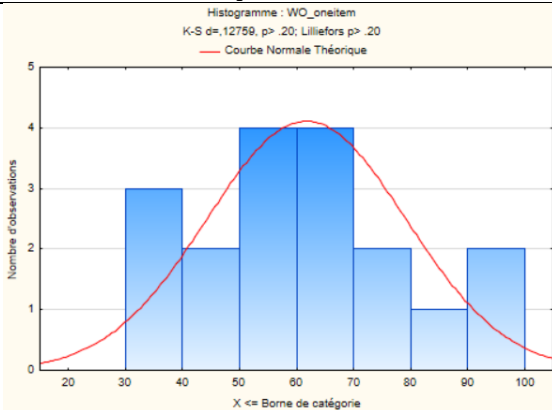
### 2) Order



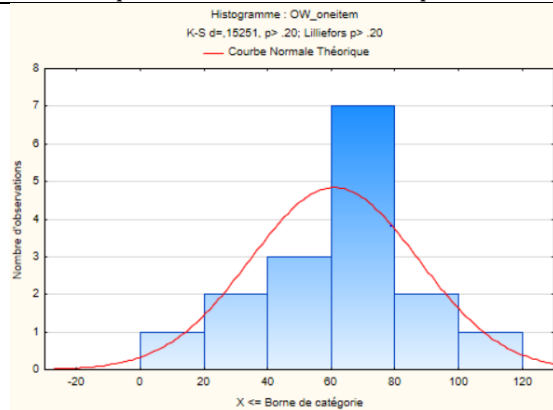


## German

**Weinstein questionnaire before one item question**

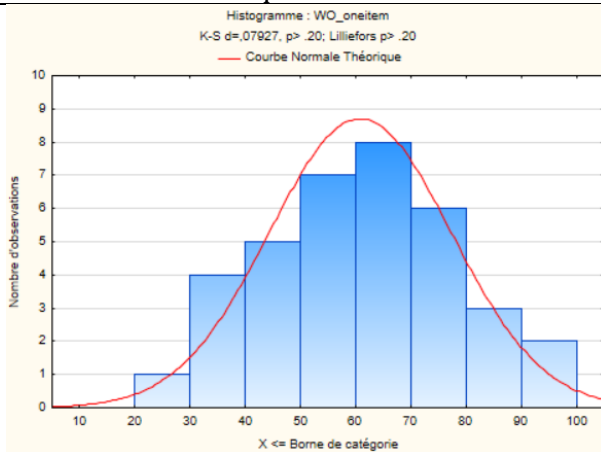


**One item question before Weinstein questionnaire**

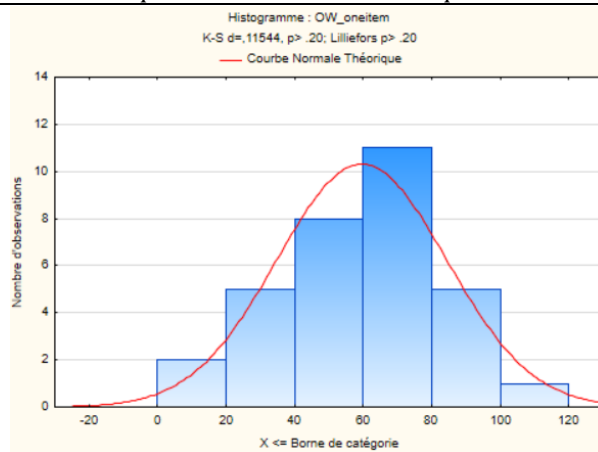


## All

**Weinstein questionnaire before one item question**

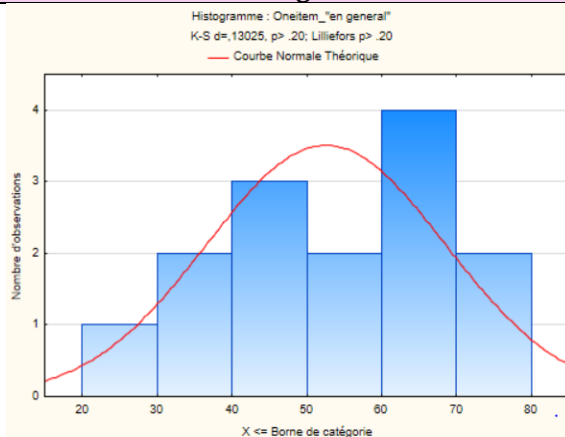


**One item question before Weinstein questionnaire**

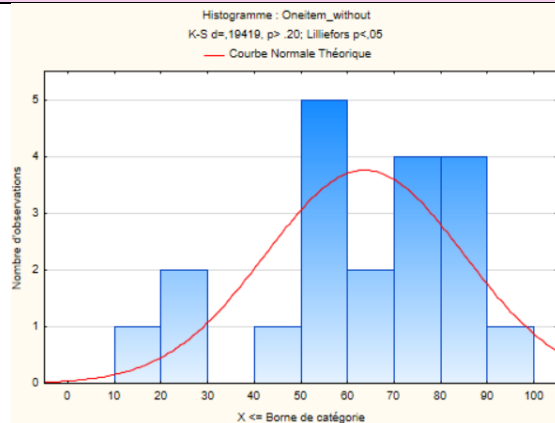


### 3) Wording

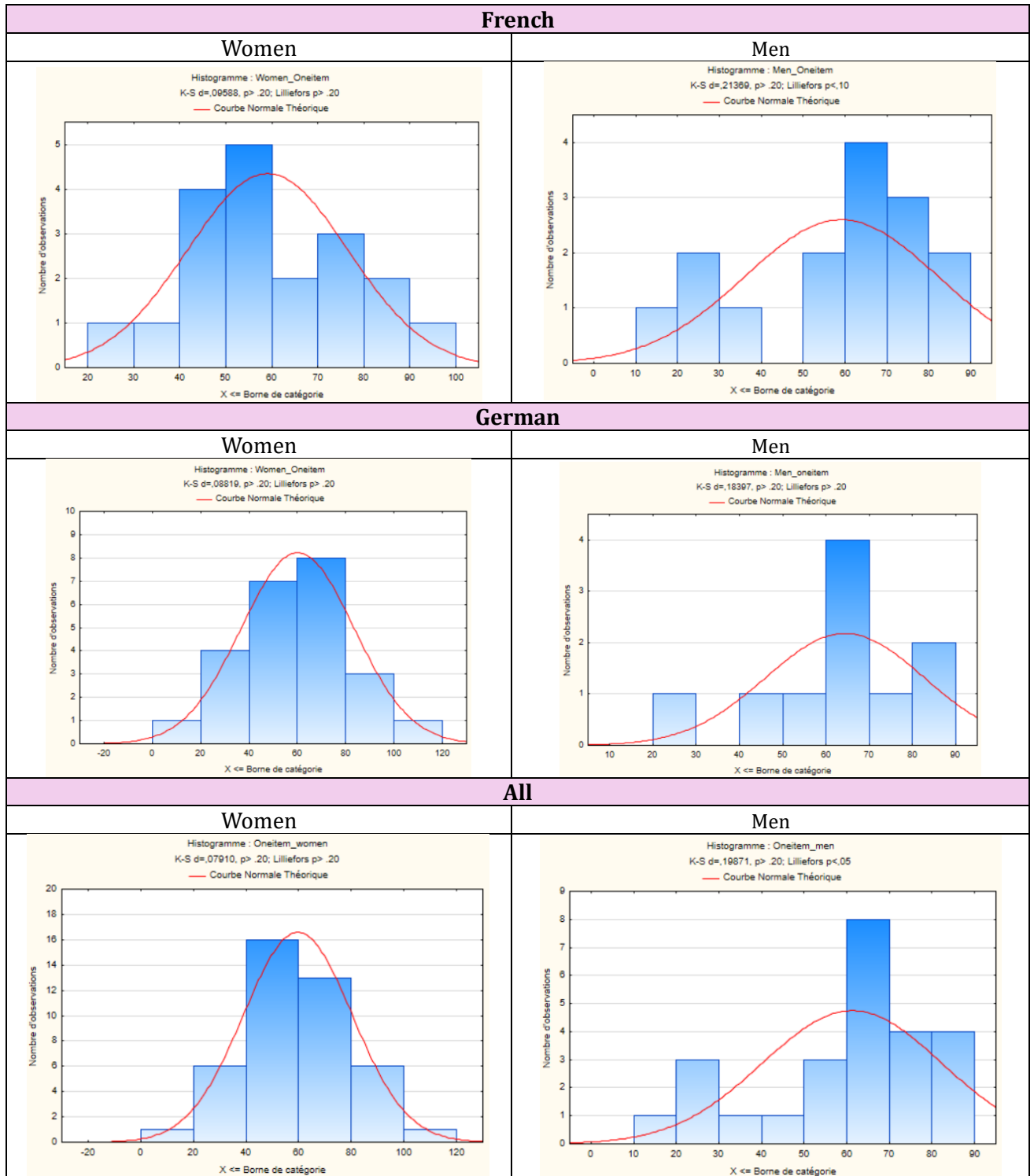
**With "en général"**



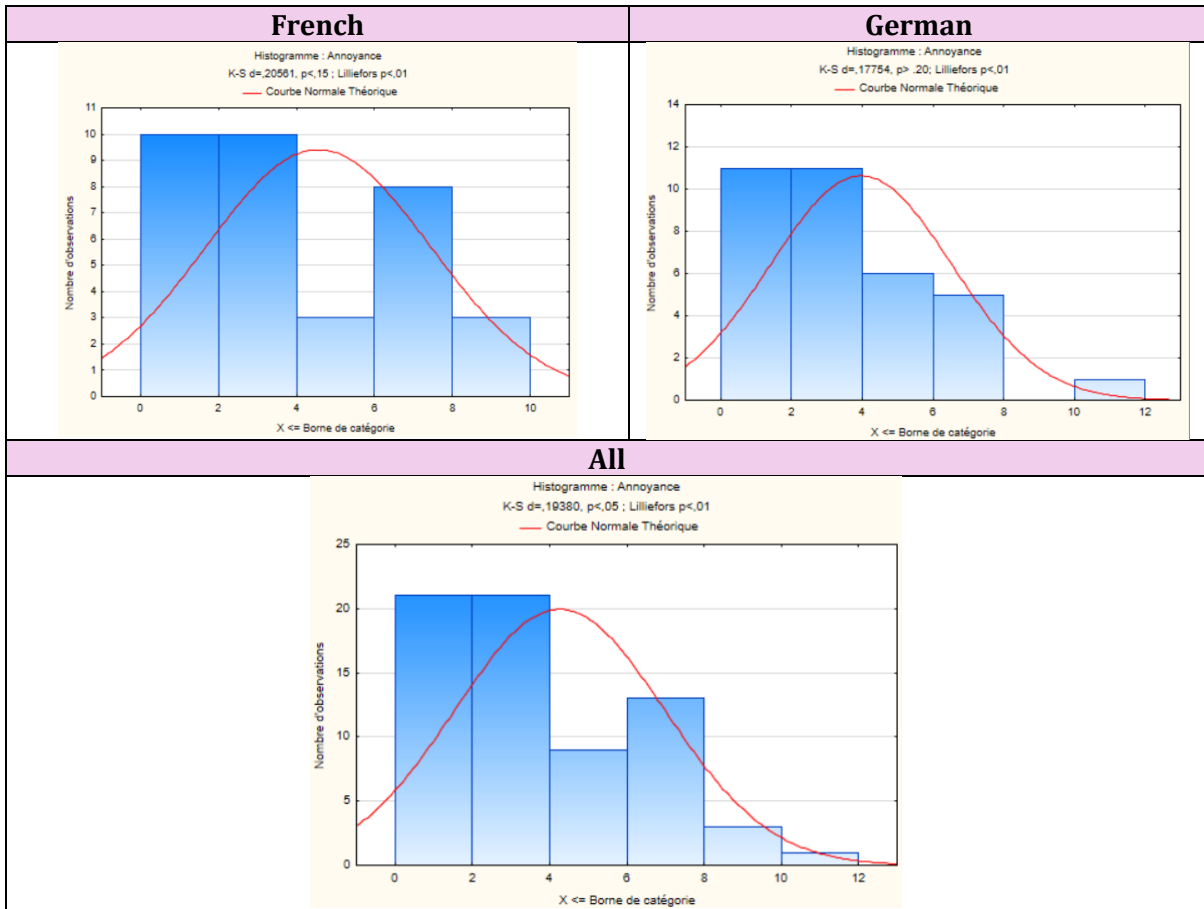
**Without**



#### 4) Sex

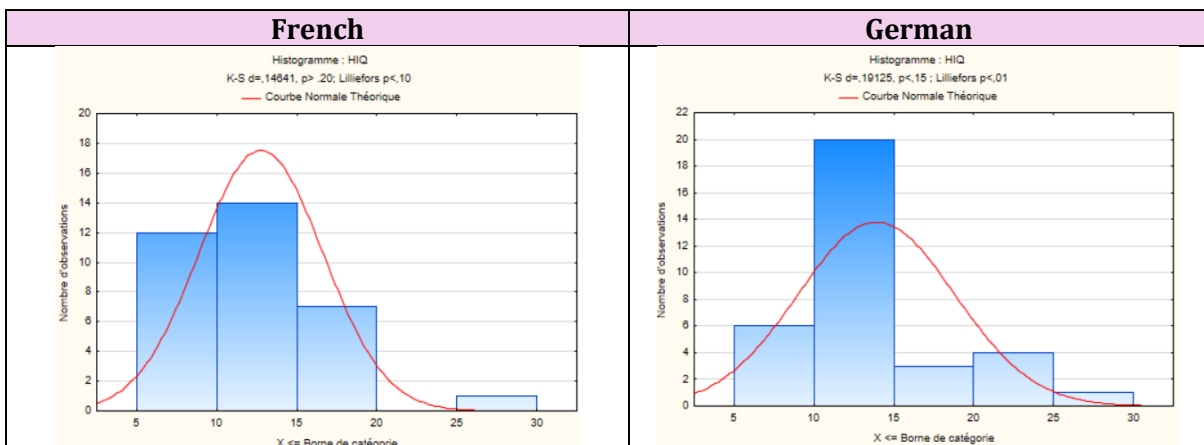


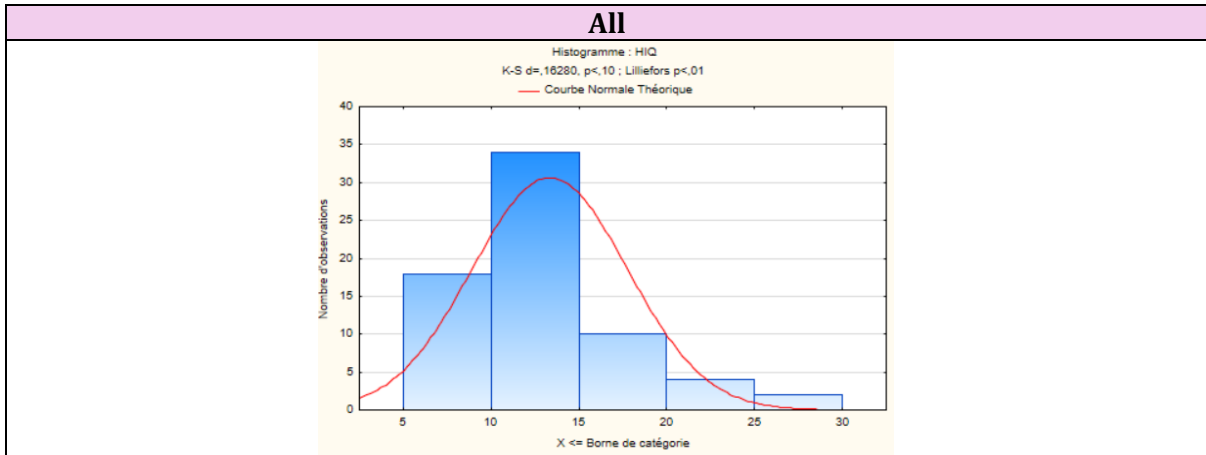
## B) Annoyance



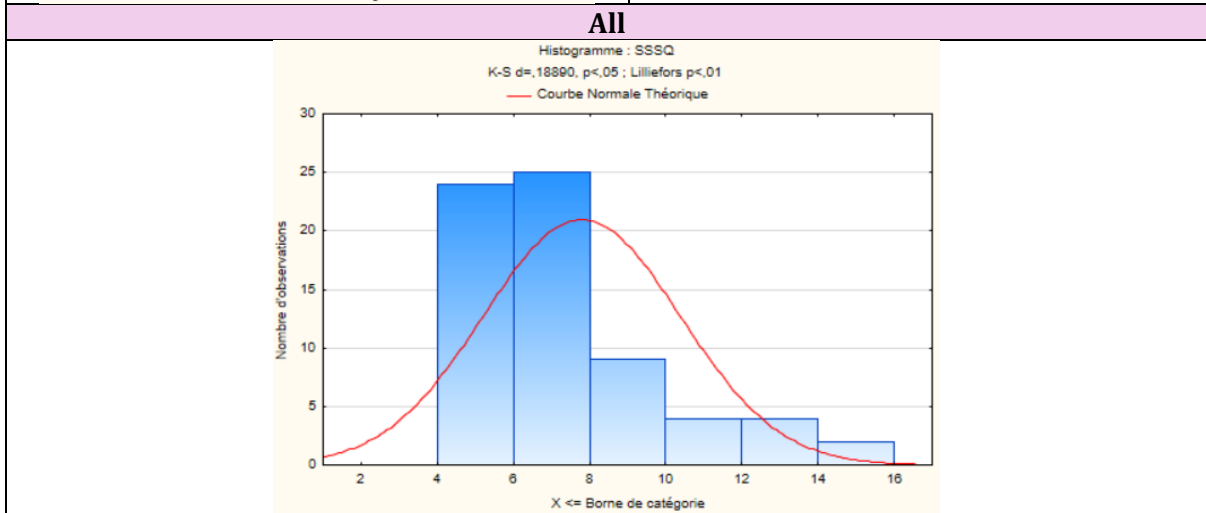
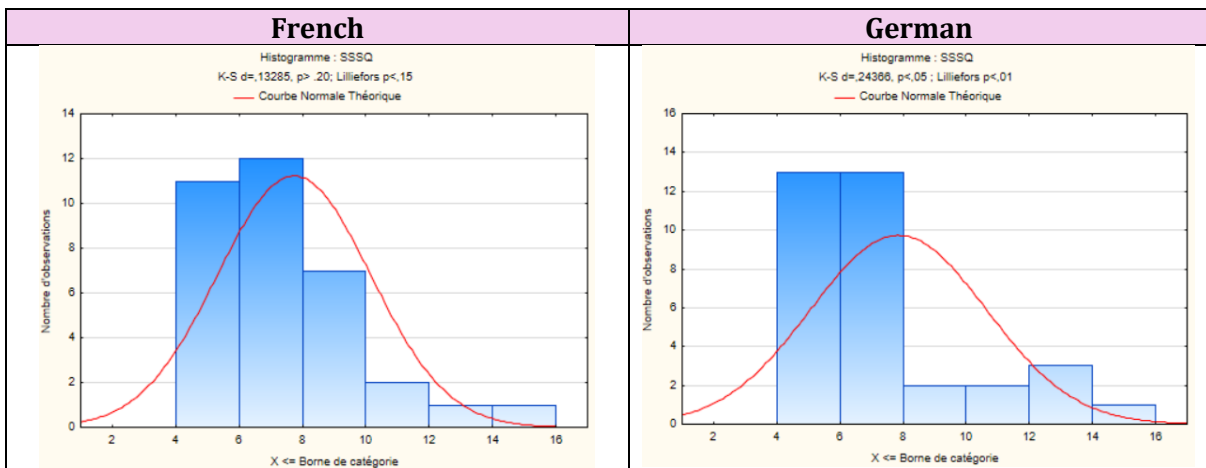
## C) Hyperacusis

### 1) HIQ



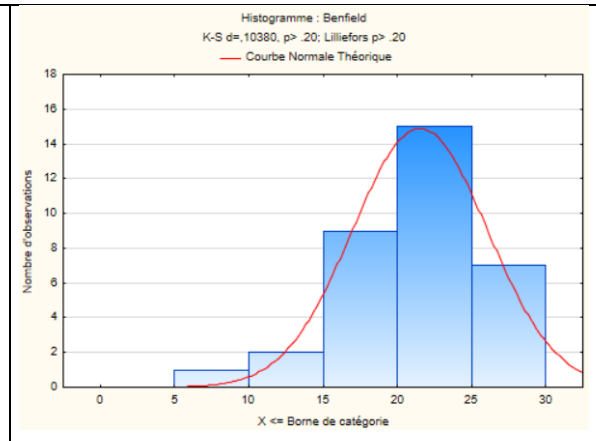
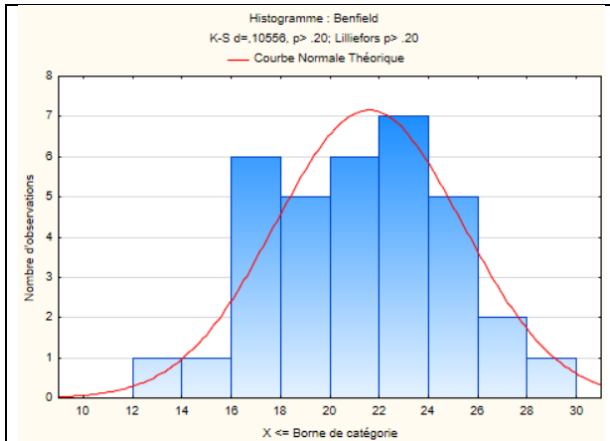


**2) SSSQ**

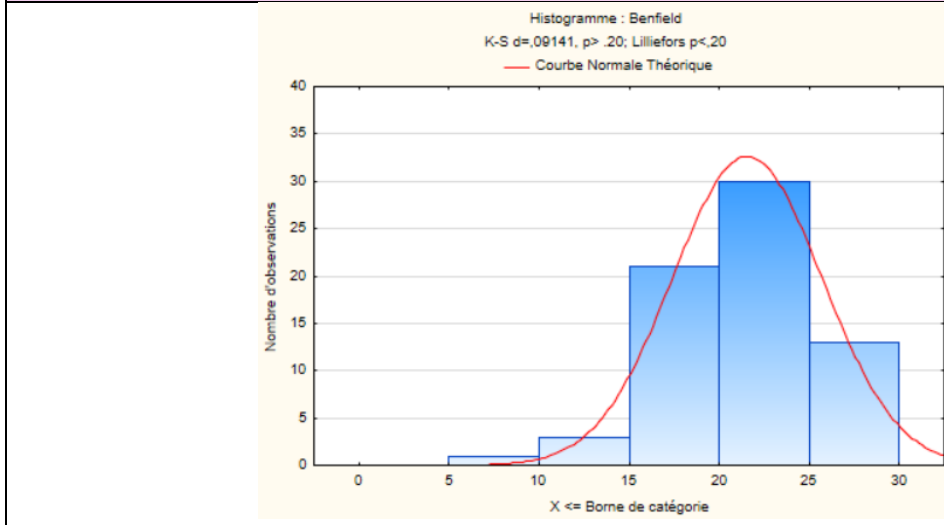


**V) Benfield**

<b>French</b>	<b>German</b>
---------------	---------------



**All**



## Appendix 9: Statistical distribution of $F_{\max}$

Table extracted from Chanquoy, L. (2005), "Statistiques appliquées à la psychologie", Chapitre 2, page 308. HACHETTE supérieur.

**ANNEXE 2 : distribution de la statistique du  $F_{\max}$**

Dans chaque case, figurent les valeurs critiques du  $F_{\max}$  à  $\alpha = .05$  et la seconde ligne  $\alpha = .01$ .

ddl \ k	2	3	4	5	6	7	8	9	10
4	9,6 23,2	15,5 37	20,6 49	25,2 59	29,5 69	33,6 79	37,5 89	41,4 97	44,6 106
5	7,15 14,9	10,8 22	13,7 28	16,3 33	18,7 38	20,8 42	22,9 46	24,7 50	26,5 54
6	5,82 11,1	8,38 15,5	10,4 19,1	12,1 22	13,7 25	15 27	16,3 30	17,5 32	18,6 34
7	4,99 8,89	6,94 12,1	8,44 14,5	9,7 16,5	10,8 18,4	11,8 20	12,7 22	13,5 23	14,3 24
8	4,43 7,50	6 9,9	7,18 11,7	8,12 13,2	9,03 14,5	9,78 15,8	10,5 16,9	11,1 17,9	11,7 18,9
9	4,03 6,54	5,34 8,5	6,31 9,9	7,11 11,1	7,8 12,1	8,41 13,1	8,95 13,9	9,45 14,7	9,91 15,3
10	3,72 5,85	4,85 7,4	5,67 8,6	6,34 9,6	6,92 10,4	7,42 11,1	7,87 11,8	8,28 12,4	8,66 12,9
12	3,28 4,91	4,16 6,1	4,79 6,9	5,3 7,6	5,72 8,2	6,09 8,7	6,42 9,1	6,72 9,5	7,00 9,9
15	2,86 4,07	3,54 4,9	4,01 5,5	4,37 6	4,68 6,4	4,95 6,7	5,19 7,1	5,40 7,3	5,59 7,5
20	2,46 3,32	2,95 3,8	3,29 4,3	3,54 4,6	3,76 4,9	3,94 5,1	4,10 5,3	4,24 5,5	4,37 5,6
30	2,07 2,63	2,4 3,0	2,61 3,3	2,78 3,4	2,91 3,6	3,02 3,7	3,12 3,8	3,21 3,9	3,29 4,0
60	1,67 1,96	1,85 2,2	1,96 2,3	2,04 2,4	2,11 2,4	2,17 2,5	2,22 2,5	2,26 2,6	2,30 2,6
$\infty$	1,00 1,00	1,00 1,00	1,00 1,00	1,00 1,00	1,00 1,00	1,00 1,00	1,00 1,00	1,00 1,00	1,00 1,00

## Appendix 10: two columns WO/OW of Weinstein scores and one item scores

TAB 1: One item score

	WO	OW
1	52	66
2	63	31
3	77	26
4	81	41
5	59	80
6	38	60
7	46	69
8	58	77
9	81	90
10	71	94
11	41	59
12	44	29
13	61	17
14	26	59
15	75	51
16	64	82
17	73	

18	69	
Mean	60	58
Standard error	15,9	23,9
Variance	253,8	569,6

Figure 3: Data table of responses to one-item question, according to the order of the noise sensitivity questionnaires

TAB 2: Weinstein score

	Order	WNS
1	WO	77
2	WO	92
3	WO	105
4	WO	111
5	WO	95
6	WO	88
7	WO	77
8	WO	96
9	WO	109
10	WO	90
11	WO	85
12	WO	80
13	WO	88
14	WO	82
15	WO	98
16	WO	82
17	WO	93
18	WO	86
19	OW	85
20	OW	74
21	OW	70
22	OW	92
23	OW	82
24	OW	77
25	OW	91
26	OW	109
27	OW	89
28	OW	100
29	OW	98
30	OW	66
31	OW	100
32	OW	78
33	OW	77
34	OW	102
<b>Mediane</b>		<b>88,5</b>

Figure 6: Data table of Weinstein noise sensitivity scores, according to the order of the noise sensitivity questionnaires

## Appendix 11: Comparison of German and French samples

### I) Noise sensitivity scores

#### A) Weinstein

Test U de Mann-Whitney (+ correction de continuité (Feuille de données64)) Par var. Nationality Tests significatifs marqués à p < .05000										
variable	SommeRgs French	SommeRgs German	U	Z	valeur p	Z ajusté	valeur p	N Actif French	N Actif German	2*(1-p) p exact
<b>WNS</b>	1209,500	1136,500	541,5000	0,441560	0,658808	0,441851	0,658597	34	34	0,6563

Figure 1: Mann-Whitney U-test conducted on the two samples of Weinstein score

The Mann Whitney test showed no significant difference between the German and French samples for the Weinstein score.

#### B) One item

Test t pour des Echantillons Indépendants (Feuille de données27) Note : Variables traitées comme des échantillons indépendants											
Groupe1 vs. Groupe2	Moyenne Groupe 1	Moyenne Groupe 2	valeur t	dl	p	N Actifs Groupe 1	N Actifs Groupe 2	Ec-Type Groupe 1	Ec-Type Groupe 2	Ratio F Variances	p Variances
<b>Oneitem_GR vs. Oneitem_FR</b>	61,38235	59,11765	0,449276	66	0,654705	34	34	21,75903	19,76033	1,212525	0,583070

Figure 2: Student t-test conducted on the two samples of One item score

The Student t-test showed no significant difference between the German and French samples for the one item score.

#### C) Benfield

Test U de Mann-Whitney (+ correction de continuité (Feuille de données8)) Par var. Nationality Tests significatifs marqués à p < .05000										
variable	SommeRgs German	SommeRgs French	U	Z	valeur p	Z ajusté	valeur p	N Actif German	N Actif French	2*(1-p) p exact
<b>Benfield</b>	1194,000	1152,000	557,0000	0,251444	0,801471	0,252305	0,800806	34	34	0,802740

Figure 3: Mann-Whitney U-test conducted on the two samples of Benfield score

The Mann Whitney test showed no significant difference between the German and French samples for the Benfield score.

### II) Annoyance rating

Test U de Mann-Whitney (+ correction de continuité (Feuille de données64)) Par var. Nationality Tests significatifs marqués à p < .05000										
variable	SommeRgs French	SommeRgs German	U	Z	valeur p	Z ajusté	valeur p	N Actif French	N Actif German	2*(1-p) p exact
<b>Annoyance</b>	1231,500	1114,500	519,5000	0,711402	0,476836	0,718688	0,472333	34	34	0,475502

Figure 4: Mann-Whitney U-test conducted on the two samples of annoyance rating score

The Mann Whitney test showed no significant difference between the German and French samples for the annoyance rating score.

### III) Hyperacusis scores

#### A) HIQ

Test U de Mann-Whitney (+ correction de continuité (Feuille de données68)) Par var. Nationality Tests significatifs marqués à p < .05000										
variable	SommeRgs French	SommeRgs German	U	Z	valeur p	Z ajusté	valeur p	N Actif French	N Actif German	2*(1-p) p exact
<b>HIQ</b>	1109,000	1237,000	514,0000	-0,778863	0,436061	-0,782757	0,433771	34	34	0,438517



Figure 5: Mann-Whitney U-test conducted on the two samples of hyperacusis (HIQ) score

The Mann Whitney test showed no significant difference between the German and French samples for the hyperacusis (HIQ) score.

### B) SSSQ

Test U de Mann-Whitney (+ correction de continuité (Feuille de données68))										
Par var. Nationality										
Tests significatifs marqués à p < .05000										
variable	SommeRgs French	SommeRgs German	U	Z	valeur p	Z ajusté	valeur p	N Actif French	N Actif German	2*(1-p) p exact
SSSQ	1188,000	1158,000	563,0000	0,177851	0,858840	0,180138	0,857045	34	34	0,859762

Figure 6: Mann-Whitney U-test conducted on the two samples of hyperacusis (SSSQ) score

The Mann Whitney test showed no significant difference between the German and French samples for the hyperacusis (SSSQ) score.

## Appendix 12: Full sample (n=68), comparison of female and male noise sensitivity scores

Weinstein:

Test U de Mann-Whitney (+ correction de continuité (Feuille de données94))										
Par var. Sex										
Tests significatifs marqués à p < .05000										
variable	SommeRgs Groupe 1	SommeRgs Groupe 2	U	Z	valeur p	Z ajusté	valeur p	N Actif Groupe 1	N Actif Groupe 2	2*(1-p) p exact
WNS	1533,500	812,5000	487,5000	0,629603	0,528955	0,630018	0,528683	43	25	0,527444

Student's t-test conducted on the two sample of Weinstein scores ( $n_{women}=43$  and  $n_{men}=25$ )

No significant difference between the two samples.

One item:

Test t pour des Echantillons Indépendants (Feuille de données92)											
Note : Variables traitées comme des échantillons indépendants											
Groupe1 vs. Groupe2	Moyenne Groupe 1	Moyenne Groupe 2	valeur t	dl	p	N Actifs Groupe 1	N Actifs Groupe 2	Ec-Type Groupe 1	Ec-Type Groupe 2	Ratio F Variances	p Variances
Oneitem_women vs. Oneitem_men	59,67442	61,24000	-0,299250	66	0,765690	43	25	20,68439	21,00452	1,031194	0,906555

Mann Whitney U-test conducted on the two sample of Weinstein scores ( $n_{women}=43$  and  $n_{men}=25$ )

No significant difference between the two samples.

## Appendix 13: French translation of the questionnaires used in the real survey and their changes

### Weinstein noise sensitivity questionnaire

	Bigras et al	Survey's version
1*	Cela ne me dérangerait pas de vivre dans une rue bruyante si l'appartement que j'avais était agréable.	Cela ne me dérangerait pas de vivre dans une rue bruyante si l'appartement que j'avais était agréable.
2	Je suis plus conscient(e) du bruit que je ne l'étais auparavant.	Je suis plus conscient·e du bruit que je ne l'étais auparavant.
3*	Personne ne devrait s'inquiéter si quelqu'un met en marche sa stéréo à plein régime de temps en temps.	Personne ne devrait s'inquiéter si quelqu'un met en marche sa stéréo à plein régime de temps en temps.

4	Au cinéma, les murmures et les emballages de bonbons froissés me dérangent.	Au cinéma, les murmures et les emballages de bonbons froissés me dérangent.
5	Je suis facilement réveillé(e) par le bruit.	Je suis facilement réveillé-e par le bruit.
6	S'il y a du bruit là où j'étudie, j'essaie de fermer la porte et/ou la fenêtre ou encore je me déplace ailleurs.	S'il y a du bruit là où j'étudie, j'essaie de fermer la porte et/ou la fenêtre ou encore je me déplace ailleurs.
7	Je m'énerve quand mes voisins sont bruyants.	Je m'énerve quand mes voisins sont bruyants.
8*	Je m'habitue à la plupart des bruits sans trop de difficulté.	Je m'habitue à la plupart des bruits sans trop de difficulté.
9	Ça ne me dérangerait pas qu'un appartement que je souhaite louer soit situé en face d'une caserne de pompiers.	Cela me dérangerait qu'un appartement que je souhaite louer soit situé en face d'une caserne de pompiers.
10	Parfois, les bruits me tapent sur les nerfs et m'irritent.	Parfois, les bruits me tapent sur les nerfs et m'irritent.
11	Même la musique que j'aime normalement me dérange si j'essaie de me concentrer.	Même la musique que j'aime normalement me dérange si j'essaie de me concentrer.
12*	Cela ne me dérangerait pas d'entendre les bruits de la vie quotidienne des voisins (des pas, eau courante, etc.)	Cela ne me dérangerait pas d'entendre les bruits de la vie quotidienne des voisins (des pas, eau courante, etc.)
13	Quand je veux être seul(e), cela me dérange d'entendre des bruits extérieurs.	Quand je veux être seul-e, cela me dérange d'entendre des bruits extérieurs.
14*	Je suis bon(ne) pour me concentrer, peu importe ce qui se passe autour de moi.	Je peux me concentrer, peu importe ce qui se passe autour de moi.
15*	Dans une bibliothèque, cela ne me dérange pas que les gens tiennent une conversation s'ils le font calmement.	Dans une bibliothèque, cela ne me dérange pas que les gens tiennent une conversation s'ils le font calmement.
16	Il y a souvent des moments où je veux un silence complet.	Il y a souvent des moments où je veux un silence complet.
17	Les motocyclettes devraient être obligées d'avoir des silencieux plus grands.	Les motocyclettes devraient être obligées d'avoir des silencieux plus grands.
18	Je trouve difficile de me détendre dans un endroit bruyant.	Je trouve difficile de me détendre dans un endroit bruyant.
19	Je m'énerve contre les gens qui font du bruit qui m'empêche de m'endormir ou d'effectuer mon travail.	Je m'énerve contre les gens qui font du bruit qui m'empêche de m'endormir ou d'effectuer mon travail.
20*	Cela ne me dérangerait pas de vivre dans un appartement aux murs fins.	Cela ne me dérangerait pas de vivre dans un appartement aux murs fins.
21	Je suis sensible au bruit.	Je suis sensible au bruit.

### Rating scale :

Tout à fait d'accord	D'accord	Plutôt d'accord	Plutôt pas d'accord	Pas d'accord	Pas du tout d'accord
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### Changes :

	Item	Reasons of change
2	Je suis plus conscient-e du bruit que je ne l'étais auparavant.	Gender neutral
5	Je suis facilement réveillé-e par le bruit.	Gender neutral
9	Cela me dérangerait qu'un appartement que je souhaite louer soit situé en face d'une caserne de pompiers.	To better fit Worthington et al's (2017) version (and Weinstein's polarity).
13	Quand je veux être seul-e, cela me dérange d'entendre des bruits extérieurs.	Gender neutral
14	Je peux me concentrer, peu importe ce qui se passe autour de moi.	Better match the French language (rather than Quebecois)

## NoiseQ

	Version sent by Griehfahn	Survey's version
1	J'ai du mal à me reposer dans un environnement bruyant.	J'ai du mal à me reposer dans un environnement bruyant.
2	J'ai besoin de calme et de tranquillité pour effectuer un travail difficile.	J'ai besoin de calme et de tranquillité pour effectuer un travail difficile.
3	Je suis prêt à accepter des inconvénients pour vivre dans un endroit calme.	Je suis prêt·e à accepter des inconvénients pour vivre dans un endroit calme.
4	Je suis très sensible au bruit de voisinage.	Je suis très sensible au bruit de voisinage.
5	Il m'est difficile de communiquer dans un environnement bruyant.	Il m'est difficile de communiquer dans un environnement bruyant.
6	Je n'ai pas de problème pour effectuer une tâche ordinaire dans un environnement bruyant.	Je n'ai pas de problème pour effectuer une tâche ordinaire dans un environnement bruyant.
7	Je deviens très agité si j'entends quelqu'un parler alors que j'essaie de m'endormir.	Je deviens très agité·e si j'entends quelqu'un parler alors que j'essaie de m'endormir.
8	Quand je suis plongé dans une discussion, je ne remarque pas si c'est bruyant autour de moi.	Quand je suis plongé·e dans une discussion, je ne remarque pas si c'est bruyant autour de moi.
9	Je peux m'endormir même quand c'est bruyant.	Je peux m'endormir même quand c'est bruyant.
10	Je suis nettement moins performant dans les endroits bruyants.	Je suis nettement moins performant·e dans les endroits bruyants.
11	Ecouter la musique fort m'aide à me relaxer après le travail.	Ecouter la musique fort m'aide à me relaxer après le travail.
12	Au restaurant, je ne peux me concentrer sur ma conversation lorsqu'à d'autres tables des personnes parlent à voix haute.	Au restaurant, je ne peux me concentrer sur ma conversation lorsqu'à d'autres tables des personnes parlent à voix haute.
13	J'ai besoin d'un environnement calme pour être capable d'effectuer de nouvelles tâches.	J'ai besoin d'un environnement calme pour être capable d'effectuer de nouvelles tâches.
14	Lorsque les gens autour de moi sont bruyants, j'ai du mal à accomplir mon travail.	Lorsque les gens autour de moi sont bruyants, j'ai du mal à accomplir mon travail.
15	J'ai besoin d'un environnement complètement calme pour avoir une bonne nuit de sommeil.	J'ai besoin d'un environnement complètement calme pour avoir une bonne nuit de sommeil.
16	Même le plus petit bruit m'empêche de m'endormir.	Même le plus petit bruit m'empêche de m'endormir.
17	Je suis sensible au bruit.	Quand je suis à la maison, je m'habitue rapidement au bruit.
18	Quand je suis à la maison, je m'habitue rapidement au bruit.	Au cinéma, je suis gêné·e par le chuchotement des gens et le froissement des papiers.
19	Au cinéma, je suis gêné par le chuchotement des gens et le froissement des papiers.	Je pense que la musique interfère avec les conversations.
20	Je pense que la musique interfère avec les conversations.	Il m'est très difficile de suivre une conversation quand la radio marche en même temps.
21	Il m'est très difficile de suivre une conversation quand la radio marche en même temps.	Si mon lieu de travail était bruyant, j'essaierais toujours de trouver des solutions pour y remédier.
22	Si mon lieu de travail était bruyant, j'essaierais toujours de trouver des solutions pour y remédier.	Lorsque je danse, je ne fais pas attention au volume sonore de la musique.
23	Lorsque je danse, je ne fais pas attention au volume sonore de la musique.	Vivre dans une rue bruyante ne me dérangerait pas.
24	Vivre dans une rue bruyante ne me dérangerait pas.	Lorsque les enfants des autres sont bruyants, je préfère ne pas les voir jouer devant chez moi.
25	Lorsque les enfants des autres sont bruyants, je préfère ne pas les voir jouer devant chez moi.	Je préfère un endroit calme le week-end.
26	Je préfère un endroit calme le week-end.	Je ne me sens pas bien reposé·e lorsque la nuit précédente a été bruyante.
27	Je ne me sens pas bien reposé lorsque la nuit précédente a été bruyante.	Quand je suis chez moi, je n'aime pas laisser la radio ou la TV allumée juste pour avoir un fond sonore.

28	Quand je suis chez moi, je n'aime pas laisser la radio ou la TV allumée juste pour avoir un fond sonore.	Quand la musique est forte dans un restaurant, j'interromps ma conversation.
29	Quand la musique est forte dans un restaurant, j'interromps ma conversation.	Je peux effectuer des tâches compliquées avec de la musique en fond sonore.
30	Je peux effectuer des tâches compliquées avec de la musique en fond sonore.	Je me réveille au moindre bruit.
31	Je me réveille au moindre bruit.	J'évite les activités de loisirs qui sont bruyantes.
32	J'évite les activités de loisirs qui sont bruyantes.	Je n'aime pas les activités bruyantes dans mon quartier.
33	Je n'aime pas les activités bruyantes dans mon quartier.	Les bruits de mes voisins peuvent être extrêmement dérangeants (par exemple, le bruit des pas).
34	Les bruits de mes voisins peuvent être extrêmement dérangeants (par exemple, le bruit des pas).	Même lorsqu'il est fort, le bruit du tonnerre ne me réveille habituellement pas.
35	Même lorsqu'il est fort, le bruit du tonnerre ne me réveille habituellement pas.	Il m'est difficile de me concentrer sur une conversation en présence de bruits de niveaux élevés.
36	Il m'est difficile de me concentrer sur une conversation en présence de bruits de niveaux élevés.	

### Rating scale:

Tout à fait d'accord	Plutôt d'accord	Plutôt pas d'accord	Pas du tout d'accord
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### Changes:

All wording changes have been made to ensure gender-neutral wording.

Item 17 was removed from the questionnaire as it consisted of a repetition of the single-item question and item 21 of the Weinstein Noise Sensitivity Questionnaire. Furthermore, in all published studies using the NoiseQ-R, collected during Task 1 (including Griefahn, 2008; Pierrette, Parizet et al., 2015) - the 12-item version of the NoiSeQ-R (which does not include item 17) was used (which was originally published by Griefahn, 2008, in an ASA conference abstract only).

### LEF

	Reconciled version	Survey's version
1	Avant de commencer à travailler, j'essaie d'éliminer toutes sources de bruit.	Avant de commencer à travailler, j'essaie d'éliminer toute source de bruit.
2	Quand je suis épuisé(e) la musique forte me revigore.	Quand je suis épuisé·e, la musique forte me revigore.
3	Un sommeil réparateur n'est possible que dans un environnement absolument calme.	Un sommeil réparateur n'est possible que dans un environnement absolument calme.
4	Les portes qui claquent ne m'effraient pas.	Les portes qui claquent ne m'effraient pas.
5	Dans un restaurant, je trouve irrespectueux si les gens parlent fort à la table voisine.	Dans un restaurant, je trouve irrespectueux si les gens parlent fort à la table voisine.
6	Je peux écouter la radio tout en lisant le journal.	Je peux écouter la radio tout en lisant le journal.
7	Le weekend, j'aime être dans un endroit calme.	Le weekend, j'aime être dans un endroit calme.
8	J'ai souvent envie de silence.	J'ai souvent envie de silence.
9	Quand il y a du bruit, même le meilleur des repas ne pourrait me plaire.	Quand il y a du bruit, même le meilleur des repas ne pourrait me plaire.
10	Si j'entends quelqu'un parler quand je veux m'endormir, cela m'énerve.	Si j'entends quelqu'un parler quand je veux m'endormir, cela m'énerve.
11	On attache trop de valeur à la protection contre le bruit.	On attache trop de valeur à la protection contre le bruit.

12	Je n'aime pas aller à des événements s'ils sont bruyants.	Je n'aime pas aller à des événements s'ils sont bruyants.
13	Même au moindre bruit, j'ai du mal à m'endormir.	Même au moindre bruit, j'ai du mal à m'endormir.
14	Je pense que même un grand bruit de fond n'affecte pas mes performances.	Je pense que même un grand bruit de fond n'affecte pas mes performances.
15	Il n'y a aucun plaisir à discuter si la radio est allumée en même temps.	Il n'y a aucun plaisir à discuter si la radio est allumée en même temps.
16	En dansant, on peut mettre la musique aussi forte qu'on le souhaite.	En dansant, on peut mettre la musique aussi forte qu'on le souhaite.
17	Là où c'est calme, je suis plus détendu.	Là où c'est calme, je suis plus détendu·e.
18	Même un orage ne peut pas me sortir du sommeil.	Même un orage ne peut pas me sortir du sommeil.
19	Quand il y a du bruit autour de moi, j'ai du mal à trouver des mots.	Quand il y a du bruit autour de moi, j'ai du mal à trouver des mots.
20	Manger dans un environnement bruyant me donne mal à l'estomac.	Manger dans un environnement bruyant me donne mal à l'estomac.
21	Je ne peux m'endormir que dans un silence total.	Je ne peux m'endormir que dans un silence total.
22	J'aime écouter de la musique forte en faisant le ménage.	J'aime écouter de la musique forte en faisant le ménage.
23	Je suis d'avis, que la musique forte dans un café ne perturbe pas une conversation.	Je suis d'avis, que la musique forte dans un café ne perturbe pas une conversation.
24	Les collègues qui sont bruyants me rendent nerveux (nerveuse).	Les collègues qui sont bruyants me rendent nerveux·se.
25	J'essaie toujours d'échapper au plus vite au bruit quotidien de la rue.	J'essaie toujours d'échapper au plus vite au bruit quotidien de la rue.
26	Pendant le travail, la musique de fond ne me dérange pas.	Pendant le travail, la musique de fond ne me dérange pas.
27	Je remarque les bruits gênants plus tard que les autres.	Je remarque les bruits gênants plus tard que les autres.
28	Il est désagréable de discuter dans le bruit.	Il est désagréable de discuter dans le bruit.
29	Le bruit rend agressif.	Le bruit rend agressif·ve.
30	J'évite les événements bruyants comme les matchs de football ou les fêtes foraines.	J'évite les événements bruyants comme les matchs de football ou les fêtes foraines.
31	Le bruit me rend agressif (agressive) sur mon lieu de travail.	Le bruit me rend agressif·ve sur mon lieu de travail.
32	Les voisins doivent être aussi silencieux que s'ils n'étaient pas là.	Les voisins doivent être aussi silencieux que s'ils n'étaient pas là.
33	Je me réveille au moindre bruit.	Je me réveille au moindre bruit.
34	Je suis capable de travailler vite et de me concentrer dans un environnement bruyant.	Je suis capable de travailler vite et de me concentrer dans un environnement bruyant.
35	La musique doit être écoutée à plein volume.	La musique doit être écoutée à plein volume.
36	Lorsque je suis en ville et fais les courses, je ne remarque pas le bruit de la rue.	Lorsque je suis en ville et fais les courses, je ne remarque pas le bruit de la rue.
37	Après une soirée dans un endroit bruyant, je me sens épuisé(e).	Après une soirée dans un endroit bruyant, je me sens épuisé·e.
38	Quand je veux m'endormir, presque aucun bruit ne me dérange.	Quand je veux m'endormir, presque aucun bruit ne me dérange.
39	Les tâches mentalement exigeantes nécessitent du calme.	Les tâches mentalement exigeantes nécessitent du calme.
40	La musique forte ne nuit pas à mon audition.	La musique forte ne nuit pas à mon audition.
41	Si un chien aboie sous mes fenêtres quand je lis le journal, cela m'énerve.	Si un chien aboie sous mes fenêtres quand je lis le journal, cela m'énerve.
42	Je trouve agréable, que la télévision ou la radio soient allumées en fond sonore pendant la journée.	Je trouve agréable, que la télévision ou la radio soit allumée en fond sonore pendant la journée.

43	Si la musique est forte dans un endroit, je cesse de discuter.	Si la musique est forte dans un endroit, je cesse de discuter.
44	Je suis capable de me concentrer sur un livre même s'il y a de la musique à côté.	Je suis capable de me concentrer sur un livre même s'il y a de la musique à côté.
45	Si une fête devient trop bruyante, alors je m'en vais.	Si une fête devient trop bruyante, alors je m'en vais.
46	Après le travail, j'aime écouter de la musique forte.	Après le travail, j'aime écouter de la musique forte.
47	A mon avis, le silence doit être total pendant la nuit.	A mon avis, le silence doit être total pendant la nuit.
48	Si c'est bruyant, je désire faire quelque chose pour y remédier.	Si c'est bruyant, je désire faire quelque chose pour y remédier.
49	Il est évident que l'on ne peut pas travailler dans le bruit.	Il est évident que l'on ne peut pas travailler dans le bruit.
50	Quand je suis plongé(e) dans une conversation, je ne remarque pas si le lieu est bruyant.	Quand je suis plongé·e dans une conversation, je ne remarque pas si le lieu est bruyant.
51	Je me détends en écoutant de la musique forte.	Je me détends en écoutant de la musique forte.
52	Le bruit rend malade.	Le bruit rend malade.

### Rating scale:

Tout à fait d'accord	Plutôt d'accord	Plutôt pas d'accord	Pas du tout d'accord
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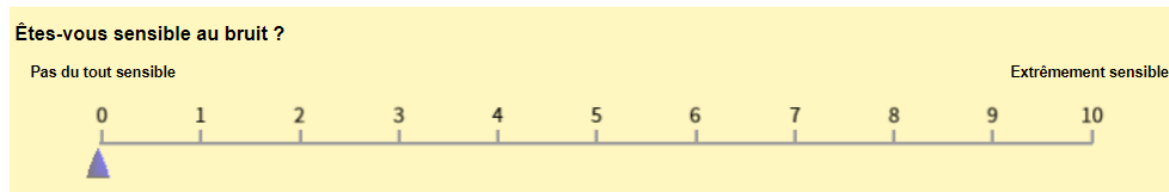
### Changes:

The only changes made to the reconciled version concern gender-neutral wording and a few grammatical and spelling errors.

### One item scale:

#### Sensibilité au bruit en général

Veuillez faire coulisser le curseur à la position souhaitée; vous pouvez choisir des valeurs intermédiaires



### 1-item scale (Kodji et al. 2023) :

**Original (Kodji et al. 2023) :** En ce qui concerne le bruit en général, estimez-vous que par rapport aux personnes de votre entourage, vous êtes :

1: beaucoup plus sensible, 2: un peu plus sensible, 3: aussi sensible, 4: un peu moins sensible, 5: beaucoup moins sensible ?

### Survey version:

Par rapport aux personnes de votre entourage, estimez-vous que vous êtes ... .. au bruit ?

beaucoup moins sensible	moins sensible	aussi sensible	un peu plus sensible	beaucoup plus sensible
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suivant

**Appendix 14: correlation analysis of the 19 common items of NoiseQ and LEF questionnaires**

	Pearson	Person	Time
1	0,701	0,701	33,2
2	0,696	0,696	20,2
3	0,739	0,739	25,4
4	0,856	0,856	15,3
5	0,684	0,684	8,1
6	0,232	0,232	25,7
7	0,725	0,725	15,4
8	0,518	0,518	12,3
9	0,654	0,654	11,8
10	0,466	0,466	9,5
11	0,601	0,601	11,3
12	0,224	0,224	11,9
13	0,247	0,247	9,8
14	0,708	0,708	11,5
15	0,490	0,490	10,5
16	0,726	0,726	13,7
17	0,689	0,689	21,7
18	0,828	0,828	15,5
19	0,745	0,745	10,3
20	0,607	0,607	9,1
21	0,656	0,656	11,8
22	0,645	0,645	12,2
23	0,795	0,795	30,4
24	0,746	0,746	8,5
25	0,620	0,620	10,8
26	0,558	0,558	16,3
27	0,504	0,504	13,2
28	0,656	0,656	23,0
29	0,408	0,408	23,2
30	0,403	0,403	17,2
31	0,707	0,707	13,8
32	0,798	0,798	9,4
33	0,731	0,731	9,6
34	0,775	0,775	14,9
35	0,717	0,717	14,0
36	0,169	0,169	12,7
37	0,201	0,201	13,3
38	0,787	0,787	18,3
39	0,611	0,611	10,9
40	0,734	0,734	9,9
41	0,587	0,587	27,2
42	0,514	0,514	19,4
43	-0,199	-0,199	13,4
44	0,760	0,760	10,1
45	0,664	0,664	18,6
46	0,600	0,600	11,4
47	0,477	0,477	26,6

156	0,985	0,985	10,0
157	0,375	0,375	21,6
158	0,403	0,403	26,5
159	0,731	0,731	14,5
160	0,795	0,795	7,7
161	0,336	0,336	9,5
162	0,323	0,323	7,8
163	0,694	0,694	12,5
164	0,394	0,394	9,1
165	0,407	0,407	11,7
166	0,855	0,855	12,7
167	0,158	0,158	10,2
168	0,239	0,239	11,9
169	0,536	0,536	8,7
170	0,641	0,641	12,8
171	0,807	0,807	11,4
172	0,320	0,320	16,6
173	0,237	0,237	11,6
174	0,777	0,777	11,3
175	0,452	0,452	11,6
176	0,192	0,192	11,8
177	0,522	0,522	11,5
178	0,563	0,563	17,1
179	0,879	0,879	12,6
180	0,757	0,757	21,1
181	0,626	0,626	20,9
182	0,693	0,693	10,1
183	0,816	0,816	12,6
184	0,566	0,566	11,4
185	0,633	0,633	9,5
186	0,668	0,668	18,3
187	0,300	0,300	11,1
188	0,659	0,659	15,2
189	0,769	0,769	7,7
190	0,875	0,875	11,0
191	0,525	0,525	16,8
192	0,486	0,486	12,0
193	0,475	0,475	22,0
194	0,431	0,431	10,3
195	0,644	0,644	8,6
196	0,721	0,721	15,3
197	0,691	0,691	16,0
198	0,671	0,671	11,5
199	0,749	0,749	10,5
200	0,896	0,896	16,1
201	0,487	0,487	10,7
202	0,614	0,614	11,8
203	0,794	0,794	11,5
204	0,697	0,697	9,0
205	0,700	0,700	15,9

48	0,317	0,317	11,4
49	0,702	0,702	8,8
50	0,805	0,805	6,5
51	0,543	0,543	10,9
52	0,519	0,519	13,5
53	0,645	0,645	8,3
54	0,557	0,557	11,6
55	0,668	0,668	10,5
56	0,683	0,683	12,1
57	0,199	0,199	11,8
58	0,663	0,663	15,7
59	0,755	0,755	10,7
60	0,710	0,710	11,5
61	0,503	0,503	15,0
62	0,731	0,731	14,3
63	0,100	0,100	7,4
64	0,675	0,675	10,3
65	0,488	0,488	13,2
66	0,480	0,480	18,3
67	0,635	0,635	16,3
68	0,897	0,897	13,5
69	0,748	0,748	20,2
70	0,486	0,486	8,2
71	0,459	0,459	7,9
72	0,714	0,714	12,0
73	0,347	0,347	13,5
74	0,678	0,678	14,5
75	0,645	0,645	11,9
76	0,753	0,753	9,9
77	0,780	0,780	8,4
78	0,632	0,632	13,9
79	0,505	0,505	11,1
80	0,019	0,019	16,9
81	0,274	0,274	19,6
82	0,785	0,785	18,2
83	0,710	0,710	8,2
84	0,843	0,843	8,9
85	0,244	0,244	8,3
86	0,286	0,286	7,9
87	0,340	0,340	13,0
88	0,752	0,752	8,0
89	0,643	0,643	16,6
90	0,083	0,083	7,9
91	0,324	0,324	7,2
92	0,856	0,856	14,5
93	0,711	0,711	9,5
94	0,939	0,939	11,3
95	0,736	0,736	19,7
96	0,704	0,704	21,9
97	0,580	0,580	14,4
98	0,526	0,526	15,5

206	0,584	0,584	10,6
207	0,393	0,393	16,1
208	0,518	0,518	16,0
209	0,563	0,563	9,1
210	0,672	0,672	13,6
211	0,525	0,525	17,2
212	0,853	0,853	10,5
213	0,712	0,712	27,7
214	0,825	0,825	23,6
215	0,614	0,614	12,7
216	0,604	0,604	12,5
217	0,456	0,456	15,7
218	0,803	0,803	16,2
219	0,676	0,676	16,2
220	0,768	0,768	14,6
221	0,765	0,765	11,2
222	0,552	0,552	13,4
223	0,753	0,753	15,4
224	0,600	0,600	8,7
225	0,723	0,723	9,2
226	0,482	0,482	12,0
227	0,781	0,781	7,7
228	0,645	0,645	18,3
229	0,824	0,824	14,8
230	0,919	0,919	22,7
231	0,675	0,675	7,3
232	0,374	0,374	10,2
233	0,648	0,648	14,3
234	0,455	0,455	14,1
235	0,527	0,527	10,0
236	0,629	0,629	9,9
237	0,389	0,389	12,2
238	0,213	0,213	11,4
239	0,780	0,780	14,4
240	0,670	0,670	18,6
241	0,674	0,674	12,2
242	0,550	0,550	10,9
243	0,493	0,493	13,0
244	0,564	0,564	12,2
245	0,447	0,447	16,3
246	0,716	0,716	19,0
247	0,554	0,554	17,3
248	0,574	0,574	18,3
249	0,765	0,765	13,2
250	0,678	0,678	23,8
251	0,851	0,851	9,2
252	0,305	0,305	16,9
253	0,808	0,808	8,0
254	0,698	0,698	12,8
255	0,245	0,245	9,1



99	-0,012	-0,012	5,5
100	0,514	0,514	10,3
101	0,425	0,425	23,5
102	0,479	0,479	13,8
103	0,856	0,856	9,8
104	0,368	0,368	10,1
105	0,537	0,537	25,9
106	0,699	0,699	8,3
107	0,418	0,418	13,0
108	0,587	0,587	17,5
109	0,210	0,210	13,0
110	0,796	0,796	14,7
111	0,694	0,694	11,4
112	0,663	0,663	8,9
113	0,503	0,503	17,0
114	0,408	0,408	9,3
115	0,600	0,600	25,1
116	0,755	0,755	10,4
117	0,773	0,773	15,0
118	0,027	0,027	7,5
119	0,714	0,714	9,2
120	0,700	0,700	10,7
121	0,741	0,741	18,0
122	0,568	0,568	9,7
123	0,799	0,799	13,9
124	0,553	0,553	17,4
125	0,867	0,867	13,4
126	0,862	0,862	13,7
127	0,569	0,569	12,3
128	0,479	0,479	11,6
129	0,678	0,678	12,0
130	0,659	0,659	18,9
131	0,700	0,700	13,6
132	0,616	0,616	16,8
133	0,776	0,776	23,9
134	0,840	0,840	11,3
135	0,749	0,749	11,3
136	0,784	0,784	14,7
137	0,619	0,619	12,5
138	0,670	0,670	12,2
139	0,375	0,375	11,4
140	0,278	0,278	11,7
141	0,893	0,893	9,8
142	0,971	0,971	7,9
143	0,752	0,752	20,3
144	0,475	0,475	18,7
145	0,770	0,770	7,6
146	0,666	0,666	16,0
147	0,304	0,304	18,3
148	0,687	0,687	12,2
149	0,715	0,715	11,2

256	0,472	0,472	21,2
257	0,504	0,504	12,5
258	0,739	0,739	18,9
259	0,668	0,668	15,3
260	0,754	0,754	9,6
261	0,475	0,475	22,0
262	0,882	0,882	16,5
263	0,593	0,593	10,0
264	0,527	0,527	25,2
265	0,538	0,538	12,9
266	0,831	0,831	8,4
267	0,393	0,393	14,5
268	0,691	0,691	8,3
269	0,506	0,506	9,7
270	0,710	0,710	14,5
271	0,700	0,700	13,5
272	0,555	0,555	7,4
273	0,553	0,553	9,1
274	0,368	0,368	13,7
275	0,876	0,876	8,8
276	0,854	0,854	8,2
277	0,753	0,753	11,3
278	0,834	0,834	14,6
279	0,820	0,820	23,9
280	0,776	0,776	18,6
281	0,422	0,422	14,2
282	-0,032	-0,032	6,5
283	0,546	0,546	13,4
284	0,752	0,752	13,4
285	0,595	0,595	13,1
286	0,730	0,730	14,5
287	0,887	0,887	11,8
288	0,799	0,799	21,3
289	0,774	0,774	12,8
290	0,877	0,877	11,0
291	0,598	0,598	15,6
292	-0,047	-0,047	14,5
293	-0,003	-0,003	17,0
294	0,875	0,875	9,3
295	0,495	0,495	24,1
296	0,047	0,047	10,7
297	0,701	0,701	13,0
298	0,850	0,850	14,7
299	0,737	0,737	32,0
300	0,654	0,654	19,0
301	0,774	0,774	28,3
302	0,784	0,784	15,0
303	0,599	0,599	16,6
304	0,609	0,609	28,3
305	0,451	0,451	10,3

150	0,934	0,934	10,2
151	0,690	0,690	16,8
152	0,763	0,763	10,5
153	0,629	0,629	13,1
154	0,615	0,615	9,3
155	0,756	0,756	20,7
156	0,985	0,985	10,0

306	0,606	0,606	20,7
307	0,821	0,821	29,7
308	0,299	0,299	17,5
309	0,663	0,663	14,9
310	0,805	0,805	18,8
311	0,626	0,626	17,2

### Appendix 15: Kendall test

**43**

NoiseQ	LEF
2	2
2	2
2	2
1	3
2	3
2	2
3	2
2	3
2	2
2	3
3	2
2	2
2	2
1	2
2	2
3	2
3	2
1	2
1	2
<b>-0,198955606</b>	

Corrélations du Tau de Kendall (Feuille de données3)  
Cellules à VM ignorées  
Corrélations significatives marquées à p <,05000

Variable	NoiseQ	LEF
NoiseQ	1,000000	-0,189889
LEF	-0,189889	1,000000

Coeffs de Corrélations de Rangs de Spearman (Feuille de données3)  
Cellules à VM ignorées  
Corrélations significatives marquées à p <,05000

Couples de variables	N Actifs	R de Spearman	t(N-2)	valeur p
NoiseQ & NoiseQ				
NoiseQ & LEF	19	-0,198956	-0,837049	0,414178
LEF & NoiseQ	19	-0,198956	-0,837049	0,414178
LEF & LEF				

**99**

NoiseQ	LEF
2	3
4	2
4	2
2	3
1	3
1	2
2	2
3	3
2	2
2	2
3	2
1	2
2	3
3	3
1	2
1	2
2	3
3	2
2	2
<b>-0,012314748</b>	

Corrélations du Tau de Kendall (Feuille de données3)  
Cellules à VM ignorées  
Corrélations significatives marquées à p <,05000

Variable	NoiseQ	LEF
NoiseQ	1,000000	0,038881
LEF	0,038881	1,000000

Coeffs de Corrélations de Rangs de Spearman (Feuille de données3)  
Cellules à VM ignorées  
Corrélations significatives marquées à p <,05000

Couples de variables	N Actifs	R de Spearman	t(N-2)	valeur p
NoiseQ & LEF	19	0,042017	0,173392	0,864391

282

NoiseQ	LEF
3	2
4	1
3	3
2	3
2	3
3	2
2	2
1	2
3	3
3	3
3	2
3	4
4	3
3	3
2	2
3	2
3	2
4	2
2	2

-0,032178174

292

NoiseQ	LEF
3	2
2	3
2	2
2	3
2	1
2	3
2	3
2	4
1	2
3	3
3	3
3	2
2	4
2	1
1	3
3	3
3	3
3	2
3	2

-0,046814084

293

NoiseQ	LEF
1	1
2	4
2	1
3	1
3	2
2	3
3	3
4	4
3	2
3	1
3	3
4	1
1	3
2	1
3	3
1	3
3	2
4	3
2	4

-0,002725534

Corrélations du Tau de Kendall (Feuille de données)  
Cellules à VM ignorées  
Corrélations significatives marquées à p <,05000

Variable	NoiseQ	LEF
NoiseQ	1,000000	-0,009180
LEF	-0,009180	1,000000

Coeffs de Corrélations de Rangs de Spearman (Feuille de données)  
Cellules à VM ignorées  
Corrélations significatives marquées à p <,05000

Couples de variables	N Actifs	R de Spearman	t(N-2)	valeur p
NoiseQ & NoiseQ				
NoiseQ & LEF	19	-0,017650	-0,072783	0,942829
LEF & NoiseQ	19	-0,017650	-0,072783	0,942829
LEF & LEF				

Coeffs de Corrélations de Rangs de Spearman (Feuille de données)  
Cellules à VM ignorées  
Corrélations significatives marquées à p <,05000

Couples de variables	N Actifs	R de Spearman	t(N-2)	valeur p
NoiseQ & LEF	19	-0,089183	-0,369183	0,716549

Corrélations du Tau de Kendall (Feuille de données)  
Cellules à VM ignorées  
Corrélations significatives marquées à p <,05000

Variable	NoiseQ	LEF
NoiseQ	1,000000	-0,080473
LEF	-0,080473	1,000000

Coeffs de Corrélations de Rangs de Spearman (Feuille de données)  
Cellules à VM ignorées  
Corrélations significatives marquées à p <,05000

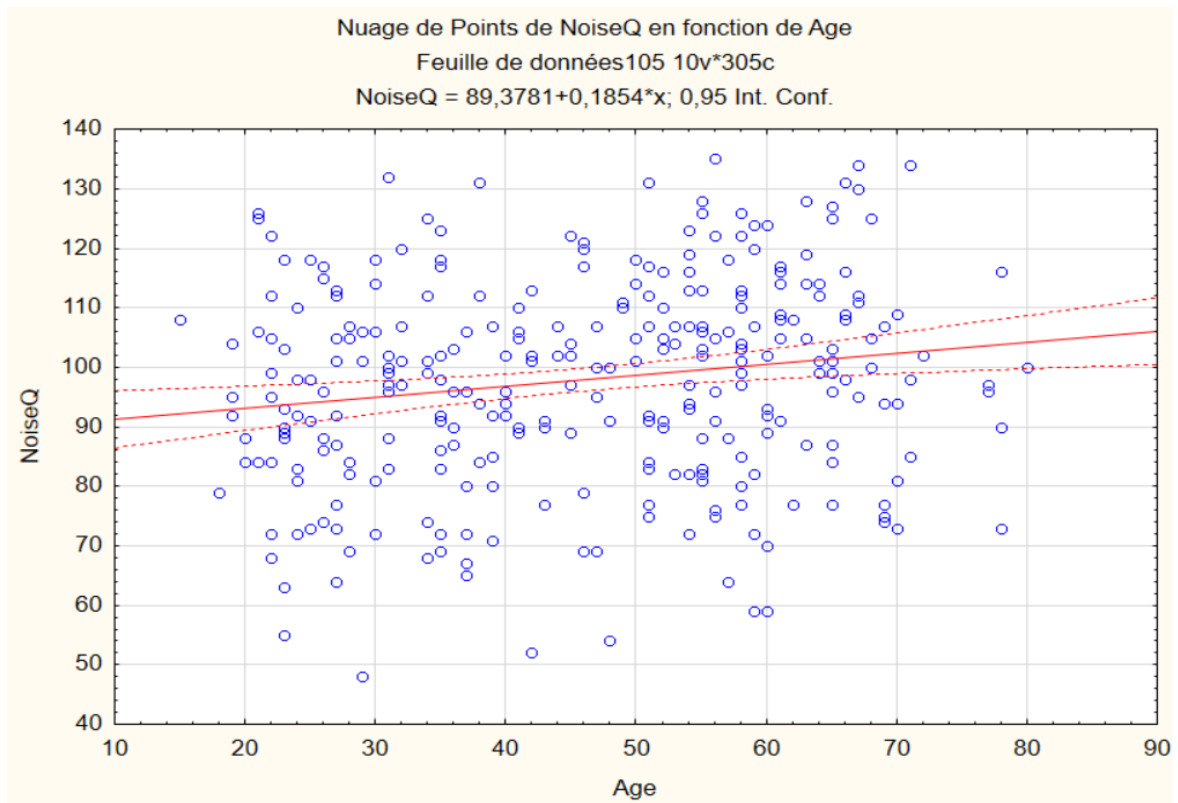
Couples de variables	N Actifs	R de Spearman	t(N-2)	valeur p
NoiseQ & LEF	19	-0,017400	-0,071753	0,943636

Corrélations du Tau de Kendall (Feuille de données)  
Cellules à VM ignorées  
Corrélations significatives marquées à p <,05000

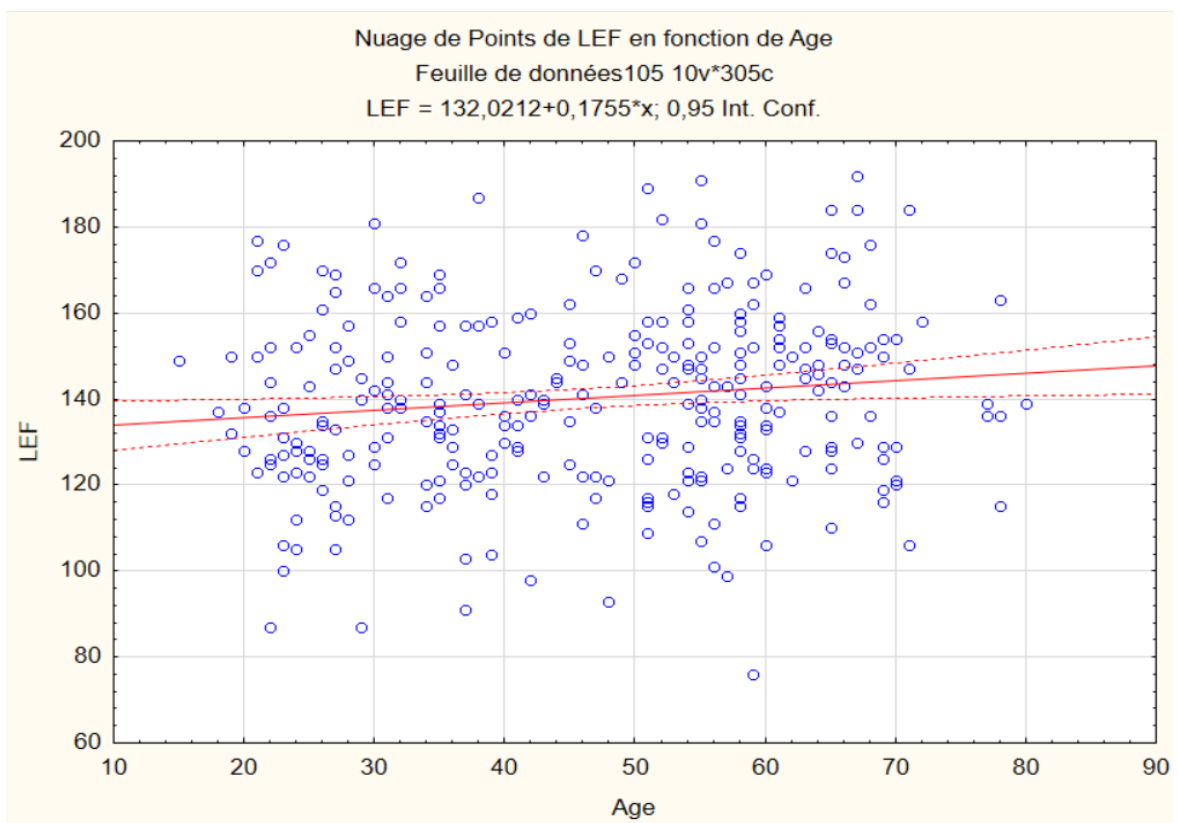
Variable	NoiseQ	LEF
NoiseQ	1,000000	-0,007813
LEF	-0,007813	1,000000

## Appendix 16: Graphs of scores correlated with age

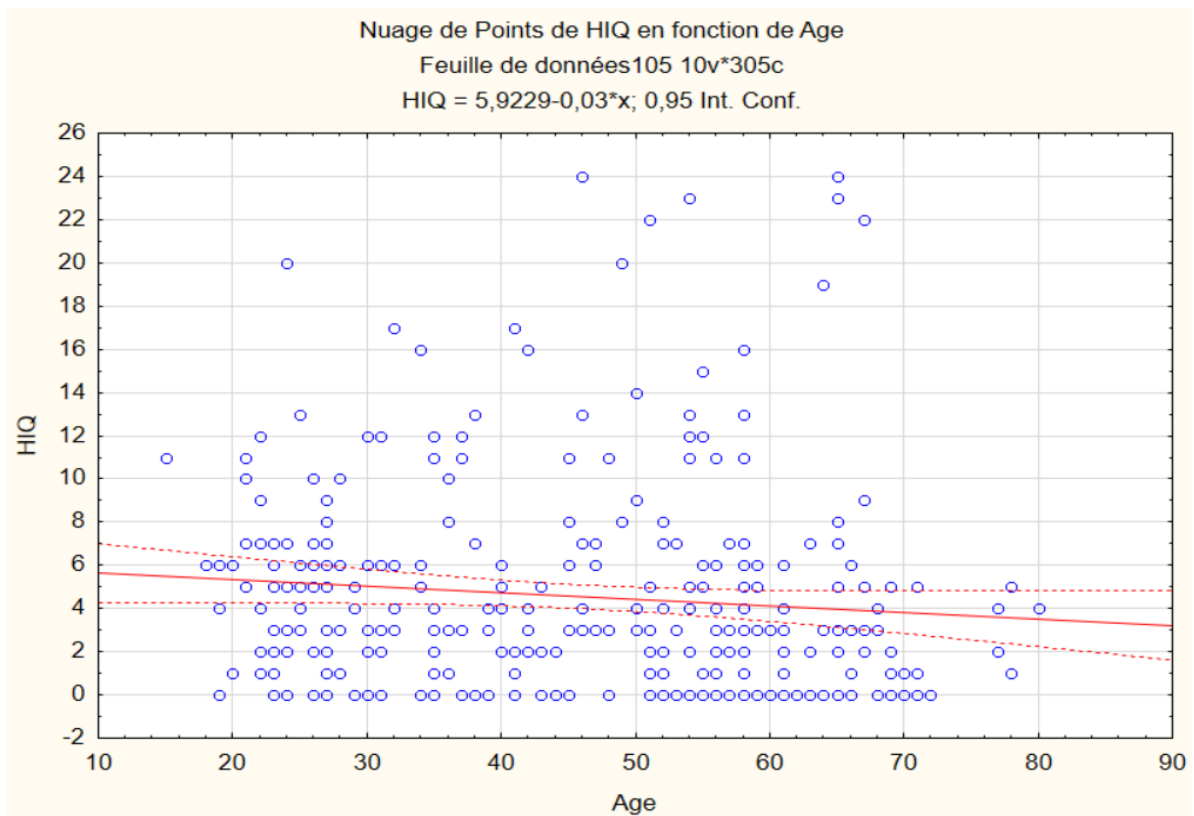
1) Graph of linear regression of NoiseQ score as a function of age



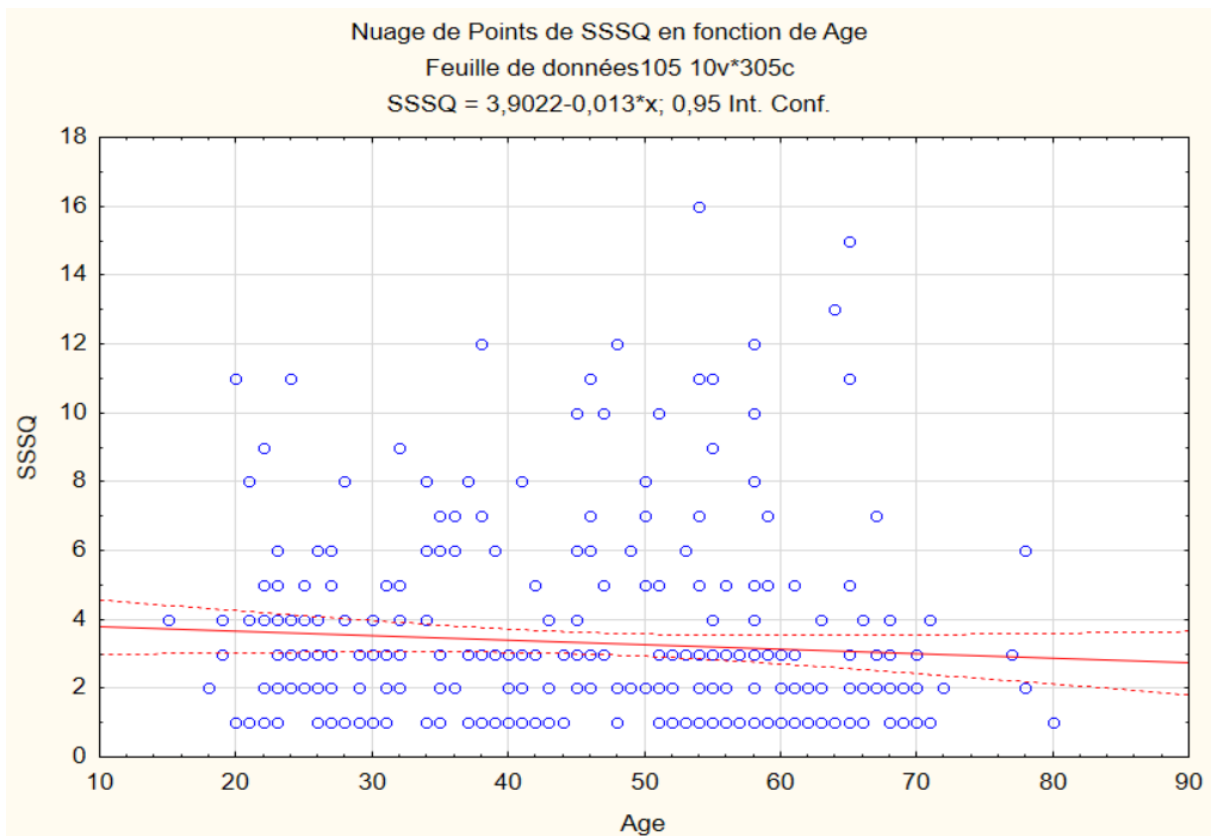
2) Graph of linear regression of LEF score as a function of age



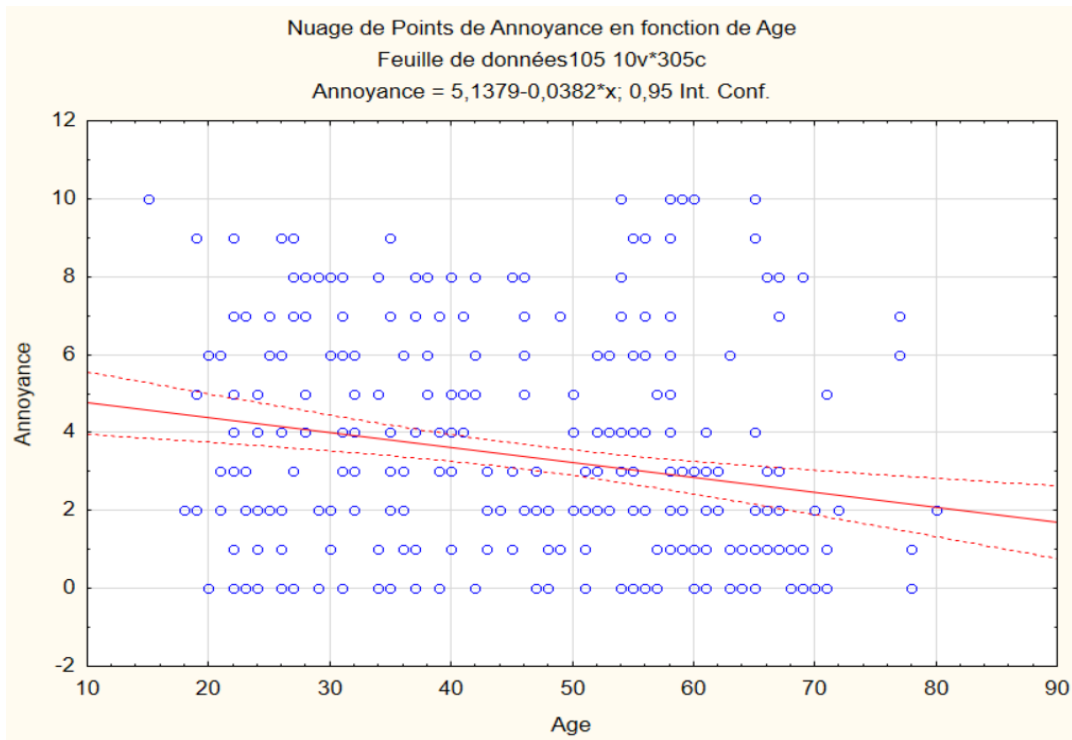
3) Graph of linear regression of HIQ score as a function of age



4) Graph of linear regression of SSSQ score as a function of age

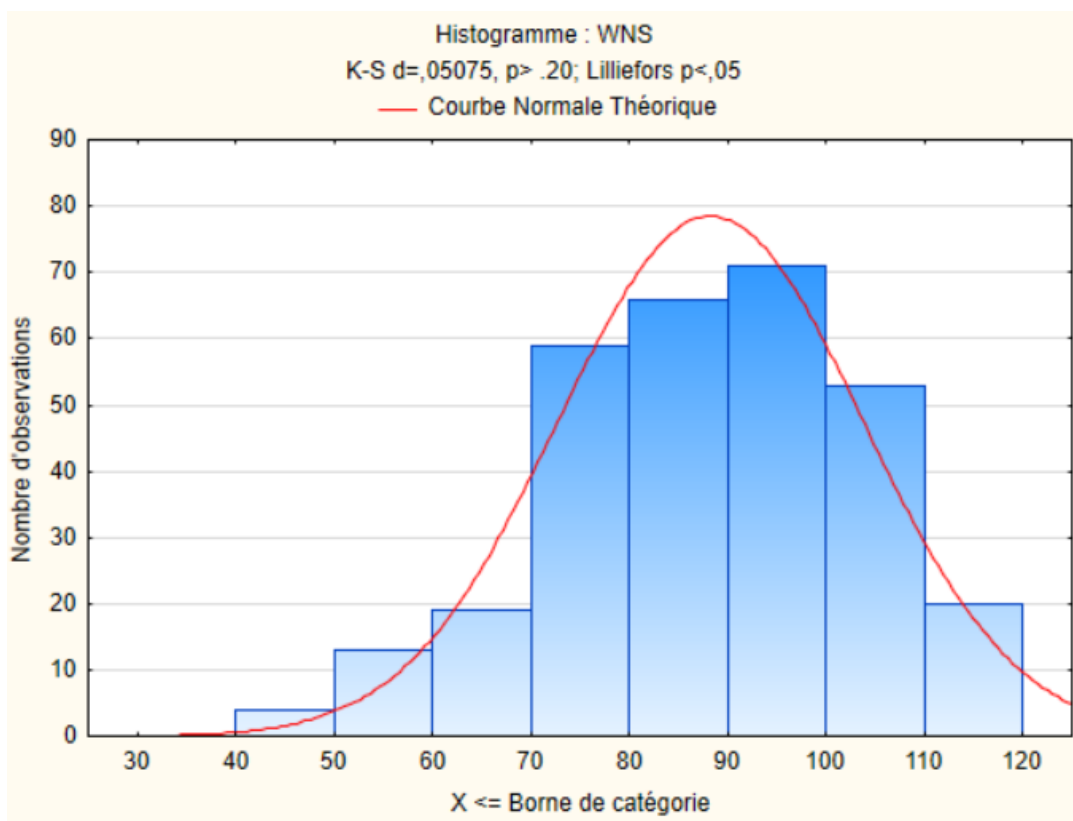


5) Graph of linear regression of annoyance score as a function of age

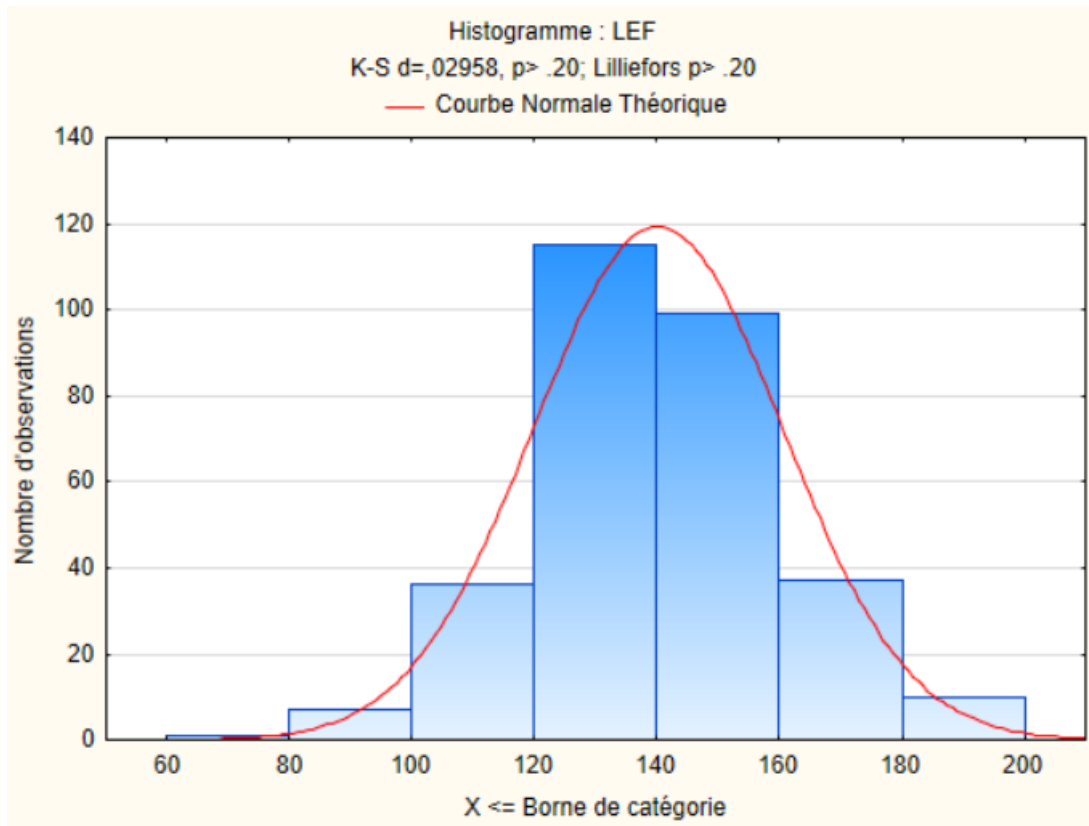


**Appendix 17: Histograms UK**

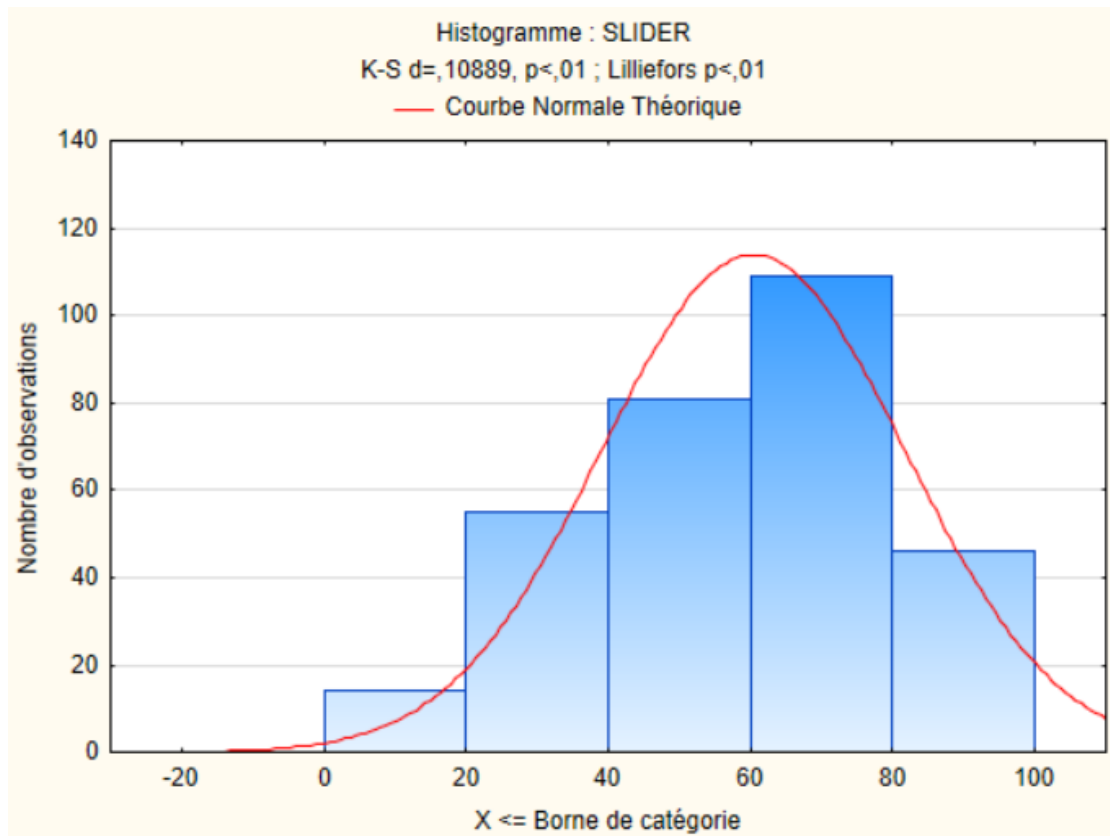
Weinstein noise sensitivity:



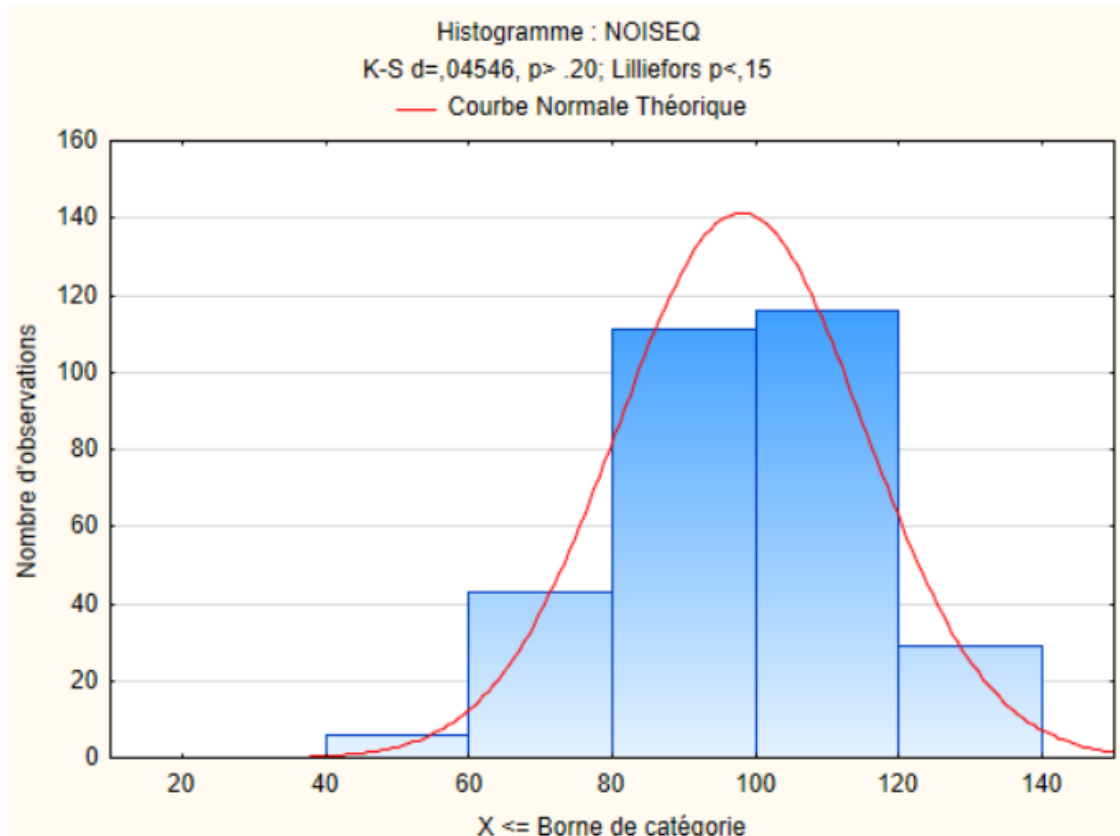
LEF:



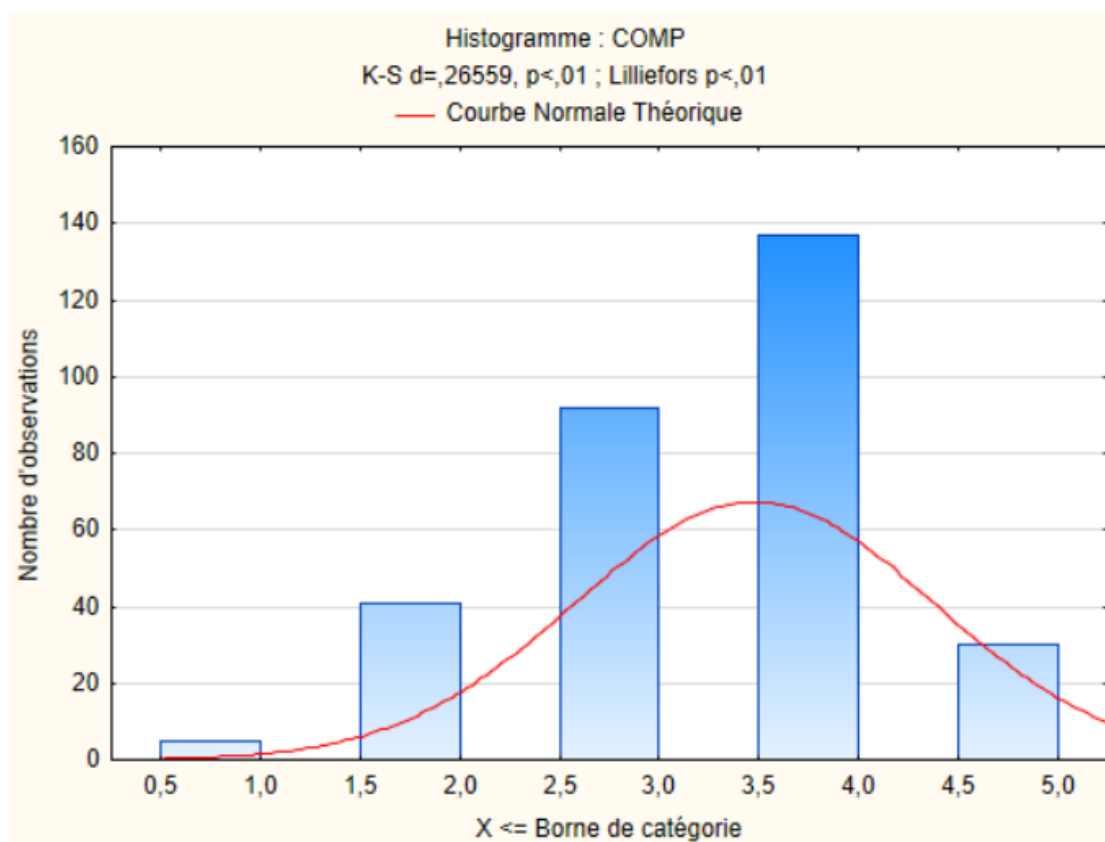
One item – slider:



NoiseQ:

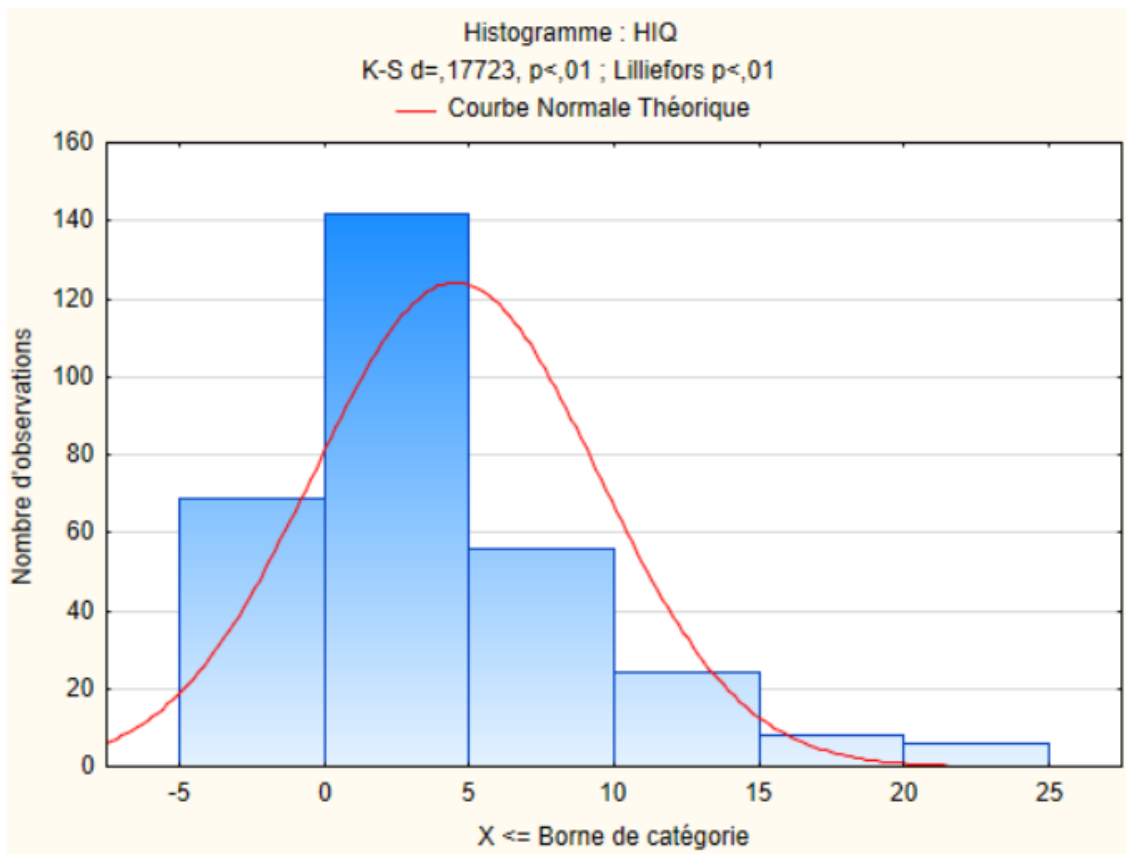


One item – comparison:

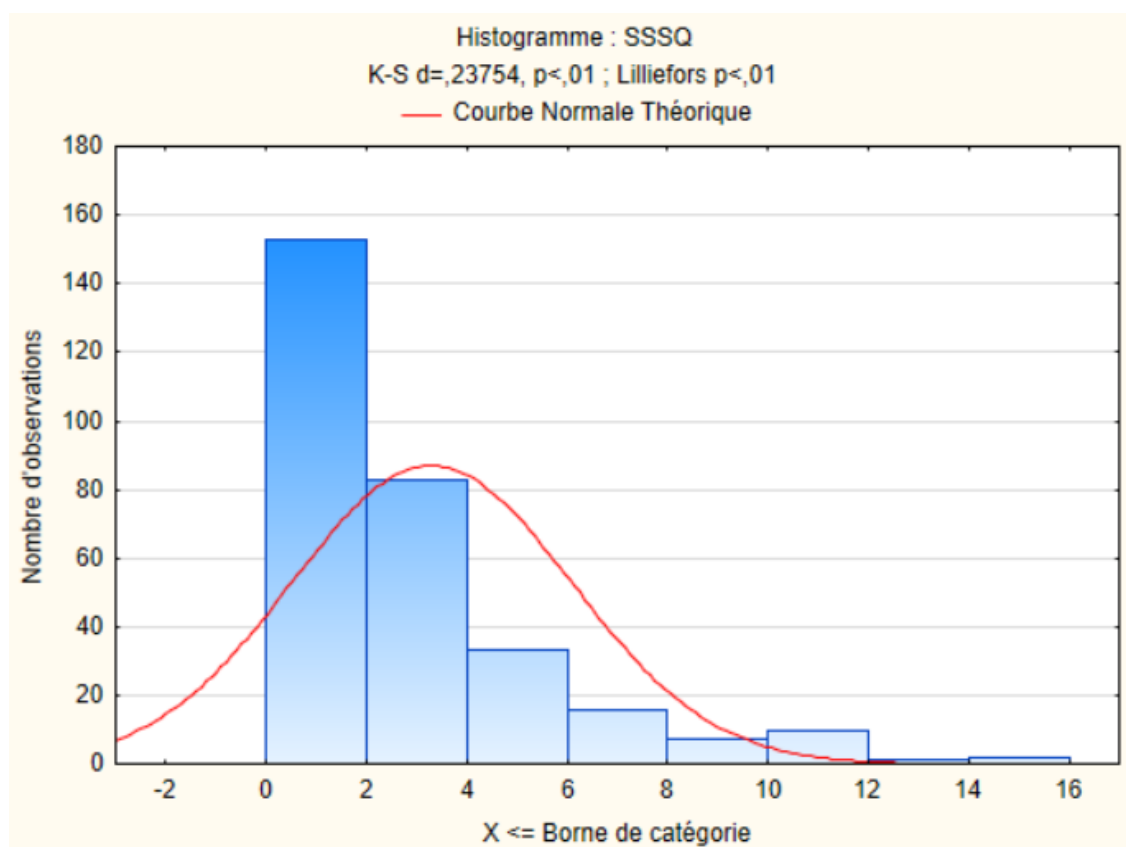


HIQ:





SSSQ:



Annoyance:

