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Research Article

Impact of Hearing Impairment on Mental Health in Elderly Partners

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Abstract: Communication is one of the important way to express and share the ideas and feeling. For effective communication, hearing plays an important role. A person having problem with hearing have difficulty in day to day life, which create several misunderstandings. This study, emphasizes how hearing loss can create poor mental health for an individual or partners. This study was conducted to determine the mental health of elderly couples having hearing impairment. The need of the study is to detect the association between hearing loss and mental health. To carry out the study, the subjects were tested (Audiological Evaluation) and the mental health checklist (MHCL) was used. The audiological assessment consisted of pure tonal audiometry (PTA), carried out in a sound-treated room, air conduction (from 250 Hz to 8000 Hz), and the bone conduction threshold (500 Hz to 4000 Hz) conduction hearing threshold calculation using the Alps 2000 AD brand audiometer. With the help of IBM-SPSS(Version-21) software, statistical analysis was used. For statistical analysis, the Pearson correlation was used. However, the gravity of the signs of change was shown to be positive. The result showed the main effect of group (i.e., individual with hearing impairment with hearing aids, hearing impairment or normal hearing, was found to be significant ($p<0.001$) on mental health score. The results also showed that the mental health of individuals with hearing impairment was significantly poorer than normal hearing, hearing impairment with hearing aid was also significantly poorer than normal. Whereas, the mental health of hearing impairment was found to be worse than hearing impairment with hearing aids. Mental health of partners with hearing impairment was significantly poorer than normal hearing, hearing impairment with hearing aid was also significantly poorer than normal. Whereas, the mental health of hearing impairment was found to be worse than hearing impairment with hearing aids. In Conclusion higher the degree of hearing loss, the more severe the mental health symptom. The result showed that, the main effect of the group, i.e., individuals with hearing impairment with hearing aids, hearing impairment, or normal hearing, was found to be significant ($p<0.001$ on marital adjustment score.

Keywords: Hearing loss (HL), MHCL Scale, Pure tone Audiometry (PTA), Mental health, and Elderly Couples. Air conduction threshold, Bone conduction threshold.

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1. INTRODUCTION

Communication is one of the important way to express and share ideas and feeling. For effective communication, hearing plays an important role, a person having problem with hearing have difficulty in day to day life, which create several misunderstandings. In day today life, it is quite systematic that they are continuously receiving information about these changes taking place in their physical environment. It is possible due to the presence of sensory systems in living beings. The changes in photic and radiant energy, vibratory energy, and chemical and mechanical energy impact the sensory system of living beings selectively depending upon the intensity of these changes as well the inherent capacity of sensory systems. When the intensity of these changes is sufficient enough, i.e., above a threshold value, it is called as stimulus, where the sensory system would receive it and the information regarding the changes in physical energy is transmitted to the organism. It happens after a series of transformations are taking place within the organisms, so that the sensory receptors are activated. Hearing loss may develop at any time during the life course. The onset can be sudden or gradual, and one or both ears can be affected. Hearing loss can result from a variety of causes (e.g., trauma, infection, genetic syndromes, aging, excessive noise exposure, etc.), and pathological changes may occur in one or more regions of the auditory system. Although some hearing loss might be temporary or treatable using medical or surgical methods, most hearing loss in adults is permanent or slowly progressive. When estimating the burden of hearing loss in a population, it is important to recognize the heterogeneity in the nature and severity of hearing loss. Individuals also vary in the extent to which auditory rehabilitation, hearing aids, and hearing assistive technologies can improve their communication function. In addition to posing a substantial burden to disease and negatively impacting quality of life, the literature highlights that, hearing impairment is associated with mental health and marital adjustments among elderly couples. According to the World Health Organization (2004) mental health is "a state of well-being in which, the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community[1]. The world population today is more mature than before. Right now, over 800 million are 60 years old or above. Projections display that, this number will increase by more than two billion in 2050. People aged 60, can now expect to survive an additional 18.5 to 21.6 years. Soon the world will have a greater number of aged adults than minors. Contrary to perceptions related to common sense, the majority of aged live in middle and low income group nations, and some of the greatest rates of aging happen in these places. Our aim of this study was to explore the role of hearing impairment in mental health in elderly couples. Our hypotheses were the control and impaired groups shall not differ in mental health, hearing aid shall reduce the problem of poor mental health, there shall be gender differences in having an effect on mental health, and hearing impairment of the partner shall have an impact on the unimpaired spouse's mental health. The objective of our study is to detect the association between hearing loss and mental health. This study was conducted to determine the mental health of elderly couples having hearing impairment.

2. METHODOLOGY

Total of 75 couples (N=150) participated in our study in the age group of 60-80 yrs. In which, 30 males had normal hearing. Whereas 15 males with hearing impairment without hearing aid and 30 males were having hearing impairment with hearing aids. Similar was the structure for 75 females (wives). In which 30 females had normal hearing, whereas 15 females with hearing impairment without hearing aids and 30 females were having hearing impairment with hearing aids. There was no couple having both impaired spouses. The sample was divided into three different groups i.e., Group A (Experimental group I), Group-B (Experimental group II) and Group C (control group). Group A was further subdivided into A-I and A-II whereas Group B was subdivided into B-I and B-II. Design of the Study: Multi group design(2x3) shall be used in this study; For this study, the ethical permission was guaranteed by the research committee of the SGT University letter no. SGTU/FBSC/Cli. Psy. /2021/752 dated 7th June 2021. Following tools were used for this study

2.1 Case-History Sheet

It includes various demographic data, that includes Name, Age, Sex, date of evaluation, educational qualification, occupation, informant, marital status, income, residence, and clinical variables like Brief complaint of the problems, age of onset, Nature of problems, family history, medical history, audiological findings, usage of hearing aids.

2.2 Audiometry (Screening and Diagnostic)

This is the type of audiometer, which is used for screening purposes. For this study, free field audiometer (Hand held) AP-2-Arphie audiometer was used. It is an Audiometer that is manufactured by Arphie Electronics Pvt. Ltd. Mumbai, India. The AP-2 is the world's first digital free field pediatric audiometer for testing hearing from the age of about 3 months. It can be used as a quick check free field audiometer for patients of any age. This audiometer uses ordinary enlight batteries. The instrument automatically switches off after the test, if left unused, for 30 seconds. The Frequency Range of the AP-2 audiometer is 500Hz – 4KHz Warble tone. The transducers of this audiometer have the capability of delivering an Air conduction intensity range of 30 dB to 90 dB. This audiometer is very portable and easy to carry anywhere therefore is also very useful in conducting camps of hearing screening. This audiometer was used for screening purposes for this study.

2.3 Diagnostic Audiometry

It consists of a variety of tests to determine the unique aspects of hearing loss, as well as the level at which the person can detect and understand speech and pure-tone. In this study, MA(Maico) 42 is a Two-channel audiometer with tone and speech audiometry were used to estimate the threshold of hearing. The MA-42 is a 2-channel diagnostic audiometer manufactured in Germany. The MA 42 audiometer delivers 11 air conduction (AC) test frequencies from 125 Hz to 8 kHz, with transducer dependent levels from -10 dB HL to 120 dBHL. Bone conduction (BC) can be tested at10 test frequencies from 250 Hz to 8 kHz with levels from -10 dB HL to 80dBHL (with the standard bone conductor B71).

2.4 Mental Health Checklist

Mental Health Check-list (MHC) was developed by Kumar in 1992. This check-list (MHC) has been developed with a view

to providing a handy tool for identifying persons with poor mental health and in need of psycho diagnostic help. Mental health is an index which shows the extent to which the person has been able to meet his environmental demands-social, emotional or physical. However, when he finds himself trapped in a situation, he does not have matching coping strategies to deal with it effectively, he gets himself mentally strained. This mental strain is generally reflected in symptoms like anxiety, tension, restlessness or hopelessness, among others. If it is felt for too long and too extensively by the person, these symptoms may take a definite form, representing a given illness. Mental health, therefore, should not be confused with mental illness; it is a study of pre-illness mental condition of the person. The final form of the Mental Health Check-list consists of 11 items (6 mental and 5 somatic), presented in a 4-point rating format.

2.5 Inclusion Criteria

- Individual with normal hearing was included in the study
- Individual with severe hearing loss (with and without hearing aids)
- Living together.
- Hearing aid-minimum 2years (The cases must be using hearing aids since last 2 years)
- No any other physiological and neurological disease
- Able to follow instructions

2.6 Exclusion Criteria

- Couples with both impaired spouses were excluded from the study
- Untreated middle ear disease
- Intellectual deficit-IQ level should be below 70.

3. VARIABLES

3.1 Independent Variables

- Hearing impairment (Two levels: impaired and normal)
- Hearing aids (Two: Level using and not using within impaired level, a nested factor
- Gender (Male and Female)

3.2 Dependent Variables

- Mental health

4. RESULTS

The present study was conducted at SGT Medical College and Hospital with the aim to study the role of hearing impairment in mental health in elderly couples. In the present study the sample size consisted of 75 couples (N=150). The sample size was divided into three different groups i.e.; Group A (Experimental group-1), Group-B (Experimental group-2), and Group-C (Control group). Group-A was further subdivided into A-I and A-II, whereas Group-B was further subdivided into B-I and B-II. All the subject fulfilling the inclusion and exclusion criteria were assessed on marital adjustment and mental health domains. To explore the objectives of the present study, 2x3 univariate analysis of variance was done with the help of IBM-SPSS(Version-21) Software. To see the differences between 3 groups Duncan's post hoc analysis was done. The presentation of results is given into following heads

4.1 Mental Health: Dependent variables.

- Self: - When the subject himself is impaired and spouse is of normal hearing.
- Partner: -When the subject himself is of normal hearing but his/her spouse is impaired.

In this section the effect of own hearing impairment in male and female subjects on mental health has been described.

Table 4.1: Showing the descriptive statistics (Mean & SD) of Mental health scores across three groups (Individuals with hearing impairment with hearing aid, hearing impairment without hearing aid and normal hearing) of males and females.

Hearing Status / Gender	Normal hearing (Mean & SD) N=60	Hearing Impairment without Hearing aids (Mean & SD) N=30	Hearing impairment with Hearing aids (Mean & SD) N=60
Male(n=75)	a. 7.26 (2.94) (Good mental health) n=30	d.20.33 (3.19) (Poor mental health). n=15	b.10.80 (1.58) (Good mental health) n=30
Female(n=75)	f.7.30 (2.91) (Good mental health) n=30	j.20.26 (3.65) (Poor mental health). n=15	h.10.56 (1.16) (Good mental health) n=30

Lesser the score, better was the mental health.

Table 4.1 is showing the descriptive statistics (Mean & SD) of mental health scores across three groups of males and females. It revealed that the mean scores of mental health of hearing-impaired males without hearing aid was 20.33 (3.19) (Poor mental health), whereas the mean scores of mental health of hearing-impaired females without hearing aid was 20.26 (3.65) (Poor mental health). Similarly, the mean score of hearing impairment with hearing aids males was 10.80 (1.58) (Good mental health) and for females 10.56 (1.16) (Good mental health). On the other hand, the mean scores of mental health of individuals with normal hearing of males was 7.26 (2.94) (Good mental health) and for females was 7.30 (2.91), (Good mental health).

Table 4.2: Summary table of ANOVA of Mental health scores across three groups (Individual with hearing impairment with hearing aid, hearing impairment without hearing aid and normal hearing) of males and females. Dependent Variable: Mental health

Source	Type III Sum of Squares	df	Mean Square	F	P<
Corrected Model	**3421.273**	**5**	**684.255**	**104.755**	**.001**
Intercept	21965.067	1	21965.067	3362.715	.001
Gender	.267	1	.267	.041	.840
Group (Hearing status of self)	**3420.407**	**2**	**1710.203**	**261.821**	**.001**
Gender*Group	.540	2	.270	.041	.960
Error	940.600	144	6.532		
Total	23335.000	150			
Corrected Total	4361.873	149			

R Squared = .784 (Adjusted R Squared = .777)

Summary table of ANOVA revealed that, corrected model based on gender, hearing impairment group and their interaction was significant with F=104.755 at 5 and 144 degree of freedom. The probability was less than .001 for type-1 error. However, the intercept was also significant at 1 and 144 degrees of freedom being significant beyond .001 level of probability because the source other than in corrected model were also significant determinants for mental health in elderly. The R^2 for the corrected model was 0.784, i.e., the sources in the study explained 78.4 % of the total variance in mental health. Table-4.2 showed the univariate analysis of variance of mental health scores across three groups (Individual with hearing impairment with hearing aids, hearing impairment without hearing aid, and normal hearing). The result showed that the main effect of group, i.e., individual with hearing impairment with hearing aids, hearing impairment without hearing aid, normal hearing, was found to be significant ($p<0.001$) on mental health score. The F value for hearing status variable was 261.821 at 2 and 144 df. Mental health of normal hearing group was best ($\bar{X}$=7.28) whereas the mean mental health of hearing impaired without hearing aid was not appreciable ($\bar{X}$=20.30). However, use of hearing aid was found to be helping the impaired having better mental health than without aid (10.68) Vs (20.30).

4.2 Mental Health: Partner's hearing impairment

In this section the effect of hearing impairment of partners or spouses in male and female subjects on mental health has been described, the subjects themselves were not hearing impaired.

Table 4.3: Showing the descriptive statistics (Mean ± SD) of Mental health scores across three groups (Partner of Individual with hearing impairment with hearing aid, hearing impairment without hearing aids and normal hearing) of males and females.

Hearing Status / Gender	Normal hearing (Mean & SD) N=60	Hearing Impairment (Mean & SD) N=30	Hearing impairment with Hearing Aid (Mean & SD) N=60
Male(n=75)	a.7.26 (2.94) (Good mental health) n=30	e.20.26 (2.54) (Poor mental health). n=15	c.12.13 (1.71) (Good mental health) n=30
Female(n=75)	f.7.30 (2.91) (Good mental health) n=30	i.18.33 (2.74) (Poor mental health). n=15	g.11.83 (1.89) (Good mental health) n=30

Table 4.3 is showing the descriptive statistics (Mean & SD) of mental health scores across three groups each of males and females. It was revealed that, the mean scores of mental health of males of hearing-impaired spouses was 20.26 (2.54) (Poor mental health), whereas the mean scores of mental health of females with hearing impaired partners was 18.33 (2.74) (Poor mental health). Similarly, the mean score of mental health of males with hearing impairment with hearing aids spouses was 12.13 (1.71) (Good mental health) and for females, it was 11.83 (1.89) (Good mental health). On the other hand, the mean scores of mental health of males with normal hearing partners was 7.26 (2.94) (Good mental health) and for females, it was 7.30 (2.91) (Good mental health).

Table 4.4: Summary table of ANOVA of Mental health scores across three groups having partners with hearing impairment with hearing aid, hearing impairment without hearing aid and normal hearing) of males and females.

Source	Sum of Squares	df	Mean Square	F	P<
Corrected Model	**2934.767**	**5**	**586.953**	**95.605**	**.001**
Intercept	22310.817	1	22310.817	3634.067	.001
Gender	18.150	1	18.150	2.956	.088
Group (Hearing status)	**2905.367**	**2**	**1452.683**	**236.618**	**.001**
Gender X Group	20.273	2	10.137	1.651	.195

Error	884.067.	144	6.139
Total	23887.000	150	
Corrected Total	3818.833	149	

R Squared = .768 (Adjusted R Squared = .760)

Summary table (Table-4.4) of ANOVA revealed that, the corrected model based on gender, hearing impairment group and their interaction was significant with F=104.755 at 5 and 144 degree of freedom. The probability was less than .001 for type-1 error. However, the intercept was also significant at 1 and 144 degrees of freedom being significant beyond .0001 level of probability. It was expressed that source other than in the corrected model were also significant determinants for mental health in elderly having impaired partners. The R^2 for the corrected model was 0.784, i.e., the sources in the study explained 78.4 % of the total variance in mental health of subjects. The ANOVA of mental health scores across three groups (Partner with hearing impairment with hearing aids, hearing impairment, and normal hearing showed that the main effect of group, was found to be significant ($p<0.001$) on mental health score. The F value for hearing status variable was 236.618 at 2 and 144 df. Mental health of the group with normal hearing partners was best ($\bar{X}=7.28$) whereas the mean mental health of subjects impaired partners without hearing aid was worst ($\bar{X}=19.30$). However, use of hearing aid by partners was found to be helping the subjects having better mental health than without hearing aid (11.98 Vs 19.30). The means of the three groups were depicted in figure 4.3. It clearly showed that if partner was of normal hearing, the mental health was good, whereas if the partners are hearing impaired and not using hearing aid it decreased their mental health; whereas use of hearing aid by partners helped a lot in the improvement of mental health.

5. DISCUSSION

Two sorts of analyses were done to assess the effect of hearing status on mental health among elderly couples: when the subjects were varying in their hearing status while their spouses were of normal hearing and when the subjects were of normal hearing but their spouses varied in their hearing status. One's own hearing status with normal partner shall affect mental health and significantly in the sense that hearing impairment resulted into poor mental health. Use of hearing aid improved both the variables. Similar effect was obtained when partner's hearing was impaired even if you were of normal hearing. When the partners were not using hearing aids despite impairment, the subject's mental health were poor. Gender was not a factor; it was equally likely for husbands as well as for wives. The results of the univariate analysis of variance for mental health scores across three groups (Individual with hearing impairment with hearing aids, hearing impairment, and normal hearing) showed that the mental health of individuals with hearing impairment was significantly poorer than normal hearing. Hearing impairment with hearing aid subjects were also significantly poorer than normal. The mental health of hearing impaired without aids was found to be of very poor. The results of the present study were consistent with the previous literature in which it was found that hearing impairment is associated with poor mental health. West, J. S. (2021) conducted a study and found that Wives' fair or poor hearing is significantly associated with an increase in husbands' depressive symptoms, net of controls. However, husbands' fair or poor hearing is not associated with an increase in wives' depressive symptoms. These findings suggest that, hearing impairment can proliferate from one spouse to the other, but this proliferation depends on gender. Health care providers need to be aware of the implications for husbands when treating women with hearing impairment.[2] Sun, Jian, et al. (2021) conducted a study in China on effect of hearing impairment on mental health in older population, and found that, hearing impairment had significantly negative effects on the cognitive function and depression status of older adults. Furthermore, we find that, social participation and exercise relieved the negative effect of hearing impairment on cognitive function. Moreover, there are no evidence indicating that, social participation or exercise relieved the adverse effect of hearing impairment on depression status.[3] Shoham, N., Lewis, G., Favarato, G., & Cooper, C. (2019), conducted a study on prevalence of anxiety disorder with hearing impairments, and found that, prevalence of anxiety is higher among people with hearing impairment than the general population; our findings indicate that this excess morbidity may be related to the hearing impairment itself, as it was associated with the severity of impairment, and reduced after surgical treatment. Clinicians should be aware of the potential impact of hearing on mental health, and that where hearing ability can be improved, this may reduce anxiety.[4] Shin, H. Y., & Hwang, H. J. (2017) conducted a study and found that the prevalence of hearing impairment is increasing and an association between hearing impairment and mental health has been reported. Elderly individuals with hearing impairment are easily susceptible to poor mental health status. Early targeted intervention to address mental health problems is recommended for people with hearing impairment.[5]Gentili, N., & Holwell, A. (2011) conducted a study on children with hearing impairment and their mental health and found that children with severe hearing impairment are at greater risk of developing psychiatric disorders and of poor psychosocial adjustment compared with their hearing peers. The reason for this is the barrier to efficient language acquisition. It is therefore essential to minimize the damage that lack of language or delayed language development can result and this can be treated through two strategies.[6]Scarinci, N., Worrall, L., & Hickson, L. (2008) conducted a study and found that Spouses referred to their constant adaptation to their partners' HI and the impact of acceptance of the HI on their lives. Spouses attributed the reduction in communication with their partner to a number of causes, including the increased time and effort involved in communicating with their partner due to frequent communication breakdowns. All spouses discussed their frustration at having to repeat for their partner during conversations at home and in social situations. Their constant reference to the need to repeat demonstrates the significant impact of this has on spouses of older people with HI.[7] Chia, Ee-Munn, et al. (2007) conducted a study on effect of hearing impairment and quality of life, and quantified the associated disease burden-age related hearing impairment on health-related quality of life in a population-based cohort of older persons.[8] Similarly, Kvam, Loeb and Tambs (2007) conducted a study on mental health of deaf respondents and found that the deaf respondents showed significantly more symptoms of mental health problems than, the hearing respondent. It was found upon analysis of subjects with normal hearing, but with partners being hearing impaired with and

without hearing aids that, their mental health was very poor than the normal hearing control elderly couples. The findings were at par when they themselves were impaired. On post-hoc analysis, it was found that the mental health of subjects with normal hearing was significantly poorer when partners were of hearing impairment with hearing aids. Whereas, the mental health was found to be worse when partners were hearing impaired without hearing aids. So, equally distressing is one's spouse's impairment even one is normal in hearing. The results were in consistent with the literature which concluded that hearing loss have negative emotional implications also on spouses of the hearing-impaired persons. (Ask, Krog & Tambs, 2010) [9,10]. Similarly**,** Wallhagen, Strawbridge, Shema and Kaplan (2004) suggested that early diagnosis and treatment of hearing loss constitute important clinical strategies to enhance the well-being of both hearing-impaired individuals and their spouses and support policy to cover hearing devices, so that they can listen properly which resulted into better mental health of the spouse of hearing-impaired patients.[11]Donaldson, Worrall, & Hickson (2004) critically reviewed the effects of hearing impairment of spouse's mental health. Spouses of older people with hearing impairment frequently urge their hearing-impaired partners to see help for their hearing difficulties. spouses of older people with hearing impairment become so frustrated with their partners hearing loss that, they are often the primary reason why the hearing-impaired person require hearing aids. They have investigated the effect of hearing impairment on families are commonly focused on the person with the impairment and most commonly, the significant other has merely been used as a proxy to describe the perceived problems of his or her spouse.[12] Morgan, A., Hickson, L., & Worrall, L. (2002), conducted a study on impact of hearing impairment on older couples and found that, results indicated a moderately significant relationship between hearing impairment and hearing disability/handicap, with individuals rating the impact of hearing impairment on disability more severely than on handicap. A significant relationship was also found between hearing impairment and the mental health subscale of the SF-36. Significant relationships were demonstrated between hearing disability/handicap and three quality of life domains on the SF-36: mental health, bodily pain, and physical functioning. All relationships were found to exist independently of age.[13] Kramer, S. E., Kapteyn, T. S., Kuik, D. J., & Deeg, D. J. (2002), conducted a study on association of hearing impairment and chronic diseases with psychosocial health status in older people and found that high prevalence of hearing impairment in the elderly and the expected increase of elderly in the population in the near future, this study on the importance of hearing impairment contributes relevant information. Hearing impairment appears to be highly influential on the psychosocial health status of older people. When studying the effect of hearing impairment in the entire sample, significant differences are found for all psychosocial variables. Compared to their normally hearing peers, adjusted for covariates and comorbidity, hearing impaired elderly show significantly more depressive symptoms, lower feelings of mastery, lower scores on self-efficacy, more feelings of loneliness, and a smaller social network size.[14]

6. CONCLUSIONS

The result showed the main effect of group, i.e., (individual with hearing impairment with hearing aids, hearing impairment, normal hearing, was found to be significant ($p<0.001$) on mental health score. The results also showed that the mental health of individuals with hearing impairment was significantly poorer than normal hearing, hearing impairment with hearing aid was also significantly poorer than normal. Whereas, the mental health of hearing impairment was found to be worse than hearing impairment with hearing aids. Mental health of partners with hearing impairment was significantly poorer than normal hearing, hearing impairment with hearing aid was also significantly poorer than normal. Whereas, the mental health of hearing impairment was found to be very poorer than hearing impairment with hearing aids. The individuals with hearing aid were having better mental health and marital adjustment as compared to individuals with hearing impairment. It showed that prescription of hearing aid was helpful for patients with hearing impairment to improve their mental health. Similarly, partners of individuals with Hearing aid were having better mental health and marital adjustment as compared to individuals with hearing impairment. It depicts that prescription of hearing aid is not only helpful for patients with hearing impairment, but also for their partners to improve their mental health.

7. AUTHORS CONTRIBUTION STATEMENT

Dr. Vivek Kumar Jha conceptualized the idea of topic, data-collection, compiled and Statistical analysis was carried out by Mr. Puneet Kapoor.

8. ETHICAL CLEARANCE

All procedure performed in this study followed all ethical standard of the Shree Guru Gobind Singh Tricentenary University by the letter no. SGTU/FBSC/Cli.Psy./2021/752 dated 7th June 2021.Written consent were taken from all the participant.

9. CONFLICT OF INTEREST

Conflict of interest declared none.

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