Regional Conference on Acoustics and Vibration 2017 (RECAV 2017)

PREFACE

This book of abstracts is a compilation of the abstracts of the papers contributed to the Regional Conference on Acoustics and Vibration (RECAV) in Denpasar, Bali, Indonesia, being held on November 27-28, 2017. RECAV 2017 is jointly organized by the Association of Acoustics and Vibration Indonesia (AAVI) and Society of Acoustics (Singapore) (SAS) presenting the theme "Enhancing Acoustics and Vibration Research, Education, and Professionalism in Global Community ". It is the intention of this book that participants would be able to see the overview of the papers presented in this conference and to make a plan in attending the sessions with respect to their interest. The range of research in acoustics and vibration and its current developments may also be observed in this book of abstracts which would provide information on various findings that could be of interest to those working in the relevant area. Our great appreciation to all contributions from authors coming from 14 countries for this conference. On behalf of the committee, I would like to thank to all participants and contributors of RECAV 2017 for attending this conference, submitting papers, taking part of the exhibitions, taking part in partnership and sponsorship, and for all kind of supports to make this conference successful. It is our hope that this conference would be enjoyable and provides fruitful interactions between all participants.

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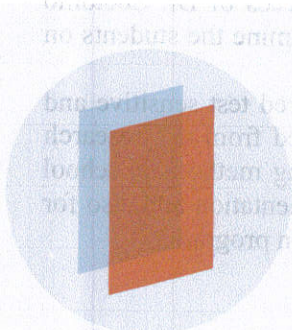

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The modified whispered test for screening of hearing impairment in children at the elementary school

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Abstract. Hearing impairment in children could be identified by several methods of hearing test. The conventional whispered test is designed with the distance of 6 meters measurement. There is a need to get smaller examination room, then there is a method to modify the distance. this method is Modified Whispered Test, that is quite practical, simple and can be performed in smaller room and for the large groups. The study was designed to know whether the modified whispered test was sensitive or not to screen the hearing impairment among the elementary school students. This study will improve the program of early detection of the hearing impairment among the elementary school students in Surabaya Indonesia. A cross sectional study of 100 elementary school students has been conducted at Sekolah Dasar Negeri Kali Rungkut I, II and III Surabaya. The study was analyzed the validity of whispered test compare to the gold standard, Audiometry. The population-based sample of 100 children (aged 6 to 13 years), was taken randomly and proportionally from the 1st to 6th grade students. It was concluded that the modified whispered test applicable for screening of hearing impairment among elementary school children, with 80% sensitivity, 95,2% specificity and 0,752 Youden Index on 41-55 dB degree of hearing loss (Moderate Hearing Loss). Further Studies of hearing impaired children are necessary to plan preventive and curative program.

1. Introduction

Hearing impairment of children could be identified by several methods of hearing test [1]. Whispered test was one of those tests that was quite practical, simple and available for large groups [2] [3]. The modified Whispered test has been used to reduce the distance between the physician and the patient of the conventional method. Each of these manoeuvres, the physician is positioned face to face to the patient, then turning the head on the opposite site to the patient's tested ear, as well as the patient's head on the contrary sides. It may have resulted reducing the distance of about one-third from the conventional method which is 6 meters distance [4]. The modified Whispered test has been used as screening method of hearing impairment among candidate students and employees of Dr. Soetomo general hospital in Surabaya for years [5]. So far there was no experience to examine the students on the elementary school, therefore this study would be applicable to children.

The problem in this study to find the validity, whether the modified Whispered test sensitive and specific results in finding children with hearing loss. The benefits to be achieved from this research was to get the method of modified whispered test as one of the hearing screening methods in school children. This study would find the advantages and disadvantages in the implementation and also for the reference in preparing the children to perform the hearing impairment detection program.

2. Theory

2.1. Hearing mechanism

The ear acts as a hearing organ, in which the incoming sound waves are captured by the ear and transmitted to the cerebral cortex, so that the sound sensation can be heard. This mechanism occurs through two stages, conduction and perception. At this stage sound waves through the outer ear canal, the tympanic membrane, the hearing bone chain and ends in the foramen ovale.

At this stage the sound waves received by the foramen ovale will be continued by the perilymph on the vestibule scale. Through these endolymph sound waves will move the Reisner membrane and basal membrane on a media scale, then it will vibrate the hair cells in the Corti organon and result in a change of electrical potential. The potential of electricity was channelled as a stimulus of hearing in the cerebral cortex [6].

2.2. Hearing screening

Screening is a method to identify early hearing loss and a part of program planning to address it. So, this activity is not merely that stands alone, but more a component of a wider strategy. Screening is very useful in national program planning for early detection, intervention and rehabilitation of hearing loss and is a potential step undertaken in the primary health care strategy [7].

2.3. Hearing examination

A frequent and routine hearing examination with existing facilities and infrastructure will improve the skill of the examiner. The following are described various types of hearing tests that are often performed, and the results of such examinations may be complementary for the proper diagnosis [8]. The hearing test that are commonly performed as Tuning Fork Test, Speech Test which consists of conversation test and whispered test, Pure Tone Audiometry, Speech Audiometry, Tympanometry.

2.4. Hearing screening with a modified whispered test

The modified whispered test was as follows [9]: 1) the child sits face to face to the examiner, the examiner's head turning to the opposite of the tested ear , 2) the finger index of the examiner push on the tragus of the untested ear, then it was continues to move to make a sound as a masking, 3) whispered words was tested by turning the examiner head to the untested ear, 4) when the test done with the right side of tested ear, then change the direction with the other side of ear, 5) the whispered words were taken from the Phonetical Balanced list (PB list), whispered 5 to10 words, then the student was told to imitate loudly when it had been heard. 6) if the student can correctly repeat of 80% the whispered words, then the ears were considered as good or pass and expressed similarly with the conventional whisper test of 6 meters. On the contrary the result was considered fail when the student could not imitate 80% of the words whispered.

2.5. Hearing test

Hearing examination at elementary school age was an important step for catching hearing disorders within the school environment. Test screening ever done the sound test sound 3 m distance from the ear by repeating ten words whispered correctly. This test has a sensitivity of 100% and a diagnostic specificity of 74.4%. Children in the age group of 6-13 years (elementary school age) are considered to have reliable hearing examination results, either by audiometry or a whispering test. At the age ranging from 6 years, the child has passed a critical period of speech and language speech so that it was considered quite skilled in undergoing the auditory examination. This factor was important to be considered in the examination of the whispered test, because the child must be able to capture the spoken word and repeat what it hears. Generally, children older than 5 years of normal intelligence may follow a standard pure audiometric examination intended for adults [10].

Speech was an oral or verbal language that consists of a series of words or sentences. The word consists of syllables and finally the smallest sound unit that can distinguish the meaning was called phoneme. Seen from the lexical aspect of the smallest idea unit called morpheme. In Indonesia there were two forms of morphemes. The bound morpheme such as prefix, insertion and suffix. The free

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3.2.8. Pure Tone Audiometry Test. It will be given an instruction to the children that he would hear a sound in one ear for each examination. When the children hear the sound, noted with raising the hand fingers according to which ear hears. The right ear heard with the right hand, and vice versa. After the sound was not heard again immediately hand down. The right ear was checked first then left, except when the left ear was better hearing from the right, then the left ear was checked first. Audiometry was performed first checks start at 1000 Hz frequency. Then, checked it again for 2000, 3000, 4000, 6000, 8000 Hz. After that check again 1000 Hz tone followed by the examination of low tones: 500, 250 and 125 Hz. Weber tests on all frequencies with vibrators placed on the median line. Conducted hearing threshold examination through bone delivery from the frequency of 250 Hz continue to raise up to 8000 Hz. Result from the examination was determined the value of the child's hearing threshold.

4. Data analysis

The study was designed to know whether the modified Whispered test was sensitive or not to screen the hearing impairment among children in the elementary school students. This study will improve the program of early detection of the hearing impairment among the elementary school students. It was expected that the modified Whispered test would be sensitive in screening the hearing impairment.

A cross sectional study of 100 elementary school students has been conducted at SDN Kali Rungkut I, II and III Surabaya, from October to November 1997. The study would compare the first group (which was tested by modified whispered voice test) and the second group (which was tested by audiogram as the gold Standard). The sensitivity, the specificity and Youden Index were counted. The Youden Index should be closer to 1.

The population-based sample of 100 children (aged 6 to 13 years), was taken randomly and proportionally from the 1st to 6th grade students. The ratio between male and female was 1:1. The study revealed the following results. There were 86 parents (86%) without any complain about their children and 14 parents (14%) complained that their children had hearing problem. Otoscope examinations, it was detected 130 normal ears (65%), 64 ears (32%) with retracted tympanic membrane, 3 ears (1,5%) with perforated tympanic membrane and 3 ears (1,5%) with cicatrix. Ear, Nose and Throat examination revealed 36 normal children (36%) and 54 children (54%) with several diseases. The common disorders were Chronic adeno tonsilitis in 25 children (25%) and Chronic pharyngitis in 23 children (23%). The noise rate of school ranged from 50 dB to 80 dB and 45-55 dB of the examination room. There were 185 ears (92,5%) who passed the screening modified Whispered test (could retell 80% or more of the whispered words) and 15 ears (7,5%) who failed. From the pure tone audiometry of which the frequency ranged from 250 to 8000 Hz were found 166 normal ears (83%), 29 ears (14,5%) with mild hearing loss (26-40 dB) and 5 ears (2,5%) with moderate hearing loss. From the audiogram in 3 frequencies (500 – 1000 - 2000 Hz) were found 170 normal ears (85%), 25 ears (12,5%) with mild hearing loss (26-40 dB) and 5 ears (2,5%) with moderate hearing loss. The modified whispered test of mild hearing loss had 10,3 % of sensitivity, 95,2 % of specificity and 0,055 of Youden Index. For moderate hearing loss, it had 80 % of sensitivity, 95,2% of specificity and 0,752 of Youden Index. The mean hearing level of 166 normal ears (83%) had air conduction ranged from 14,8 to 20,5 dB and unnormal ears were 26,1 to 33,5 dB. There were 8 ears (4%) of sensorineural hearing loss with 30-50 dB hearing loss at frequency of 4-6 kHz. Air conduction hearing level of normal otoscope ears ranged from 16 dB to 21,2 dB and unnormal ears ranged from 18,1 dB to 25 dB.

5. Conclusion

It was concluded that the modified Whispered test applicable for screening of hearing impairment among elementary school children, with 80% sensitivity, 95,2% specificity and 0,752 Youden Index on 41-55 dB degree of hearing loss.

Further Studies may suggest planning preventive and curative program, based on the results of the prevalent hearing impaired among the children.

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and independent morpheme was called the word. When viewed from the physical aspect, speech was a form of sound that consists of complex vibrations that always change both the tone, the tempo and the volume of the voice. The smallest sound unit of speech or phoneme can be divided into two types: vowel sound and consonant sound. Each phoneme has a different frequency with each other. This was important for the recognition of individual sounds. Consonant frequencies were generally higher than vowels, but consonants were more sensitive to distortion than vowels. In general, perceptual deafness was damaged in high tones, most of which are consonants.

3. Methods

3.1. Type of research

The type of research was using comparison of Cross Sectional Study.

3.2. Procedure

The procedure for this research was:

3.2.1. Preparation of examination room.

3.2.2. Finding the clean and quite class room that located at the Elementary School of Kali Rungkut I.

3.2.3. Noise Measurement. Noise was measured with a calibrated sound level meter, 1/2 meter from a 1.2-meter-high window from the ground. Battery in good condition. Measurements on the "A" frequency weights and "Fast" time weights.

3.2.4. Measurement of the intensity of the auditor's whisper. When the examiner whisper voice, and was listened to by the child's ears, the intensity was measured by a sound meter level device placed next to the child's ear with the direction of the microphone facing in accordance with the child's ears.

3.2.5. Sampling was selected randomly to determine the sample of study participants was taken tests, the modified Whispered test and audiometry. The examiner of the whisper test was 1 qualified person from audiology clinic. This test was conducted in the selected examination room located at SDN Kali Rungkut I. While the audiometric examination was done in the Audiology clinic room of RSUD Dr. Soetomo, with examiners from qualified audiometrician other than examiners of whisper tests. Routine physical examination of the ears, nose and throat was also performed on all students performed by the researcher.

3.2.6. Performing the modified whispered test. Examiners sit face to face with the participants in the examination room. When the right ear was examined, the examiner looked away right. the index finger of the examiner closed the left ear canal by depressing the tragus and moving repeatedly to create an ear-masking sound, thus the sound to be heard only from the right ear. Sound whispered out with air spare in the lungs after ordinary expiration. Whispered 10 words from PB list of available words. The child was asked to repeat what has been heard. When spoken correctly 80% of the words above, was considered normal hearing and passed. If not, then it was recorded as abnormal or failed which means not pass in the test.

3.2.7. Audiometric Test. It was in the audiology room of Dr. Soetomo. The examiner was an audiologist. The examination room used was soundproof. The tool used was an electroacoustic device that can produce pure tunes with measurable frequency and intensity. The sound was received by the child through headphones placed over the outer ear canal for air delivery and through the vibrator for bone conduction. The audiometer used was a type of "Madsen".

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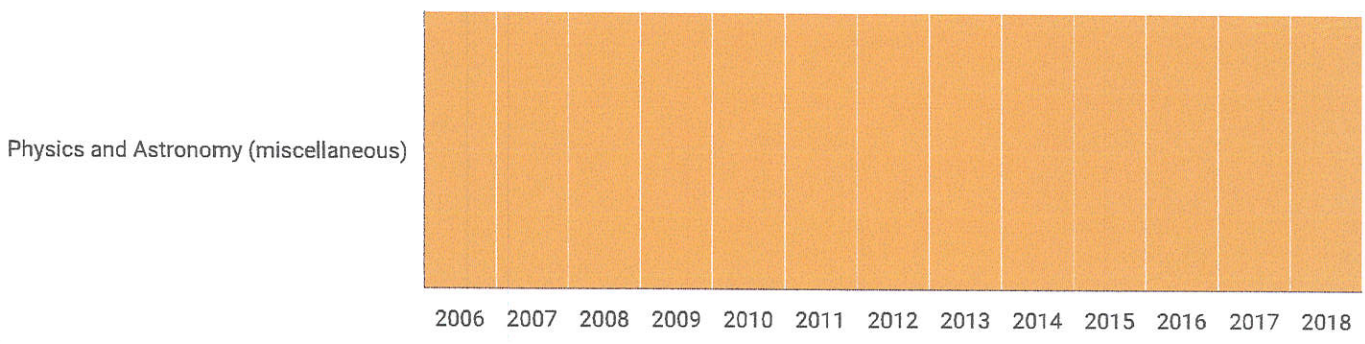

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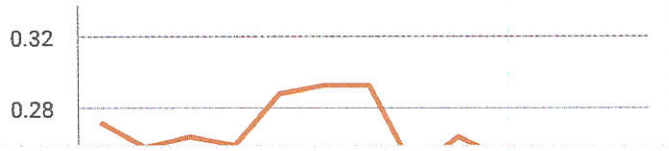

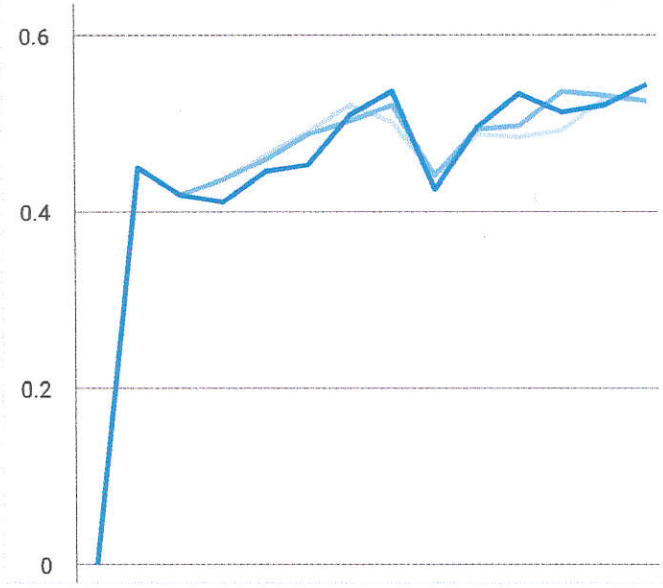

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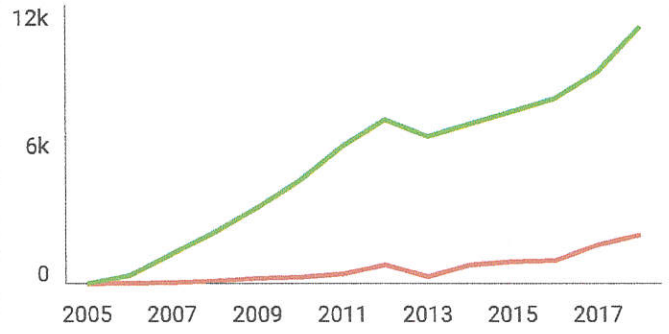

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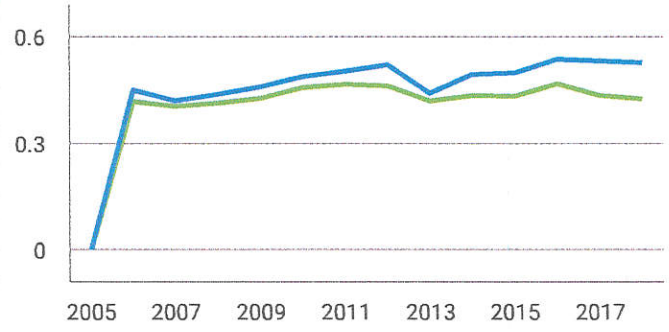

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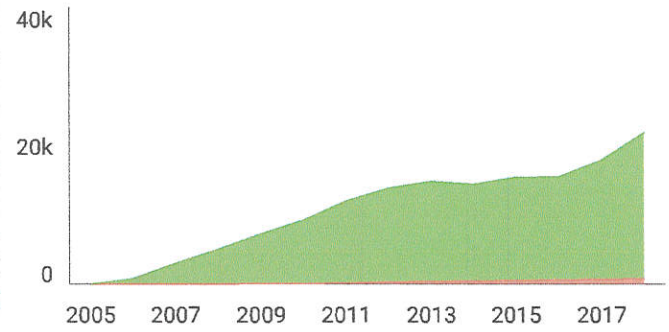

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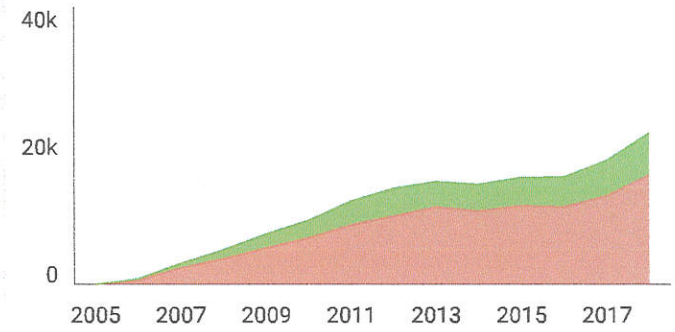

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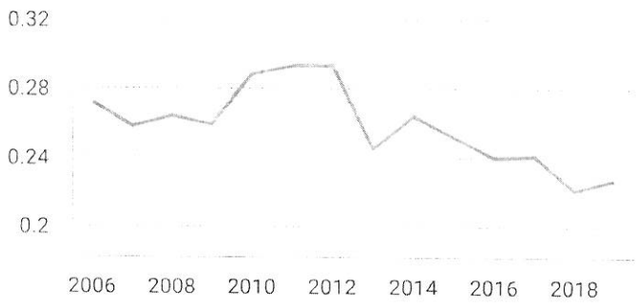

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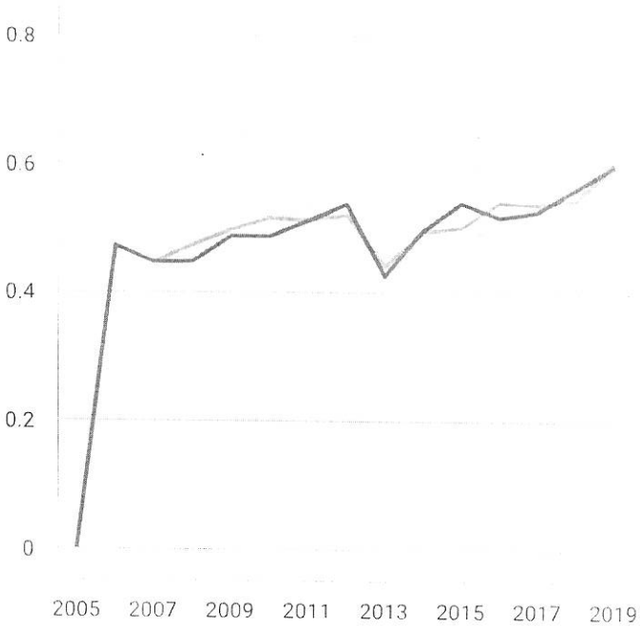

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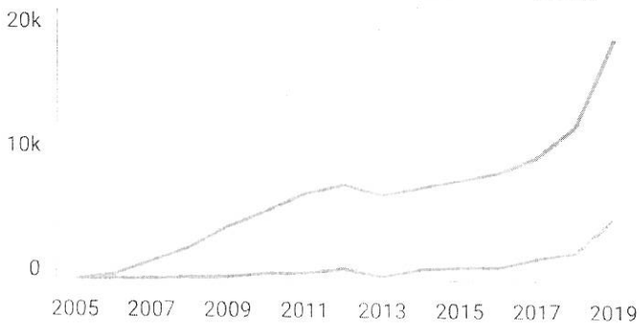

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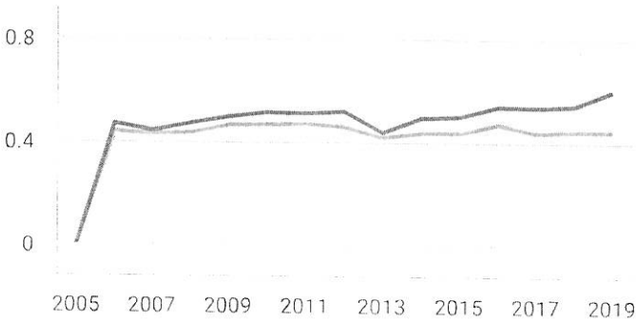

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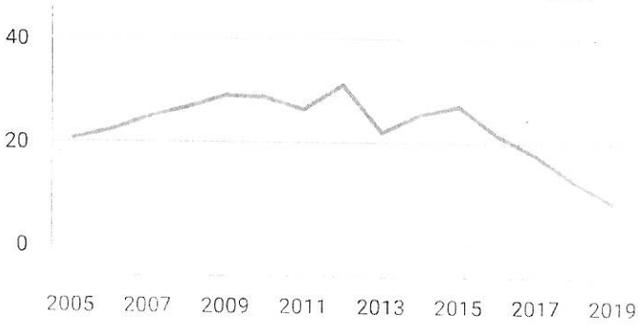

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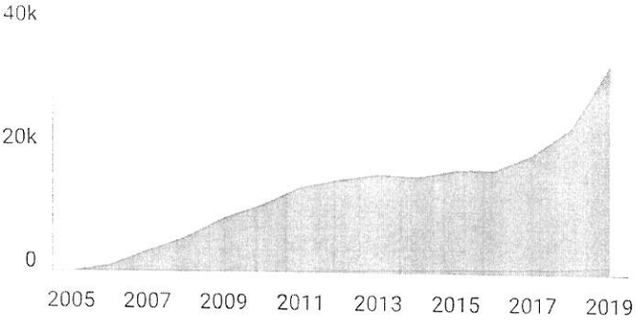

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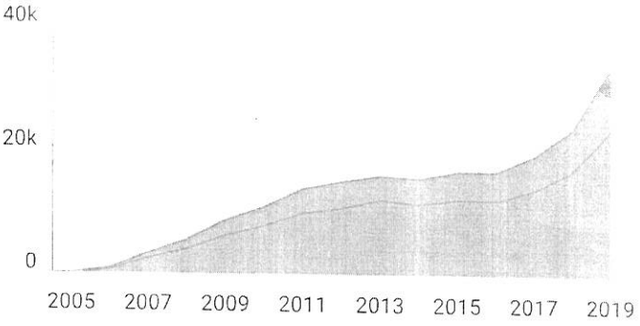

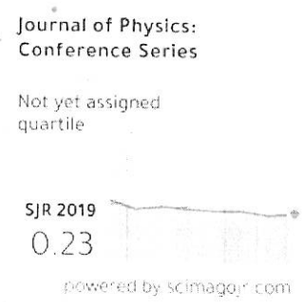

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