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Study of the Relationship between Communication Competence and Heart Rate Variability among International Postgraduate Students of a Malaysian Public University

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Abstract—Communication competence is among the main skills that enable individuals to conduct fruitful interactions with different people. This study was carried out to examine the relationship between communication competence and heart rate variability (HRV) among individuals from different nationalities. The quantitative method was used to conduct this study. This study had two data collection procedures which were the quantitative survey and HRV data set. The participants of this study were 128 postgraduate students of a Malaysian public university. Based on their agreements, 40 of them were participated in the HRV data collection procedure of this study. Based on the results from this study, the levels of communication competence and heart rate variability of the participants had close relationship, and individuals with good levels of communication competence were good in heart rate variability and vice versa. Based on the results, their good scores of heart rate variability as an important internal factor helped the participants to increase the levels of their communication competence and their good levels of communication competence helped them to have more successful interactions with their peers. The results from this study may be helpful for future researchers to focus on these issues and also for university students to pay attention on their daily communication as an important factor for their personal and university related lives.

Keywords—Communication; Communication competence; Heart rate variability; Biofeedback technology

1. Introduction

Human communication is among the main factors that enabled human-beings to share their information, to establish social relationships and achieve the so-called value of globalization. Communication among people from various nationalities and cultural backgrounds has considered as the means of exchanging and transformation of their cultural and social values and norms [1]. Their good levels of communication competence help people to communicate properly and have successful interactions. Thus, communication competence is an important issue to be evaluated. Assessment of communication competence and the ways and factors that affect the process of development of communication competence among individuals from various nationalities may help them to improve the levels of their communication competence. According to reference [2], the skills of interacting, listening, understanding, cooperation, leadership, and capability to bring someone's personal goals in the line are constructing communication competence.

Interactions among students may help them to achieve their social and academic goals and their interactions may also help them to improve their personal skills. Interactions in an academic setting are helpful for teaching and learning, and a broad range of academic interactions is necessary for gaining social, intellectual and personal goals of students, and communication in the academic setting can be considered as a set of meditational tools to achieve personal goals of communicators [3]. Moreover, there interactions with different people may help students to reduce their personal anxieties. Usually, students in the collegiate environment experience some level and degree of anxiety [4].

However, the previous works have assessed communication competence among people based on their self-reported answers for the survey questionnaires and did not match the results of their surveys with any technology mediated results. Reference [5] asks researchers to focus on both of the internal and external factors that daily interaction among individuals. Heart rate variability (HRV)-biofeedback as an important internal ability of individuals could affect their interpersonal communication competence [6]. Thus, one of the main internal abilities that may affect daily communication among individuals is their heart rate variability (HRV). Heart rate variability, the change in the time intervals between adjacent heartbeats, is an emergent property of interdependent regulatory systems that operates on different time scales to adapt to environmental and psychological challenges [7]. According to reference [7], a good range of heart rate variability associated with human performance, creativity, psychological flexibility and harmony. The HRV-biofeedback technology helps individuals to assess heart rate variability. It was also asserted that, the use of HRV-biofeedback technology has positive effects on the increase of human performance [8]. HRV-biofeedback is a trustable technology to assess heart rate variability of individuals [9]. Thus, this study was conducted to assess the relationship between communication competence and heart rate variability (HRV) among individuals from different nationalities through the application of the HRV-biofeedback technology.

2. Conceptual Support

Reference [10] have hypothesized that generally there are two approaches for assessment of communication competence, as the first way focuses on the social abilities and behavioural description of communicators and the second is communication approach. The communication approach focuses on the affective and cognitive explanations. According to them, researchers and scholars in the communication field typically use the psychological means and measures to evaluate communication competence [10]. Moreover, in some ways, communication competence is a demonstration of the combination of the social abilities approach with the communication approaches [11]. According to the System Theory, the existence of "the dynamic, interactive nature of the communication process between two or more individuals" is important to have successful interactions [12].

The Attribution Theory of reference [5] focuses on the assessment of the relationship between the external and internal abilities of people that could affect their daily interactions. According to this theory, factors that construct communication competence of individuals are both internal and external. According to reference [6], HRV-biofeedback as one of the main internal competence and abilities of human-being may have influence interactions among them and have connections with the levels of their communication competence. Moreover, the use of HRV-biofeedback is effective on the improvement of wellness and wellbeing among different people, and good HRV is associated with creativity, well-performance and self-control skills of individuals [7]. The previous studies on the use of HRV-biofeedback found that the use of HRV-biofeedback technology is effective on the increase of the human performance, including the educational setting [8]. Thus, assessment of the

relationship between communication competence and heart rate variability among individuals from different nationalities may add some interesting results in the literature.

3. Literature Review

According to reference [13] communication among people from different backgrounds has influence on the three interconnected facets for intercultural transformation which are: functional fitness, intercultural identity development, and psychological health. Their daily involvement in interactions with their peers enable students to demonstrate the levels of their anxiety and this issue may encourage them to decrease their anxiety and gain the essential and helpful skills for their interpersonal and intergroup interactions [3]. Interactions among students help them to evaluate and understand the levels of communicative skills of their peers and prepare themselves accordingly. As stated, understanding of the levels of skills and proficiencies of their interlocutors help individuals to have better interactions and collaborations [14]. The communicative situation among individuals enables researchers to assess and know the levels of their skills and abilities [15].

Communication competence plays the role of an umbrella perception which encompasses of affective, behavioural and cognitive skills of communicators during their involvement in intercultural communication [16]. Nowadays, communication experiences an era of renaissance and researchers have examined its and problems in the different fields of knowledge, as linguistics, psychology, philosophy and so on [17]. The previous researchers have argued that the use of HRV biofeedback has positive effects on the human performance. Studies on HRV showed that the higher and good level of HRV is linked with psychological flexibility, creativity and skills of individuals to deal faster with the affective, cognitive and physiological stresses [18]. At the same time, the low level of HRV is connected with stress, anxiety, and depressions [19]. As stated by reference [20], individuals with social nervous may bring a high level of negative perspective about their performance in the society.

According to reference [21], the spectrum has three types of frequency ranges which are: very low frequency (VLF) which indicates the frequency less than 0.03 Hz, low frequency (LF) which indicates the frequency levels from 0.03 to 0.15 Hz, and high frequency (HF) which denotes the range of 0.18 to 0.4 Hz. Biofeedback technology demonstrates a potential role in the increase of performance [28]. According to reference [23], the psychophysiological consistency helps individuals to convert the stress feelings into the dynamic energy; also, through the self-regulation abilities and self-control, the individuals can change the negative stress and feeling into the helpful energy, and this process may improve the academic and physical performance [24]. Thus, assessment of the relationship between communication competence and heart rate variability is important and may bring some interesting results.

4. Methodology

The quantitative method which included two different data collection procedures was used to conduct this study. Researchers include several data collection procedures to well answer their questions. The data collection procedure included the quantitative survey and the HRV-biofeedback data sets [25].

A. Instruments

The revised version of Interpersonal Competence Questionnaire (ICQ) of reference [26] which has 32 items was used to collect the quantitative data for communication competence [26]. The ICQ questionnaire is a well-established instrument for interpersonal communication competence. The ICQ questionnaire measures the level of interpersonal competence based on the Likert Scale with 5 options per item, and under 5 factors which are: Initiation; Negative Assertion; Disclosure; Emotional Support; Conflict Management. For the HRV-biofeedback data collection, the emWave PC biofeedback (1.0) tool and software of the HeartMath Institute were used. The emWave tool and software are reliable for the HRV data collection and have been used by different researchers to assess HRV and internal abilities of individuals [27][9].

The HRV data collection section had three sessions which were heart focus (which asks the volunteers to shift their focus on the area of their hearts or centre of their chests), heart breathing (which ask the volunteers to breath slowly and deeply, and imagine air entering and leaving through the heart area), and heart feeling (which asks the volunteer to remember a time when they felt good and try to re-experience that feeling and focus on

that good feeling when breathing through the area of their hearts). These steps were introduced by the HeartMath Institute's the Quick Coherence Technique [9][27].

B. Participants

This study had 128 participants from 17 different countries. From all participants, 100 (78.1%) of them were male, and 28 (21.9%) of them were female. From all of them, 73 (57%) of them were master students, and 57 (43%) of them PhD students. From all participants, 40 of them were participated in the HRV data collection section as well. The participants of HRV data collection section belonged into two different groups, as 20 from the participants with good mean scores in communication competence, and 20 others from the participants with relatively low mean scores in communication competence.

5. Findings

The essential tests of SPSS were used to analyze both of the survey data and the HRV data sets. Based on the descriptive test, this study had 128 participants with their *M/SD* scores of 95.4/13.2. From all participants, 100 of them were male and 28 others were female with their *M/SD* scores of 94.9/12.7, and 95.8/13.2 respectively. From all of them 73 of them master students with their *M/SD* scores of 93.6/13, and 55 of them were PhD students with their *M/SD* scores of 96.1/12.8.

Moreover, the independent-samples t-test was applied to compare the mean scores of the main components of communication competence. The mean scores of the initiation construct and the conflict management construct were compared. A significant difference was found as $t(124) = 61.382, P < .01$, and the mean score of initiation was $M = 3.5, SD = .6$, and for conflict management was $M = 3.2, SD = .37$. The same test was applied to compare the mean scores of the disclosure construct and the negative assertion construct, and a significant difference was found as $t(124) = 43.884, P < .01$. Mean score for the disclosure was $M = 3.0, SD = .77$, and for the negative assertion it was $M = 2.8, SD = .36$. The mean scores for disclosure and the conflict management were compared through the independent-samples t-test, but no significant difference was found as $t(124) = 61.214, P < .05$. Also, the mean score for disclosure was higher as $M = 3.4, SD = .42$ than $M = 3.1, SD = .57$ conflict management.

The HRV data were also analyzed through the descriptive test of SPSS. The results from HRV data showed that the participants with good mean score in communication competence also had higher scores in all three sessions of the HRV data set. Table 1 below illustrates the mean scores of both groups of the HRV section participants for all three sessions.

The bivariate correlation test was used to find out the probable correlations between the main constructs of communication competence and the HRV sessions and some positive correlations were found. Table 2 below includes the results from the correlation test.

Table 1: The differences between mean scores of both groups for HRV sessions

Session	Participants with higher CC scores	Participants lower CC scores
Heart focus		
LF	24.2	17.5
HF	12.6	9.2
Heart breathing		
LF	29.1	21.3
HF	14.5	17.1
Heart feeling		
LF	28.7	19.4
HF	10.3	8.7

Table 2: Illustrates the correlations results

1- Initiation	1	2	3	4
2- Disclosure				
3- Conflict management	.492	.348		
4- HF-heart focus	.392	.472	.621	
5- HF- heart breathing	.463			.324

The results from this study showed that generally the participants were good in communication competence and there were some relationships between their communication competence and heart rate variability.

6. Discussion

Communication is among the important factors of modern life for all human beings. As Kim & McKay-Semmler (2013) asserted, communication is the main transporter of personal and social relationships among people from different backgrounds. Moreover, daily communication among students from different nationalities who stay and study in multicultural university campuses is important for them to have successful lives. Individuals, especially university students may need some skills and abilities to conduct successful interactions. The levels of their communication competence are among the main factors that may affect their daily interactions. Some internal and external abilities construct communication competence. As heart rate variability associated with human performance, psychological flexibility and creativity (McCraty & Shaffer, 2015), thus the relationship between communication competence and heart rate variability of postgraduate students from different backgrounds was assessed through this study.

Based on the results from this study, generally the levels of communication competence of the participants were good and their overall mean score for the quantitative data was higher than average mean. The results from this study confirmed the existence of close relationships between communication competence and heart rate variability. According to the results, the participants who had higher mean scores in communication competence had higher mean scores in heart rate variability as well. These results show the existence of close relationship between the internal and external abilities of individuals. The mentioned results are supportive of the argument of McCraty and Shaffer (2015) on the relationship between heart rate variability and human performance and creativity.

Based on the results from correlation tests, there were some positive correlations between the main constructs of communication competence and good HRV scores for two of the three sessions of HRV data. It means that, individuals could improve the levels of their communication competence through the improvement of their internal abilities and vice versa. The results from this study based on the relationship between communication competence and heart rate variability are quite new and may add some useful information into the literature.

7. Conclusion

This study was carried out to assess the relationship between communication competence and heart rate variability among international postgraduate students of a Malaysian public university. The results from this study confirmed the existence of close relationship between communication competence and heart rate variability, and their mutual effects on each other. Based on the results, the participants who were good in communication competence were good in heart rate variability and vice versa. Thus, through the improvement of their heart rate variability, individuals could improve the levels of their communication competence and social skills as well. The results from this study may encourage and help individuals to focus on factors that may affect their communication competence and their daily interactions. The results may also encourage researchers to assess the relationships between internal and external abilities of individuals and use some probable technologies in the field of human communication to strengthen their findings.

8. Pragmatic Implications

The results from this research project could be helpful for researchers and university students in the field of communication to understanding the relationship between communication competence and heart rate variability. These results could help higher education institutions and other multicultural organizations to observe and improve the levels of communication competence of their students/staff through the application of HRV-biofeedback technology and techniques which are easily applicable. Researchers in the future can use the HRV-biofeedback technology and techniques to strengthen their findings from the regular surveys and establish some pragmatic relationship between the social sciences and technology. Universities and other organizations through the preparation of HRV-biofeedback technology and facilities could help their students and staff to develop their internal abilities and communication competence through the use of HRV-biofeedback technology and through the regular assessment of their HRV by the use of the said technology.

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