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## HYPERION UNIVERSITY

# CONTENTS

**Research articles**

# RELATIONSHIP OF CORE SELF-EVALUATION TRAITS: SELF-EFFICACY, LOCUS OF CONTROL AND SELF-ESTEEM - WITH ACADEMIC ACHIEVEMENT

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**Abstract**

*This article presents results of the relationship of self-efficacy, locus of control and self-esteem, with academic achievement. The aim of this research was to demonstrate that the three traits are predictors of academic achievement. Participants were 100 students (mean age: 28.7 years) of Psychology and Education Sciences at the University of Hyperion, Bucharest. It was used a non-experimental predictive correlational design. Variables were measured by means of items from SES - Self-Efficacy Scale, LOC - Rotter's Questionnaire and RSES - Rosenberg Self-Esteem Scale. Academic achievement was expressed through learning outcomes, the overall averages of the previous year of study. With respect to academic achievement, Pearson correlations were .02 for self-efficacy and .04 for locus of control. The results have shown a positive relationship for self-efficacy and a negative relationship for locus of control. For self-esteem the correlation was not statistically significant. Previous findings from several studies are used for discussing similarities between the three traits and their relationship to academic achievement.*

## 1. INTRODUCTION

Children are evaluated since kindergarten and from the first year of school they get grades according to knowledge and learning. We can say that formal education implies social assessment, thus having a fundamental role in the development of future adults. Both teachers and parents have always placed a special emphasis on school results which they classify as success or failure. A study with students sample has demonstrated that beliefs about their abilities are essential elements in their school success or failure. In literature, a central place is

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the importance of self-efficacy on school motivation (Pajares, 2003).

Self-efficacy represents the belief of a person about how well can perform the necessary behaviors to deal with prospective situations (Bandura, 1982) and is considered to be a positive predictor of cognitive engagement, an essential factor in self-regulation, but also a mediating factor of the relationship between past performance and further performance (Diseth, 2011). Performance is defined as the fulfillment of goals at a higher level (Sonnentag & Frese, 2002).

It is particularly important to distinguish between self-efficay and self-esteem. Self-efficacy refers to the perception we have about our own abilities through which we achieve a certain performance, while self-esteem pertains to global perception of our own value. Thus, if a person who obtains poor results in a specific situation has a low level of self-efficacy for that area that involves certain skills, the perception of his own value will not be affected unless his self-esteem is closely related to the performance he achieves in the activity of that field (Schwarzer, 2014).

Self-esteem is defined as the positive or negative self-evaluation of one's own self, expressed by degrees of approval or disapproval, indicating the extent to which the person is perceived as capable, valuable or important (Rosenberg, 1965). Self-esteem is considered to be the result of the influences of different situations, such as personal success (Rosenberg, Schooler, & Schoenbach, 1989). Research on students sample has shown that people who rely on self-esteem have achieved results that correlate negatively with academic performance, but positively with academic difficulties (Lawrence & Crocker, 2009).

Both self-efficacy and locus of control refers to beliefs about their own capabilities. In the case of self-efficacy, the problem is whether the person thinks he is capable of carrying out the necessary actions to succeed, while, in the case of locus of control, the question is whether the person believes or not that he is capable of influencing the results (Judge, Erez & Bono, 2002).

The concept of locus of control refers to individuals beliefs about the causes of events in their lives (Judge, Erez & Bono, 2002; Rizeanu, 2016). Rotter describes expectation as representing the possibility that a behavior can lead to a particular result. A behavior will be determined by the individual's expectation that he will achieve the goal to which he was directed (Rotter, 1945). Rotter believes that people with internal locus of control have a greater chance to retrieve information from their own experience and thus improve their future behavior in similar situations. They also seem to have more initiative to change or improve their own living conditions, are more resilient to external manipulation, they value more their own skills and capabilities and are more oriented towards achieving goals. Rotter concludes that people with internal locus of control are better adapted and more effective in their life (Rotter, 1966).

## 2. OBJECTIVE AND HYPOTHESES

### 2.1. OBJECTIVE

The main objective of this research is to analyse the relationship of three traits: self-efficacy, locus of control and self-esteem with academic achievement, in order to demonstrate that these traits are predictors of academic achievement.

### 2.2. HYPOTHESES

$H_1$: Self-efficacy is positively related to academic achievement.
$H_2$: Locus of control is negatively related to academic achievement.
$H_3$: Self-esteem is positively related to job academic achievement.

## 3. METHOD

### 3.1. PARTICIPANTS

The investigated group included 100 participants aged between 19 and 59 years old (mean age: 28.7 years), students of Psychology and Education Sciences at the University of Hyperion, Bucharest.

### 3.2. INSTRUMENTS

In order to evaluate self-efficacy it was used the Self-Efficacy Scale (SES) developed by Ralf Schwarzer and Matthias Jerusalem (1995).

To evauate locus of control it was used Rotter's Questionnaire (LOC) developed by Julian Rotter (1966).

To measure self-esteem it was used Rosenberg's Self-Esteem Scale (RSES) developed by Morris Rosenberg (1965).

Academic achievement is expressed through learning outcomes. University's notice boards facilitated collection of the grades obtained by the students participants.

### 3.3. PROCEDURE

The research took place at Hyperion University, Bucharest. Participants were tested with the same investigative tools and they recieved the same instructions.

All the collected data was analysed in SPSS using dispersion diagrams, linear regression analysis and Pearson correlation analysis.

### 3.4. EXPERIMENTAL DESIGN

The research method was non-experimental with predictive correlative design with a criterion variable - academic achievement and three predictive variables, where „O" represents the training phase, „$O_1$" represents self-efficacy assessment, „$O_2$" locus of control assessment and „$O_3$" self-esteem assessment.

$$N \quad O \qquad O_1, O_{2,} O_3$$

## 2. RESULTS

Dispersion diagrams, linear regression analysis and Pearson correlations have shown as expected, a positive relationship for self-efficacy and self-esteem with academic achievement and a negative relationship for locus of control with academic achievement. For self-esteem the correlation was not statistically significant.
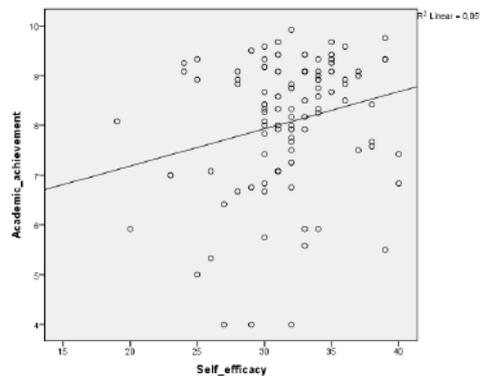


Figure 1. Dispersion diagram of the relationship between academic achievement and self-efficacy

The scatterplot presents regression line sloping from the bottom left to the upper right which indicates a positive relationship between academic achievement and self-efficacy. $r^2 = .05$ – this means that .25% of self efficacy variance is given by the variance of academic achievement.
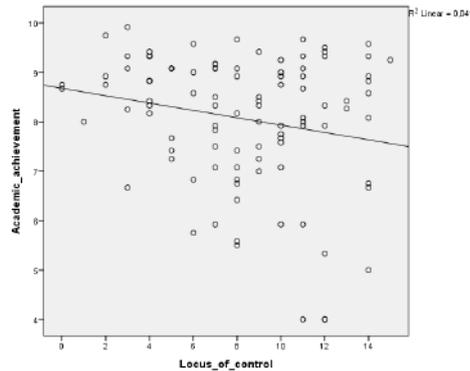


Figure 2. Dispersion diagram of the relationship between academic achievement and locus of control

The scatterplot presents regression line sloping from the top left to the bottom right which indicates a negative relationship between academic achievement and locus of control. $r^2 = .04$ – this means that .16% of locus of control variance is given by the variance of academic achievement.
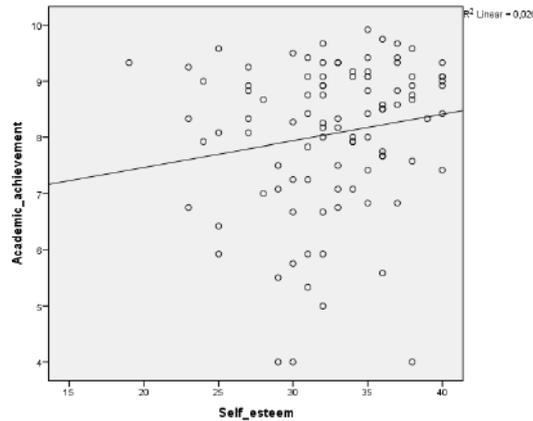


Figure 3. Dispersion diagram of the relationship between academic achievement and self-esteem

The scatterplot presents regression line sloping from the bottom left to the upper right which indicates a positive relationship between academic achievement and self-esteem $r^2 = .02$ – this means that .04% of self-esteem variance is given by the variance of academic achievement.

Table 1. Linear regression analysis

| Coefficients[a] | | | | | | | |
|---|---|---|---|---|---|---|---|
| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | 95,0% Confidence Interval for B | |
| | B | Std. Error | Beta | | | Lower Bound | Upper Bound |
| 1 (Constant) | 6.476 | 1.484 | | 4.364 | .000 | 3.530 | 9.421 |
| Self-efficacy | .054 | .039 | .162 | 1.389 | .168 | -.023 | .130 |
| Locus of control | -.047 | .041 | -.127 | -1.145 | .255 | -.128 | .034 |
| Self-esteem | .008 | .034 | .028 | .242 | .810 | -.060 | .077 |

a. Dependent Variable: Academic achievement

For self-efficacy the point where the regression line intersects the vertical axis is 5.69. The non-standardized regression coefficient is .07 - this means that for each increase by 1 of self-efficacy scores, the academic achievement scores increases by .07. The standardized regression coefficient is .22 - this is equal to the Pearson correlation coefficient between variables. The 95% confidence interval for the slope of the regression line takes values from .01 to .13 - the non- standardized coefficient has the value of the population between these values. For locus of control the point where the regression line intersects the vertical axis is 8.67. The

non-standardized regression coefficient is -.07 - this means that for each increase by 1 of locus of control scores, the academic achievement scores decreases by .07. The standardized regression coefficient is -.20. The 95% confidence interval for the slope of the regression line takes values from -.14 to -.002. For self-esteem the point where the regression line intersects the vertical axis is 6.52. The non-standardized regression coefficient is .04 - this means that for each increase by of self-esteem scores, the academic achievement scores increase by .04. The standardized regression coefficient is .16. The 95% confidence interval for the slope of the regression line takes values from -.01 to 0.10.

Table 2. Pearson correlation analysis

| Variable | | Academic achievement |
|---|---|---|
| Self-efficacy | Pearson Correlation | .226* |
| | Sig. (2-tailed) | .024 |
| | N | 100 |
| Locus of control | Pearson Correlation | -.202* |
| | Sig. (2-tailed) | .043 |
| | N | 100 |
| Self-esteem | Pearson Correlation | .161 |
| | Sig. (2-tailed) | .109 |
| | N | 100 |

*. Correlation is significant at the 0.05 level (2-tailed).

With respect to academic achievement, Pearson correlation analysis shows for self-efficacy a weak positive relationship, statistically significant for $p = .02$, and for locus of control a weak negative relationship, statistically significant for $p = .04$. For self-esteem the correlation was not statistically significant ($p = .10$). These results support $H_1$ - there is a positive relationship between self-efficacy and academic achievement and $H_2$ – there is a negative relationship between locus of control and academic achievement.

## 3. CONCLUSIONS

The purpose of this research was to demonstrate that self-efficacy, locus of control and self-esteem are predictors of academic achievement. The results have shown that students who have high self-efficacy and internal locus of control are predisposed to achieving high performance. Although in the case of self-esteem the results were not significant, the relationship was positive. Research on students sample has shown that people who rely on self-esteem have achieved results that

correlate negatively with academic performance, but positively with academic difficulties (Lawrence & Crocker, 2009).

A study that have examin the meta-analytical results of self-esteem, self-efficacy, locus of control and emotional stability showed that these traits are among best predictors for job satisfaction and job performance (Judge & Bono, 2001). The results of the study highlighted that locus of control is less self-oriented than other features, although many elements from Rotter's theory and other studies reflect self-orientation. Moreover, locus of control has characteristics common to other features, especially with self-efficacy. It is very possible that people with low self-efficacy level to believe that they are not in control of their lives (external locus of control) (Judge, Erez, & Bono, 2002).

The results illustrate the importance of developing and implementing programs designed to increase school motivation, differentiated and individualized school curricula that ensure school success, as well as programs of self-motivation and personal development. Self-efficacy is closely related to the resources we allocate to solving a task.

Bandura (1977) considers increasing the level of self-efficacy is important because it will cause a significant increase in performance (Stajkovic & Luthans, 1998). An important study has revealed that people with a high level of self-efficacy who are experiencing difficult situations, use their resources optimally and they don't give up easily (Wolters, Shirley, & Pintrich, 1996).

The traits analyzed in the context of this article benefit from the attention of health psychology. In order to ensure the continuity of the highlighted ideas, another topic that would require scientific research should determine the implications of all psychological factors considered to be responsible for maintaining health. Thus, in addition to self-efficacy, locus of control and self-esteem, should be included in the study optimism, feeling of consistency and robustness (Bubulac, Gatej, Rizeanu, 2018). Researchers of a cross-cultural study pursued psychological adaptation to receiving a cancer diagnosis of a population whose culture was based on superstition. The results were at least interesting, given the participants background. Thus, internal locus of control correlated positively and external locus of control correlated negatively with adaptation to disease (Sun & Stewart, 2000). People with a high level of self-efficacy use their resources optimally and successfully unlike people who have a low level of self-efficacy, who tend to give up when they have difficulties (Stajkovic & Luthans, 1998). Self-efficacy has an impact on the way people think, the choices they make, the goals they propose, the effort they make, the way they anticipate the results, the level of resistance in stressful or problematic situations and on the quality of emotional life, level of stress and depression (Pajares & Urdan, 2006; Rizeanu, Bubulac, Popa-Velea, 2018).

The present study has some limitations as respects the sample made up of only 100 participants, thus it requires prudence in generalizing the results. It is also important that has not been taken into account the extreme level of variables. The level of intelligence is an important factor to be considered in a future research. It should be proven that intelligence is not the only one that has established performance.

In summary, results of the present study indicate that self-efficacy and locus of control are significant predictors of academic achievement. However, there is much to be known about the exact nature of the traits and the processes by which they affect these outcomes, therefore, more research is needed to examine the common effects of the traits, as predictors of academic achievement (Constantin, Rizeanu, 2018).

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# THE RELATIONSHIP BETWEEN CONSCIENTIOUSNESS AND COOPERATION: THE MEDIATING ROLE OF SOCIABILITY

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*Abstract*

*This paper tries to determine whether there is an association between conscientiousness and cooperation and whether this relationship is mediated by sociability. Conscientiousness, cooperation and sociability are psychological constructs that have an important role in an individual's life, therefore it is important to determine in which way the relationship between these variables can improve the quality of life and the expression of adaptive behaviours. Regardless of age, conscientiousness is a trait that can be found in both children and adults and it has many benefits for the quality of life because it has an important role in many life outcomes.*

*The findings of this study shown that although sociability doesn't have a strong mediating role on the relationship between conscientiousness and cooperation, conscientiousness predicts cooperation.*

***Keywords:*** *conscientiousness, cooperation, sociability*

## 1. INTRODUCTION

### 1.1. Conscientiousness

Conscientiousness is one of the most studied dimensions of The Big Five model of personality (Barrick & Mount, 1991) which also includes extraversion, agreeableness, neuroticism, and openness.

Although, conscientiousness is one of the five-factor model of personality, constructs related to conscientiousness were discussed as far back as Aristotle and

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are included in classic personality taxonomies established by Cattell (1957), Eysenck (1998), Gough (2000) and Tellegen and Waller (2008).

Individuals who score high on the conscientiousness scale are dutiful and diligent (McCrae & John, 1992), are more reliable, have a stronger work ethic, have more self-discipline (McCrae & Costa, 1987), tend to follow social norms for impulse control, are goal directed, planful and are able to delay gratification (Roberts, Bogg, Walton, Chernyshenko & Stark, 2004).

More than that, studies (McCrae, 1993) confirm that conscientiousness is a personality trait that tends to be stable during the adulthood.

Conscientiousness is one of the most important predictors of academic achievement (Noftle and Robins, 2007). Students that are conscientious at school tend to have higher grades, especially the ones that have a better impulse control (MacCann, Duckworth & Roberts, 2009; Noftle & Robins, 2007; Paunonen & Ashton, 2001). Conscientious students have better grader because they are more focused on their assignments and they make an effort to achieve academic performances. They are more motivated than the other students (Richardson & Abraham, 2009) and they believe in their potential to succeed (Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011).

Studies have found a positive association between conscientiousness and ocupational status (Judge et al., 1999) and with job performance (Barrick & Mount, 1991). It was also found that conscientiousness predicts financial outcomes (Shaffer, 2020) because individuals high on conscientiousness tend to have higher incomes (Judge et al., 1999) and net worth (Letkiewicz & Fox, 2014). Conscientious individuals have greater career achievements (Spurk & Abele, 2011), better attitudes toward their work (Bowling & Burns, 2010; Ng et al., 2005), show more commitment to their jobs, and work well independently as well as in groups (Spurk & Abele, 2011; Sutin & Costa, 2010).

Costa, McCrae and Dye (1991) suggests that conscientiousness reflects a human need for achievement and commitment to work. Conscientiousness consists of six facets: order, achievement string, deliberation, self-discipline, dutifulness and competence.

Regarding conscientiousness, we must take into account the moral side such as the consideration of future consequences (CFC). Previous studies (Joireman et al., 2008; Joireman, Strathman & Balliet, 2006; Adams & Nettle, 2009; Gick, 2014; Lafreniere & Cramer, 2006; Strathman et al., 1994) have shown that some personality factors such as conscientiousness, impulsivity, ability to delay of gratification and self-control are related to consideration of future consequences (CFC). While conscientiousness is a general and comprehensive concept, consideration of future consequences (CFC) is a domain-specific trait (Cao & Xia, 2020).

Regarding the organizational field, conscientious individuals tend to avoid stealing and drinking during the working hours, to be late or absent at work and they are less likely to quit their jobs (Bowling & Burns, 2010; Roberts et al., 2007).

Conscientiousness is an important factor also for the love life. Conscientious individuals are less likely to get divorced (Solomon & Jackson, 2014a) because they tend to have higher levels of commitment and relationship satisfaction (Dyrenforth, Kashy, Donnellan & Lucas, 2010; Solomon & Jackson, 2014b) and they are less likely to cheat on their partner (Buss & Shackelford, 1997). Also, conscientious people are more forgiving (Hill & Allemand, 2012) and instead of fighting, they tend to solve the problem (Baker & McNulty, 2011).

## 1.2. Cooperation

Cooperation is one of the most valuable processes of the human being. The process of cooperation has several benefits regarding the human intractions and the societal and economic development (Sutter & Untertrifaller, 2020).

It is important to determine if the cooperation between individuals is a natural process or is determined by the posibility of punsishment. Also, an interesting question is whether people cooperate naturally or they do it just because other people do so. Studies (Keser & van Winden, 2000; Fischbacher, Gächter, & Fehr, 2001) have shown that while some people only cooperate if others do so too, there are others who either cooperate or do everything by themselves.

It is important to understand the willingness of cooperation. Sutter and Untertrifaller (2020) have conducted an experimental study on 328 children aged between 4 - 5 years old. The researchers let the children play the prisoners' dillema game with their parents. The prisoners' dillema game is the most well-known and one of the most heavily studied games that captures the conflict between short-term losses and the long-term benefit of cooperation. The results of the study have shown that there is an association between the children's likelihood to cooperate in a prisoner's dillema game and their parents' education. More exactly, if the parents hold a high-school or university degree, the children was more likely to cooperate compared to the children whose parents followed less than 13 years of schooling. Also, it was found a positive association between the parents' cooperation rate and the children's cooperation rate.

## 1.3. Sociability

Sociability is an important dimension of personality (Brook & Schmidt, 2020). A definition of sociability may be a preference for being with others rather than being alone (Cheek & Buss, 1981).

Sociability is a determinant factor of the human condition because it has influences on human behavior (Cheek & Buss, 1981; Mitrofan, Gatej, 2019).

During childhood and adolescence, cooperation is associated to approach motivations that are reinforced through social-rewards (Shiner & DeYoung, 2013).

Higher levels of sociability determine the adaptive behavior, but has also been found as a risk factor for maladaptive behavior (Santesso, Schmidt, & Fox, 2004).

Sociability was also studied from the perspective of groups dynamics. Thus, it was discovered that groups that are characterized by a medium level of sociability tend to be less successful (Leach, Ellemers, & Barreto, 2007) than the ones that are characterized by high levels of sociability.

Due to the lack of information in the literature about the role of sociability in individual's life, it is important to analyse whether there is an association between sociability, cooperation and conscientiousness. Whether we are talking about the academic environment or about the organizational field, sociability is an important factor in people's lives because it determines the social connections established by an individual, as well as his appurtenance to a social group.

Thus, we propose the following concept model (Figure 1).
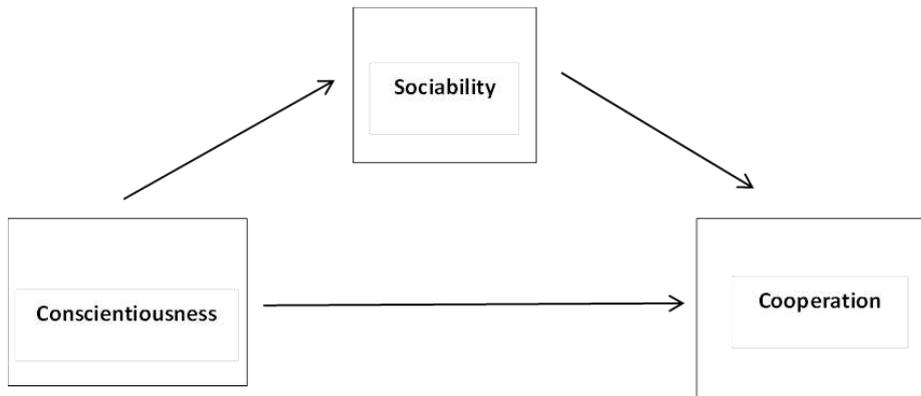


*Figure 1.* The concept model

## 2. OBJECTIVE AND HYPOTHESES

### 2.1. Objective

The main objective of this study is to identify a possible association between conscientiousness and cooperation. Another objective is to identify the mediating role of sociability on the relationship between conscientiousness and cooperation. Conscientiousness, cooperation and sociability are psychological constructs that have an important role in an individual's life, therefore it is important to determine

in which way the relationship between these variables can improve the quality of life and the expression of adaptive behaviours.

## 2.2. HYPOTHESES

*Hypothesis 1.* There is a correlation between conscientiousness and cooperation.

*Hypothesis 2.* There is a correlation between conscientiousness and sociability.

*Hypothesis 3.* There is a correlation between sociability and cooperation.

*Hypothesis 4.* The relationship between conscientiousness and cooperation is mediated by sociability.

## 3. METHOD

### 3.1. PARTICIPANTS AND PROCEDURE

The sample included 142 Romanian participants, 84.5 % women (n = 120) and 15.5 % men (*n* = 22). The average age of the sample was 29.40 (SD = 9.77). The study was conducted on a non-random convenience sample. All of the participants are students at Hyperion University, Faculty of Psychology and Educational Sciences. For data collection we used social media platforms. Thus, participants received the link to the questionnaire via their social media platforms. On the first page of the questionnaire were information about the purpose of the study and about the confidential aspect of the data collection.

### 3.2. MEASURES

*Conscientiousness* was measured using the Factor III [Conscientiousness] 10-item scale (Goldberg et al., 2006). The scale contains 10 items (e.g, *"Pay attention to details"*). The items were scored on a five – point scale (1 = *entirely false* to 5 = *entirely true*).

*Cooperation* was measured using the Cooperation Scale (Goldberg et al., 2006) that contains 12 items (e.g., *"Value cooperation over competition"*) The items were scored on a five – point scale (1 = *entirely false* to 5 = *entirely true*).

*Sociability* was measured using the Sociability Scale (Goldberg et al., 2006). The scale contains 1o items (e.g., "*Can't do without the company of others"*). The items were scored on a five – point scale (1 = *entirely false* to 5 = *entirely true*).

## 4. RESULTS

In order to test possible correlations evoked by the first three hypotheses we ran the Pearson Correlation procedure using the SPSS® program. The results shown below (Table 1) revealed a significant correlation (p < .01) but of low intensity (r = .28) between cooperation and conscientiousness which supports hypothesis 1. Hypothesis 2 and 3 were not supported by the results.

We also calculated Cronbach's alpha reliabilities for each scale. The Conscientiousness scale has a Cronbach's alpha of .76, the Cooperation scale has a Cronbach's alpha of .58, while the Sociability scale has a Cronbach's alpha of .70. All of the values are above the threshold limit (.70), except the Cooperation scale.

Table 1. Correlations between the variables

|  | 1 | 2 | 3 |
|---|---|---|---|
| 1. Conscientiousness | (.76) |  |  |
| 2. Cooperation | .28** | (.58) |  |
| 3. Sociability | -.04 | -.13 | (.70) |

*Note.* Cronbach's alpha reliabilities are in parentheses on the diagonal, **correlation is significant at the 0.01 level (2-tailed).

In order to test hypothesis 4, we run the mediation analysis using PROCESS by Andrew Hayes which is a program associated to SPSS® program. The results shown a weak indirect effect which means that sociability doesn't have a significant mediating role on the relationship between conscientiousness and cooperation. Although sociability is not a strong mediator for the relationship between conscientiousness and cooperation, hypothesis 4 was sustained by the results. However, we obtained a significant direct effect which means that conscientiousness influences cooperation.

## 5. CONCLUSIONS

The findings of this study indicate that conscientiousness predicts cooperation between people. This finding supports the results of other studies (Spurk & Abele, 2011; Sutin & Costa, 2010) that showed that people high on conscientiousness tend to work well in groups. This is an important outcome of this study because both variables are part of the human personality (Barrick & Mount, 1991; Rizeanu, 2020). The results of this study support the findings of other studies (Hill & Allemand, 2012) that showed that people high on conscientiousness tend to cooperate more with other individuals which contributes to creating social connections and romantic relationships. Although, the results showed a weak mediating role of sociability on the relationship between conscientiousness and cooperation, we recommend for future studies to use more participants and a random sample in order to obtain more accurate results.

The finding of this study bring a significant understanding both in the field of social psychology and organizational psychology because it tries to explain the individuals adaptive behaviours and the way that people tend to form social connection.

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# THE INFLUENCE OF TOBACCO AND ALCOHOL CONSUMPTION ON SOCIABILITY

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**Abstract**

*The nature of addictions such as tobacco and alcohol represent an area studied mostly in the context of medicine. In that context, the psychological study offers a new insight in understanding those types of substance consumption in terms of cognitions, behaviors and social environment. This study proposes to investigate the variability of sociability in terms of alcohol and tobacco users, as to take notice whether these behaviors replace maladaptively healthy social mechanisms of society. In this case, this study has implications both in psychological study, as of theoretical implications, and in common knowledge, because if people know what really makes them take risks regarding their health, they might take other healthier decisions. The results, even though were not significant, still offer a greater understanding as to why people drink alcohol and smoke tobacco.*

*Keywords: Tobacco usage, Alcohol usage, Sociability, Coping mechanism, Social psychology*

## 1. INTRODUCTION

### 1.1. The consumption of alcohol and tobacco
#### 1.1.1. Tobacco consumption

The tobacco consumption represents the biggest preventable risk factor in developed countries (Bergen & Caporaso, 1999). In this sense, the prevalence of tobacco addiction was reduced drastically in the latest years, alongside with the diseases associated with nicotine consumption, but it still represents a risk factor

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manifested especially along the young, persons with low socio-economic status, low educational achievement and persons that come from disadvantaged environments (Bergen & Caporaso, 1999; Rizeanu, 2018).

The addictive nature of smoking appears in order to maintain a high level of nicotine in the brain of the users.

According to figure 1, the smoking behaviour can be interpreted in terms of motivations, as addiction or habit, and as a result of peer pressure, the equilibrium between those two explaining both the initial phases of the addiction as well as the later stages.

From a health psychology standpoint, smoking represents a complex construct that gathers a series of individual and social characteristics. Smoking cessation can be temporary or permanent, relapsing representing a reappearance of the first stage. Contrary to this, it is known that smoking relapsing concludes in a higher level of use of any addictive substance, and especially tobacco (Glassman, 1990). It appears as if the smoking cessation can be a group event, thus a person cessing smoking can determine other people to quit smoking as well, provoking a chain reaction towards nicotine addiction (Christakis & Fowler, 2008).
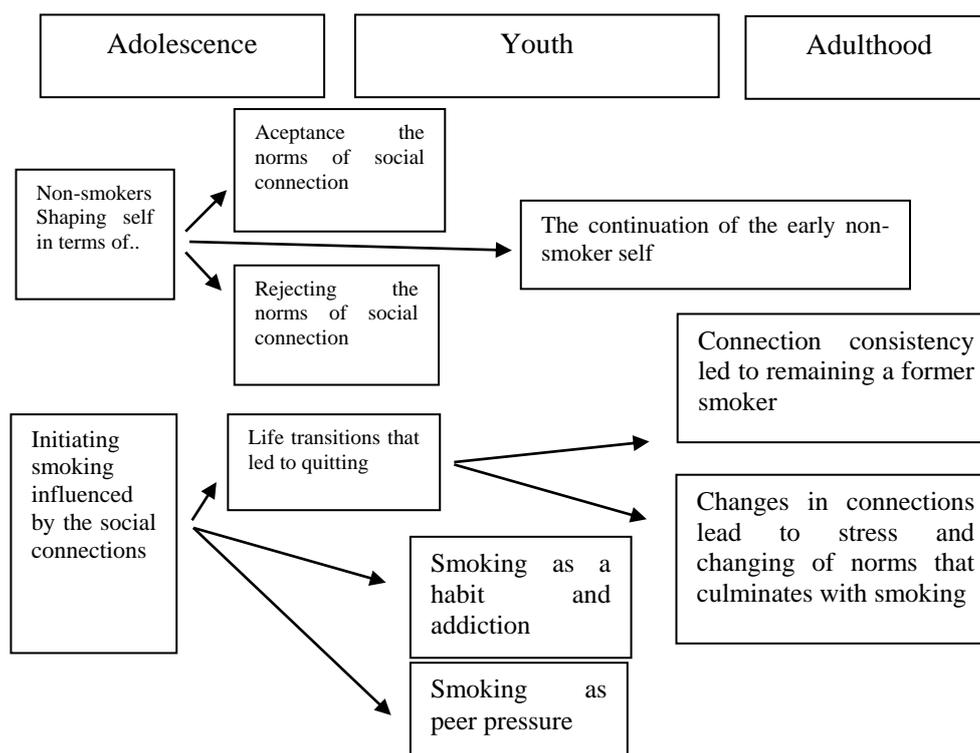


Figure 1 – The dynamic between social connections and smoking (Thomeer, Hernandez, Umberson, & Thomas, 2019)

### 1.1.2. Alcohol consumption

Alcohol addiction and abuse can produce substantial morbidities. In this sense, the alcohol abuse can be associated with severe anxiety, depressive episodes, insomnia, suicidal tendencies and other substance abuse (Rizeanu, 2014). Regular abuse of alcohol can predispose the individual to heart diseases, stroke, cancer and cirrhosis, affecting the gastrointestinal, cardiovascular and immune system. From a psychological standpoint, alcohol abuse can lead to temporary cognitive deficiencies, wake-sleep cycle disorders and anterograde amnesia. All these are ways in which the alcohol consumption reduces the life quality overall and the natural functioning ability of a person's body (Schuckit, 2009). Additionally, excessive abuse of alcohol was associated with non-fatal injuries, suicidal tendency, sexually transmitted diseases and violence (Gmel, Rehm, & Kuntsche, 2003). The drinking behavior starts usually in the adolescence (Johnston, O'Malley, Bachman, & Schulenberg, 2004), fact that supports the importance of promoting informative campaigns and the study of the relationship between addictions and results of them both short term and long term (Rizeanu, 2012).
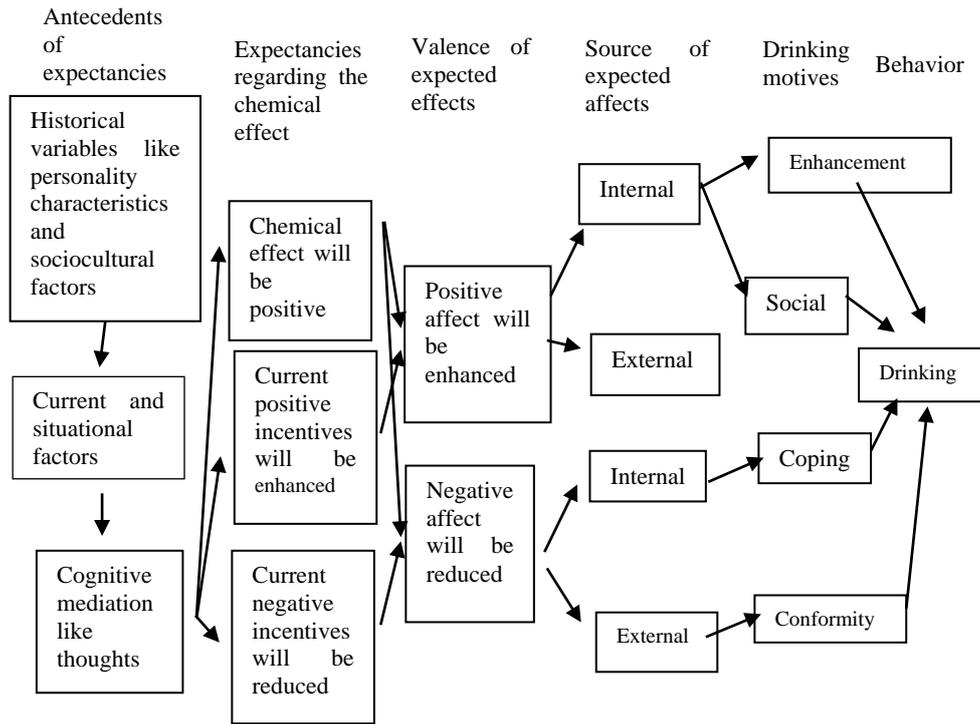


Figure 2: The dynamics of alcohol consumption: Reasons and motives for drinking
(Cooper, 1994; Cox & Klinger, 1988; 1990)

Heavy drinking was associated especially with the coping need (Abbey, Smith, & Scott, 1993), thus the decision of alcohol abuse can be viewed as a sum of multiple factors in the emotional and rational areas. In general terms, alcohol consumption starts from four motives: enhancement, social, coping and conformity (figure 2).

Regarding alcohol consumption, it was raised in the last years, especially in China and in developing countries, but surprisingly, it reduced in the developed countries.

### 1.2 Smoking and drinking as social facilitating behaviours

Smoking represents a dynamic behavior that fluctuates during life in relation to natural changes in life and social connections (Elder, Johnson, & Crosnoe, 2003), presenting components such as: avoidance, initiation, continuation, stopping and relapsing of the smoking behavior. This type of behavior is prevalent especially in the youth, being initiated in adolescence and diminishing in terms of a person assuming the adult role (CDC, 2011; Chen & Jacques-Tiura, 2014). During life, there are transitions that determine behavioural changes relating health. These social transitions come with norms, responsibilities, stressors and sanctions according to the shared values in the respective environment (Frech, 2014; Pampel, Mollborn, & Lawrence, 2014; Rizeanu, 2015).

The nature of social relationships during lifetime can influence trajectories in human lives according to the principle of linked lives (Carr, 2018). This principle stipulates the idea that individual life is mixed in complex social relationships that can influence health decisions including decisions regarding smoking.

Even though the principle of linked lives supports the idea that the greatest influence in individual life is the interaction with other persons in the immediate social circle, Erickson (2003) supports the idea that even persons in enlarged social circles such as co-workers or distant friends can have a significant influence regarding health behaviours.

The allegiance to social networks alongside smokers rises the person's risk to initiate smoking (Christakis & Fowler, 2008), while the non-smoker status is especially prevalent in the case of persons that have a large family that shares religious values. Most of non-smokers share this status because they attached it to their self, this aspect being enforced by social support, beliefs, attitudes regarding health and other components of the belief system associated to their psyche.

Regarding the social influence on the smoking, four mechanisms are responsible of the most of the variance regarding smoking, social support, social strain, contagion and social control. Social connections can generate social support (Thoits, 2011), that can lead to the extinction of interruption of the smoking

behavior. At the same time, social connections can induce stress, that can determine the activation of smoking as a coping mechanism (Umberson et al., 2008; McDermott, Dobson, & Owen, 2006; Reczek, Thomeer, Kissling, & Liu, 2016). Regarding contagion, it can explain the reasons for the enlarging of the smoking circles, that also prevent people from quitting (Margolis & Wright, 2015). Also, social control processes can determine variations in terms of tobacco consumption and changes to the smoker/non-smoker status, according to social models associated to smoking regarding members of a certain group (Umberson, Donnelly, & Pollitt, 2018).

The study realised by Thomeer, Hernandez, Umberson & Thomas (2019) identifies the dynamic between tobacco consumption and sociability, integrating in his model (Figure 1) aspects such as norms, dynamic change and relationship circles, but also the smoker's motivations in relation to the non-smoker motivation of maintaining the associated status.

On the other hand, the alcohol consumption seems to be in an even closer link to the social environment, as the figure 2 explains, there seem to be two main reasons for drinking associated with social relations, social enforcing and conformity. Accordingly, an individual can expect to an enhancing of certain positive effects, or a reduction of negative effects, from a social standpoint translating to receiving social attention and approval. Additionally, an individual can think in terms of conformism and tension avoidance among the group members. Even though there seem to be predisposing traits associated with the initiation of said behaviours, the main determinant factors for maintaining these behaviours remain situational and social factors (Baer, 2002; Quigley & Marlatt, 1996).

In terms of personality, an important role in initiating drinking and smoking behaviours goes to traits such as novelty seeking, extraversion, impulsivity and neuroticism being associated with a bigger consumption of substances and a greater chance of consumption altogether (Breslau, Kilbey, & Andreski, 1993; Kassel, Shiffman, Gnys, Paty, & Zettler-Segal, 1994)

In terms of sociability, both smoking and alcohol intake can be viewed as having two types of effects, actively and passively. Actively, smoking can be viewed as a social behavior as long as there is a known fact that smokers tend to get more breaks at work and they can integrate themselves better in the smoking circles by engaging in this behavior themselves. Also, actively, alcohol has the role of reducing censorship and of dynamizing the individual, being easier for him to express values, beliefs and attitudes in the behavioural area. In regards to the passive role of alcohol intake and smoking, as referred to the period after the substance has lost the influence on the individual, there is a question regarding what kind of habitual response effect can these social behaviors have on an individual in terms of sociability and communicatively. This represents the

question in the current study, regarding the degree in which the smoking and drinking behaviors predict a greater general sociability.

This issue raises other certain questions such as whether people consume substances to supplement certain deficiencies regarding socialisation or they use them to overcome certain social anxieties that keeps them from living in the social environment accordingly to their individual needs. If this is the case, the present study could provide an insight regarding the mechanisms involved in initiating this kind of addiction and could offer clarifications regarding the degree in which psychological elements meet practical elements through the lens of substance abuse.

## 2. OBJECTIVE AND HYPOTHESES

### 2.1. OBJECTIVE

The current study has the objective to measure the differences in sociability in terms of smoker/non-smoker and drinker/non-drinker status. Whether these differences exist or not, it will provide important insight in the social side of addictions, in terms of initiating and maintaining a potentially dangerous health behavior.

### 2.2. HYPOTHESES

*H1-* There is a significant difference in sociability between smokers and non-smokers.

*H2-* There is a significant difference in sociability between drinkers and non-drinkers.

*H3-* There is a correlation between the alcohol and tobacco consumption.

## 3. METHOD

### 3.1. Participants

The research sample included 142 participants, 84.5% of them being women, and 15.5% males who ranged in age from 20 to 62 years. The mean age was 29.40 years (SD=9.776). The participants were chosen conveniently from students of Hyperion University, Faculty of Psychology and Educational Sciences, Department of Psychology.

### 3.2 Measures

In this study was used the SOCIABILITY scale (Goldberg et al., 2006), alongside questions that involved whether participants consume tobacco or alcohol. The SOCIABILITY scale mentioned above includes 10 items such as "Can't do without the company of others" measured on a five-point Likert scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree).

### 3.3 Procedure

The research sample completed the SOCIABILITY scale on-line, via Google Forms. Data was collected in 2020. Before completing the assessment, the participants were informed of what this research program entails, asking them to sign an informed consent agreement, describing the working procedure, the benefits and the risks of the program and the confidentiality, then asking them if the collected data during the program can be used for research purposes.

## 4. RESULTS

In order to test the research hypotheses, we analysed the data as it follows: we applied a independent t-test for both alcohol consumption and tobacco. The results were not significant for neither the first, nor the second hypothesis, obtaining a p of 0.25 for tobacco consumption, and for being greater than the alpha threshold of 0.05, we must reject the first hypothesis (table 1). For the second hypothesis, we obtained a p of 0.72, and again, being greater than the alpha threshold of 0.05, we must reject the second hypothesis (table 2). These results show that nor the consumption of alcohol, nor the consumption of tobacco significantly determine a greater level of sociability. In this context, smoking and drinking remain active mechanisms of socialization with no latent effect on socialization overall. In terms of reliability, the SOCIABILITY scale showed a Cronbach's Alpha of .589.

As for the third hypothesis, even though the literature would suggest both alcohol abusers and tobacco users share a certain degree of similarity in terms of personality and demographic variables, there is no relationship between these two substance uses, as the correlation between the smoker status and the drinker status turn out to be of 0.76, at a p of .36 (table 3) being greater than the alpha threshold of 0.05, we must reject the third hypothesis.

Table 1: Independent t-test for determining the influence of tobacco consumption on socialization

|  | M | t | df | p |
|---|---|---|---|---|
| Tobacco | 0.46 | 0.523 | 140 | 0.259 |

Table 2: Independent t-test for determining the influence of alcohol consumption on socialization

|  | M | t | df | p |
|---|---|---|---|---|
| Alcohol | 1.63 | 1.297 | 140 | 0.728 |

Table 3: Correlation between alcohol and tobacco consumption

|  | 1 | 2 |
|---|---|---|
| 1. Smoking status |  |  |
| 2. Alcohol | 0.076 |  |

## 5. CONCLUSIONS

Even though the hypotheses of this study were rejected, it still offers a significant insight in the smoking and drinking behaviors. As it was stated in the introduction, the active effect of increased socialization tendencies remains valid, but as the results shown, there is no significant passive increase in socialization tendencies.

These results can also be interpreted as to why the addictive character even exists from a psychological standpoint. Thus, people that usually drink or smoke do not create additional coping mechanisms for help in social situations in the absence of these substances, as they continue to use them for the very same reason.

These results also provide another reason for people to take healthier decisions, as it was shown that tobacco and alcohol use do not make people more sociable or friendlier. After use, individuals are exactly the way they were before consumption in terms of sociability.

This study has its limits, among which counting the homogeneity of the sample in terms of age, socio-economic status and gender. Thus, future studies could consider investigating the same hypotheses using a larger, more heterogenous sample, or even use an experimental design in order to prove the proper causality.

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# A REVIEW ON COGNITIVE IMPACT OF SCHOOL-AGE CHILDREN IN THE BACKGROUND OF HYPO-/ HYPERGLYCAEMIA

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**Abstract**

*Cognitive impairment in children with type 1 diabetes has been intensively analyzed and studied in a number of studies and then meta-analyzes, with not succeed or understanding the impact of glycemic control concerning cognitive performances in children with diabetes, both in hypoglycemia, and hyperglycemia, being known that to adult, diabetes leads over time to permanent cognitive impairment, neurodegeneration or Alzheimer's disease. At children, presence of diabetes overlap to the most active periods in their brain's development and cognitive functions as well, which can lead to concern that these children are exposed to the cognitive risk as secondary effects. Children with diabetes have a greatly increased risk of manifesting mild neurocognitive dysfunction. Because the level of glycemic control is crucial for the risk of future complications, we are very interested in finding out the effects of glycemic variation on cognitive development in children in both the short and long term. When we talk about diabetes, we must refer to two main goals: preventing complications and ensuring a quality of life close to healthy people. Early detection of cognitive deficits in different areas can facilitate effective treatment options and can help reduce adverse effects on diabetes management and disease outcomes.*

*Keywords:* diabetes, neurocognitive, hypoglycemia, hyperglycemia, children.

## 1. INTRODUCTION

Diabetes is one of the most serious chronic diseases and also, a medical problem that we must take care of, given its prevalence, through both the increase the risk of disability and mortality (World Health Organisation, 2020). Diabetes causes effects in the whole body, irreversible structural changes, but also brings changes to the psychological sphere of a patient. Diabetes is a condition characterized by elevated or instability of blood glucose levels due to reduced

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insulin secretion. Diabetes represents a major risk for brain damage. It causes slow, asymptomatic, but significant damage into the body. Research has shown that diabetes can directly damage the brain through insulin resistance, memory loss or even Alzheimer's disease. If the harmful effects of diabetes on the retinal, renal, cardiovascular and peripheral nervous systems are widely recognized, less attention has been paid to the effect of diabetes on cognitive function (Kodl and Seaquist, 2008; Rizeanu, 2015).

Both type 1 and type 2 diabetes have been associated with poor performance in many areas of cognitive function. Brain damage is associated with acute and chronic hyperglycemia, insulin resistance, hyperinsulinemia, diabetic ketoacidosis and hypoglycemic events for diabetic patients. Hyperglycemia is a cause of cognitive impairment, neurodegeneration, brain atrophy and dementia at the diabetic patient (Moheet, Mangia & Seaquist, 2015).

Type 1 diabetes occurs in childhood, including infants, but is more common in older children, aged between 6 and 13 years. It is an autoimmune disease, the cause of which is an attack of the immune system on the cells of the pancreas that produces insulin. More than 240 mg/dl is considered an over glycaemic amount (hyperglycaemia) and can be considered dangerous by severely affecting of the eyes, heart function, kidney function, blood vessels, but also of the brain. If there is a very low level of blood sugar (hypoglycaemia), the brain does not function normally, and the child may be confused, irritable, and almost always hungry. If the blood sugar decrease under 40 mg/dl, the child's brain receives too little glucose for functioning and both the judgement and muscle coordination will be affected (American Diabetes Association, 2020).

Cognitive dysfunction in type 1 and type 2 diabetes has many similarities, but there are important differences. Both conditions are associated with mental and motor retardation and similar decreases in attention skills and executive functioning. In addition, both types are characterized by neural slowing, increased cortical atrophy, microstructural abnormalities in the white matter tract, and similar, but not identical, changes in the brain (McCrimmon, Ryan et al., 2012).

Regarding of children with diabetes, exposure to the glycemic extremes (severe hypoglycemia, chronic hyperglycemia and diabetic ketoacidosis) overlaps the period of time most active in the brain development and the cognitive functions, which may lead to the concern that these children are exposed to the cognitive risk as secondary effects (Cato & Hershey, 2016).

## 2. EVIDENCES

Diabetes mellitus was associated with decrements in cognitive function and changes in brain structure. Diabetes is associated with a significantly increased risk of cognitive decline and an increased risk of dementia on long-term. Type 1

diabetes is commonly diagnosed during childhood and adolescence. This is a period of rapid developmental changes in the central nervous system and there has been concern that the younger brain may be more susceptible to extremes of glycemia. Both types of diabetes have been associated with poor performance in several areas of cognitive function and evidence of abnormal and structural and functional brain MRI (Moheet, Mangia & Seaquist, 2015). Neurophysiological, cerebrovascular, and neuroimaging studies also show evidence of CNS abnormalities (Ryan, 2009). Cognitive deficits can occur in the earliest stages of diabetes and are exacerbated by the duration of diabetes and glycemic control, but it is not yet possible to predict what is the greatest risk of developing cognitive impairment (Zilliox, Chadrasekaran et al., 2016).

The human brain depends on glucose as a source of energy, and acute hypoglycemia results in subsequent cognitive impairment. In general, performance on complex cognitive tasks deteriorates when blood glucose drops below 48 mg/dL (Ryan, 2009).

Hyperglycemia has the strongest association with the risk of developing cognitive impairment (Dik, Jonker et al., 2007).

And if, type 2 diabetes is associated with a 50% increase in the risk of dementia (Biessels, Staekenborg et al., 2006) and has been associated with deficits in attention, information processing, motor speed, executive functioning and verbal memory (Monette et al., 2014; Palta, Schneider et al, 2014; Wong et al., 2014), we propose to find out the impact of type 1 diabetes on cognitive functions in formation to the children to prevent cognitive impairment.

The first 5 years of life are considered a particularly critical period for brain development: special sensitivity to changes in glucose levels characteristic of diabetes could lead to an increased probability of structural and functional brain deficiencies and neurocognitive deficits (Berg and Linton, 2009).

Children diagnosed early in life, before 7 years of age, appear to be most vulnerable, showing impairments on virtually all types of cognitive tests, with learning and memory skills being particularly affected (Ryan, 2009).

A study has shown that in children with diabetes before 7 years there was a reduction in intellectual performance and a mild atrophy of the brain compared to adults with the same duration of diabetes or children who later developed diabetes (Ferguson, Blane et al., 2005).

The children who developed diabetes very early in life, diagnosed before the age of 2, had a significantly increased risk of not finishing school, compared to diabetic patients diagnosed after that age or with the reference population. (Ryan, 2009)

Results from several meta-analyses for more of 15 cross-sectional pediatric studies suggest that there are 2 distinct phenotypes associated with diabetes age at onset (Gaudieri, Chen et al., 2008). The children between 4 to 6 years of life (the early onset phenotype) show small to medium standardized effect sizes in

comparison with non-diabetes children in almost all cognitive domains, including learning and memory (d = -0.5), attention and executive functions (d = -0.4), psychomotor speed (d = -0.37), and verbal intelligence (d = -0.35). The differences may be clinically significant and may have an impact on performance in the classroom (Biessels et al., 2006; Gaudieri et al., 2008). Diabetic children are more likely to perform more poorly than their nondiabetic peers in the classroom and earn lower scores to school performance and verbal intelligence (Ryan, 2009). Specialized neuropsychological testing reveals evidence of dysfunction in a variety of cognitive domains, including sustained attention, visuoperceptual skills, and psychomotor speed. On the other hand, those diagnosed after the age of 6 years (later onset phenotype), show much smaller differences on a more limited set of cognitive domains, when compared to the healthy children's (d < 0.2) For these individuals, verbal intelligence and psychomotor speed are most consistently affected, while executive functions are only sometimes affected, and learning and memory are usually intact (Van Duinkerken and Ryan, 2020).

There are studies suggesting that a severe hypoglycemia has a negative impact on specific neuropsychological functions, such as intelligence, verbal and spatial memory, verbal, fluency, visuomotor and visuospatial skills, and information processing speed. This impact may be related to the duration of the disease, the frequency of severe hypoglycemia (Perantie et al., 2008). More rapid cognitive decline is associated with a longer duration of diabetes (Gudala, Bansal, et al., 2013).

Few studies that have tracked subjects over time have noted that verbal IQ scores tend to decrease as the duration of diabetes increases (Northam et al., 2001). These effects appeared to be more pronounced in boys and children with an earlier onset of diabetes (Schoenle et al., 2002).

Researchers found a link between hypoglycemia and poor results on verbal IQ, poorer performance of focused attention and cognitive inhibition (Northam et al., 2009), poorer results on updating information (Naguib et al., 2009) and spatial information (Perantie et al., 2008). Previous studies have consistently shown that the early onset of diabetes predicts poorer cognitive function and most researchers have hypothesized that hypoglycemia played a key role in initiating cerebral dysfunction (Abraham, Jones et al., 2018).

Another meta-analysis of 24 studies published between 1980 and 2005 regarding the neuropsychological performance in young people under 19 with type 1 diabetes was focused on performance of seven cognitive domains. The result was statistically associated with poor visuospatial performance (d = -0.29), motor speed (d = -0.26) and writing (d = -0.28), sustained attention (d = -0.21), and reading (d = -0.23). Smaller effects were identified on complete IQ (d = -0.14), on overall Performance (d = -0.18) and verbal IQ (d = -0.15). Severe hypoglycemia was associated with short-term verbal memory deficits (d = -0.14). The conclusions of this meta-analysis indicated that children with type 1 diabetes have mild cognitive

impairments and a subtly reduced overall intellectual functioning (Naguib, Kulynskaia et al., 2009).

The adverse effects of diabetes on reading and writing may be a direct consequence of the basic visuospatial abnormalities, of the reduced motor speed, and weak sustained attention identified in children with diabetes. Recent reports do not identify the problem that may affect cognition in children with diabetes. However, the significance of the slight decreases in reading and writing reported in this meta-analysis requires clarification (Naguib, Kulynskaia et al., 2009).

Weaker motor speed in children with diabetes can be attributed of slow mental capacity in the childhood, which, together with reduced flexibility, was the main finding in the meta-analysis of cognition in adults with diabetes (Brands, Biessels et al., 2005).

The scientific search engines identified 33 other studies that analysed the cognitive function of children with diabetes. The meta-analyses and studies was performed indicated a decrease in cognitive performance in children with diabetes, compared with groups of healthy children, recording negative results in a number of areas, as follows: complete IQ (d = -0.7), information processing speed (d = -0.3), psychomotor efficiency (d = -0.6), sustained attention (d = -0.3), cognitive flexibility (d = -0.5), visual perception (d = -0.4), visuospatial ability (d = -0.29), verbal IQ (d = -0.15). In this case, poor cognitive performance in diabetic patients appeared to be associated with the presence of microvascular complications, but not with the occurrence of severe hypoglycaemic episodes or poor metabolic control (Brands, Biessels et al., 2005).

These studies considered the premise that in patients with type 1 diabetes, cognitive dysfunction is characterized by a slowdown in mental speed and a decrease in mental flexibility, also learning and memory are reduced. A decrease in mental efficiency occurs with hypo- and hyperglycaemic glucose fluctuations that occur naturally in children with type 1 diabetes (Gonder-Frederick, Zrebiec et al. 2009).

A recent systematic review showed that cognitive dysfunctions commonly seen in patients with type 1 diabetes are associated with low information processing speed, psychomotor efficiency, attention, memory, learning, problem solving skills, motor speed, vocabulary, video construction, visual perception, somatosensory examination, motor power, mental flexibility and executive function. Among these areas, the slow speed of information processing, psychomotor efficiency, attention, visuoconstruction and mental flexibility were strongly supported by the results. Type 1 diabetes is associated with chronic hyperglycaemia and exposure to severe hypoglycaemia. The long-term brain effects of these consequences of diabetes have been poorly supported (Hye-Geum, 2019).

However, the contribution of these variables, respectively the episodes of hypoglycemia and/or hyperglycemia are difficult to decide.

The human brain is influenced on the continuous availability of glucose and rapid malfunctions during hypoglycemia, but recovers quickly; a single episode of hypoglycemic coma temporarily affects intellectual function, but no permanent effect on cognitive ability is evident after 36 hours. But chronic hyperglycemia can affect the structure and function of the brain (Ferguson, Blane et al., 2003).

A meta-analysis for a group of 2.144 children, of which 1.393 subjects with type 1 diabetes and 751 control subjects from 19 studies regarding pediatric diabetes, concluded that type 1 diabetes was associated with slightly lower general knowledge (**-0.13**), with small differences compared to control subjects on a wide range of domains, excluding learning and memory, which were similar for both groups. Learning and memory skills, both verbal and visual (**-0.28** and **-0.25**), were more affected for children with diabetes early onset than diabetes with late onset, along with attention skills and executive function (**-0.27**). Comparing with nondiabetic control subjects, the effects in children with diabetes at the beginning were higher, especially for learning and memory (**-0.49**). The effect sizes tends to range from ~ 0.4 to 0.5 for learning, memory and attention skills, but are even smaller for other cognitive areas (Gaudieri, Chen et al., 2008).

## 3. CONCLUSIONS

Children with diabetes presented deficits in a wide range of neuropsychological tests compared to nondiabetic subjects. Comparative neuropsychological findings among children with and without diabetes showed negative effects on overall results. These gaps were not very important, but they can put children with diabetes at a disadvantage compared to their peers, especially in difficult educational environments.

Pediatric diabetes generally refers to slightly lower cognitive scores in most cognitive areas. The most pronounced and pervasive cognitive effects for children with early onset diabetes show a moderately lower performance compared to control subjects. The magnitude of these effects tends to be relatively modest, with estimates generally being around 0.2 or less, although there is much variation between different studies (Gaudieri, Chen et al. 2008).

The conclusions of the studies so far are inconsistent and inhomogeneous, they have not reached a common denominator in terms of cognitive impairment of children with diabetes and have failed to fully explain the comparative differences between children with diabetes and non-diabetic children.

The wide variation in cognitive abilities addressed has made it difficult to draw a conclusion about the pattern of existing cognitive deficits.

There is a valid presumption that many other factors may be involved in the onset of cognitive impairment in children with diabetes, such as very specific medical conditions, response to treatment, obesity, emotional problems or other.

Not all early-onset diabetic children had registered cognitive dysfunction and not all tests in a particular cognitive field differentiated the diabetics from the non-diabetics. Why some tests are more sensitive to diabetes related variables than others remains unknown and unexamined (Ryan, 2009).

Therefore, in order to explain and prevent these problems, it is important to conduct in-depth research on each aspect.

Because diabetes affects planning and coordination, which are so important in the overall management of the disease and for many daily activities, executive function may suffer. Therefore, it is very important to prevent cognitive decline. Evidence obtained from neurocognitive assessments suggests that cognitive dysfunction should be listed as one of the many complications of diabetes.

It is important also, to certainly clarify the impact of metabolic control on cognitive functions from an early age and to facilitate adequate psychological, educational and medical support.

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# INCREASING THE VOCATIONAL POTENTIAL IN THE ACADEMIC ENVIRONMENT: MEANINGS, ACHIEVEMENTS, PERSPECTIVES

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***Abstract***

*Our aim in this research was to analyse the student's compatibility with the profile of their chosen faculty. We started from the idea according to which the compatibility between the value system and the faculty profile leads to an increase in self-efficacy. Students from the Polytechnic faculty, the AES (Academy of Economic Sciences) and Psychology took part in this research. In order to test the starting hypotheses, we employed the AVS survey, the SES scale of self-efficacy and a survey on decisional styles. Results showed that 30% of AES students fit into the economic value system, 36% of Polytechnic students fit into the theoretical value system, and 30% of the Psychology students fit into the social value system. Regarding the degree of self-efficacy, in 35.7% of the AES students who fit the profile of the faculty self-efficacy is present, in 35.7% of the polytechnic students that have a theoretical value system self-efficacy is present and in 41.7% of the psychology students who fit into the social value system self-efficacy is present. Furthermore, 41.7% of these students, who fit into a religious value system, also demonstrate self-efficacy; psychology students show a predominantly intuitive decisional style, whereas the AES students show a predominantly rational decisional style.*

***Keywords:*** *vocational counseling, career, professional orientation, educational counseling, university abandon*

## 1. INTRODUCTION

The aim of the present research is to provide an overview of the current academic environment in Romania. As a general objective, we aim at analysing student compatibility with the profile of their chosen faculty. As specific objectives, we would like to emphasize the fact that students choose the profile of their faculty without taking into consideration their personal values as well as to study the relation between value systems, the choice of faculty profile and self-efficacy.

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The reason for choosing this topic was the stringent necessity to introduce a programme of vocational counseling in schools and high schools.

In our current Romanian society, people receive very little information about the role and importance of vocational counseling, therefore going for careers that are unsuitable for them, which may lead to job dissatisfaction, low performance and stress.

In psychology the concept of career has been extensively studied, especially in regard to the way people choose a certain field. In the recent years, the specialty literature has focused on the practice of career development and counseling regarding psychological implications such as self-efficacy, decisional style or personal values (Abele, Spurk, 2009).

With regard to personal values, studies have shown that they represent an essential aspect when choosing the right career. On the basis of these values, a person can orient itself correctly to a certain field. The relation between job performance, job satisfaction and the capacity for goal achievement has been investigated (Feldman, 2002; Herr, Cramer & Niles, 2004; Patton & McMahon, 2006).

Studies on self-efficacy in relation to career have shown that it has an influence on the choices people make regarding the activities they will get involved in, on the individuals willingness to sustain effort and persevere in fulfilling tasks, his/her emotional reactions, response to stress, and job performance. It is also strongly associated with professional interests, job satisfaction, commitment and devotion to the job, as well as with a capacity for responsible management of work activities and relations. (Abele, Spurk, 2009; Betz, 2000; Bora, 2003; Ignat, Clipa, 2010; Patrick et. al., 2011).

Decision is considered to be one of the key elements in career development. Recent research has established that career decision is related to specific results in the field of work, especially with job satisfaction, organisational structure and performance (Bratu, Rizeanu, Constantin, Rizeanu, 2018). People who make decisions based on an accurate appraisal of their knowledge and abilities generally derive a better appreciation from the point of view of job performance. Determination in regard to decision-making was found to be associated with a high degree of satisfaction in the chosen career (Bright et.al., 2005; Duffy, Raque Bogdan, 2010; Earl, Bright, 2004; Gunkel et.al., 2010; Pânisoară, Pânisoară, 2010).

The interest in this field issues a word of warning about the importance of implementing a programme of vocational counseling in schools and highschools. A less studied part is the way this programme should be introduced to the students, so that it would offer them a better knowledge of their own abilities, interests and personal values as well as a proper direction towards a field where they could perform well and obtain satisfaction (Bogluț, Rizeanu, Burtăverde, 2015).

The implementation of such a programme of vocational counseling represents a future direction of this study.

## 2. **OBJECTIVE AND HYPOTHESES**

### 2.1. OBJECTIVE

*Main objective:* The main objective of this paper is to analyse student compatibility with the profile of their chosen faculty.

*Specific objectives:* As specific objective, we aim at emphasizing the fact that students choose the profile of their faculty without taking into account personal values. Another objective is to study the relation between value system, the choice of faculty profile and self-efficacy.

### 2.2. HYPOTHESES

*General hypotheses:* We suppose that a low percent of the students are compatible with the profile of their chosen faculty. The more the value system agrees with the faculty profile, the more self-efficacy is improved. We suppose that there is a connection between the decisional style and the faculty profile.

*Specific hypotheses:*

We suppose that students from the AES have a predominantly rational decisional style.

We suppose that students from the Polytechnic have a predominantly rational decisional style.

We suppose that students from Psychology have a predominantly intuitive decisional style. We suppose that there are differences of compatibility with the faculty profile, according to gender.

We suppose that there are differences in the degree of self-efficacy according to gender.

We suppose that there is a correlation between the decisional style and the value system.

We suppose that there is a correlation between the decisional style and the level of self-efficacy.

## 3. **METHOD**

The first step when carrying out the current research consisted in studying the specialty literature. Subsequently, the most adequate instruments were chosen in order to measure the studied variables. The chosen groups were asked to fill in the

tests according to the following instructions: „Please read carefully the statements included in these surveys and choose the answer that fits you best!" After collecting all the tests, they were scored, and the data were introduced in the database of the statistic programme SPSS, where they were statistically processed with a view to validating the hypotheses of the present research.

## 3.1. PARTICIPANTS/SUBJECTS

In order to carry out the present research a number of 90 participants were tested, male and female, with ages between 18 and 25, first year students at the Faculty of Psychology, Hyperion University, at the AES and the Polytechnic. They were divided into three lots as follows: 30 participants from the Faculty of Psychology, 30 participants from the AES, 30 participants from the Faculty of Polytechnic. Of the total participants, 34.4% are male, and 65.6% of participants are female; The average age of the participants is 21.23.

## 3.2. INSTRUMENTS

**The AVS survey**, translated and adapted by Mihaela Roco (1994) was used to assess personal values. The survey is made up of two parts, the first comprising 30 items, with dichotomous answers, yes/no, the second including 15 items, with four answer options, a, b, c or d, which have to be ranked in the order of the preferences of each participant who fills in the survey. The highest score will reveal the participant's personal value. The test is applied with paper and pencil, without any time limit.

**The SES scale of self-efficacy** (Schwarzer & Jerusalem, 1995) comprises 10 items and is designed with the aim of assessing a person's convictions regarding its own capacity of dealing with the setbacks encountered during task-solving. The scale was created in 1981 by Matthias Jerusalem and Ralf Schwarzer and so far it has been used in numerous studies and adapted for 33 languages. The SES scale may be said to measure self-efficacy in adapting to everyday problems, confidence in goal-setting, effort investment and perseverance in action.

**The Survey Decisional Styles** (Gati, Krausz & Osipow, 1996). In order to delineate the participants decisional style, we adapted a survey made up of 5 items, each representing one of the 5 decisional styles, rational, dependent, spontaneous, intuitive and hesitating. Participants were instructed to read carefully all the five statements and choose the one that fit them best.

## 4. RESULTS

After applying the AVS test, we obtained an average value of 16.68, with the following frequencies: 24.4% theoretical, 16.7% economic, 26.7% social, 6.7% political, 10% aesthetic and 15.6% religious;

After applying the decisional style questionnaire, we obtained an average value of 20, with the following frequencies: 43.3% rational, 21.1% dependent, 7.8% avoidant, 22.2% intuitive, 5.6% spontaneous;

After applying the SES test, we obtained the average value of 50, with the following frequencies: 44.4% present, 55.6% absent.

### The statistical interpretation of results

The statistical results validated the proposed hypotheses, as follows: Regarding the hypothesis that a low percent of students is compatible with the profile of the chosen faculty, results have shown that: only 30% of the participants in the study, students from the AES, fit into the economic value system; 36% of the participants, students from the Polytechnic faculty, fit into the theoretical value system, and 30% of the participants, students from the Psychology faculty, fit into the social value system.

Table 1-Association between faculty and value system

| Faculty | Theoretical | Economic | Social | Political | Esthetic | Religious |
|---------|-------------|----------|--------|-----------|----------|-----------|
| AES | 30% | **30%** | 23.3% | 10% | 0% | 6.7% |
| Polytechnic | **36%** | 20% | 26.7% | 3.3% | 10% | 3.3 % |
| Psychology | 6.7% | 0% | **30%** | 6.7% | 20% | 36.7% |

The second hypothesis which presupposes that the more the value system corresponds to the faculty profile, the more self-efficacy increases, is validated, as follows: 35.7% of the AES students, who fit into the economic value system, have self-efficacy, being the largest percent, compared with the other value systems. 35.7% of the Polytechnic students, who fit into the theoretical value system have self-efficacy, being the largest percent, compared with the other value systems. 41.7% of the Psychology students, who fit into the social value system, have self-efficacy. Also, 41.7% of them, who fit into the religious value system have self-efficacy.

Table 2-Association between faculty, value system and self-efficacy

| Self-efficacy Present | Theoretical | Economic | Social | Political | Esthetic | Religious |
|---|---|---|---|---|---|---|
| AES | 28.6% | **35.7%** | 28.6% | 0% | 0% | 7.1% |
| Polytechnic | **35.7%** | 28.6% | 28.6% | 0% | 7.1% | 0% |
| Psychology | 0% | 0% | **41.7%** | 8.3% | 8.3% | 41.7% |
| Self-efficacy Absent | Theoretical | Economic | Social | Political | Esthetic | Religious |
| AES | 31.2% | **25.0%** | 18.8% | 18.8% | 0% | 6.2% |
| Polytechnic | **37.5%** | 12.4% | 25% | 6.2% | 12.5% | 6.2% |
| Psychology | 11.1% | 0% | **22.2%** | 5.6% | 27.8% | 33.3% |

The third hypothesis presupposes that there is a connection between decisional style and faculty profile, as follows: the first working hypothesis presupposes that students from the AES have a predominantly rational decisional style. This is validated, results show that 66.7% of the student participants from the AES have a rational decisional style. The second hypothesis presupposes that students in the Polytechnic have a predominantly rational decisional style. This was invalidated, results showing that the greatest percent, 33.3% of Polytechnic students have a dependent decisional style, followed by a rational decisional style, 30% of them. The third working hypothesis presupposes that Psychology students have an intuitive decisional style. According to the results, this is validated. 40% of the Psychology students have an intuitive decisional style.

Table 3- Association between faculty and decisional style

| Faculty | Decisional Style | | | | |
|---|---|---|---|---|---|
| | Theoretical | Economic | Social | Political | Esthetic |
| AES | **66.7%** | 13.3% | 0% | 10% | 10% |
| Polytechnic | **30%** | 33.3% | 13.3% | 16.7% | 6.7% |
| Psychology | 33.3% | 16.7% | 10% | **40%** | 0% |

The fourth working hypothesis presupposes that there are differences in the compatibility with the faculty profile, depending on gender. Results show that this is validated, as follows: regarding AES students, results show that 36.4% of the students who fit the economic profile of the faculty are female, and only 12.5% are male. From the Polytechnic students who fit the theoretical profile of the faculty, 53.3% are female, while 20% are male. From the Psychology students who fit the social profile of the faculty, 37.5% are male, and 27.3% are female.

Table 4-Association between faculty, value system and gender

| Male | | Theoretical | Economic | Social | Political | Esthetic | Theoretical |
|------|------|------|------|------|------|------|------|
| | AES | 37.5% | **12.5%** | 25.0% | 12.5% | 0% | 12.5% |
| | Polytechnic | **20.0%** | 20.0% | 40.0% | 6.7% | 6.7% | 6.7% |
| | Psychology | 12.5% | 0% | **37.5%** | 0% | 12.5% | 37.5% |
| Female | | Theoretical | Economic | Social | Political | Esthetic | Theoretical |
| | AES | 27.3% | **36.4%** | 22.7% | 9.1% | 0% | 4.5% |
| | Polytechnic | **53.3%** | 20.0% | 13.3% | 0% | 13.3% | 0% |
| | Psychology | 4.5% | 0% | **27.3%** | 9.1% | 22.7% | 36.4% |

Regarding the hypothesis that there are differences in the degree of self-efficacy according to gender, this is validated, results showing that self-efficacy is present in 54.8% of the male participants, a greater percent, compared with 39% of the female participants.

Table 5-Association between self-efficacy and gender

| | Self-efficacy | |
|------|------|------|
| **Gender** | Absent | Present |
| Male | 54.8% | 45.2% |
| Female | 39% | 61% |

The hypothesis which presupposes that there is a correlation between decisional style and value system was invalidated. Results show that there is no correlation between the two variables, for $p=0.15$.

The hypothesis which presupposes that there is a correlation between decisional style and self-efficacy was invalidated. Results show that there is no correlation between the two variables, for $p=0.14$.

## 5. CONCLUSIONS

The low number of students who fit the profile of their chosen faculty can be put down to the lack of students' knowledge regarding their abilities, interests and personal values and their importance in choosing a field of activity. Young people choose this field on the basis of other criteria such as parents or friends suggestions, the financial attractiveness of certain fields, or the ease with which they can access that field.

The hypothesis that the more the value system corresponds to the faculty profile, the more self-efficacy increases, is validated. This can be due to the fact that a person who has better knowledge of its abilities, interests and personal values and orients itself according to them, becomes a person who is confident that it can

organize, carry out and adapt strategies in order to obtain the desired results. These people can set themselves high goals, invest more effort and more time into solving a difficult task. These results have been supported by other authors, for example Honicke & Broadbent (2016).

Regarding the decisional style, results confirmed that AES students have a predominantly rational decisional style. In the economic field, the individual uses a logical and organized approach to decision-making, and he has to elaborate detailed plans and take into account all the alternatives.

With regard to the decisional style of the Psychology students, results have confirmed that it is mostly intuitive. Here a person focuses on intuition and its own impressions when making a decision, instead of looking for evidence to support decision-making, and does what he/she feels it is best. These results have been supported by other authors (Bergeron & Romano, 1994).

The limits of this research are the low number of participants, who were not chosen randomly, and the fact that variables such as the environment, the economic status and the grade average for entrance into the faculty were not taken into account.

Its contribution consists in emphasizing the fact that in the academic environment, only a low number of students fit the profile they have chosen, which leads to low self-efficacy. From here future directions might be creating strategies and programmes of vocational counselling, which should lead to an increase in the percentage of students who fit the faculty profile.

Such an undertaking will shortly lead to an increase in job performance and job satisfaction in the Romanian society as well as to an increase in the number of specialists available on the job market.

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# SENZATION SEEKING AND VIOLATION OF TRAFFIC RULES PREDICTORS FOR DRIVING PERFORMANCE

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*Abstract*

*The objectives and hypotheses are focused on evidencing how the sensation seeking factors and violation of traffic rules predict the driving performance. Method: The participants were 40 drivers aged between 25 and 50 years old, the driver license minimum 5 years from Bucharest. Instruments: The Arnett Inventory of Sensation Seeking (Arnett, 1994), the Manchester Driving Behavior Questionnaire (Reason, Manstead, Stradling, Baxter & Campbell, 1990) and the number of small accidents, traffic errors and warnings. Results and Conclusions: The assumptions of the present study have been partially confirmed. Hence, violation of rules predicts the traffic errors, the intensity as dimension of sensation seeking predicts small accidents in traffic and the violation of rules dimension predict the traffic warnings (p<.05). Further studies shall investigate the gender differences in sensation seeking novelty and intensity and violation of speed limits. Also, the driver population research sample should be enlarged.*

*Keywords: sensation seeking, driving behavior, rule violation, traffic errors.*

## 1. INTRODUCTION

Jain, Kontogiannis, Kossiavelou & Marmaras (2002) conducted a study focused on evidencing the driving performance predicted by errors, speed convictions and violations. The authors were interested to analyze driving performance variables in the way of accidents predicted by aberrant driving behavior. Hence, they presented in their study the aberrant driving behavior from the perspective of errors, convictions and violations. Hence, they identified three types of violations: highway code, aggressive driving behavior and situational violations. They find out that tendency to commit highway-code violations predict accident liability and aggressive violations were statistically significant correlated with speed involvement convictions and law-breaking.

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Arnett (1994) page 291 presents a correlation table between novelty and intensity as scales of the sensation seeking scale and risky behavior in traffic with the dimensions: driving over the speed limit, car racing, vandalism and others. The internal consistency coefficients were between .81 and .87.

Zuckerman & Aluja (2014) were interested to investigate the measures of sensation seeking. In this book chapter, the authors cited previous studies of Zuckerman highlighting that the high and low scores of the sensation seeking scale depend on genetic, biochemical, physiological and neurological individual differences. In this way Zukerman (2005, 2007, 2008a, 2008b, 2011) cited by Zuckerman & Aluja (2014) developed the biosocial theory of sensation seeking as part of the personality construct.

Either Arnett (1994) or Zuckerman & Aluja (2014) underline the importance of the Sensation Seeking Scale of Zuckerman (1964) and present references in their studies about this scale. The Sensation Seeking Scale developed by Zuckerman (1964) consists of 40 items and is structured on the following dimensions: Thrill and Adventure Seeking, Experience Seeking, Disinhibition and Boredom Susceptibility.

Amirfakhraei, Taghinejad & Sadeghifar (2013) were interested to investigate the relationship between risky driving behavior and sensation – seeking. The sample was a number of 200 students from Islamic Azad University. The authors applied the Manchester Driving Behaviour scale and the Zukerman Sensation Seeking scale due to evidence the relationship between the variables. Hence, the findings highlighted that total score of sensation-seeking correlate statistically significant with the total score of the driving behavior scale. Also, the authors evidence that the sensation seeking factors correlate statistically significant with the driving behavior total score. Furthermore, the authors find out the significant correlations between the traffic violation and traffic speed.

Zahra, Neda, Mehran & Mohammad (2017) conducted a study focused on the relationship between the sensation-seeking and dangerous driving behaviors in Iran. The findings highlighted that the sensation seeking factors measure with the Sensation Seeking Scale developed by Zuckerman (1964) predicted dangerous driving behaviors measured with the Manchester Driver Behavior Questionnaire. Furthermore, the authors evidence a statistically significant correlation between the adventure-seeking, boredom susceptibility and dangerous driving behaviors.

Zhang, Fu & Guo (2011) were interested to evidence the relationship between the risk attitude, perception, behavior, personality and driving risk awareness in China. The participants were 196 drivers and completed paper pencil the Risk Attitude Scale (mixed item from research questionnaires), Risk Perception Scale (mixed item from research questionnaires), Risk Behavior Scale (mixed item from research questionnaires) and Sensation Seeking Scale - Chinese version translated by Chunxing (1994). The authors calculate all the psychometric indicators,

factorial analysis and provide a model of "Sensation seeking as an indicator of a driver's risk awareness" (Zhang, Fu & Guo, 2011, page 10).
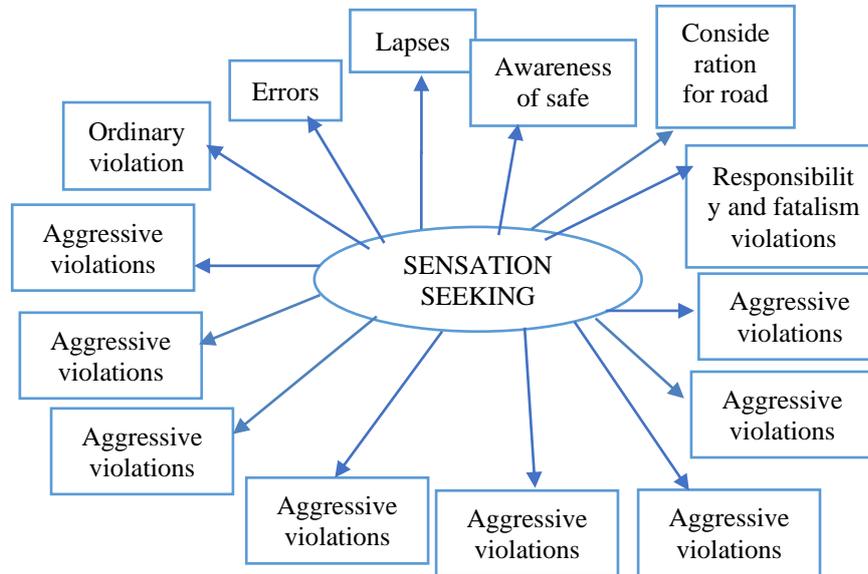


Figure 1 The model of "Sensation seeking as an indicator of a driver's risk awareness" (Zhang, Fu & Guo, 2011, page 10).

Sârbescu (2013) conducted a study investigating the psychometric properties of the Manchester Driver Behaviour Questionnaire on 200 participants, Romanian sample.

Yilmaz & Celik (2006) investigated the risky driving attitudes and traffic violations on a sample of 600 individuals driving different types of vehicles in Eskişehir-Turkey. The authors selected risky driver attitudes in traffic: the recklessness attitudes towards traffic safety, and risk behavior questionnaire by Ulleberg & Rundmo (2003) and the driver's behavior developed by Reason et al. (1990). The findings evidenced that the fourth hypotheses confirmed and using the factor analysis, the path model explained 82% of the total variation taking in analyze the risky driver attitudes variable. Hence, the risky driver attitude is related with the variables: obedience to speed rules, caring about traffic accidents, risk taking tendency and violations of rules.

Iversen (2004) conducted a study regarding the relationship between risk-taking attitudes and risky driving behavior. The sample consists in a number of 1604 of drivers. The findings confirmed the hypotheses and evidenced that the

assuming the risk variable is related with the accidents and crashes occurred while driving after risk assuming.

## 2. OBJECTIVE AND HYPOTHESES

### 2.1. OBJECTIVE

The general objective of the research is focused on highlighting the fact that violation of the rules and sensation seeking are predictors of the small accidents, traffic warnings and traffic errors.

### 2.2. HYPOTHESES

The hypotheses are testing the bivariate correlation and also the prediction.

The general hypothesis of the study evidence that sensation seeking and rule violation are predictors for small accidents, traffic errors and traffic warnings.

The hypotheses of the study are the followings:
1. We assume that there is a statistically significant correlation between the novelty as sensation seeking dimension and traffic errors.
2. We assume the novelty as dimension of sensation seeking is predictor for traffic warnings.
3. We assume the intensity as dimension of sensation seeking is predictor for the number of the small accidents in traffic.
4. We assume that the violation of the rules is predictor for the traffic errors.
5. We assume that the violation of the rules is predictor for small accidents.
6. We assume that violation of the rules is predictor for traffic warnings.

## 3. METHOD

### 3.1. THE PARTICIPANTS

The participants were a number of 40 drivers with minimum 5 years of experience, age between 25 and 50 years old, Bucharest Romania.

### 3.2. THE INSTRUMENTS

The Arnett Inventory of Sensation Seeking assesses the sensation seeking traits of personality (Arnett, 1994). The two dimensions of the inventory indicate the risk preferences highlighted by the 20 items. As the author evidenced in this inventory, sensation seeking is defined as a need for novel and intense stimulation

(Arnett, 1994). The AISS inventory in structured on items using a scale in four points from 1 to 4 and the internal consistency coefficients were between .81 and .87.

Manchester Driving Behavior Questionnaire (Reason, Manstead, Stradling, Baxter & Campbell, 1990) is designed on two dimensions: rule violation and errors from a point-scale from 1 to 6. In the present study the Canadian version was applied. Wåhlberg, Dorn & Kline (2011) highlighted in their study that the questionnaire has start point in the error theory of Reason (Reason, 1987; Reason, Manstead, Stradling, Baxter & Campbell, 1990) cited by Wåhlberg, Dorn & Kline (2011) and also the measures of the aberrant driving behaviours quantified as errors, lapses and rules violations). From MDBQ questionnaire was applied only the rule violation scale.

The driving performance questionnaire with 3 items: number of small accidents, traffic errors and warnings.

### 3.3. PROCEDURE

The instruments were applied paper and pencil respecting the anonymity, ethics in research and the GDPR legislation was respected. The instruments were applied between 14 and 18 PM in different location, most of the participants were undergraduate and master students.

### 3.4. THE DESIGN

Testing the hypothesis with the regression model the variables are:
1. Independent variables: novelty and intensity as dimension for the sensation seeking and the rule violation for the driving behaviour,
2. Dependent variables: number of small accidents, number of traffic warnings and number of traffic errors.

### 4. RESULTS

The first hypothesis of the study was tested using the Pearson bivariate correlation statistical test. Hence, there is a statistically significant bivariate correlation between the novelty as sensation seeking personality trait and traffic errors as measure of driving performance (r=-.522; p<.01).

Testing the second hypothesis regarding the novelty (dimension of sensation seeking) is predictor for traffic warnings, the simple regression model has been applied. According to the results, the hypothesis has not been confirmed.

The third hypothesis "We assume the intensity as dimension of sensation seeking is predictor for the number of the small accidents in traffic" has been tested and the results can be seen in table 1.

In the table 1 can be seen the Constant, the Unstandardized Coefficients and the Standardized Coefficients of the regression model.

Table 1 – Coefficients[a]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | **B** | **Std. Error** | **Beta** | **t** | **Sig.** |
| 1 | (Constant) | 40.239 | 8.473 | | 4.749 | .000 |
| | Intensity-sensation seeking | .486 | .223 | .334 | 2.182 | .035 |

a. Dependent Variable: Small accidents

Small accidents =40.239+.486* Intensity-sensation seeking
Also, the values for R and R Squared are the followings: R= .334 and R Squared=.111.

The fourth hypothesis of the study "We assume that the violation of the rules is predictor for the traffic errors." has been has been tested using the simple regression model. The results can be seen in the table 2.

Table 2– Coefficients[a]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | **t** | **Sig.** |
| 1 | (Constant) | 5.728 | .757 | | 7.563 | .000 |
| | Violation of the rules | .330 | .072 | .597 | 4.585 | .000 |

a. Dependent Variable: Traffic errors

The regression equation according table 2 is the following (confirmed hypothesis at threshold p<.01):

Traffic errors =5.728+.330* Violation of the rules

For testing the fifth hypothesis of the study "We assume that the violation of the rules is predictor for small accidents" the linear regression model has been applied.

In table 3 can be seen the Constant, the Unstandardized Coefficient and the Standardized Coefficients values.

Table 3– Coefficients[a]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 53.201 | 1.752 | | 30.368 | .000 |
| | Violation of the rules | .542 | .166 | .467 | 3.258 | .002 |

a. Dependent Variable: Small accidents

According the table 3 the regression equation is the following confirmed hypothesis at threshold p<.01):

Small accidents =53.201+.542* Violation of the rules
The values for R and R Squared are the followings: R= .467 and R Squared=.467.

Testing the sixth hypothesis with the simple linear regression model "We assume that violation of the rules is predictor for traffic warnings", the results can be seen in the table 4.

Table 4– Coefficients[a]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 56.839 | 1.713 | | 33.180 | .000 |
| | Violation of the rules | .410 | .163 | .379 | 2.521 | .016 |

a. Dependent Variable: Traffic warnings

According the table 4 the regression equation is the following:

Traffic warnings =56.839+.410* Violation of the rules
     Hence, the hypothesis has been confirmed (p<.05).


## 5.  CONCLUSIONS

The results evidenced that testing the first hypothesis the novelty as sensation seeking personality trait correlate statistically significant negative with the number of traffic errors as measure of driving performance (r=-.522; p<.01).

These findings explain that a high level of novelty as sensation seeking correlate with small number of traffic errors. Also, the novelty doesn't predict the number of traffic warnings (the second hypothesis was not confirmed). Regarding the intensity as dimension of sensation seeking the hypothesis has been confirmed statistically significant that predicts in a positive way the number of the small accidents in traffic. Reading the items of the intensity dimension of the sensation seeking can be observed that the high level of the implications in assuming risk actions predict high number accidents in traffic. Also, the violation of the rules predicts statistically significant the number of the traffic errors, small accidents and traffic warnings (p<.05). The scientific literature supports the results (Amirfakhraei, Taghinejad & Sadeghifar, 2013; Erke, 2009; Goldenbeld, 2017; Klauer, Guo, Simons-Morton, Ouimet, Lee & Dingus, 2014; Reason et al. 1990; Rizeanu, Gatej, Ciolacu, 2017; Yilmaz & Celik, 2006). Further studies should investigate the relation between the speed limit violation and the sensation seeking, and traffic performance.

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# THE RELATIONSHIP BETWEEN MINDFULNESS, ANXIETY AND SELF ESTEEM

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***Abstract***

*Mindfulness is essential in Buddhist teachings and denotes a careful state of mental perception (individual perceptions, sensations, thoughts and feelings) (Walach, Buchheld, Buttenműller, Kleinknecht & Schmidt, 2006). The objectives of the study are focused on evidencing the relations between the variables: self-esteem, anxiety and mindfulness. The hypotheses tested the bivariate correlation between the anxiety and low level of self-esteem and also the prediction between the mindfulness dimensions, and anxiety and self-esteem. The method: The participants are a group of 53 people aged between 22 and 45, both women and men. The instruments are the followings: The Five-factor Mindfulness Questionnaire (FMQ) (Baer et al., 2006); Coopersmith Self-Esteem Inventory (Coopersmith, 1967); General Anxiety Questionnaire (Spitzer, Kroenke, Williams & Lowe, 2006). The variables for testing the predictive models were the followings: Independent variables: Observing, Nonjudging of inner experience, Nonreactivity to inner experience and Dependent variables: Self-Esteem, Low level of anxiety. The results confirmed the hypotheses at statistically significant level (p<.05). Future directions on the study are focused on the relationship between mindfulness and organizational variables as: burnout, work involvement, overload work and many others.*

***Keywords:*** *mindfulness, observation, nonjudging of inner experience, nonreactivity to inner experience.*

## 1. INTRODUCTION

Jain Veneziani & Voc (2015) adapted the Cognitive and Affective Mindfulness Scale-Revised on an Italian population. The authors underline that Feldman, Hayes, Kumar, Greeson & Laurenceau (2007) highlighted that mindfulness include four dimensions: Attention, Present focus, Awareness and Acceptance. The study focused on validation of the CAMS-R scale on the Italian

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population and running the factorial analysis in order to load the items on the fourth factors.

The authors tested the convergent validity between the Italian version of CAMS-R and the Mindful Attention Awareness Scale (Brown & Ryan, 2003). The authors tested the confirmatory factor analysis and after the participant's reduction to a sample of 407, the goodness-of-fit indexes sustained the model.

The main objectives of the authors Kotzé & Nel (2016) were interested to analyse the psychometric properties of the Mindful Attention Awareness Scale and also the Freiburg Mindfulness Inventory. Both inventories measure facets of the mindfulness. The authors conducted a Confirmatory Factor Analysis (CFA) and the indicators sustained the model. Also, the Alpha Cronbach reliability was above .70.

Comparing the reliabilities and validity of the Mindful Attention Awareness Scale and also the Freiburg Mindfulness Inventory on a South African sample, the findings evidenced the unidimensional factor structure.

Dekeyser, Raes, Leijssen, Leysen & Dewulf (2008) were interested to study the relationship between mindfulness skills and interpersonal behaviour. The authors were interested to investigate the factor structure and the reliability of the Kentucky Inventory of Mindfulness Skills (Baer, Smith, & Allen, 2004). They replicate the factors of the instrument: Observe, Describe, Act with Awareness and Accept without Judgement. The mindfulness factors were positively and statistically significant associated with expressing oneself in social situations. The observation factor was associated with the engagement in empathy.

Baas, Nevicka & Ten Velden (2014) were interested to study the relationship between the mindfulness and the creativity. The mindfulness instrument was the MAAS scale (Brown & Ryan, 2003). For the creativity (Creative achievements and behaviour) measurement the authors used the scale Creative Achievement Questionnaire (Carson et al., 2005). In order to measure the creativity in an optimum assessment, the authors used the "Creative ideation" performance test. They found out that the observation dimension of the mindfulness scale is statistically significant related with the variables: creative achievements, self-reported creativity, and originality of ideas. the flexibility played a mediating role between the observation and creativity. In the third study the authors highlighted that mindfulness dimensions description act with awareness are predictors for the creative achievement, creative behaviour and originality.

Shapiro, Carlson, Astin & Freedman (2006) were interested to study the implications of mindfulness either in physical or physical symptoms.

Pepping, O'Donovan & Davis (2013) conducted two studies focused on evidencing the positive effects of mindfulness on self-esteem. The authors found out that the four facets of the mindfulness scale predict the variables self-esteem

and life satisfaction. The experimental design from the second study highlighted that the mindfulness state induced had effects in increasing the level of self-esteem.

Greeson & Brantley (2009) were interested to evidence the relationship between mindfulness and anxiety disorders taking as central element the fear experience.

Quaglia, Braun, Freeman, McDaniel & Brown (2016) conducted a meta-analytic study highlighting effects of mindfulness training on the dispositional mindfulness. In their study, the authors analysed the Five Facet Mindfulness Questionnaire (Baer et al., 2006), Kentucky Inventory of Mindfulness Skills (Baer et al., 2004), Mindful Attention Awareness Scale (Brown & Ryan, 2003) and Philadelphia Mindfulness Scale (Cardaciotto et al., 2008). The meta-analytic study included a number of 88 articles based on the effect of mindfulness training on the variable mindfulness as self-reported.

Webb, Beard, Forgeard & Björgvinsson (2019) were interested to evidence that the mindfulness factors predict the anxiety and depression. The participants were a number of 134 patients (ages 18–72 years old), patients with anxiety and depression that were able to complete the questionnaires. The authors used the Five Facet Mindfulness Questionnaire – Short Form (Bohlmeijer et al. 2011), Cognitive Behavioral Therapy-Skills Checklist (Jarrett et al. 2011), Patient Health Questionnaire – 9 Items (Kroenke and Spitzer, 2002), Generalized Anxiety Disorder Scale – 7 Items (Spitzer et al., 2006), Miniature International Neuropsychiatric Interview (Sheehan et al., 1998). The findings highlighted the association between mindfulness skills according the five facets mindfulness scale, cognitive behavioural scale and both depressive and anxiety symptoms improvement. The authors were interested to evidence the behavioral activation, cognitive restructuring in predicting anxiety symptom change. They find out that nonreactivity predicts symptom change as individuals with higher levels of anxiety may have a positive improvement from mindfulness training. Baer (2011) was interested to investigate the methods for assessing psychological variables and the development of mindfulness questionnaires.

## 2. **OBJECTIVE AND HYPOTHESES**

### 2.1. OBJECTIVE

The general objective of the research highlights the relations between mindfulness, general anxiety and self-esteem.

Secondary objectives:

- Establishing bivariate correlation between self-perceived anxiety and self-esteem.
- Establishing regression models in order to be able to predict the level of anxiety starting from the ability to detach, relax, tend to meditate and reduce voluntary control.

## 2.2. HYPOTHESES

The research hypotheses are both bivariate correlation between variables and prediction.

1. We assume that there is a statistically significant correlation between high anxiety level and low self-esteem.
2. The tendency to observe things naturally (involuntarily, undirected) predicts an increased level of self-esteem.
3. Non-reactivity to inner experience predicts a low level of anxiety.
4. Not judging future experience predicts a low level of anxiety.

## 3. METHOD

### 3.1 THE PARTICIPANTS

The participants were a group of approximately 53 people aged between 22 and 45, both women and men from different professional backgrounds. They responded by filling out a Google document form.

### 3.2. THE INSTRUMENTS

1. The five-factor Mindfulness Questionnaire (FMQ) (Baer et al., 2006) consists of 5 factors with a number of 39 items on the Likert scale from 1 to 5. The five factors of the questionnaire are the followings: Observing, Describing, Acting with Awareness, Nonjudging of inner experience, Nonreactivity to inner experience.
2. Coopersmith Self-Esteem Inventory (Coopersmith, 1967) - the internal consistency (Alpha Cronbach) is estimated between 0.61 and 0.71. The reliability was estimated by Johnson et al. (1983). Test-retest reliability was estimated at 0.88 (Coopersmith, 1967). For the present study it was calculated the total score of the self -esteem scale.
3. General Anxiety Questionnaire (Spitzer, Kroenke, Williams & Lowe, 2006) with 7 items on a scale from 1 to 4.

Löwe et al. (2008) investigated the structure of GAD-7 factor on a group of 5030 people reporting one-dimensional structure in a nationally representative

study. Kertz et al. (2013) used confirmatory factor analysis (CFA) in an acute psychiatric sample of 232 patients.

Studies on psychometric characteristics were conducted regarding: internal consistency, test-retest fidelity, criterion validity, construct validity, concurrent validity and convergent validity (Löwe et al. 2008; Mossman et al. 2007; Ruiz et al. 2011).

### 3.3. PROCEDURE

The Ethical code and GDPR legislation for research were respected. The instruments were applied on-line by filling out a Google document form. The participants were informed about the research consent and also about the anonymous identity.

### 3.4. THE DESIGN

Testing the correlation hypothesis the variables were: low self-esteem and anxiety.

In order to test the regression hypotheses, the variables were the followings:

- Independent variables: Observing, Nonjudging of inner experience, Nonreactivity to inner experience,
- Dependent variables: Self-Esteem, Low level of anxiety.

## 4. RESULTS

After the data collection the hypothesis were tested using the program SPSS.

Testing hypothesis 1: 'We assume that there is a statistically significant correlation between anxiety level and low self-esteem'. The low self-esteem variable was obtained reversing the items of the self-esteem questionnaire.

Table 1 – Correlation matrix

|  | low self-esteem | anxiety |
| --- | --- | --- |
| low self-esteem | 1 | r = .894 |
| anxiety | r = .894 | 1 |

The hypothesis was statistically significantly confirmed at the .01 threshold with a Pearson bivariate correlation coefficient r = .894

Testing the second hypothesis: "The tendency to observe things naturally (involuntarily, undirected) predicts an increased level of self-esteem." In table 2 can be seen the R and R Square values for the prediction model. For testing this

hypothesis, the variable self-esteem was calculated as the sum of all the items of the questionnaire after reversing the low self-esteem items.

Table 2 – Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .958a | .918 | .916 | 5.26 |

a. Predictors: (Constant), Self-Esteem

b. Dependent Variable: Observe

In the table 3 can be seen the Constant, the Unstandardized Coefficients and the Standardized Coefficients of the regression model.

Table 3 – Coefficients[a]

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | (Constant) | 1.509 | 1.296 | | 1.764 | .050 |
| | Observing | 2.166 | .091 | .958 | 23.852 | .000 |

a. Dependent Variable: Self-Esteem

Hence, the hypotheses regarding the dimension observing of the mindfulness as predictor for the self-esteem has been confirmed at the significance p=.029<.05. The regression equation according the presented model is the following:

Self-Esteem =1.509+2.166* Observing

Testing the third hypothesis regarding the "Non-reactivity to inner experience predicts a low level of anxiety", the R and R Square values can be seen in the table 4.

Table 4– Model Summary[b]

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .881a | .776 | .771 | 6.8660 |

a. Predictors: (Constant), Non-reactivity to inner experience

b. Dependent Variable: Low level of anxiety

According the standardized coefficients for the regression model, the regression equation is the following:

Low level of anxiety =3.812-1.262* Non-reactivity to inner experience

Hence, the hypothesis has been confirmed for the statistically significant threshold p<.01.

The fourth hypothesis "Not judging future experience predicts a low level of self-perceived anxiety" was tested with the simple linear regression model.

In the table 5 can be seen the R and R Square values for the regression model.

Table 5 – Model Summary[b]

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .885a | .783 | .779 | 6.75 |

a. Predictors: (Constant), Not judging future experience

Appling the linear regression model, the regression equation is the following:

Low level of anxiety =3.343-1.276* Not judging future experience

Hence, the hypothesis has been confirmed for the statistically significant threshold p<.05.

## 5. CONCLUSIONS

The research hypotheses were confirmed at the statistically significant threshold p<.05. The five facets of the mindfulness questionnaire: Observing, Describing, Acting with awareness, Nonjudging of inner experience, Nonreactivity to inner experience are basic variables in establishing low level of anxiety (Webb, Beard, Forgeard, & Björgvinsson, 2019). Hence the results highlight that the dimensions non-reactivity to inner experience and not judging future experience predict statistically significant (p<.05) the low level of anxiety. The observing dimension of the mindfulness scale predicts statistically significant positive the level of self-esteem (p=.029<.05). Brown & Ryan (2003) highlighted the importance of the mindfulness in psychological wellbeing. Also, Pepping, O'Donovan & Davis (2013) supported by their study the positive effects of mindfulness on self-esteem. The findings by testing the first hypothesis evidence that anxiety level and low self-esteem are positive statistically significant correlated (p<.05). As support for the findings, Sowislo & Ulrich (2013) in their study presented at page 217 the relation between low self esteem and anxiety.

Further studies will start from the findings and shall be relate the mindfulness, anxiety and self-esteem with organizational variables as: burnout, work involvement, overload work and many others.

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# TRANSFORMING LIKERT SCORES TO RATIO SCALE

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***Abstract***

*Two methods of scoring Likert items as weighted sum are proposed with different weights to response categories of different items using only the frequencies of Item–Response categories. The methods result in continuous data satisfying equidistant property with specified zero value and thus provide platform to perform parametric analysis. Proposed approaches made the data homogenous and distinguished the same summative score on the basis of how the score was obtained. The proposed methods and the summative score method passed normality test and produced same number of independent factors with different factor loadings. Reconciliation of the ordinal - interval controversy is reached in the sense that there may not be much harm in using summative Likert scores which correlates high with the weighted sum approaches. However, considering the theoretical advantages including meaningfulness of operations and comparisons, platform to undertake parametric statistical analysis and easiness to compute weights, no tied scores and no outliers, method based on area under the N (0, 1) may be used for making equidistant Likert scores.*

**Keywords:** *Likert items, weighted sum, monotonic and equidistant, normal curve, ordinal-interval*

## 1. INTRODUCTION

Likert scales are used frequently in social science, health status, and survey. However, concern is raised on measurement aspects of ordinal data with unknown distance between successive categories, generated by such a scale and associated operations to permit parametric analysis and hence validity of outcomes. Lantz, ( 2013) observed that the subjects do not perceive Likert type scale as equidistant and suggested further studies on subject perceptions for such scale. Predominance of articles treating ordinal data as interval was observed by Harwell & Gatti, (2001).

Large volume of literature exists on controversy between treating ordinal data as interval and use of parametric analysis (Wilson, 1971; Gaito, 1980; Townsend & Ashby, 1984; Narens & Luce, 1986; Velleman & Wilkinson, 1993; Zumbo &

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Zimmerman, 1993; Hand, 1996; Jamisson, 2004). Major reasons of such ordinal – interval controversy appears to be non- availability of a globally accepted transformation of Likert scores satisfying desired properties from measurement theory point of view. Wu and Leung, (2017) suggested increasing the number of Likert scale points to 11 to bring the scale closer to the underlying distributions with lower values of Kolmogorov-Smirnov (KS) statistics and interval scale. However, increasing Likert scale points may aggravate the problem of non-equidistance in Likert items.

The problem of ordinal data has been addressed by researchers in terms of rescaling ordinal data to scales having properties of interval level measurement so that parametric statistics can be used. The following important approaches merit consideration:

i) Alternative least squares optimal scaling (ALSOS): A model driven technique by Jacoby (1999) to provide optimal set of measurement values assuming that the respondents construe questions in a similar way. The assumption is generally not found to be true and failure to correctly specify the model will result in biased values of the optimally scaled variables generated from iterative process.

ii) Item response theory (IRT): It is theoretically sound and needs satisfaction of rigorous assumptions. Further explorations may be made for Likert scale with no "correct" or "wrong" answer, Granberg-Rademacker (2010). Harwell and Gatti (2001) used IRT to rescale scores from 5-point rating scale into intervals and found that the model did not adequately fit the data. From IRT, even large ordinal scales can be radically non-linear.

iii) Anchoring vignettes (AVs): Advocated by King et al. (2003) attempts using AVs to better mitigate the problem of differential item functioning (DIF). AVs are application-specific remedies that ask respondents to answer questions about hypothetical aspects described in the vignettes. AVs offer a strong theoretical and practical way of handling DIF, but have practical difficulties like need to have more than one vignette for a given latent attitude or variable and vignette responses are not available in secondary datasets.

iv) Markov Chain Monte Carlo Scaling (MCMC): By Granberg-Rademacker (2010) is a method based on a multivariate normal distribution and Bayesian methodology to find prior information about the latent, unobserved variable to calculate the posterior distribution, requiring a number of iterations. Empirically, MCMC performed better than OLS, ALSOS monotonic, and ALSOS non-monotonic approaches.

In addition to complex procedure involved in each of the above said method of conversion, question arises on how accurate the rescaled data represent the actual data. Score of a subject in Likert scale is obtained by adding his/her score in each item, presuming that the items have equal weights. But a particular score may

be obtained by several subjects in several fashions. Thus, interpretation of score of a subject needs to consider how the score was obtained i.e. to consider the response categories of the items endorsed by the subject. Moreover, results of Factor Analysis (FA) usually revels that factor loadings of the items comprising that scale differ and thus contradicts justification of equal weights to the items. If Principal Component Analysis (PCA) is conducted, sum of factor loadings is in general different from one. FA or PCA attempts to assign different weights to different items. Attempts to have different weights to different response categories of different items to score Likert items are rather rare. Barua (2013) used weights to each Likert item of the questionnaire considering item score, weights by Content Experts, internal reliability or Cronbach's alpha and Item discrimination index (IDI) in terms of Spearman's Correlation. Major limitations of this approach are (i) Item score assumes equal weights to items, (ii) Weights by Content Experts are subjective. Reliability or agreement among the experts needs to be considered also (iii) IDI as Spearman correlation with total score and Item reliability as correlation between item score and total score - are questionable. If all subjects choose a particular response category of an item, variance of the item is zero and thus correlation with total score or with any other item is undefined. Cronbach's $\alpha$ may not perform well for discrete data with more than one dimension. Zijlmans et al. (2018) observed that Cronbach's $\alpha$ cannot be used to estimate item-score reliability, (iv) There are other methods with different sets of assumptions to measures Item discrimination index. Suitable measure of weights to items can be attempted where weights are not calculated using sum of Likert scores since addition may not be meaningful.

Thus, need is felt to have new methods of scoring Likert items as weighted sum where weights are assigned to different response categories using only the frequencies or empirical probabilities of Item – Response categories to have continuous data satisfying desired properties and providing a platform to perform analysis parametric set up and to compare the methods and also to have reconciliation of debate on ordinal vs. interval level of Likert scoring in terms of correlation between proposed weighted sum approaches and usual summative scores.

The rest of the paper is structured as follows. In the following Section, the methodology for obtaining weights to response categories of Likert items is presented. Section 3 elaborates on such weights and properties of such weighted sums. Empirical verification for the proposed methods is discussed in Section 4. The paper is rounded up in Section 5 by recalling the salient outcomes of the work and suggesting reconciliation of debate on ordinal vs. interval level.

## 2. METHODOLOGY

The starting point is the basic Item- score matrix $((X_{ij}))$ where $n$-individuals are in rows and scores of $m$- Likert items are in columns and $X_{ij}$ represents score of the $i$-th individual in the $j$-th item and takes discrete value between 1 to 5 for a 5-point scale.

For the usual summative scoring method, $\sum_{j=1}^{m} X_{ij}$ gives score of the $i$-th individual; $\sum_{i=1}^{n} X_{ij}$ indicates score of the $j$-th item and total test score i.e. sum of scores of all the individuals on all the items is obtained by $\sum_{i=1}^{n} \sum_{j=1}^{m} X_{ij}$.

Instead of assigning weights to items, it may be prudent to assign different weights to different response categories for different items, where the weights are positive and satisfy $\sum_{j=1}^{5} W_{ij} = 1$. The transformed score of the $i$-th subject for choosing the $j$-th response category of an item is $W_{ij} X_{ij}$. Thus, both individual scores and item scores provide measurements of continuous variable. However, the transformed scores as weighted sum should satisfy the equidistant property i.e. $5W_5 - 4W_4 = 4W_4 - 3W_3 = 3W_3 - 2W_2 = 2W_2 - W_1$. The condition is satisfied if and only if $W_1, 2W_2, 3W_3, 4W_4, 5W_5$ forms an Arithmetic Progression (AP). A positive common difference ensures that for an item, if a subject chooses $j$- th response category (say 4), his/her transformed score for the item must be greater that the transformed score if he/she had chosen $(j-1)$-th response category (say 3).

To ensure satisfaction of the equidistant property, it is proposed to derive initial weights $\omega_{ij}$ by suitable methods so that $\omega_{ij} > 0$ and $\sum_{j=1}^{5} \omega_{ij} = 1$, followed by correction factor, based on which intermediate weights $W_{ij}$ for $j=$ 1, 2, 3...5 are to be calculated and finally selected weights may be obtained by $W_{ij(Final)} = \frac{W_{ij}}{\sum_{j=1}^{5} W_j} = 1$.

If common difference is denoted by $\alpha > 0$ and $W_1 = \omega_1$, then $\alpha = 2W_2 - W_1 \Longrightarrow W_2 = \frac{\omega_1 + \alpha}{2}, W_3 = \frac{\omega_1 + 2\alpha}{3}, W_4 = \frac{\omega_1 + 3\alpha}{4}$ and $W_5 = \frac{\omega_1 + 4\alpha}{5}$

Note that

i) The above said method of finding common difference holds irrespective of process of finding initial weights so long the initial weights add up to one.

ii) However, a negative $\alpha$ may not satisfy $W_2 < W_1$ and $2W_2$ may not exceed $W_1$.

iii) If weights are based on empirical probabilities of basic Item score matrix, then item scores and individual scores are obtained as expected values and hence provide measurement of continues variables satisfying conditions of linearity.

iv) The metric data and linearity of scores by weighted sum by the above said approach enables generation of scores that is cardinal, equidistant and continuous to permit calculation of almost all descriptive statistics and also to undertake

relevant estimation, testing of hypothesis, relevant analysis used in multivariate statistics. However, normality needs to be tested empirically.

v) If frequency of a particular response category of an item is zero, the method may fail and can be taken as zero value for scoring Likert items as weighted sum

## 3. PROPOSED METHODS

In addition to the usual summative method of scoring Likert items with five response categories marked as 1,2,3,4 and 5 (Method 1), two proposed methods are described below.

### 3.1 METHOD 2 (BASED ON FREQUENCY OF EACH RESPONSE CATEGORY)

Here, initial weight to *j*-th response category of the *i*-th item is defined as the ratio of frequency of the *j*-th response category of the *i*-th item and total number of subjects i.e. $\omega_{ij} = \frac{f_{ij}}{n}$.

Clearly, $\omega_{ij} > 0$ and $\sum_{j=1}^{5} \omega_{ij} = \frac{\sum_{j=1}^{5} f_{ij}}{n} = 1$

Observations:

- Initial weight ($\omega_{ij}$) depends heavily on frequency of the response category i.e. $f_{ij}$
- $\omega_{ij}'s$ may not follow increasing order
- The initial weights do not satisfy the monotonic condition. For example, if $f_{i5} < f_{i4}$ then $5\omega_{i5}$ may not exceed $4\omega_{i4}$.
- Weighted sum score based on $\omega_{ij}$ do not satisfy the equidistant condition

CALCULATION OF FINAL WEIGHTS FOR METHOD 2:

To satisfy the monotonic and the equidistant conditions, correction factor is required based on which intermediate weights $W_{ij}$ and finally selected weights $W_{ij(Final)}$ for *j*= 1, 2, 3...5 are to be calculated. The suggested steps are as follows:

Step-1: Arrange the $\omega_{ij}'s$ of the *i*-th item in increasing order.

Call them $\omega_{i1}$ $\omega_{i2}$, $\omega_{i3}$, $\omega_{i4}$ and $\omega_{i5}$, where $\omega_{i1} = \frac{f_{min}}{n}$ and $\omega_{i5} = \frac{f_{max}}{n}$ where maximum and minimum frequency are $f_{max}$ and $f_{min}$ respectively.

Step – 2: To ensure that the transformed scores satisfy the equidistant property, consider $W_{i1} = \omega_{i1} = \frac{f_{min}}{n}$. Find the correction factor $\alpha$ so that

$W_{i1} + 4\alpha = 5W_{i5} \Longrightarrow \alpha = \frac{5f_{max} - f_{min}}{4n}$

Define $W_{i2} = \frac{\omega_{i1} + \alpha}{2}$, $W_{i3} = \frac{\omega_{i1} + 2\alpha}{3}$; $W_{i4} = \frac{\omega_{i1} + 3\alpha}{4}$; and $W_{i5} = \frac{\omega_{i1} + 4\alpha}{5}$

Step – 3: However, $\sum_{j=1}^{5} W_j \neq 1$. To make sum of the weights equals to one, divide each $W$ by the obtained value of $\sum_{j=1}^{5} W_j$ and get final weights $W_{ij(Final)} = \frac{W_{ij}}{\sum_{j=1}^{5} W_j}$

Here, $j.W_{j(Final)} - (j-1).W_{(j-1)(Final)} = \frac{\alpha}{\sum_{j=1}^{5} W_j} \,\forall\, j = 2,3,4,5$

Thus, from the initial weights $\omega_{ij}'s$ the final weights $W_{ij(Final)}$ can be obtained as per the correction factor $\alpha$ and satisfying equidistant property.

## 3.2 METHOD 3(BASED ON AREA UNDER STANDARD NORMAL CURVE)

Initial weights based on area under the $N(0, 1)$ are obtained as follows:

Step 1: For the $i$-th item and the $j$-th response category, find proportion of frequency of the response category to the sample size i.e. $p_{ij} = \frac{f_{ij}}{n}$. Also find the cumulative proportions $(C_i)$

Step 2: Find area $(A_i)$ under the standard Normal curve for each $C_i$.

Step 3: Take initial weights as $\omega_{ij} = \frac{A_i}{\sum A_i}$

*Observations:*

1. Sum of initial weights is equal to one i.e. $\sum_{j=1}^{5} \omega_{ij} = 1$

2. The initial weights are in increasing order and thus satisfy the monotonic condition (1.1) under the assumption of $p_{ij} > 0$ .

CALCULATION OF FINAL WEIGHTS FOR METHOD 3:

To make the transformed scores equidistant for a 5-point scale, consider the correction factor $\gamma = \frac{Max.area - Min.area}{3}$ since the difference between Maximum area and the Minimum area is contributed by 3 response categories. Determine the modified areas $\Delta_1, \Delta_2, \Delta_3, \Delta_4$ and $\Delta_5$ as follows:

$\Delta_1 = A_1$(unchanged), $\Delta_2 = \frac{\Delta_1 + \gamma}{2}$, $\Delta_3 = \frac{\Delta_1 + 2\gamma}{3}$, $\Delta_4 = \frac{\Delta_1 + 3\gamma}{4}$, $\Delta_5 = \frac{\Delta_1 + 4\gamma}{5}$

Since $\sum_{j=1}^{5} \Delta_j \neq 1$, define final weights $W_{j(Final)} = \frac{\Delta_j}{\sum_{j=1}^{5} \Delta_j}$

Here, $j.W_{j(Final)} - (j-1).W_{(j-1)(Final)} = \frac{\gamma}{\sum_{j=1}^{5} \Delta_j} \,\forall\, j = 2,3,4,5$

The transformed scores based on the final weights so defined ensure equidistant condition and also satisfy $\sum_{j=1}^{5} W_{j(Final)} = 1$,

**Summary:**

In Method 2 and 3:

- Initial weights consider empirical probabilities obtained from data considering the frequencies of Item – Response categories without involving

assumptions of continuous nature or linearity or normality for the observed variables or the underlying variable being measured.

- Each $W_{j(Final)} > 0$.
- Score emerging from each of the proposed weighted sum approaches satisfy equidistant property and also satisfy $\sum_{j=1}^{5} W_{j(Final)} = 1$
- Item and individual scores are obtained as expected values and generate cardinal data.
- Since, $0 < W_{j(Final)} < 1$, mean and variance of test scores as well as item scores from Method 2 and Method 3 will get reduced in comparison to the same from Method 1.

## 4. EMPIRICAL VERIFICATION

The method of usual summative score and the two proposed methods are compared empirically using data obtained from administration of a 5- point Likert test with 7 items to 101 subjects, who could answer completely the entire questionnaire.

### 4.1 CALCULATION OF WEIGHTS

Calculation of weights to various response categories of different items by Method 2 and Method 3 are given at Table 1 and Table 2 respectively.

Table 1
Calculation of weights to response categories of Items: Method 2

| Item | Description | RC-1 | RC-2 | RC-3 | RC-4 | RC-5 | Total |
|------|-------------|------|------|------|------|------|-------|
| 1 | Frequency | 4 | 9 | 3 | 36 | 49 | 101 |
| | Proportions($\omega_{1j}$) | 0.03960 | 0.0891 | 0.02970 | 0.35644 | 0.48515 | 1.00 |
| | Intermediate weights($W_{1j}$) ($\alpha = 0.599$) | 0.03960 | 0.31930 | 0.41253 | 0.45915 | 0.48712 | 1.717 |
| | Final weights ($W_{1j(Final)}$) | 0.02306 | 0.18589 | 0.24016 | 0.26730 | 0.28359 | 1.00 |
| 2 | Frequency | 49 | 25 | 6 | 13 | 8 | 101 |
| | Proportions ($\omega_{2j}$) | 0.48515 | 0.24753 | 0.05941 | 0.12871 | 0.07921 | 1.00 |
| | Intermediate weights($W_{2j}$) $\alpha = 0.59158$) | 0.48515 | 0.53837 | 0.55611 | 0.56497 | 0.57030 | 2.714S4 |
| | Final weights ($W_{2j(Final)}$) | 0.17870 | 0.19830 | 0.20483 | 0.20810 | 0.21006 | 1.00 |
| 3 | Frequency | 27 | 32 | 10 | 18 | 14 | 101 |
| | Proportions($\omega_{3j}$) | 0.26733 | 0.31683 | 0.09901 | 0.17822 | 0.13861 | 1.00 |

| | | RC-1 | RC-2 | RC-3 | RC-4 | RC-5 | |
|---|---|---|---|---|---|---|---|
| | Intermediate weights($W_{3j}$) ($\alpha$ =0.37129) | 0.26733 | 0.31931 | 0.33663 | 0.34530 | 0.35049 | 1.6196 |
| | Final weights ($W_{3j(Final)}$) | 0.16511 | 0.19722 | 0.20792 | 0.21327 | 0.21648 | 1.00 |
| 4 | Frequency | 5 | 12 | 11 | 31 | 42 | 101 |
| | Proportions($\omega_{4j}$) | 0.04950 | 0.11881 | 0.10891 | 0.30693 | 0.41584 | |
| | Intermediate weights($W_{4j}$) ($\alpha$ =0.50743) | 0.04950 | 0.27846 | 0.35478 | 0.39295 | 0.41584 | 1.4913 |
| | Final weights ($W_{4j(Final)}$) | 0.03319 | 0.18670 | 0.23786 | 0.26345 | 0.2788 | 1.00 |
| 5 | Frequency | 6 | 13 | 7 | 33 | 42 | 101 |
| | Proportions($\omega_{5j}$) | 0.05941 | 0.12871 | 0.06931 | 0.32673 | 0.41584 | 1.00 |
| | Intermediate weights($W_{5j}$) ($\alpha$ =0.50495) | 0.05941 | 0.28218 | 0.35644 | 0.39356 | 0.41584 | 1.5076 |
| | Final weights ($W_{5j(Final)}$) | 0.03941 | 0.18719 | 0.23645 | 0.26108 | 0.27586 | 1.00 |
| 6 | Frequency | 29 | 14 | 12 | 25 | 21 | 101 |
| | Proportions($\omega_{6j}$) | 0.28713 | 0.13861 | 0.11881 | 0.24752 | 0.20792 | 1.00 |
| | Intermediate weights($W_{6j}$) ($\alpha$ =0.329208) | 0.28713 | 0.30817 | 0.31518 | 0.31869 | 0.32079 | 1.549 |
| | Final weights ($W_{6j(Final)}$) | 0.18525 | 0.19882 | 0.20335 | 0.20561 | 0.20697 | 1.00 |
| 7 | Frequency | 9 | 14 | 6 | 32 | 40 | 101 |
| | Proportions($\omega_{7j}$) | 0.08911 | 0.13861 | 0.05941 | 0.31683 | 0.39604 | 1.00 |
| | Intermediate weights($W_{7j}$) ($\alpha$ =0.480198) | 0.08911 | 0.28465 | 0.34983 | 0.38243 | 0.40198 | 1.5083 |
| | Final weights ($W_{7j(Final)}$) | 0.05909 | 0.18876 | 0.23199 | 0.25360 | 0.26657 | |

*Legend: RC- j $\Longrightarrow$ j-th Response category for j=1, 2,3,4,5*

Table 2

| Item | Description | RC-1 | RC-2 | RC-3 | RC-4 | RC-5 | Total |
|---|---|---|---|---|---|---|---|
| | Cumulative Proportions | 0.03960 | 0.12871 | 0.15842 | 0.51485 | 1.00 | |
| | Area under N(0,1) | 0.516 | 0.5517 | 0.5636 | 0.695 | 0.8413 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Modified area($\Delta_1$) ($\gamma$ =0.108433) | 0.516 | 0.31222 | 0.24429 | 0.21033 | 0.18995 | 1.47278 |
| | Final weights ($W_{1j(Final)}$) | 0.35036 | 0.21199 | 0.16587 | 0.14281 | 0.12897 | 1.00 |
| 2 | Cumulative Proportions | 0.48515 | 0.73267 | 0.79208 | 0.92079 | 1.00 | |
| | Area under N(0,1) | 0.6879 | 0.7673 | 0.7852 | 0.8212 | 0.8413 | |
| | Modified area($\Delta_2$) ($\gamma$ =0.051133) | 0.6879 | 0.36952 | 0.26339 | 0.21032 | 0.17849 | 1.70962 |
| | Final weights ($W_{2j(Final)}$) | 0.40237 | 0.21614 | 0.15406 | 0.12302 | 0.10440 | 1.00 |
| 3 | Cumulative Proportions | 0.26733 | 0.58416 | 0.68317 | 0.86139 | 1.00 | |
| | Area under N(0,1) | 0.6064 | 0.7190 | 0.7517 | 0.8051 | 0.8413 | |
| | Modified area($\Delta_3$) ($\gamma$ =0.0783) | 0.6064 | 0.34235 | 0.25433 | 0.21032 | 0.18392 | 1.59733 |
| | Final weights ($W_{3j(Final)}$) | 0.37963 | 0.21433 | 0.15922 | 0.13167 | 0.11514 | 1.00 |
| 4 | Cumulative Proportions | 0.04950 | 0.16831 | 0.27723 | 0.58416 | 1.00 | |
| | Area under N(0,1) | 0.5199 | 0.5675 | 0.6103 | 0.7190 | 0.8413 | |
| | Modified area($\Delta_4$) ($\gamma$ =0.507426) | 0.5199 | 0.31352 | 0.24472 | 0.21032 | 0.18969 | 1.47815 |
| | Final weights ($W_{4j(Final)}$) | 0.35172 | 0.21210 | 0.16556 | 0.14229 | 0.12833 | 1.00 |
| 5 | Cumulative Proportions | 0.05941 | 0.18812 | 0.25743 | 0.58416 | 1.00 | |
| | Area under N(0,1) | 0.5239 | 0.5753 | 0.6026 | 0.7190 | 0.8413 | |
| | Modified area($\Delta_5$) ($\gamma$ =0.1058) | 0.5239 | 0.31485 | 0.24517 | 0.21032 | 0.18942 | 1.48366 |
| | Final weights ($W_{5j(Final)}$) | 0.35311 | 0.21221 | 0.16524 | 0.14176 | 0.12767 | 1.00 |
| 6 | Cumulative Proportions | 0.28713 | 0.42574 | 0.54455 | 0.79208 | 1.00 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Area under N(0,1) | 0.6141 | 0.6664 | 0.7054 | 0.7852 | 0.8413 | |
| | Modified area($\Delta_6$) ($\gamma$ =0.075733) | 0.6141 | 0.34492 | 0.25519 | 0.21032 | 0.18341 | 1.60794 |
| | Final weights ($W_{6j(Final)}$) | 0.38192 | 0.21451 | 0.15871 | 0.13080 | 0.11406 | 1.00 |
| 7 | Cumulative Proportions | 0.08911 | 0.22772 | 0.28713 | 0.60396 | 1.00 | |
| | Area under N(0,1) | 0.5359 | 0.5910 | 0.6141 | 0.7257 | 0.8413 | |
| | Modified area($\Delta_7$) ($\gamma$ =0.1018)) | 0.5359 | 0.31885 | 0.2465 | 0.21032 | 0.18862 | 1.50019 |
| | Final weights ($W_{7j(Final)}$) | 0.35722 | 0.21254 | 0.16431 | 0.14020 | 0.12573 | 1.00 |

Calculation of weights to response categories of Items: Method 3
*Legend: RC- j $\Longrightarrow$ j-th Response category for j=1,2,3,4,5*

*Observations:*
- Equidistant property is satisfied for Method 2 and 3.
- Inter Quartile range (IQR) ($Q_3 - Q_1$) for Method 2 and Method 3 was 1.28181 and 3.33277 respectively. Number of outliers defined as observations that fall below $Q_1 - 1.5$(IQR) or above $Q_3 + 1.5$ (IQR) was 3 for Method 2 and Nil for Method 3.

## 4.2 BREAKING OF TIES

Method 1 resulted in large number of ties of subject scores. Length of tie ranged between 2 to 12 over 14 levels of scores. For Method 2, scores of only two subjects were tied at 3.57363 and no tie was found in Method 3

Consideration of different weights to different response categories of different items by Method 2 and 3 resulted in breaking ties of subject scores in Method 1. Thus, Method 2 an3 distinguish the same summative score on the basis of how the score was obtained. For example, six subjects who scored 20 each in Method 1, obtained different scores for Method 2 and 3 as can be seen from the Table- 3.

Table – 3
Tied Scores of Method 1 and corresponding scores in Method 2 and 3
(Example)

| Item-wise scores | Total  score as per |
|---|---|

| Item 1 | Item 2 | Item 3 | Item 4 | Item 5 | Item 6 | Item 7 | Method 1 | Method 2 | Method 3 |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 5 | 1 | 4 | 1 | 3 | 4 | 20 | 4.30484 | 3.284806 |
| 4 | 1 | 1 | 4 | 4 | 1 | 5 | 20 | 5.092923 | 3.500008 |
| 2 | 1 | 1 | 4 | 3 | 4 | 5 | 20 | 4.634009 | 3.422747 |
| 5 | 5 | 2 | 4 | 1 | 2 | 1 | 20 | 4.412625 | 3.304028 |
| 2 | 2 | 2 | 4 | 4 | 1 | 5 | 20 | 4.779016 | 3.431687 |
| 4 | 1 | 2 | 3 | 4 | 1 | 5 | 20 | 4.91835 | 3.476549 |

### 4.3 RELATIONSHIPS OF SCORES BY VARIOUS METHODS:

For the $i$-th item, a score of $j$ as per Method 1 becomes $j.W_{ij(Final)}$ in Method 2 and Method 3. Thus, scores under the three methods are linearly related. However, $W_{ij(Final)}$ are different for different item – response category combinations and different methods. For illustration, relationships of score of Item 1 under the three Methods are shown in Table – 4.

Table – 4

Relationships of scores of Item 1 and the proposed Methods

| Scores | | |
|---|---|---|
| **Method 1** | **Method 2** | **Method 3** |
| 1 | 0.023056 | 0.350358 |
| 2 | 2(0.185888)= 0.371776 | 2(0.211992) = 0.423984 |
| 3 | 3(0.240165) = 0.720495 | 3(0.16587) = 0.49761 |
| 4 | 4(0.267304) = 1.069216 | 4(0.142808) = 0.571232 |
| 5 | 5(0.283587)= 1.417935 | 5(0.128972)= 0.64486 |

Clearly, scores of Item 1 by Method 2 and 3 are equidistant, since

$$5W_{15(Final)} - 4W_{14(Final)} = 4W_{14(Final)} - 3W_{13(Final)} = 3W_{13(Final)} - 2W_{12(Final)}$$

$$= 2W_{12(Final)} - W_{11(Final)} = 0.34872 \text{ for Method 2}$$
$$= 0.07362 \text{ for Method 3}$$

If $M_i$ denote subject scores obtained by the $i$-th Method, for $i$ =1, 2, 3, then regression equations on $M_1$ are as follows:

$$M_2 = (-)\ 0.7973 + 0.27549\ M_1 \quad \text{where } R^2 = 0.9492$$
$$M_3 = 2.343404 + 0.0541\ M_1 \quad \text{where } R^2 = 0.7325$$
$$M_2 = (-)\ 8.57656 + 3.941475 M_3 \quad \text{where } R^2 = 0.7763$$

High value of $R^2$ indicate goodness of fit of the data to the linear model. The figure 1 indicates almost linearity of subject scores by the three methods
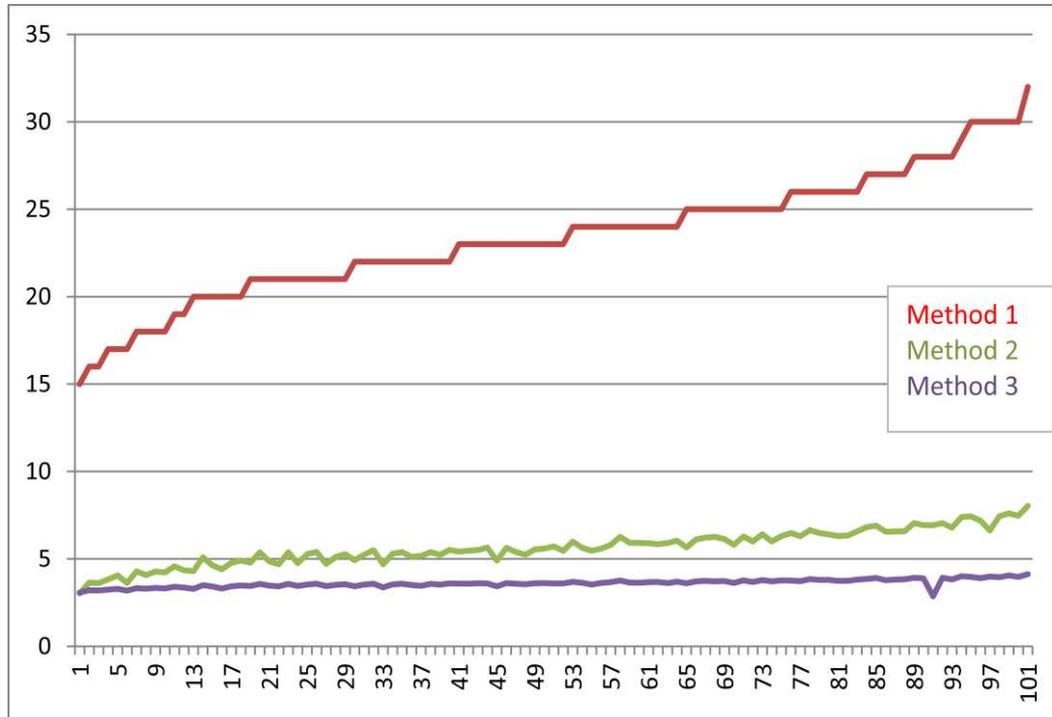
Fig. 1: Scores of subjects by three methods

## 4.4 DESCRIPTIVE STATISTICS

Descriptive statistics for method 1, method 2 and method 3 are shown in Table – 5.

Table – 5

Descriptive statistics for various Methods

| Description | Method 1 (Summative score) | Method 2 (Based on frequency of response category | Method 3 (Based on area under $N(0,1)$) |
|---|---|---|---|
| Test mean | 23.40594 | 5.65081 | 3.60965 |
| Range of Item mean | [2.06931, 4.15842] | [0.41171,1.12446] | [0.43435, 0.58289] |
| Test variance | 12.38356 | 0.99015 | 0.04948 |
| Range of item variance | [1.21465, 2.38752] | [0.08476, 0.18113] | [0.00159,0.01431] |
| Test skewness | 0.003312 | -0.09789 | -0.34659 |
| Range of Item skewness | [-1.46419, 1.02592] | [-1.46419, 1.02592] | [-5.34448, 1.02592] |
| Test Kurtosis | 1.39444 | -0.16945 | 0.59986 |

| Range of Item Kurtosis | [-1.54227, 1.39444] | [-1.54227, -0.11678] | [-1.54227, 43.96021] |
|---|---|---|---|

Observations for Method 2 and 3:

- Significant reduction of mean and variance for the test as well as for the items.

- The weighted sum scores made the data more homogenous. Method 3 had minimum variance.

- Test skewness was close to zero for each method. However, same was not found to be true for the item 3 by Method 3. Ratio of sample skewness and Standard Error of Skewness (SES) for the Methods 1, 2 and 3 were 0.013787, -0.40752 and -1.44283 respectively. Thus, the population is very unlikely to be skewed either positively or negatively.

- Test kurtosis (excess of 3) had low values for Methods 2 and 3. However, kurtosis of the summative score method was highest (around 1.40). Ratio of sample kurtosis and Standard Error of Kurtosis (SEK) exceeded 2 for each of the three methods implying that test scores of each method had positive excess kurtosis (leptokurtic).

## 4.5 ITEM RELIABILITY

A subject score of $j$ in $i$-th item as per the Method 1, translates into $j.W_{ij(Final-Method\ 2)}$ and $j.W_{ij(Final-Mathod\ 3)}$ respectively $\forall\ j = 1,2,3,4,5$. However, weights vary across the items and response categories. Linearity of the three sets of scores and different weights to response categories of different items is likely to keep correlation between a pair of item unchanged for some of the items but not for all. However, Item reliability in terms of correlation between item scores and test scores differed for different Methods due to combined effect of different weights. Table 6 gives Item-total correlations for the three methods.

Table – 6
Item reliability for various Methods

| | Item reliability (Item-total correlation) | | |
|---|---|---|---|
| | **Method 1** | **Method 2** | **Method 3** |
| Item 1 | 0.261721 | **0.362304** | 0.315228 |
| Item 2 | **0.298098** | 0.213792 | 0.143324 |
| Item 3 | 0.396144 | 0.330685 | **0.471869** |
| Item 4 | 0.460183 | **0.518658** | 0.487556 |
| Item 5 | 0.385952 | **0.412299** | 0.362374 |
| Item 6 | **0.465345** | 0.327931 | 0.263309 |
| Item 7 | 0.390203 | **0.458053** | 0.450303 |

*Legend: Max. Correlations (Item reliability) are given in bold*

## 4.6. RANK CORRELATION OF ITEM RELIABILITY

Spearman ρ between Item reliability obtained by various methods are shown in the Table – 7

Table - 7
Rank Correlation Matrix (Spearman ρ) of Item reliability

|  | Method 1 | Method 2 | Method 3 |
|---|---|---|---|
| Method 1 | 1.0 | 0.14286 | 0.39286 |
| Method 2 |  | 1.0 | 0.78571 |
| Method 3 |  |  | 1.0 |

**Observations:** Rank correlation (Spearman ρ) of item reliability was maximum between Method 2 and Method 3.

## 4.7 TEST OF NORMALITY

Anderson – Darling test for Normality was used to test $H_0$: subject scores follow Normal distribution. Values of test statistic and associated *p*-values for each of the four methods are shown in the Table – 8.

Table - 8
Anderson – Darling test of Normality

|  | **AD statistics** | ***p*-values** | **Remarks** |
|---|---|---|---|
| Method 1 | 0.504 | 0.199148427 | I $H_0$ is accepted |
| Method 2 | 0.163 | 0.942107874 | $H_0$ is accepted |
| Method 3 | 0.294 | 0.593228512 | $H_0$ is accepted |

## 4.8. FACTURE STRUCTURES FOR THE METHODS

PCA and also FA with varimax rotation and Kaiser Normalization resulted in 4 independent factors explaining cumulative variance of around 66% for each of the three methods. The rotated component matrix (loadings) containing estimates of correlations between items and estimated components for the various methods are given in Table – 9.

Table - 9
Rotated Component Matrix for the three methods

|  | **Components** | | | |
|---|---|---|---|---|
|  | **1** | **2** | **3** | **4** |

| | | | | |
|---|---|---|---|---|
| Item 1 | -0..065 (-0.251) [-0.133] | 0.060 (0.146) **[0.756]** | **-0.711** **(-0.697)** [0.140] | 0.114 (-0.132) [-0.172] |
| Item 2 | **0..875** **(0.905)** **[0.812]** | 0.181 (0.154) [-0.117] | 0.195 (-0.017) [0.251] | -0.126 (0.027) [0.263] |
| Item 3 | **-0.581** (-0.382) [-0.112] | 0.349 (0.259) **[-0.643]** | 0.461 (0.733) [0.166] | -0.323 (-0.157) [-0.407] |
| Item 4 | 0.079 (0.075) [0.041] | **0.935** **(0.944)** [-0.011] | -0.086 (0.031) **[0.913]** | 0.044 (-0.008) [-0.096] |
| Item 5 | 0.019 (0.144) [0.470] | -0.011 (-0.136) [0.343] | 0.071 (0.146) [-0.088] | **-0.684** **(-0.637)** [-0.205] |
| Item 6 | 0.102 (0.119) [-0.032] | -0.102 (-0.150) [-0.035] | **0.584** (0.227) [-0.039] | **0.527** **(0.736)** **[0.865]** |
| Item 7 | -0.366 (-0.450) **[-0.563]** | 0.329 (0.330) [0.137] | -0.056 (-0.115) [0.417] | 0.459 (0.308) [0.213] |

*Legend: Substantial loadings are given in bold*

Note: Figures without parentheses denote factor loadings by Method 1; figures within ( ) denote factor loadings by Method 2 and figures within [ ] denote factor loadings by Method 3

Observations:

- Load of an item to a component was different for different Methods.
- Item 1 had maximum load with the $2^{nd}$ component by Method 3 followed by $3^{rd}$ component in Method 1 and 2
- Item 2 was heavily loaded with the $1^{st}$ component by all the three methods
- Item 3 had substantial load to $1^{st}$ component and $2^{nd}$ component in Method 3.
- Loads of the Item 4 were substantial for $2^{nd}$ component (Method 1 and 2) and $3^{rd}$ component(Method 3)
- Item 5 had high load to the $4^{th}$ component by Method 1 and 2
- Item 6 was heavily loaded with the $4^{th}$ components by all the three Methods and with $3^{rd}$ component (Method 1)
- Item 7 showed substantial load with the $1^{st}$ component by Method 1 only

## 4.9 CORRELATIONS AMONG THE METHODS

Subject scores obtained by each of the three methods are linear in nature and thus, high correlations are likely between a pair of methods. Correlation matrix of the three methods is given in Table – 10.

Table 10
Correlation matrix of the three Methods

|          | Method 1 | Method 2 | Method 3 |
|----------|----------|----------|----------|
| Method 1 | 1        | 0.97427  | 0.85586  |
| Method 2 |          | 1        | 0.88110  |
| Method 3 |          |          | 1        |

Observations: Almost linear relationships among the methods resulted in high correlation between each pair of methods.

## 5. CONCLUSIONS

The proposed methods of scoring Likert scale as weighted sum where different weights are assigned to different response categories using only the frequencies or empirical probabilities of Item – Response categories resulted in continuous data satisfying equidistant property and providing platform to perform analysis in parametric set up. If frequency of a particular response category of an item is zero, the method may fail and can be taken as zero value for scoring Likert items as weighted sum. Proposed approaches made the data homogenous and distinguished the same summative score on the basis of how the score was obtained.

All the three methods passed normality test and produced same number of independent factors though factor loadings were different for different methods.

Each of the proposed method had strong linear relationship with the summative score method (Method 1). Correlations ranged between 0.88 to 0.94. However, Item reliability in terms of correlation between item scores and test scores differed for different Methods due to combined effect of different weights. High correlations among the methods provide a reconciliation of the ordinal - interval controversy, in the sense that there may not be much harm in using data generated from summative scores of Likert questionnaire assuming equal weights which correlates high with the transformed scores as weighted sum satisfying many desired properties.

However, considering the theoretical advantages including meaningfulness of operations and comparisons, platform to undertake parametric statistical analysis and easiness to compute weights, either the Method 2 or 3 may be used for scoring Likert items. Empirically, the Method 3 showed minimum value of variance, no tied scores and no outliers. Thus, Method 3 may be preferred over the Method 2.

After giving weights to response categories, studies may be undertaken to assign further weights to items so as to ensure equal correlation between item score and test score i.e. the test score is equi-correlated with item scores or standardized score of each item, to further justify summation of item scores which are of equal importance  and explore relationships of the weighted sum approaches and summative Likert scores when the latter may not follow normal distribution and effect size using simulation studies involving multi data set for generalization.

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# PSYCHOLOGICAL IMPACT OF COVID-19 LOCKDOWN IN INDIA

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***Abstract***

*COVID-19 pandemic has affected the world not only as medical disorder but also in psychologically. As a part of a preventive strategy, in India a nationwide lockdown was announced by government in March 2020.This study aims to evaluate psychological symptoms and coping methods in people under COVID-19 government lockdown. We used were demographic variables, corona related behaviour and Diagnostic and Statistical Manual of Diseases Fifth Edition (DSM V) Self-Rated Level 1 Cross-Cutting Symptom Measure—Adult among 37 subjects. We observed that majority of the subjects had depression, anxiety, anger, sleep problems and repetitive thoughts and behaviours. Female subjects were more affected than males. Students, using social media and post graduated subjects had high scores on most of the psychological domains. Those under lockdown for 15 days or more, doctor by profession were affected more with depression, anxiety and sleep problems. Music, drawing, spending time with family and reading helps to lower the psychological distress. COVID-19 has not only taken a toll by deaths, but its psychological impact on survivors and families is a long lasting one.*

*Keywords: COVID-19 lockdown, mental health, psychological impact, DSM V*

## INTRODUCTION

With the beginning of 2020, the world has encountered one of the greatest challenges to mankind in the form of COVID-19 or the Corona Virus Disease 2019. It emerged in Wuhan, China between December 2019 and early 2020, and then globally the cases were reported. WHO announced the Novel Corona virus Pneumonia of China as a Public Health Emergency of International Concern (PHEIC).The rapid spread of the disease has not only affected the physical health, but also mental health of the community. Human to human transmission has made the scenario worse; for which WHO recommends social distancing, self isolation and home or hospital quarantine as preventive measures. Willingly or unwillingly,

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human beings have been trapped in this situation. In India too, as a part of preventive measure, government announced a country-wide lockdown for 20 days in late March 2020 (UN news, March 2020). Apart from essential services, all of the offices, shops, malls, small factories, etc have been under this effect. The nation was at a standstill. A country wide home stay was implemented. This situation for was sudden and most of people never imagined that they had to be home bound for a considerable duration.

Mental health and epidemic outbreaks have been widely studied. De Roo A et al. (1998); Shultz J M et al. (2016); Tsuruta K et al, Wu K K et al. (2005) have reported about psychiatric disorders like anxiety, depression and Post Traumatic Stress Disorder (PTSD) associated with outbreaks of diseases like SARS, Ebola and Legionnaires Disease in different parts of the world respectively. A recent study by Liu N et al. (2020) also suggest that in China, a midst of COVID -19 outbreak, there was high prevalence of post traumatic stress symptoms in the domains of re-experiencing, negative alterations in cognition or mood, and hyper-arousal. The challenges and stress experienced by health care workers like doctors, nurses, paramedical staff, etc could trigger common mental disorders which in turn could result in hazards that exceed the consequences of the COVID-19 epidemic itself (Bao et al 2020).

## OBJECTIVE AND HYPOTHESES

This study aims to evaluate psychological symptoms and coping methods in people under COVID-19 government lockdown in India.

## METHOD

A total 37 subjects were considered for study through an online questionnaire through email and social networking over a period of 20 days in March 2020. An informed consent was taken prior to the questionnaire about the confidentiality. Subjects, who agreed for the consent, involve in selfie practices and regularly using internet was considered for the study. Questionnaire included the following

1. **Demographic profile**: Age, Sex, Education, Occupation were considered under this set of questions.

2. **Corona related information** : questions like duration of complete stay at home i.e. self isolation, any known person having COVID-19, Government quarantine duration to self and family, main source of information about COVID-19, preventive measures taken at personal level and coping methods during lockdown were included.

3. **Diagnostic and Statistical Manual of Diseases Fifth Edition (DSM V) Self-Rated Level 1 Cross-Cutting Symptom Measure—Adult**: This is a self- or

informant-rated measure that assesses mental health domains that are important across psychiatric diagnoses. This adult version of the measure consists of 23 questions that assess 13 psychiatric domains, including depression, anger, mania, anxiety, somatic symptoms, suicidal ideation, psychosis, sleep problems, memory, repetitive thoughts and behaviours, dissociation, personality functioning, and substance use. Each item inquires about how much (or how often) the individual has been bothered by the specific symptom during the past 2 weeks. Each item on the measure is rated on a 5-point scale (0=none or not at all; 1=slight or rare, less than a day or two; 2=mild or several days; 3=moderate or more than half the days; and 4=severe or nearly every day). The measure was found to be clinically useful and to have good test-retest reliability in the DSM-5 Field Trials that were conducted in adult clinical samples (Narrow et al. 2013).

## RESULTS

Out of 37 participants, demographic variables are as shown in table 1; among which majority of the study subjects were of age 20 to 30 years, post graduation as education qualification and job going. We had almost equal number of male and female subjects.

Table 1 – Demographic variable distribution of study subjects (N=37).

| Demographic variable | | Number of subjects |
|---|---|---|
| Age | 20 to 30 | 21 |
| | 31 to 40 | 11 |
| | 41 to 50 | 2 |
| | more than 50 | 3 |
| Sex | male | 18 |
| | female | 19 |
| Education qualification | under graduation | 10 |
| | post graduation | 27 |
| Occupation | doctor | 11 |
| | job | 18 |
| | business | 4 |
| | housewife | 2 |
| | student | 2 |

Assessing the DSM-5 Level 1 Cross-Cutting Symptom Measure, 30% had some or other psychological symptoms. The self rating on severity of

psychological domains in past 2 weeks, 16% of subjects rated slight i.e. rare, less than a day or two and 3% of subjects rated severe i.e. nearly every day. Considering individual domains (as shown in Table 2), 63.5% had depression, 60.2% had anxiety, 45.9% had anger, 43.2% had sleep problems, 36.4% had personality functioning issues, 33.7% had mania and 27% had repetitive thoughts and behaviours. On further analysis, of individual domain severity, 10.6% rated depression to be severe and 11.3% rated anxiety to be severe and anger, sleep problems, mania and personality functioning to be mild to moderate in severity.

Table 2 – Percentage of Subjects (N=37) who scored on the domains on The DSM-5 Level 1 Cross-Cutting Symptom Measure

| Psychological Domain | Average score of responses with Slight to Severe rating on scale | Percentage | Average score of responses with None rating on scale | Percentage |
|---|---|---|---|---|
| Depression | 23.5 | 63.5 | 13.5 | 36.4 |
| Anger | 17 | 45.9 | 20 | 54.0 |
| Mania | 12.5 | 33.7 | 24.5 | 66.2 |
| Anxiety | 14.7 | 60.2 | 22.3 | 39.8 |
| Somatic Symptoms | 8.5 | 22.9 | 28.5 | 77.0 |
| Suicidal Ideation | 6 | 16.2 | 31 | 83.7 |
| Psychosis | 4.5 | 12.1 | 32.5 | 87.8 |
| Sleep Problems | 16 | 43.2 | 21 | 56.7 |
| Memory | 9 | 24.3 | 28 | 75.6 |
| Repetitive Thoughts And Behaviours | 10 | 27.0 | 27 | 72.9 |
| Dissociation | 8 | 21.6 | 29 | 78.3 |
| Personality Functioning | 13.5 | 36.4 | 23.5 | 63.5 |
| Substance Use | 1.7 | 4.59 | 35.3 | 95.4 |

Also, 80.9% of subjects with age group 20 to 40 years had high scores on depression, 66.67% had anxiety, 61.9% had anger, 57% had sleep problems and 47.6% repetitive thoughts and behaviours. Age group 41 to 50 years had high scores on somatic symptoms. Scores of depression, anxiety, anger and somatic

symptoms in females were 89%, 79%, 74% and 32% respectively. 55.5% of male subjects had high scores on depression, 44% had anxiety, 44% had repetitive thoughts and behaviours and 37% had sleep problems. Education up to post graduation was associated with depression (66.7%), anxiety (70.3%), anger (55.5%) and sleep problems (37%). Students had majority of psychological domains present and job going subjects had depression and anxiety. Doctors who participated in studies had depression (73%), anxiety (69%) and sleep problems (45%). Most of the subjects had no issues on personality functioning, psychosis, memory and substance use domains.

Those subjects who were under 0 to 15 days of lockdown had higher depression (67%), anxiety (60%) and sleep problems (45%) as compared to others. Those who were under 6 to 10 days had anger (60%) and who were less than 11 to 15 days had somatic symptoms (66%). Social media usage for surfing of COVID-19 related information was associated with depression (82%), sleep problems (65%), anxiety (58%), anger (53%) and somatic symptoms (47%). Majority of subjects (98%) felt Government source of information published on newspaper, news channels on TV and mobile as well as social media government pages as authentic and true. Almost all the subjects (99%) knew the preventive measures against COVID-19 as recommended by Government authorities like washing hands for 20 seconds with soap, not shaking hands or physical touch people, sneeze or cough by covering your mouth with cloth or inside the shoulder, social distancing - avoid going out, moving in crowds, etc. As a part of everyday activities, those who did music, painting and drawing, reading and spending time with family were associated with lesser psychological symptoms (28 to 34%) than watching Web series and watching TV (55 to 59%).

## DISCUSSION

Majority of the pandemics have associated with psychological symptoms during and after the outbreak whereas this study focuses on the psychological symptoms during lockdown days of COVID19 pandemic in India. The most common psychological symptoms reported in this research were depression and anxiety, which were reported by Wang C, Cao W, Qiu J et al (2020) and other studies in recent past De Roo A et al (1998); Shultz J M et al (2016); Tsuruta K et al and Wu K K et al (2005). This study also reports anger as a psychological response during lockdown and outbreak which is reported by Shigemura J et al (2020). Young people (18–30 years) were found to be more under psychological distress which were reported by studies from Wang C, Cao W, Qiu J et al (2020). Female subjects had depression, anxiety, anger and somatic symptoms as compared to male subjects, which are also reported by multiple studies (Liu, Wang, Qiu, Lai et al, 2020). Male subjects had repetitive thoughts and behaviours which are reported by past studies about obsession symptoms more common in males (Mathis

et al, 2011). Education up to post graduation was associated with more psychological issues probably because of high self-awareness of their health (Qiu et al, 2020; Roberts et al, 2018). Our frontline warriors (i.e. doctors, nurses, paramedical staff, etc) to COVID-19 are not spared to psychological symptoms. Lai J et al (2020) reports on mental health outcomes among healthcare workers considerable depression, anxiety and sleep problems as reported by doctors. Association of social media use and its psychological impact specifically in depression and sleep related problems have been reported by Lin L.Y et al and Levenson, J. C et al (2016). Specific up-to-date and accurate health information (e.g., treatment, local outbreak situation) and particular precautionary measures (e.g., hand hygiene, wearing a mask) were associated with a lower psychological impact of the outbreak (Wang et al, 2020). Music lowers depression levels (Miranda & Claes, 2009) and most subjects in this study doing music as an activity have low scores on depression and anxiety. Rutter M. (1999) found that spending a quality time with family is a kind of family therapy and integral component of resilience (relative resistance to psychosocial risk experiences), which can be done during the lockdown days very effectively; this study also reports similar findings.

## CONCLUSION

COVID-19 has not only taken a toll across the world as far as medical disorder is concerned, but it has also challenged each one psychologically. The lockdown is a part of a preventive strategy to curb the spread of the disease and if not tackled well individually, it definitely makes one vulnerable to mental health problems. The future of COVID-19 pandemic is dicey and diffuse, but we as an individual have to take care of ourselves and family to stay physically and mentally fit.

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