

Personality Traits, Thinking Styles, and Emotional Intelligence in Nursing, towards Healthcare Providers' Characterization and Safer Patient Care

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How to cite this paper: Bataweel, A.O. (2023) Personality Traits, Thinking Styles, and Emotional Intelligence in Nursing, towards Healthcare Providers' Characterization and Safer Patient Care. *Open Journal of Nursing*, 13, 130-166.
<https://doi.org/10.4236/ojn.2023.132009>

Received: January 29, 2023

Accepted: February 25, 2023

Published: February 28, 2023

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Abstract

Background: This study explored nursing personality traits (Big Five Inventory BFI), emotional intelligence (EI), and thinking styles (Rational, RS, and Experiential, ES) together with demographic data to see how they could relate and the implication of this on nurses and patient safety. **Design:** A cross-sectional study. **Methods:** Nursing sample (n = 435). Participants completed a self-report online survey, which included demographic information, followed by questionnaires to measure personality traits, thinking styles, and emotional intelligence. **Results:** Spearman's rank correlation was computed to assess the relationship between EI and Extraversion; there was a moderate positive correlation between the two variables, $r = 0.487$, $p < 0.001$. Spearman's rank correlation was computed to assess the relationship between EI and Agreeableness, and there was a strong positive correlation between the two variables, $r = 0.731$, $p < 0.001$. Spearman's rank correlation was computed to assess the relationship between EI and Conscientiousness, and there was a strong positive correlation between the two variables, $r = 0.723$, $p < 0.001$. Spearman's rank correlation was computed to assess the relationship between EI and Neuroticism, and there was a moderate negative correlation between the two variables, $r = -0.666$, $p < 0.001$. Spearman's rank correlation was computed to assess the relationship between EI and Openness, and there was a moderate positive correlation between the two variables, $r = 0.467$, $p < 0.001$. **Conclusion:** Different studies consolidated each other, and all converge and channel into the concept of characterization of healthcare providers for better support to them and safer patient care. EI correlated with all BFI components, and both positively impacted all desirable behaviors. Therefore, it would be valuable if organizations invested in increasing EI in their providers as it might

highlight areas for improvement and equip providers with appropriate and advantageous coping strategies.

Keywords

Patient Safety, Emotional Intelligence, Thinking Style, Rational Style, Experiential Style, Medical Error, Personality Traits, BFI, Burnout, And Healthcare Worker Characterization

1. Introduction

Personality traits affect patient safety as it was reported to be associated with how healthcare workers cope with stress, burnout, and job performance [1] [2]. Personality traits can give insight into how individuals might behave given certain traits, which is helpful for the organization [3]. The Big Five Inventory (BFI) was found to be very reliable as a stand-alone trait scale in measuring personality traits (extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience) [4]. Many studies stressed the importance of knowing nurses' personality traits as it could predict the most appropriate career choices, giving organizations a baseline to whom they need to seek for the job and addressing any personal traits issues [5].

Personality traits in nurses were found to be linked to job satisfaction apart from the usually known factor like salary and work environment, and it was recommended that organizations should know their nurses' personality traits before evaluating job satisfaction and work to improve this aspect as well [6]. High-score conscientiousness and agreeableness traits were found to have a significant positive effect on compassion fatigue for pediatric nurses, which is a critical point to take into account when allocating nurses with children to take this into account to reduce stress and burnout [7]. Similarly, it was found that high scores in extraversion, conscientiousness, and openness to experience in nurses positively affected workplace learning and nursing competency [8]. However, a low score in conscientiousness and a high score in neuroticism increased the likelihood of errors in nursing medication administration [9] and would increase emotional exhaustion and depersonalization [10]. Additionally, different studies in different countries found that nurses with a high score in neuroticism suffered more stress and had a negative attitude toward their job [11].

One of the severe issues in healthcare worldwide is ineffective communication between healthcare providers themselves and between healthcare providers and their patients, which would compromise the care causing medical errors or workplace violence: verbally, physically, and sexually [12]. It was found that knowing healthcare providers' personality traits and emotional intelligence (EI) would help the organization in predicting who is at risk of having ineffective communication and the propensity towards violent communication, where neu-

roticism had a direct effect on violent behavior in nurses and organization should improve emotional intelligence to reduce this risky issue [12]. Another study looked at how the pandemic of COVID-19 caused healthcare providers, including nursing, psychological distress. It was found that healthcare providers with high scores in extroversion trait were significantly at less risk of this. Therefore, it was recommended to make personality assessments part of all organizations, so they support their providers better [13].

During ethical patient issues, moral reasoning, which is an essential aspect for healthcare workers, was affected by personality traits. It was found that stable nurses' and physicians' providers reasoned better and had more self-control, whereas stability was measured by three personality traits: conscientiousness, agreeableness, and neuroticism [14].

Emotional Intelligence (EI) could help in identifying certain behavior aspects that organizations might need to focus on for a healthier workforce [15]. A high score of EI was found to significantly correlate with less stress and burnout, better mental health, better performance and retention, better adjustment with organizational change, less self-harm and more happiness and life flexibility during challenges, more self-control against addiction and safer patient care [16]-[24]. EI was even used to predict the academic achievement of students, where it was found that EI components: Self-Control, Well-Being, and Sociability had a positive effect, and in contrast, Emotionality had a negative impact [25]. Additionally, the Sociability factor was found to be a strong predictor of two essential skills: Divergent Thinking and Creative Personality [26]. EI components of Well-Being, Self-Control, and Sociability also predicted mental and physical health and protection from risky behaviors [27].

EI was found to be sensitive to the culture where western differed from eastern cultures, affecting how each culture behaves [28]. For example, the Lebanese scored higher than the UK participants on sociability and emotional perception; on the other hand, the UK participant scored higher on optimism and stress management. This could explain some conflicting studies for EI, for example, gender differences. Gender will also be investigated, and how EI varies among males and females even though there was an expectation that EI would be higher in females due to their biological nature towards being emotional [19]. For example, some studies found Females to have higher EI than males [29], and others found males to score higher in EI [19]. Some other studies looked at specific components where they found males to score higher in Self-Control and Sociability [30]. Other studies did not find any gender differences [31] [32].

Self-Control (SC) is one of the four factors that would be measured in this study for nursing as a high score of SC was found to have a critical effect on individuals handling a difficult situation, the persistence to find solutions to issues, more responsible and dependable in managing tasks, and would also resist any harmful temptation of alcohol abuse, lessening the effect of stress on memory and attention, and ability to fight addiction to negative behavior [18].

Education level was found to be significantly correlated with emotional intelligence in nursing but not marital status, age, and years of experience [31]. However, other studies found that years of experience and age in Saudi nurses were significantly correlated with EI [32]. In general, high scores of EI were found to be associated with lower burnout and work stress in a study for South African nurses where they recommended assessing EI in nurses and addressing any gaps [33]. Other studies had similar recommendations for nurses and recommended training, as it was found that training increased EI significantly [34] [35]. This was a crucial recommendation as lower EI scores were associated with destructive behavior at the workplace, namely narcissism, Machiavellianism, and psychopathy [36].

Another important dimension that will be investigated is the thinking style so we can have a broader understanding of nurses' behavior, personality, and cognition. Two types of thinking styles have reliable measuring tools: Rational Style (RS) and Experiential Style (ES), which have been used by healthcare providers to compare them to each other for differences and utilize this for better patient care [37]. RS is more conscious, analytical, and structured compared with ES, which is more automatic, intuitive, and emotional, and it was found that nurses' scored significantly higher in RS compared to their ES, but when compared to physicians, nurses' scored significantly higher in ES [37]. Another study found that the thinking style affected how nursing leaders behaved [38]. It was found that head nurses who were rational thinkers had a significant correlation with psychoticism (risk takers, anti-social behaviors, impulsiveness, or non-conformist behavior). On the other hand, head nurses with more experiential thinking styles significantly correlated with neuroticism traits (more prone to anxiety, depression, and burnout) [38]. Similar to the personality trait during the COVID-19 pandemic, it was found that healthcare providers, including nurses, who used an experiential thinking style had significantly more intrinsic motivation to cope with changes [39]. It was recommended that organizations pay attention to this, try to understand their nursing leaders, and offer targeted education according to their thinking style.

Finally, the relationship between personality dimensions and EI was investigated. It was found that EI and personality dimensions significantly correlated positively with Extraversion, Conscientiousness, and Agreeableness and negatively with neuroticism negative [40] [41] [42] [43]. Therefore, this research study will explore nursing personality traits and EI to see if there were relationships between them and how they differ by gender, age, and other demographic data, and how would this help impact patient safety.

2. Method

2.1. Participants

A simple random sampling was used to recruit nurses at King Fahad Medical City (KFMC), Riyadh, Kingdom of Saudi Arabia, from 29 December 2022-12 Jan-

uary 2023. All KFMC's nurses were included.

There were 2400 nurses at the time of the study. The number of responses received was 750, making the response rate 31.3%. The completed responses were 435 out of the 750 total responses. The final sample ($N = 435$) comprised seventy-nine males and three-hundred-fifty-six females.

Considering a total number of 2400 nurses, the online Raosoft sample size calculator (<http://www.raosoft.com/samplesize.html>) estimated a minimum sample size of 350 nurses to ensure a confidence level of 95% with a 5% margin of error.

2.2. Design

A cross-sectional, self-administered online survey was conducted with all nurses through KFMC emailing system. Qualtrics XM Platform survey tool was used for the survey construction and IBM® SPSS® Statistics (version 28) was used for the analysis. Demographic data were first collected. The survey then presented participants with 40 questions to calculate the thinking styles, 30 questions for the emotional intelligence calculation and finally 44 for the personality trait measure.

2.3. Demographic

Gender, age, social status, marital status, smoking, time on social media, exercising habits, original nursing degree grade, leadership position, education level, years of experience, and Blood Group.

2.4. Procedure

Ethical approval was obtained from King Fahad Medical City Institutional Review Board—IRB (reference number: 22-622). Nurses were asked to complete an online electronic survey to collect data about decision-making, emotional intelligence, and personality trait. Clicking the link or copying the link into a web browser, participants were brought directly to the study via Qualtrics.

Nurses were asked to complete an online electronic survey to collect data about their thinking styles. The survey comprised a questionnaire including socio-demographic information and assessing nurses' thinking styles using the Rational-Experiential Inventory-40 (REI-40) [16]. The REI-40 has been validated and has internal consistency scores (Cronbach's alpha) ranging from 0.74 to 0.91 [44]. This 40-item questionnaire consists of 4 subscales: rational ability, rational engagement, experiential ability, and experiential engagement. Each subscale is measured by ten items that are scored on a five-point Likert scale from "Definitely False; score (1)" to "Definitely True; score (5)". The responses for negatively-worded questions were reversed scored. The total score was computed by summing responses from each category and was divided by 10 for the average score for each participant for each category.

Nurses were asked to complete an online electronic survey to collect data about

emotional intelligence. The survey was composed of the Trait Emotional Intelligence questionnaires to measure the trait EI and other variables [45]. The research tool Trait Emotional Intelligence Questionnaire (TEIQUe-Short Form) was used to measure the nurses' emotional intelligence level. The short form comprised 40 items developed on a seven-point Likert scale ranging from disagree to agree completely. Out of the EI global as one single measure, four factors stem from it: well-being, Self-Control, Emotionality, and Sociability, with excellent internal consistency ranging from 0.89 - 0.92 [44] [46]. K.V. Petrides will calculate scores for all researchers who collect data using this measure, so no information is available on scoring procedures for this questionnaire. An Excel sheet with only the EI selection data, with no reference to anything else to identify participants, was submitted to their website <https://psychometriclab.com/teique-manual-2/> for calculations of all factors and facets.

Nurses were asked to complete an online electronic survey to collect data about the Big Five. The survey was composed of the Big Five Inventory (BFI) of 44 items scored by a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The BFI is a reliable psychometric inventory for measuring personality traits and has been translated into many languages worldwide with high reliability and validity [47] [48] [49] [50].

2.5. Statistical Analysis

A descriptive analysis (frequency, percentages, mean \pm standard deviation (SD)) will summarize the categorical and continuous variables. Appropriate tests will be used depending on the normality distribution of the data.

2.6. Ethical Consideration

King Fahad Medical City's Institutional review board approved the study (IRB Log Number: 22-622). Participant's completion of the study questionnaires implied their consent to take part in the study.

3. Results

3.1. Descriptive Statistics

Preliminary analysis

Thinking style (**Table 1**), EI (**Table 2**), and BFI data (**Table 3**) had excellent internal reliability.

Tables 4-15 show nurses' demographic data. **Table 16** shows data from the normality test, Shapiro-Wilk; all data were not normally distributed, and non-parametric tests will be used accordingly.

Table 1. Internal reliability statistics for thinking style data.

Cronbach's Alpha	N of Items
0.903	40

Table 2. Internal reliability statistics for emotional intelligence (EI) data.

Cronbach's Alpha	N of Items
0.872	30

Table 3. Internal reliability statistics for BFI data.

Cronbach's Alpha	N of Items
0.889	44

Table 4. Nurses' frequency by gender.

Gender	Frequency	Percent
Male	79	18.2
Female	356	81.8
Total	435	100.0

Table 5. Nurses frequency by age.

Age	Frequency	Percent
Less than 23	2	.5
24 - 26	20	4.6
27 - 29	31	7.1
30 - 35	143	32.9
36-less than-50	195	44.8
More than 50	44	10.1
Total	435	100.0

Table 6. Nurses' frequency by marital status.

Marital Status	Frequency	Percent
Single	133	30.6
Married	274	63.0
Divorced	9	2.1
Separated	15	3.4
Widow	4	0.9
Total	435	100.0

Table 7. Nurses frequency by exercising.

Exercising	Frequency	Percent
Never	110	25.3
Once a Week	137	31.5
Twice a Week	71	16.3
Three times and more a week	117	26.9
Total	435	100.0

Table 8. Nurses' frequency by social media usage.

Social media usage/day	Frequency	Percent
Less than 2 hours	148	34.0
Between 2 - 5 hours	211	48.5
More than 5 hours	76	17.5
Total	435	100.0

Table 9. Nurses frequency by error rate.

Error rate	Frequency	Percent
No	334	76.8
Yes	101	23.2
Total	435	100.0

Table 10. Nurses' frequency by smoking.

Smoking	Frequency	Percent
Yes	64	14.7
No	371	85.3
Total	435	100.0

Table 11. Nurses frequency by grade at nursing degree.

Grade at nursing degree	Frequency	Percent
Pass	32	7.4
Good	136	31.3
Very Good	182	41.8
Excellent	73	16.8
Cannot Remember	12	2.8
Total	435	100.0

Table 12. Nurses frequency by blood group.

Blood Group	Frequency	Percent
A+	96	22.1
A-	4	0.9
B+	107	24.6
B-	3	0.7
AB+	34	7.8
O+	170	39.1
O-	6	1.4
Do not know	15	3.4
Total	435	100.0

Table 13. Nurses frequency by experience.

Experience	Frequency	Percent
Less than 5 years	59	13.6
Between 5 - 10 years	124	28.5
Between 11 - 20	185	42.5
More than 20 years	67	15.4
Total	435	100.0

Table 14. Nurses' frequency by the main job.

Main Job	Frequency	Percent
In-Patient	231	53.1
Out-Patient	95	21.8
Providing Support	109	25.1
Total	435	100.0

Table 15. Nurses frequency by leadership position.

Leadership Position	Frequency	Percent
Yes	173	39.8
No	262	60.2
Total	435	100.0

Table 16. Nursing data test of normality (Shapiro-Wilk).

Data	Shapiro-Wilk (Sig)
Well-Being Factor	<0.001
Self-Control Factor	<0.001
Emotionality Factor	<0.001
Sociability Factor	<0.001
Global EI	<0.001
Rational Style (RS)	<0.001
Experiential Style (ES)	<0.001
Extraversion	<0.001
Agreeableness	<0.001
Conscientiousness	<0.001
Neuroticism	<0.001
Openness	<0.001

3.2. Primary Analysis

Objective 1: Style of thinking

Objective 1.1 Correlation of Thinking styles (RS and ES) and Global EI

Spearman's rank correlation was computed to assess the relationship **between RS and Global EI**. There was a moderate positive correlation between the two variables, $r = 0.653$, $p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between ES and Global EI**. There was a moderate positive correlation between the two variables, $r = 0.517$, $p < 0.001$.

Objective 1.2 Correlation of Thinking styles (RS and ES) and BFI components

Spearman's rank correlation was computed to assess the relationship **between RS and Extraversion**. There was a weak positive correlation between the two variables, $r = 0.318$, $p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between RS and Agreeableness**. There was a moderate positive correlation between the two variables, $r = 0.561$, $p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between RS and Conscientiousness**. There was a strong positive correlation between the two variables, $r = 0.606$, $p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between RS and Neuroticism**. There was a moderate negative correlation between the two variables, $r = -0.427$, $p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between RS and Openness**. There was a moderate positive correlation between the two variables, $r = 0.532$, $p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between ES and Extraversion**. There was a weak positive correlation between the two variables, $r = 0.287$, $p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between ES and Agreeableness**. There was a moderate positive correlation between the two variables, $r = 0.435$, $p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between ES and Conscientiousness**. There was a moderate positive correlation between the two variables, $r = 0.481$, $p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between ES and Neuroticism**. There was a weak negative correlation between the two variables, $r = -0.328$, $p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between ES and Openness**. There was a moderate positive correlation between the two variables, $r = 0.457$, $p < 0.001$.

Objective 1.3 Thinking styles (RS and ES) and demographic data

Objective 1.3.1 RS&ES vs. Leadership position:

A Mann-Whitney test was used to compare RS and Leadership position. There was a significant difference where nurses in a leadership position had higher RS

scores (**Table 17**), $U = 19377.500$, $z = -2.562$, $p = 0.010$, with a small effect size $r = 0.123$.

A Mann-Whitney test was used to compare ES and leadership position. There were no significant differences ($U = 20818.500$, $z = -1.438$, $p = 0.150$).

Objective 1.3.2 RS&ES vs. Gender:

A Mann-Whitney test was used to compare RS and Gender. There were no significant differences ($U = 12436.000$, $z = -1.610$, $p = 0.107$).

A Mann-Whitney test was used to compare ES and Gender. There were no significant differences ($U = 12861.500$, $z = -1.188$, $p = 0.235$).

A Wilcoxon signed rank test revealed a significant difference in the thinking styles within nurses (**Table 18**), $n = 435$, $Z = -13.558$, $p < 0.001$. Nurses tended to be more of an RS than ES with a strong effect size, $r = 0.65$.

Objective 1.3.3 RS&ES vs. Main Job:

A Kruskal-Wallis H test was used to compare RS and Main Job. There was a significant difference where nurses that provided support to other nurses had higher RS scores (**Table 19**), RS: $H(2) = 20.479$, $P \leq 0.001$.

A Kruskal-Wallis H test was used to compare ES and Main Job. There was a significant difference where nurses that provided support to other nurses had higher ES scores (**Table 20**), ES: $H(2) = 13.251$, $P = 0.001$.

Objective 1.3.4 RS&ES vs. Education Level:

A Kruskal-Wallis H test was used to compare RS and Education Level. There was a significant difference where nurses with a higher educational degree had higher RS scores (**Table 21**), RS: $H(2) = 14.601$, $P = 0.002$.

A Kruskal-Wallis H test was used to compare ES and Education levels. There was a significant difference where nurses with a higher educational degree had higher ES scores (**Table 22**), ES: $H(2) = 10.612$, $P = 0.014$.

Objective 1.3.5 RS&ES vs. Exercising:

A Kruskal-Wallis H test was used to compare RS and Exercising (**Table 23**). There was a significant difference, RS: $H(3) = 12.705$, $P = 0.011$.

A Kruskal-Wallis H test was used to compare ES and Exercising (**Table 24**). There was a significant difference, RS: $H(3) = 10.971$, $P = 0.012$.

Table 17. RS scores.

Leadership position	<i>Md</i>	<i>N</i>
Yes	3.50	173
No	3.35	262

Table 18. RS and ES scores.

Thinking styles	<i>Md</i>	<i>N</i>
RS	3.40	435
ES	3.20	435

Table 19. RS scores.

Main Job	<i>Md</i>	<i>N</i>
In-Patient	3.40	231
Out-Patient	3.20	95
Providing Support	3.65	109

Table 20. ES scores.

Main Job	<i>Md</i>	<i>N</i>
In-Patient	3.23	231
Out-Patient	3.10	95
Providing Support	3.30	109

Table 21. RS scores.

Education level	<i>Md</i>	<i>N</i>
Diploma degree	3.15	43
Bachelor degree	3.35	339
Master degree	3.75	49

Table 22. ES scores.

Education level	<i>Md</i>	<i>N</i>
Diploma degree	3.03	43
Bachelor degree	3.20	339
Master degree	3.30	49

Table 23. RS scores.

Exercising	<i>Md</i>	<i>N</i>
Never	3.35	110
Once a week	3.35	137
Twice a week	3.30	71
Three times and more a week	3.70	117

Table 24. ES Scores.

Exercising	<i>Md</i>	<i>N</i>
Never	3.15	110
Once a week	3.20	137
Twice a week	3.20	71
Three times and more a week	3.33	117

Objective 2: Emotional Intelligence EI

Objective 2.1 Correlation of EI and BFI components

Spearman's rank correlation was computed to assess the relationship **between EI and Extraversion**. There was a moderate positive correlation between the two variables, $r = 0.487, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between EI and Agreeableness**. There was a strong positive correlation between the two variables, $r = 0.731, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between EI and Conscientiousness**. There was a strong positive correlation between the two variables, $r = 0.723, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between EI and Neuroticism**. There was a moderate negative correlation between the two variables, $r = -0.666, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between EI and Openness**. There was a moderate positive correlation between the two variables, $r = 0.467, p < 0.001$.

Objective 2.1.1 Self-Control (EI-Factor) vs. BFI components:

Spearman's rank correlation was computed to assess the relationship **between Self-Control and Extraversion**. There was a moderate positive correlation between the two variables, $r = 0.408, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Self-Control and Agreeableness**. There was a moderate positive correlation between the two variables, $r = 0.577, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Self-Control and Conscientiousness**. There was a moderate positive correlation between the two variables, $r = 0.587, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Self-Control and Neuroticism**. There was a moderate negative correlation between the two variables, $r = -0.639, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Self-Control and Openness**. There was a moderate positive correlation between the two variables, $r = 0.380, p < 0.001$.

Objective 2.1.2 Sociability (EI-Factor) vs. BFI components:

Spearman's rank correlation was computed to assess the relationship **between Sociability and Extraversion**. There was a moderate positive correlation between the two variables, $r = 0.405, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Sociability and Agreeableness**. There was a moderate positive correlation between the two variables, $r = 0.496, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Sociability and Conscientiousness**. There was a moderate positive correlation between the two variables, $r = 0.560, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Sociability and Neuroticism**. There was a moderate negative correlation between

the two variables, $r = -0.561$, $p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Sociability and Openness**. There was a moderate positive correlation between the two variables, $r = 0.318$, $p < 0.001$.

Objective 2.2 EI and demographic data

Objective 2.2.1 EI vs. Leadership position:

A Mann-Whitney test was used to compare EI and Leadership position. There was a significant difference where nurses in a leadership position had higher EI scores (**Table 25**), $U = 17407.500$, $z = -4.097$, $p < 0.001$, with a small effect size $r = 0.20$.

Objective 2.2.2 EI vs. Gender:

A Mann-Whitney test was used to compare EI and Gender. There was no significant difference, $U = 13430.500$, $z = -0.625$, $p = 0.532$.

Objective 2.2.3 EI vs. Smoking:

A Mann-Whitney test was used to compare EI and Smoking. There was no significant difference, $U = 10533.000$, $z = -1.442$, $p = 0.149$.

However, one of the EI factors found to have significance with smoking which is the Well-Being factor: A Mann-Whitney test was used to compare Well-Being and Smoking. There was a significant difference (**Table 26**), $U = 9891.000$, $z = -2.136$, $p = 0.033$, with a small effect size $r = 0.10$.

Objective 2.2.4 EI vs. Error rate:

A Mann-Whitney test was used to compare EI and error rate. There was no significant difference, $U = 15333.000$, $z = -1.386$, $p = 0.166$.

However, one EI factor was found to have a significant error rate, which is the Self-Control factor: A Mann-Whitney test was used to compare Self-Control and error rate. There was a significant difference (**Table 27**), $U = 14592.500$, $z = -2.061$, $p = 0.039$, with a small effect size $r = 0.10$.

Objective 2.2.5 EI vs. Main Job:

A Kruskal-Wallis H test was used to compare EI and the main job. There was a significant difference for EI and all its factors (**Table 28**), EI: $H(2) = 14.761$, $P < 0.001$.

A Kruskal-Wallis H test was used to compare the EI-factor of Well-Being and the main job. There was a significant difference (**Table 29**) in, Well-Being factor: $H(2) = 6.349$, $P = 0.042$.

A Kruskal-Wallis H test was used to compare the EI factor of Self-Control and the main job. There was a significant difference (**Table 30**), Self-Control factor: $H(2) = 13.958$, $P < 0.001$.

A Kruskal-Wallis H test was used to compare the EI-factor of Emotionality and the main job. There was a significant difference in the Emotionality factor (**Table 31**): $H(2) = 12.730$, $P = 0.002$.

A Kruskal-Wallis H test was used to compare the EI factor of sociability and the main job. There was a significant difference in the Sociability factor (**Table 32**): $H(2) = 21.619$, $P < 0.001$.

Table 25. EI scores.

Leadership position	<i>Md</i>	<i>N</i>
Yes	5.03	173
No	4.53	262

Table 26. Well-Being factor scores.

Smoking	<i>Md</i>	<i>N</i>
Yes	4.67	64
No	5.17	435

Table 27. Self-Control factor scores.

Error rate	<i>Md</i>	<i>N</i>
No	4.50	334
Yes	4.17	101

Table 28. EI global.

Main Job	<i>Md</i>	<i>N</i>
In-Patient	4.70	231
Out-Patient	4.40	95
Providing Support	5.17	109

Table 29. Well-Being factor.

Main Job	<i>Md</i>	<i>N</i>
In-Patient	5.00	231
Out-Patient	5.00	95
Providing Support	5.67	109

Table 30. Self-Control factor.

Main Job	<i>Md</i>	<i>N</i>
In-Patient	4.33	231
Out-Patient	4.17	95
Providing Support	4.67	109

Table 31. Emotionality factor.

Main Job	<i>Md</i>	<i>N</i>
In-Patient	4.88	231
Out-Patient	4.38	95
Providing Support	5.25	109

Table 32. Sociability factor.

Main Job	<i>Md</i>	<i>N</i>
In-Patient	4.33	231
Out-Patient	4.17	95
Providing Support	5.00	109

Objective 2.2.6 EI vs. Education Level:

A Kruskal-Wallis H test was used to compare EI and Educational Level. There was no significant difference: $H(3) = 4.254, P = 0.171$.

Objective 2.2.7 EI vs. Experience:

A Kruskal-Wallis H test was used to compare EI and years of experience. There was a significant difference for EI and all its factors (**Table 33**), EI: $H(3) = 22.582, P < 0.001$.

A Kruskal-Wallis H test was used to compare the EI factor of Well-Being and the years of experience. There was a significant difference in the Well-Being factor (**Table 34**): $H(3) = 21.467, P < 0.001$.

A Kruskal-Wallis H test was used to compare the EI factor of Self-Control and the years of experience. There was a significant difference in, Self-Control factor (**Table 35**): $H(3) = 14.973, P = 0.002$.

A Kruskal-Wallis H test was used to compare the EI factor of Emotionality and the years of experience. There was a significant difference in, Emotionality factor (**Table 36**): $H(3) = 15.397, P = 0.002$.

A Kruskal-Wallis H test was used to compare the EI factor of sociability and the years of experience. There was a significant difference in the Sociability factor (**Table 37**): $H(3) = 16.230, P = 0.001$.

Objective 2.2.8 EI vs. Age:

Spearman's rank correlation was computed to assess the relationship **between EI and Age**. There was a weak positive correlation between the two variables, $r = 0.215, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Age and Well-Being factor**. There was a weak positive correlation between the two variables, $r = 0.190, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Age and Self-Control factor**. There was a weak positive correlation between the two variables, $r = 0.180, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Age and Emotionality factor**. There was a weak positive correlation between the two variables, $r = 0.187, p < 0.001$.

Spearman's rank correlation was computed to assess the relationship **between Age and Sociability factor**. There was a weak positive correlation between the two variables, $r = 0.180, p < 0.001$.

Objective 2.2.9 EI vs. Grade at nursing degree:

A Kruskal-Wallis H test was used to compare EI and Grade at nursing degree. There was no significant difference, EI: $H(3) = 6.453$, $P = 0.092$.

However, there was a significance in two EI factors: Well-Being and Sociability (**Table 38**). For Well-Being factor: $H(3) = 8.060$, $P = 0.045$.

For Sociability factor (**Table 39**): $H(3) = 8.093$, $P = 0.044$.

Table 33. EI global.

Years of Experience	<i>Md</i>	<i>N</i>
Less than 5 years	4.13	59
Between 5 - 10 years	4.70	124
Between 11 - 20 years	4.87	185
More than 20 years	5.20	67

Table 34. Well-Being factor.

Years of Experience	<i>Md</i>	<i>N</i>
Less than 5 years	4.50	59
Between 5 - 10 years	5.17	124
Between 11 - 20 years	5.00	185
More than 20 years	5.67	67

Table 35. Self-Control factor.

Years of Experience	<i>Md</i>	<i>N</i>
Less than 5 years	4.00	59
Between 5 - 10 years	4.33	124
Between 11 - 20 years	4.50	185
More than 20 years	4.83	67

Table 36. Emotionality factor.

Years of Experience	<i>Md</i>	<i>N</i>
Less than 5 years	4.13	59
Between 5 - 10 years	4.75	124
Between 11 - 20 years	5.00	185
More than 20 years	5.25	67

Table 37. Sociability factor.

Years of Experience	<i>Md</i>	<i>N</i>
Less than 5 years	4.00	59
Between 5 - 10 years	4.33	124
Between 11 - 20 years	4.50	185
More than 20 years	4.67	67

Table 38. Well-Being factor.

Grade at nursing degree	<i>Md</i>	<i>N</i>
Pass	4.92	32
Good	4.83	136
Very Good	5.17	182
Excellent	5.34	73

Table 39. Sociability factor.

Grade at nursing degree	<i>Md</i>	<i>N</i>
Pass	4.00	32
Good	4.42	136
Very Good	4.50	182
Excellent	5.67	73

Objective 2.2.10 EI vs. Social Media Usage:

A Kruskal-Wallis H test was used to compare EI and Social Media Usage (**Table 40**). There was a significant difference, EI: $H(3) = 9.211$, $P = 0.010$

Additionally, there was a significance in two EI factors: Well-Being and Self-Control.

For Well-Being factor (**Table 41**): $H(2) = 14.765$, $P < 0.001$.

For Self-Control factor (**Table 42**): $H(2) = 7.306$, $P = 0.026$.

Objective 2.2.11 EI vs. Exercising:

A Kruskal-Wallis H test was used to compare EI and Exercising. There was no significant difference, EI: $H(3) = 5.856$, $P = 0.119$.

However, there was a significance with one EI factor: Well-Being (**Table 43**): $H(3) = 10.295$, $P = 0.016$.

Objective 3: Big Five Inventory (BFI) Personality Traits**Objective 3.1 BFI and demographic data**Objective 3.1.1 BFI vs. Leadership position:

There was significance between the leadership position and four of the BFI components: Extraversion, Agreeableness, Conscientiousness, and Neuroticism but not with openness.

A Mann-Whitney test was used to compare Extraversion and Leadership position. There was a significant difference where nurses in a leadership position had higher Extraversion scores (**Table 44**), $U = 19914.500$, $z = -2.149$, $p = 0.032$, with a small effect size $r = 0.10$.

A Mann-Whitney test was used to compare Agreeableness and Leadership position. There was a significant difference where nurses in a leadership position had higher Agreeableness scores (**Table 45**), $U = 19914.500$, $z = -2.426$, $p = 0.015$, with a small effect size $r = 0.12$.

A Mann-Whitney test was used to compare Conscientiousness and Leadership position. There was a significant difference where nurses in a leadership position

had higher Conscientiousness scores (**Table 46**), $U = 19246.500$, $z = -2.666$, $p = 0.008$, with a small effect size $r = 0.13$.

A Mann-Whitney test was used to compare Neuroticism and Leadership position. There was a significant difference where nurses in a leadership position had lower Neuroticism scores (**Table 47**), $U = 17447.500$, $z = -4.073$, $p < 0.001$, with a small effect size $r = 0.20$.

Table 40. Global EI.

Social Media Usage	<i>Md</i>	<i>N</i>
Less than 2 hours	4.99	148
Between 2 - 5 hours	4.70	211
More than 5 hours	4.49	76

Table 41. Well-Being.

Social Media Usage	<i>Md</i>	<i>N</i>
Less than 2 hours	5.50	148
Between 2 - 5 hours	5.00	211
More than 5 hours	4.83	76

Table 42. Self-Control.

Social Media Usage	<i>Md</i>	<i>N</i>
Less than 2 hours	4.50	148
Between 2 - 5 hours	4.33	211
More than 5 hours	4.25	76

Table 43. Well-Being factor.

Exercising	<i>Md</i>	<i>N</i>
Never	4.83	110
Once a week	5.33	137
Twice a week	5.00	71
Three times and more a week	5.33	117

Table 44. Extraversion.

Leadership position	<i>Md</i>	<i>N</i>
Yes	3.25	173
No	3.13	262

Table 45. Agreeableness scores.

Leadership position	<i>Md</i>	<i>N</i>
Yes	4.11	173
No	3.89	262

Table 46. Conscientiousness scores.

Leadership position	<i>Md</i>	<i>N</i>
Yes	3.89	173
No	3.67	262

Table 47. Neuroticism scores.

Leadership position	<i>Md</i>	<i>N</i>
Yes	2.50	173
No	2.88	262

Objective 3.1.3 BFI vs. Smoking:

One BFI component, agreeableness, was significant with smoking. A Mann-Whitney test was used to compare agreeableness and smoking. There was a significant difference where nurses who did not smoke had higher scores (**Table 48**), $U = 9814.500$, $z = -2.218$, $p = 0.027$, with a small effect size $r = 0.11$.

Objective 3.1.4 BFI vs. Error rate:

Two BFI components, Agreeableness and Conscientiousness, were significant with error rate.

A Mann-Whitney test was used to compare agreeableness and error rate. There was a significant difference where nurses who did not err had higher scores (**Table 49**), $U = 14089.500$, $z = -2.513$, $p = 0.012$, with a small effect size $r = 0.12$.

A Mann-Whitney test was used to compare conscientiousness and error rate. There was a significant difference where nurses who did not err had higher scores (**Table 50**), $U = 14553.000$, $z = -2.093$, $p = 0.036$, with a small effect size $r = 0.10$.

Objective 3.1.6 BFI vs. Education Level:

There were no significant differences between BFI and Education Level.

Objective 3.1.7 BFI vs. Experience:

There were significant differences between experience and four of the BFI components: Extraversion, Agreeableness, Conscientiousness, and Neuroticism but not with openness.

A Kruskal-Wallis H test was used to compare Extraversion and Experience. There was a significant difference, Extraversion (**Table 51**): $H(3) = 11.438$, $P = 0.010$.

A Kruskal-Wallis H test was used to compare Agreeableness and Experience. There was a significant difference (**Table 52**), Agreeableness: $H(3) = 15.379$, $P = 0.002$.

A Kruskal-Wallis H test was used to compare Conscientiousness and Experience. There was a significant difference (**Table 53**), Conscientiousness: $H(3) = 17.733$, $P < 0.001$.

A Kruskal-Wallis H test was used to compare Neuroticism and Experience.

There was a significant difference (**Table 54**), Neuroticism: $H(3) = 17.733$, $P < 0.001$.

Table 48. Agreeableness scores.

Smoking	<i>Md</i>	<i>N</i>
Yes	3.67	64
No	4.00	371

Table 49. Agreeableness scores.

Error rate	<i>Md</i>	<i>N</i>
Yes	3.78	101
No	4.00	334

Table 50. Conscientiousness scores.

Error rate	<i>Md</i>	<i>N</i>
Yes	3.56	101
No	3.78	334

Table 51. Extraversion scores.

Experience	<i>Md</i>	<i>N</i>
Less than 5 years	3.13	59
Between 5 - 10 years	3.25	124
Between 11 - 20 years	3.25	185
More than 20 years	3.38	67

Table 52. Agreeableness scores.

Experience	<i>Md</i>	<i>N</i>
Less than 5 years	3.67	59
Between 5 - 10 years	4.00	124
Between 11 - 20 years	4.00	185
More than 20 years	4.22	67

Table 53. Conscientiousness scores.

Experience	<i>Md</i>	<i>N</i>
Less than 5 years	3.33	59
Between 5 - 10 years	3.67	124
Between 11 - 20 years	3.89	185
More than 20 years	3.89	67

Table 54. Neuroticism scores.

Experience	<i>Md</i>	<i>N</i>
Less than 5 years	3.00	59
Between 5 - 10 years	2.88	124
Between 11 - 20 years	2.63	185
More than 20 years	2.13	67

Objective 3.1.8 BFI vs. Marital Status:

There were significant differences between Marital status and three of the BFI components: Extraversion, Agreeableness, and Neuroticism but not with Conscientiousness and Openness.

A Kruskal-Wallis H test was used to compare Extraversion and Marital Status. There was a significant difference (**Table 55**), Extraversion: $H(3) = 15.708$, $P = 0.001$.

A Kruskal-Wallis H test was used to compare Agreeableness and Marital Status. There was a significant difference (**Table 56**), Agreeableness: $H(3) = 13.032$, $P = 0.005$.

A Kruskal-Wallis H test was used to compare Neuroticism and Marital Status. There was a significant difference (**Table 57**), Neuroticism: $H(3) = 14.346$, $P = 0.002$.

Objective 3.1.9 BFI vs. Grade at nursing degree:

There were significant differences between grades in nursing degrees and three BFI components: Conscientiousness, Neuroticism, and Openness but not with Extraversion and Agreeableness.

A Kruskal-Wallis H test was used to compare Conscientiousness and Socio-economic Status. There was a significant difference (**Table 58**), Conscientiousness: $H(3) = 8.156$, $P = 0.043$.

A Kruskal-Wallis H test was used to compare Neuroticism and Grade at nursing degree. There was a significant difference (**Table 59**), Neuroticism: $H(3) = 10.650$, $P = 0.014$.

A Kruskal-Wallis H test was used to compare Openness and Grade at nursing degrees. There was a significant difference (**Table 60**), Openness: $H(3) = 9.274$, $P = 0.026$.

Objective 3.1.10 BFI vs. Social Media Usage:

There were significant differences between Social Media Usage and three of the BFI components: Agreeableness, Conscientiousness, and Neuroticism and but not with Extraversion and Openness.

A Kruskal-Wallis H test was used to compare Agreeableness and Social Media Usage. There was a significant difference (**Table 61**), Agreeableness: $H(2) = 11.120$, $P = 0.004$.

A Kruskal-Wallis H test was used to compare Conscientiousness and Social Media Usage. There was a significant difference (**Table 62**), Conscientiousness:

$H(2) = 9.577, P = 0.008$.

A Kruskal-Wallis H test was used to compare Neuroticism and Social Media Usage. There was a significant difference (**Table 63**), Neuroticism: $H(2) = 15.508, P < 0.001$.

Table 55. Extraversion scores.

Marital Status	<i>Md</i>	<i>N</i>
Single	3.13	133
Married	3.25	274
Divorced	3.75	9
Separated	3.50	15

Table 56. Agreeableness scores.

Marital Status	<i>Md</i>	<i>N</i>
Single	3.70	133
Married	4.00	274
Divorced	4.11	9
Separated	4.44	15

Table 57. Neuroticism scores.

Marital Status	<i>Md</i>	<i>N</i>
Single	2.88	133
Married	2.63	274
Divorced	2.25	9
Separated	2.25	15

Table 58. Conscientiousness scores.

Grade at nursing degree	<i>Md</i>	<i>N</i>
Pass	3.39	32
Good	3.78	136
Very Good	3.78	182
Excellent	4.00	73

Table 59. Neuroticism scores.

Grade at nursing degree	<i>Md</i>	<i>N</i>
Pass	3.00	32
Good	2.63	136
Very Good	2.63	182
Excellent	2.50	73

Table 60. Openness scores.

Grade at nursing degree	<i>Md</i>	<i>N</i>
Pass	3.40	32
Good	3.50	136
Very Good	3.50	182
Excellent	3.70	73

Table 61. Agreeableness scores.

Social Media Usage	<i>Md</i>	<i>N</i>
Less than 2 hours	4.17	148
Between 2 - 5 hours	3.89	211
More than 5 hours	3.84	76

Table 62. Conscientiousness scores.

Social Media Usage	<i>Md</i>	<i>N</i>
Less than 2 hours	4.00	148
Between 2 - 5 hours	3.67	211
More than 5 hours	3.56	76

Table 63. Neuroticism scores.

Social Media Usage	<i>Md</i>	<i>N</i>
Less than 2 hours	2.50	148
Between 2 - 5 hours	2.75	211
More than 5 hours	2.94	76

Objective 3.1.11 BFI vs. Exercising:

There were significant differences between exercising and four of the BFI components: Extraversion, Conscientiousness, Neuroticism, and Openness but not with agreeableness.

A Kruskal-Wallis H test was used to compare Extraversion and Exercising. There was a significant difference (**Table 64**), Agreeableness: $H(3) = 13.240$, $P = 0.004$.

A Kruskal-Wallis H test was used to compare Conscientiousness and Exercising. There was a significant difference (**Table 65**), Conscientiousness: $H(3) = 8.403$, $P = 0.038$.

A Kruskal-Wallis H test was used to compare Neuroticism and Exercising. There was a significant difference (**Table 66**), Neuroticism: $H(3) = 15.540$, $P = 0.001$.

A Kruskal-Wallis H test was used to compare Openness and Exercising. There was a significant difference (**Table 67**), Openness: $H(3) = 16.437$, $P < 0.001$.

Table 64. Extraversion scores.

Exercising	<i>Md</i>	<i>N</i>
Never	3.00	110
Once a week	3.25	137
Twice a week	3.25	71
Three times and more a week	3.38	117

Table 65. Conscientiousness scores.

Exercising	<i>Md</i>	<i>N</i>
Never	3.56	110
Once a week	3.89	137
Twice a week	3.78	71
Three times and more a week	3.89	117

Table 66. Neuroticism scores.

Exercising	<i>Md</i>	<i>N</i>
Never	3.00	110
Once a week	2.63	137
Twice a week	2.88	71
Three times and more a week	2.50	117

Table 67. Openness scores.

Exercising	<i>Md</i>	<i>N</i>
Never	3.40	110
Once a week	3.50	137
Twice a week	3.50	71
Three times and more a week	3.60	117

4. Discussion

This study aimed to investigate the personality traits using the Big Five Inventory (BFI), Emotional Intelligence (EI), and Thinking Styles (RS & ES) in nurses and how the three psychometric tests, if possible, relate to each other in a consolidative way. Additionally, could these three psychometrics tests shed light on nurses, or even as a general concept for all healthcare workers, to be considered a characterization mechanism to understand healthcare workers and support them to achieve better performance and safer patient care.

Ethical and moral decision-making and error rate are at the heart of healthcare priorities for safer patient care [45] [51]. A study examined how BFI affected moral and ethical judgments in healthcare settings and patient care outcomes [14]. They found that three components of the BFI: higher conscientious-

ness scores, higher agreeableness scores, and lower neuroticism scores, which they put under one category calling it stability, affected directly and positively healthcare ethical and moral behaviors and decisions. In this study, several findings could align with this and consolidate their results. For example, conscientiousness and agreeableness were correlated positively with one of the EI factors being the Self-Control factor and negatively with neuroticism making Self-Control a good additional predictor of moral and ethical stability (objective 2.1.1). Self-control was also found to have significant differences with error rates, where nurses who did not err had higher self-control scores (objective 2.2.4). Additionally, self-control was found to have significant differences with social media usage, where nurses who used it excessively for more than 5 hours had lower self-control scores (objective 2.2.10), and this behavior of high social media usage was found to be used as a coping mechanism for negative psychological issues [52] [53]. Self-control was also found to be strongly associated with memory and attention during solving problems where better self-control scores performed better and were more successful in resolving issues under stressful situations [16]; this is in line with this study where higher scores in self-control had less error rates (objective 2.2.4). Additionally, it was found that high scores in agreeableness had a positive effect on healthcare provider and patient communication and also less error [54] [55], and this is in line with this study finding where high scores in agreeableness were found to be significantly associated with less error (objective 3.1.4), higher scores in EI (objective 2.1) and better self-control (objective 2.1.1).

Another serious issue in healthcare is aggressive behavior, where it was found that stability of the BFI predicated negatively aggressive behavior together with lower scores in Self-Control [56]. Another study for nursing found that lower scores in agreeableness, conscientiousness, and openness had a significant positive effect on verbal aggressiveness communication style with staff and patients, and high scores in neuroticism affected significantly and negatively the nurse-patient relationship [12]. Another study showed that autistic traits, difficulty in communication, anti-social behavior, and difficulty coping with change; in typically developing people were correlated negatively with EI and the BFI [19] [57]. All this shows that all mentioned studies and this study support each other and connecting the dots to give a conceptual picture of our workers and how they might behave and how the organization should apply scarce resources to support specific workers that need it. This study's results showed how higher scores in EI, BFI, and style of thinking had positive effects on all demographic data supporting healthier providers and safer patient care.

This study found that there were significant differences between BFI components of conscientiousness and agreeableness and error rate where nurses who did not err had higher scores (objective 3.1.4), which is in line with a nursing study about the likelihood of medication administration error where it was found low conscientiousness had a significant effect [9] and positive personality traits

increased nursing clinical competency in general [8]. Additionally, another study found that BFI dimensions of stability significantly helped healthcare workers from psychological distress in general and during the COVID-19 pandemic; where they have recommended making this a screening tool for healthcare providers to give them dedicated support [13], and this is something the author supports strongly as a step towards healthcare providers' characterization using any or all the three psychometric tests used in this study to give better and focused support.

Burnout in the form of emotional exhaustion (EE) and depersonalization (DP) has a negative effect on healthcare providers' mental health, job satisfaction, and safer patient care [58]. It was found that neuroticism correlated positively with EE and DP and negatively with the other BFI components [20], which is supported by this study as shown above with error rate, social media usage, and the Self-control factor. Additionally, rational thinking was correlated positively with BFI components: agreeableness, conscientiousness, openness, and extraversion, and negatively with neuroticism consolidating the above studies (objective 1.2), helping healthcare provider consider their emotion with rational objectivity. Additionally, high scores of EI were also found to be significantly related to lower stress and burnout in South African nurses. It was recommended that they make EI part of nursing curricula [33], and this is in line with this study where high scores of EI were significantly associated with lower social media usage (objectives 2.2.13), which were shown that high uses of social media related with higher stress and mental issues [52] [53].

BFI components were studied for their own merits. For example, high agreeableness scores were found with cooperate, friendly, social harmony, and sound and supportive attitude people [59]. On the other side, low-scored people in this dimension tended to be selfish, less caring, and unfriendly. From this study, it was found that low scores in this dimension were associated with a higher rate of errors (objective 3.1.4), less self-control (objective 2.1.1), and less score in EI (objective 2.1). It was also found in this study that low scores in agreeableness were associated with less or no exercising (objective 3.1.11), people who smoked (objective 3.1.3), and spending more time on social media (objective 3.1.10). In this study, nurses in leadership positions had higher scores in agreeableness (objective 3.1.1) and higher scores in EI (objective 2.2), making them more approachable, which is an important caliper that is needed for better communication with the staff where higher EI scores were significantly associated with nursing better communication [31] [60]. Additionally, higher experience at the job was associated with higher scores in agreeableness (objective 3.1.7), and interestingly marital status had an association with agreeableness where for example, married nurses had higher scores in agreeableness than singles (objective 3.1.8); perhaps marriages needed two-way, flexible and friendly atmosphere for better communication and working as a team.

High job experience in this study was significant, with high scores of EI (ob-

jective 2.2.7), which is in line with Turkish [61] and Iranian [60] studies on nurses but not with a Jordanian study on nurses [31], where they did not find any significance, and this could be due to cultural differences as mentioned before. Similar conflict with the educational level where in this study, it was not found to have a significant effect on EI (objective 2.2.6) or any of the BFI components (objective 3.1.6), which could consolidate the idea of EI and BFI predictability to each other. Nevertheless, the level of education in the Jordanian study for nurses had significance [31] but not in the Iranian study [60]. One interesting finding in this study that could support this study finding about the level of education having no effect on BFI and EI is that it had an impact on Rational thinking so that it could be more of an intellectual effect rather than emotional (objective 1.3.4).

Openness has the same results in this study under the same objectives of agreeableness; some of the good qualities for high openness is handling change better [19] [59], and high openness combined with high scores in sociability were strong predictors of creativity [26]. In this study, sociability was significantly correlated positively with openness (objective 2.1.2) and higher degree grades (objective 2.2.9). This should be looked at in the organization in a time of change and during any strategic planning and retreat.

Extraversion is also similar to agreeableness and openness, where high scores are associated with better social skills and successful careers [59], and nursing leaders had higher scores in this study (objective 3.1.1), higher Self-Control (objective 2.1.1) and better emotional intelligence scores (objective 2.1).

Low scores in conscientiousness were associated with carelessness at work [59], dishonest behavior [62], and lower academic achievement [25], and this is in line with this study as was shown, for example, in higher error rate (objective 3.1.4), low self-control (objective 2.1.1) and lower grade (objective 3.1.9) were associated with lower scores in conscientiousness.

High scores in neuroticism are associated with higher stress, depression, anger, impulsiveness, lower success in career and academic achievement, anti-social behavior and pessimistic view of life, and lower emotional intelligence scores [10] [25] [36] [52] [53] [58] [59]. This is in line with this study, where high scores of neuroticism were associated with lower emotional intelligence (objective 2.1), low self-control (objective 2.1.1), low or no exercising habits (objective 3.1.11), excessive social media usage (objective 3.1.9) lower scores in their degree grades (objective 3.1.9).

Other studies looked at EI, style of thinking, and BFI to see if they could predict each other. It was found that EI predicted both styles of thinking, RS&ES, and also the BFI components [40] [41] [42] [63] [64] [65], and it was even found that EI and BGI had a strong genetic correlation that they could be considered identical constructs [65]. This is in line with this study, where EI was positively correlated with both RS and ES (objective 1.1), and EI was correlated with all BFI components (objective 2.1). Additionally, in this study, it was also looked at

how the thinking styles related to EI and BFI components where it was found thinking styles correlated with all (objectives 1.1 and 1.2).

Healthcare organizations need to also pay attention to all three psychometric tests used in this study and their outcomes to give resources where needed most wisely [55]. For example, it was found that people with high scores in neuroticism were statistically and significantly unhappy [22]. In this study, it was shown that high scores of neuroticism were associated with less rational thinking (objective 1.2), lower self-control (objective 2.1.1), excessive social media usage (objective 3.1.10), less exercising habits (objective 3.1.11) and all this could explain the variation in reaction in healthcare providers to medical errors [55]. Additionally, lower scores in EI were associated with self-harm, personality disorder, and high scores of neuroticism [18] [21] [40], and in this study, neuroticism was found to have a negative correlation with EI (objective 2.1). It was found that healthcare providers that were involved in medical error, the term used for them as the second victim, suffer psychotically from this varies to the degrees of suicidal ideation [66] [67] and neuroticism scores could help the organization to identify who needs more support during such events.

There are conflicting results about gender and EI. This study showed no significant differences among them (objective 2.2.2), which is in line with other studies [15] [31] [36] [68] [69] [70] [71]. Others found females to be higher than males [61] [72] [73] [74], and other studies found males to have higher EI than females [75] [76]. Some studies looked at EI in nursing students where no significant differences were observed [77] [78]. However, EI was found to significantly changes with age in nursing students [78] and in Saudi nurses [32], which is in line with this study where it was found that EI had significantly higher scores with more experience (objective 2.2.7) and with age (objective 2.2.8).

This study looked at the style of thinking in nurses, where it was found that nurses were significantly more towards RS thinking with a strong effect size (objective 1.3.2) which is in line with a previous study [37]. Interestingly nursing job roles played a significant variation where nurses who worked in a supportive role, not dealing directly with patients, had higher scores of RS and ES than nurses who worked with in-patients than out-patient (objective 1.3.3). This is also accompanied by high scores of EI respectively (objective 2.2.5), and this is in line with a previous study where high scores of RS and ES predicted high scores in EI and less errors [15] [63]. This is a crucial point as both thinking styles are needed for all types of tasks; skill-based, rule-based, and knowledge-based; in order to reduce error [37].

Achieving higher job performance and leadership position was associated with high scores in personality traits and EI [64] and with authentic nursing leadership [32], and this is in line with this study where leaders had significantly higher EI (objective 2.2.1), significant high scores in rationality (1.3.1) and significantly better scores in four of the personality traits (objective 3.1.1). Low scores on personality traits and EI predicted anti-social behavior, peer problems [64],

and behavioral addictions [24], and this could be explained by low self-control scores with all BFI components (objective 2.1.1).

Healthcare depends on good and safe behavior of the staff as this will reflect positively towards safer care. One of the serious occupational hazards for healthcare workers in general and nurses in specific is needle stick injury, as it could transmit dangerous diseases like AIDS and hepatitis A and B [79]. World Health Organization (WHO) reported that 40% of cases of hepatitis A and B in healthcare workers are caused by needle-stick injuries. In the United States, four million healthcare workers suffer needle-stick injuries annually, and in the middle east, 50% of needle-stick injuries were reported for nurses [79]. This was reported to be caused by unsafe and high-risk behavior of certain nurses that had significantly lower scores in EI [79]. This is in line with this study through error rate: with Self-Control (objective 2.2.4) and with two components of the BFI (objective 3.1.4). Additionally, impulsive behavior was also significantly associated with lower scores of EI and with three components of the BFI: agreeableness, conscientiousness, and extraversion [80], and in this study, it was found that error rate was significantly affected by low scores in two of the BFI components: agreeableness and conscientiousness (objective 3.1.4). Other critical behavior at the workplace is violence, conflict resolution, and organizational citizenship behavior (OCB), where workers do more than just their job description and would promote a good and healthy environment. High scores in EI were found to have a direct and positive effect on OCB and better conflict resolution [20] [81]. Again this adds more importance to all the above, where EI plays a significant role in many behavioral aspects, and this was also shown in this study in the error rate, smoking, and social media habits.

Mental and physical health are essential aspects of healthcare providers in order to provide better and safer patient care. Specific EI components were found to predict the mental and physical health of individuals, which were: self-control, well-being, and sociability [27]. This study consolidates this indirectly, where low scores in self-control were significantly associated with errors (objective 2.2.4), excessive social media usage (objective 2.2.10), lower scores in all BFI components (objective 2.1.1), lower scores in well-being were associated with lower scores in rational thinking (objective 1.3.5) and lower scores in sociability was associated with lower grade scores (objective 2.2.9) and this could be part of the mental health. As for physical health, one could look at smoking and lack of exercise as bad health habits, where they were associated with lower scores in well-being (objectives 2.2.3 and 2.2.14, respectively).

5. Conclusion

Different studies consolidated each other, and all converge and channel into the concept of characterization of healthcare providers for better support to them and safer patient care. EI was proven to have a positive impact on all desirable behavior for the organization and is strongly linked to the BFI and thinking styles.

Therefore, it is valuable if organizations invest in improving EI in their providers [15]. Even though EI and BFI might be genetic constructs [65], short training, like 1 - 3 months, was found to increase EI scores significantly [34] [35], and the training would not change the providers' genetic construct; instead, it would highlight areas for improvement and equip them with appropriate and advantageous coping strategies [82] [83]. Organizations are encouraged to assess their workers' personality traits and observe any low scores in specific trait components to avoid undesirable behaviors or unfavorable patients' outcomes.

Limitation and Future Research

Self-report report measures could be a limiting factor as it depends on the time and the mood of participants, not forgetting biases and even fear especially for error rate data. However, having said that one needs to keep in mind that having three measures like in this study could be helpful as data consolidate each other into a convergent result about participants. Another limitation could be survey fatigue and even though more psychometric measures in a research are good to have so certain convergent conclusion could be reached, however survey fatigue might hinder good response rate. Future research could benefit from focusing on certain population of certain background and the direction of characterization might prove to be a valuable idea in understanding healthcare providers behaviours so intervention is more focused and safer patient care.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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