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A Structural Equation Model of Perceived Stress Level Related to Personality Trait, Chronotype Profile, and Eating Behaviour

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Abstract: Background: high levels of stress have hazardous impacts on nurses' health, well-being, job satisfaction, and abilities to cope with the job demands, which in turn may impact the provision of quality patient care, which is essential for universal health coverage. **Aim:** to investigate the relationship of perceived stress related to personality traits, chronotype, and eating behaviour among hospital and community nurses in Brunei. **Methods:** A cross-sectional survey on nurses from public hospitals and community health centres from all four districts in the country. The questionnaire included Perceived Stress Scale to measure stress levels, the brief Big Five Inventory to identify personality, the Morningness-Eveningness Questionnaire to identify chronotype, and the Sakata Eating Behaviour Questionnaire to identify eating behaviour. Subgroup analysis and partial least squares structural equation modelling were applied. **Results:** The structural equation model revealed that personality trait (β = 0.482) is the most salient and strongest factor contributing to perceived stress, followed by chronotype profile (β = 0.45), accounting for 71.4% of the variance explained for perceived stress. Whereas perceived stress (β = 0.719) is a factor affecting eating behaviour, which accounts for 51.6% of the variance explained for eating behaviour. **Conclusions:** This study revealed that neuroticism and evening chronotype are significant stress predictors. Stress affects eating habits, with stressed nurses showing poor eating patterns. Older and single nurses report higher stress.

Keywords: perceived stress; personality; chronotype; eating behaviour; nurses

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1. Introduction

Stress affects mental health and accounts for 80% of all occupational injuries [1]. In Iran, 7.4% of nurses are absent due to physical disability or mental exhaustion caused by stress, a higher rate than other professional groups [2]. Job stress among nurses in Malaysia ranges from 41.0% to 49.3% [3,4], meanwhile, 41.2% stress is reported among Australian nurses [5], and 90.0% stress is reported among Iranian nurses [6]. The nursing profession is stressful due to high expectations, high responsibility, and complex job demands yet minimal authority [7]. This profession constantly revolves around illness, threatening disease, lifelong disability, pain, injury, misery, and death [8]. Excessive stress can negatively impact nurses' mental and physical health [9], putting patients' lives at risk [10].

Stress is not solely caused by occupational stressors, and each person experiences stress differently as the threshold of resistance to stressors varies among individuals [11]. External factors such as occupational hazards and environmental and contextual factors

were the subjects of initial research investigations; however, only in the last two decades, have researchers started to focus on employee factors in the development of stress among nurses [12]. Therefore, available data on the subject are still scarce. Moreover, previous studies linking nurses' stress with employee factors have shown mixed results, and the majority of these studies were conducted on the non-Bruneian population.

Previous studies have shown the relationships between nurses' stress levels and either personality traits, chronotype profiles, or eating behaviour. However, to the best of our knowledge, the relationships between all of these factors have not yet been explored simultaneously. Therefore, this study aims to investigate the said relationship among hospital and community nurses in Brunei. This research intends to contribute to the body of knowledge on nursing by understanding how these factors are interlinked, which could be beneficial in informing the nurse managers, educators, and other stakeholders to put in measures and implement methods that respond to the individual differences of nurses when managing stress.

2. Background

Perceived stress is an individual's reaction to a situation that they perceive as harmful to their capabilities and health [13]. It encompasses both measurable stress and an individual's feelings about stress. Thus, perception of a stressful situation is more important than objective assessment and can have a considerable influence on how well an individual performs [14,15].

Personality is a set of psychological attributes that are comparatively established in adulthood, reflecting one's adaptability to the environment through distinctive behaviour and thought processes [16]. Various theories and scales exist to study and understand personality, but no clarity or consensus was found. After many years of extensive research, the Big Five personality dimension, developed by Robert McCrae and Paul Costa, is considered sufficient. The five traits are openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism [17,18]. Based on the differential exposure–reactivity model of the stress process, various personalities can influence both exposure and reactivity to stressful situations [19]. Some personality traits predispose people to experience stress in a way that causes psychological reactions that can be harmful to various physical systems. Understanding how personality predicts responses to stressful circumstances will help to better understand the fundamental mechanisms of stress and overall health.

The central circadian clock, situated in the hypothalamic suprachiasmatic nucleus, regulates behavioural and humoral rhythms in all living creatures, including humans [20]. The biological clock is dependent on the periodic expression of clock genes, which regulate life activities and the synthesis of clock proteins. Individual circadian typology has been characterized using the term chronotype, which pertains to a distinct activity–rest preference of an individual during a 24 h period [21]. Early risers who are more active in the mornings are considered to have a morning chronotype, whereas late risers who are more active at night are regarded as having an evening chronotype [22]. However, humans can disturb the biological clock by imposing desynchronization in operations, resulting in sleep occurring at irregular intervals [23]. This can happen when extrinsic rhythms interfere with the intrinsic circadian rhythms, such as while working shifts or operating across different time zones [24], which can lead to sleep deprivation and have a detrimental impact on job performance as well as physical and psychological health [25,26].

Stress can affect an individual's physiological equilibrium, causing abnormal eating behaviour [27]. Eating behaviour is affected by physiological, psychological, social, and genetic variables, influencing an individual's quantity of meal uptake, mealtime, meal choices, and preference [28]. Stress and hormonal interplay can alter this behaviour [29,30],

with lower leptin and insulin levels causing appetite changes [31]. Stress also causes the hypothalamic-pituitary-adrenal axis to release cortisol, contributing to excessive consumption and obesity [29,30].

3. The Study

Aims

This study aimed to investigate the relationship between perceived stress levels and personality, chronotype, and eating behaviour among hospital and community nurses in Brunei. The primary research question addressed is what is the relationship between perceived stress levels and personality, chronotype, and eating behaviour among hospital and community nurses? The secondary research question addressed is what is the relationship between perceived stress levels, personality, chronotype, and eating behaviour among hospital and community nurses of different demographic profiles such as age groups, gender, marital status, religion, nationality, race, educational backgrounds, professional titles, and years of employment?

4. Methods

4.1. Design

This is a quantitative method of research with a cross-sectional study design.

4.2. Sample and Recruitment

A population selection method was utilized where nurses from all public hospitals and community health centres in all four districts (Brunei-Muara, Tutong, Belait, and Temburong) of Brunei were recruited for the study, without sampling. Nurses from private health facilities were excluded. The following formula was used to determine adequacy of power for statistical analysis on a finite population (2200 registered nurses).

$$n\prime = \frac{NZ^2P(1-P)}{d^2(N-1)+Z^2P(1-P)}$$

where
n' = sample size with finite population correction;
N = population size;
Z = Z statistic for a level of confidence;
P = expected proportion;
d = precision.

A minimum number of respondents of at least 429 nurses was required to achieve precision (power) of 5% (d = 0.05) on a population size of 2200 nurses with an expected proportion of 50% at 95% confidence level [32]

4.3. Data Collection

The first author briefed the gatekeepers consisting of the head of nursing services from each public hospital and community health centre who did not form part of the sample to help distribute the questionnaire to all eligible participants willing to participate in this study. The survey questionnaire was distributed online from 11 January 2023 to 28 March 2023. The survey questionnaire consisted of a collection of demographic data such as age, gender, marital status, religion, nationality, race, highest qualification in nursing, years of employment, current designation, district of the workplace, and place of work to assess general characteristics of participants; the 10-item Perceived Stress Scale (PSS) to measure stress level; the 10-item brief Big Five Inventory (BFI-10) to identify personality trait; the 19-item Morningness-Eveningness Questionnaire (MEQ) to identify chronotype

profile; and 29-item Sakata's Eating Behaviour Questionnaire (SEBQ) adopted version to identify eating behaviour. The questionnaire in Malay and English was distributed online via a QR code and link, and responses were collected and retrieved in Qualtrics.

4.4. Instruments, Validity, and Reliability

Permission is not needed for all questionnaires used in this study because they are publicly available tools in the public domain. The 10-item PSS consists of five alternatives (0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often). Scores ranging from 0 to 13 would be considered low stress, 14 to 26 moderate stress, and 27 to 40 high stress. The 10-item PSS version, derived from the original 14-item version, is recommended for future research due to its reliability, validity, and superior psychometric properties [33]. It has adequate internal consistency, moderate convergent validity with stressful life events [33], and good concurrent validity with mental health problems like depression and anxiety [33] as it was derived from the 10 items in the original 14-item version with high factor loadings based on a sample of 2387 US residents [33].

The BFI-10 also consists of five alternatives (1 = disagree strongly, 2 = disagree a little, 3 = neither agree nor disagree, 4 = agree a little, 5 = agree strongly). The extraversion category would be for questions 1R (reverse score) and 5, agreeableness 2 and 7R (reverse score), conscientiousness 3R (reverse score) and 8, neuroticism 4R (reverse score) and 9, and openness 5R (reverse score) and 10. The BFI-10 scale, a shorter version of BFI-44, has been proven using peer ratings by Rammstedt and John [34] to retain significant reliability and validity levels, making it suitable for research studies with limited time constraints.

For the 19-item MEQ, the questionnaire has 19 questions, each with a number of points. The scores ranging from 16 to 30 would be considered definite evening, 31 to 41 moderate evening, 42 to 58 intermediate, 59 to 69 moderate morning, and 70 to 86 definite morning category. The MEQ, initially developed by Horne and Östberg, was made based on physiologic markers and was then validated using exploratory factor analysis by Caci et al. [35] and confirmatory factor analysis by Lee et al. [36] addressing its construct validity and reliability.

Lastly, the 29-item SEBQ adopted version consists of four alternatives (4 = strongly agree, 3 = somewhat agree, 2 = somewhat disagree, 1 = strongly disagree). The questionnaire is assessed by categorizing the 29 items into seven categories and a higher score indicated worse eating behaviour. The categories are eating rhythm abnormalities (questions 1–5), the feeling of satiety (questions 6–10), eating style (questions 11–12), cognition of constitution (questions 13–15), meal contents (questions 16–20), substitute eating and drinking (questions 21–26), and motivation for eating (questions 27–29). The SEBQ short form, which adopted 29 items from the original 30-item SEBQ, is widely used in Japan and is a reliable and valid indicator of eating disorders and obesity. The EBS short form was judged to contain appropriate questions by 2 experts for item evaluation. All items were quantitatively examined and sorted on the basis of the median [37].

4.5. Data Analysis

Information was entered and analysed using RStudio Desktop version 1.2.1335 (for Windows). The statistical analyses include the Chi-square test for independence to analyse factors associated with perceived stress levels and nurse group, one-way ANOVA to compare the mean of perceived stress levels score and the mean of nurse group number among the Big Five personality and the seven categories of Sakata's eating behaviour, multiple logistic regression to assume the presence of a linear relationship between independent variables and the dependent variable, and PLS-SEM to test and evaluate multivariate causal relationships between these variables. All statistical tests were two-sided and a p-value less than 0.05 was considered significant.

4.6. Ethical Considerations

The study protocol was reviewed and approved by the Joint Ethics Committee of Faculty and the Ministry of Health Research Ethics Committee in Brunei (Ref no: UBD/PAPRSBIHSREC/2022/90). The ethical principles were carefully followed throughout this study. All registered nurses who participated in this study were provided with an online participant's information page explaining the details of this study such as aim, objectives, procedures, inclusion criteria, exclusion criteria, matters concerning privacy, risks, discomforts, inconvenience, benefits, money matters, questions and complaints, and voluntary informed consent. All registered nurses who participated in this study provided their online informed consent.

5. Results

Following data cleaning, a total of 1700 respondent's data were used for analysis (response rate = 92.3%). Table 1 shows that there is a significant difference in the proportion of perceived stress levels (low/moderate, high) between age group (less than 30 years old, between 30 and 40 years old, more than 40 years old) populations ($p < 0.001$), gender (male, female) populations ($p = 0.005$), marital status (single, married) populations ($p < 0.001$), race (Malay, others) populations ($p < 0.001$), years of employment (less than 5 years, between 6 and 10 years, between 11 and 15 years, more than 15 years) populations ($p < 0.001$), and chronotype profile (morning, intermediate, evening) populations ($p < 0.001$).

Table 1. Factors (categorical variables) associated with perceived stress levels.

Perceived Stress Levels	Overall, $N = 1700$	Low/Moderate, $n = 222$	High, $n = 1478$	p-Value
Age				<0.001
Less than 30 years old	688 (40%)	43 (19%)	645 (44%)	
Between 30 and 40 years old	692 (41%)	139 (63%)	553 (37%)	
More than 40 years old	320 (19%)	40 (18%)	280 (19%)	
Gender				0.005
Male	480 (28%)	45 (20%)	435 (29%)	
Female	1220 (72%)	177 (80%)	1043 (71%)	
Marital Status				<0.001
Single	773 (45%)	30 (14%)	743 (50%)	
Married	927 (55%)	192 (86%)	735 (50%)	
Race				<0.001
Malay	1344 (79%)	149 (67%)	1195 (81%)	
Others	356 (21%)	73 (33%)	283 (19%)	
Qualification				0.326
Advanced diploma or below	1629 (96%)	210 (95%)	1419 (96%)	
Bachelor's or higher	71 (4.2%)	12 (5.4%)	59 (4.0%)	
Years of Employment				<0.001
Less than 5 years	666 (39%)	48 (22%)	618 (42%)	
Between 6 and 10 years	384 (23%)	74 (33%)	310 (21%)	
Between 11 and 15 years	273 (16%)	44 (20%)	229 (15%)	
More than 15 years	377 (22%)	56 (25%)	321 (22%)	
Designation				0.127
Staff nurse and below	1664 (98%)	214 (96%)	1450 (98%)	
Senior staff nurse and above	36 (2.1%)	8 (3.6%)	28 (1.9%)	
Place of Work				0.314
Hospital	1598 (94%)	212 (95%)	1386 (94%)	
Community	102 (6.0%)	10 (4.5%)	92 (6.2%)	
Chronotype Profile				<0.001
Morning	4 (0.2%)	4 (1.8%)	0 (0%)	
Evening	1043 (61%)	123 (55%)	920 (62%)	
Intermediate	653 (38%)	95 (43%)	558 (38%)	

Chi-square test for independence.

Table 2 shows that the mean (SD) of the perceived stress level scores (for 'low/moderate stress' and 'high stress', respectively) of the Big Five Personality are 4.22 (0.91) and 4.62 (1.08) for 'extraversion', 2.78 (1.02) and 3.51 (1.17) for 'agreeableness', 3.32 (0.89) and 4.09 (1.03) for 'conscientiousness', 4.55 (1.60) and 3.98 (1.46) for 'neuroticism', and 3.13 (1.23) and 3.86 (1.22) for 'openness'. The mean of the perceived stress level scores for 'high stress' are significantly higher than 'low/moderate stress' for 'extraversion' ($p < 0.001$), 'agreeableness' ($p < 0.001$), 'conscientiousness' ($p < 0.001$) and 'openness' ($p < 0.001$), whereas the mean of the perceived stress level scores for 'high stress' are significantly lower than 'low/moderate stress' for neuroticism ($p < 0.001$).

Table 2. Comparing the mean scores of the Big Five Personality and the seven categories of Sakata's Eating Behaviour scores among different stress levels.

Factors	Perceived Stress Levels		*p*-Value
	Low/Moderate, *n* = 222	High, *n* = 1478	
Personality traits			
Extraversion	4.22 (0.91)	4.62 (1.08)	<0.001
Agreeableness	2.78 (1.02)	3.51 (1.17)	<0.001
Conscientiousness	3.32 (0.89)	4.09 (1.03)	<0.001
Neuroticism	4.55 (1.60)	3.98 (1.46)	<0.001
Openness	3.13 (1.23)	3.86 (1.22)	<0.001
Eating Behaviour			
Eating Rhythm Abnormalities	12.18 (1.43)	11.10 (2.37)	<0.001
Feeling of Satiety	11.95 (1.76)	10.51 (2.44)	<0.001
Eating Style	4.99 (2.15)	4.39 (1.67)	<0.001
Cognition of Constitution	9.58 (1.95)	7.51 (2.30)	<0.001
Meal Contents	13.09 (2.89)	11.19 (2.74)	<0.001
Substitute Eating and Drinking	15.22 (2.84)	12.95 (3.54)	<0.001
Motivation for Eating	6.95 (2.34)	6.34 (2.26)	<0.001

The mean (SD) of the perceived stress level scores (for 'low/moderate stress' and 'high stress') of the seven categories of Sakata's Eating Behaviour are 12.18 (1.43) and 11.10 (2.37) for 'eating rhythm abnormalities', 11.95 (1.76) and 10.51 (2.44) for 'feeling of satiety', 4.99 (2.15) and 4.39 (1.67) for 'eating style', 9.58 (1.95) and 7.51 (2.30) for 'cognition of constitution', 13.09 (2.89) and 11.19 (2.74) for 'meal contents', 15.22 (2.84) and 12.95 (3.54) for 'substitute eating and drinking', and 6.95 (2.34) and 6.34 (2.26) for 'motivation for eating'. The mean of the perceived stress level scores for 'high stress' are significantly lower than 'low/moderate stress' for all of the seven categories of Sakata's Eating Behaviour ($p < 0.001$).

Table 3 shows that those who are more than 40 years old have 4.58 times the odds of having 'high' perceived stress levels compared to those who are less than 30 years old ($p = 0.003$), those who are single have 3.75 times the odds of having 'high' perceived stress levels compared to those who are married ($p < 0.001$), those who are not Malay have 0.28 times the odds of having 'high' perceived stress levels compared to those who are Malay ($p < 0.001$), those who have been employed for more than 15 years have 0.16 times the odds of having 'high' perceived stress levels compared to those who have been employed for less than 5 years ($p < 0.001$), those with the agreeableness personality trait are 1.36 times (95%CI: 1.10, 1.70) more likely to have a high level of stress ($p = 0.006$), those with the conscientiousness personality trait are 2.25 times (95%CI: 1.78, 2.87) more likely to have a high level of stress ($p < 0.001$), those with the neuroticism personality trait are 0.58 times (95%CI: 0.50, 0.67) more likely to have a high level of stress ($p < 0.001$), those with the openness personality trait have 1.27 times (95%CI: 1.05, 1.54) more likely to have a high level of stress ($p = 0.016$), those with eating rhythm abnormalities are 1.19 times (95%CI:

1.05, 1.36) more likely to have a high level of stress (p = 0.006), those with the feeling of satiety are 0.74 times (95%CI: 0.66, 0.84) more likely to have a high level of stress (p < 0.001), and those with the cognition of constitution are 0.71 times (95%CI: 0.63, 0.81) more likely to have a high level of stress (p > 0.001).

Table 3. Factors associated with 'high' perceived stress levels (using multiple logistic regression).

Variable	Multiple Logistic Regression		
	Adj. OR	**95% CI**	***p*-Value**
Age			
Less than 30 years old (reference)			
More than 40 years old	4.58	1.71, 12.4	0.003
Between 30 and 40 years old	0.56	0.29, 1.09	0.090
Marital Status			
Married (reference)			
Single	3.75	2.33, 6.28	<0.001
Race			
Malay (reference)			
Others	0.28	0.17, 0.44	<0.001
Years of Employment			
Less than 5 years (reference)			
Between 11 and 15 years	1.17	0.56, 2.45	0.7
More than 15 years	0.16	0.06, 0.38	<0.001
Between 6 and 10 years	1.22	0.64, 2.36	0.5
Personality Traits			
Extraversion	0.90	0.63, 1.27	0.529
Agreeableness	1.36	1.10, 1.70	0.006
Conscientiousness	2.25	1.78, 2.87	<0.001
Neuroticism	0.58	0.50, 0.67	<0.001
Openness	1.27	1.05, 1.54	0.016
Eating Behaviour			
Eating Rhythm Abnormalities	1.19	1.05, 1.36	0.006
Feeling of Satiety	0.74	0.66, 0.84	<0.001
Eating Style	0.96	0.82, 1.12	0.610
Cognition of Constitution	0.71	0.63, 0.81	<0.001

Figure 1 demonstrates the PLS-SEM model used to explore the relationship between chronotype profile, personality trait, perceived stress, and eating behaviour. The structural equation model illustrated that personality trait (β = 0.482) is the most salient and strongest factor contributing to perceived stress, followed by chronotype profile (β = 0.45), accounting for 71.4% of the variance explained for perceived stress among nurses in Brunei (R-square = 0.714). Whereas perceived stress (β = 0.719) is a factor affecting eating behaviour, which accounts for 51.6% of the variance explained for eating behaviour among nurses in Brunei (R-square = 0.516). With respect to this structural model, Table 4 presents the measurement model whereby the reliability and convergent validity are reported. Cronbach's alpha statistics indicated that all the constructs had good to excellent internal consistency reliability except for personality traits, particularly, the latent variable—extraversion, agreeableness, conscientiousness, neuroticism, and openness. The average variance explained (AVE) for these latent variables was also lower than 0.5 for openness and conscientiousness, indicating that the latent variance may not be completely captured by the respective items. However, these items were not dropped as they are conceptually important to the questionnaire.

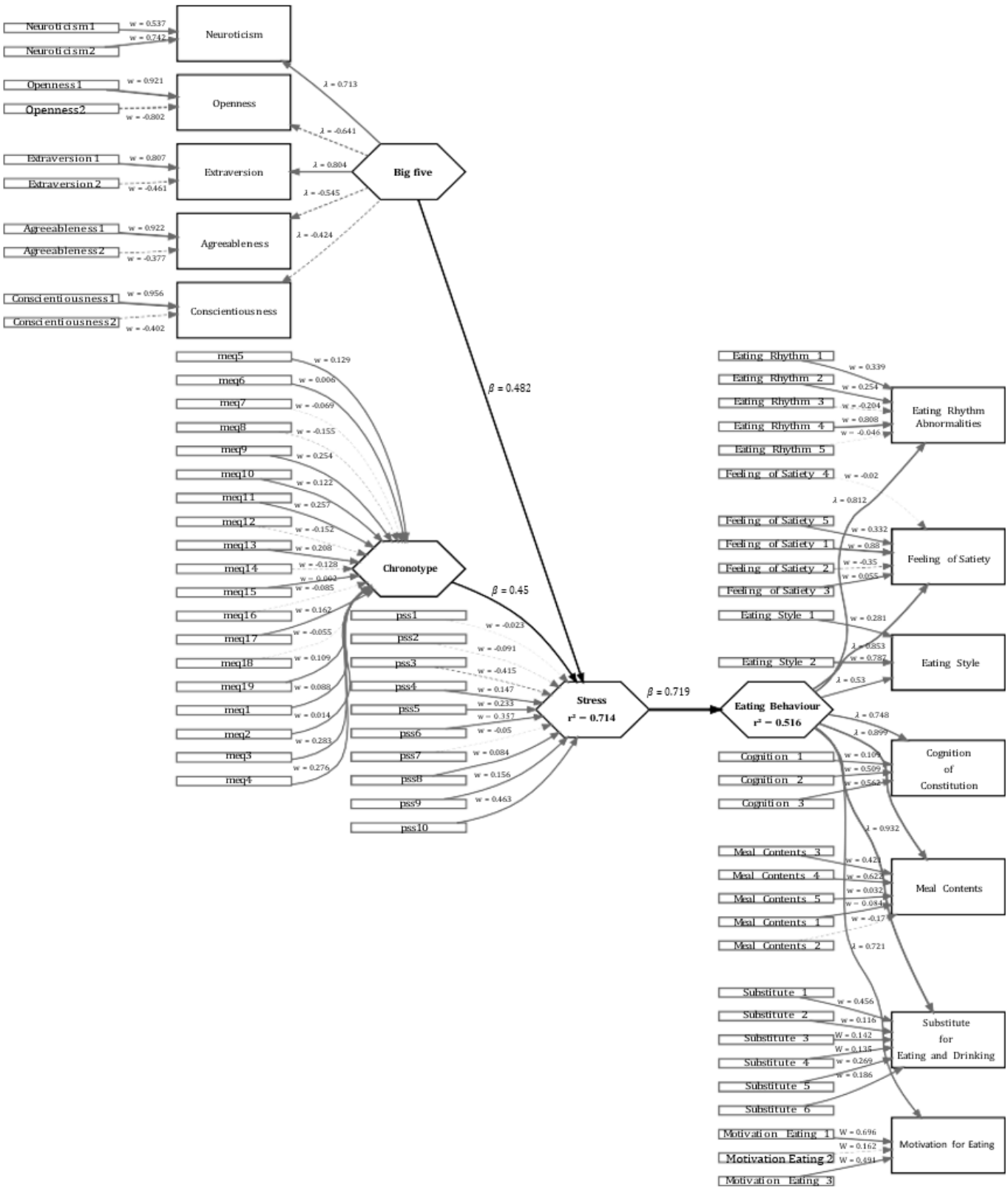

Figure 1. PLS-SEM path analysis of the relationship between perceived stress and chronotype, personality trait, and eating behaviour.

Table 4. Measurement model of PLS-SEM.

Path Coefficients	**Stress**	**Eating Behaviour**		
R-square	0.714	0. 516		
Adj. R-square	0.714	0.516		
Big five	0.482			
Chronotype	0.45			
Stress		0.719		
Reliability:	**alpha**	**rhoC**	**AVE**	**rhoA**
Big five	−0.313	0.003	0.408	0.669
Chronotype	0.634	0.581	0.152	1.000
Stress	0.790	0.749	0.308	1.000
Eating Behaviour	0.897	0.921	0.632	0.920
Extraversion	−0.444	0.088	0.582	1.000
Agreeableness	−0.024	0.226	0.504	1.000
Conscientiousness	0.179	0.258	0.467	1.000
Neuroticism	0.336	0.746	0.597	1.000
Openness	0.499	0.018	0.337	1.000
Eat Rhythm	0.479	0.601	0.296	1.000
Satiety	0.534	0.556	0.283	1.000
Eat style	0.811	0.896	0.813	1.000
Cognition	0.816	0.879	0.707	1.000
Meal Content	0.723	0.770	0.474	1.000
Substitute for Eating Drinking	0.821	0.860	0.519	1.000
Motivation	0.877	0.879	0.713	1.000

6. Discussion

To the best of our knowledge, our study was the first to attempt to explore the relationships between nurses' perceived stress levels, personality, chronotype, and eating behaviour simultaneously. This study evolved from the increasing concern about nurses' mental health issues surrounding the nursing profession in Brunei. Given that nursing has been identified as a profession with significant stress levels, it was critical to rule out the primary causes of stress among nurses. This study may contribute to the body of knowledge of nursing education and may be beneficial for individuals and organizations to take a proactive approach to reduce stress among hospital and community nurses in the country.

6.1. Personality Trait as Main Factor of Stress Among Nurses

The PLS-SEM of our study revealed that personality trait is the strongest factor contributing to perceived stress (β = 0.482). Previous studies stated that those with the neuroticism personality were more prone to stress formation as they had greater reactivity to stressors compared to the other personality traits—extraversion, agreeableness, openness, and conscientiousness [38,39]. Our multiple logistic regression test showed that those with neuroticism have 0.58 times the odds to have high levels of perceived stress ($p > 0.001$). Scoring low in neuroticism is often regarded as being emotionally stable [40] because

anxiety, anger, insecurity, impulsiveness, sensitivity, irrational thinking, low self-esteem, and ineffective coping, especially to psychological stress, are more likely to be experienced by those with neuroticism. These people are also prone to the development of various psychiatric disorders resulting from recurrent nervous tension, depression, frustration, guilt, and self-consciousness [41]. Therefore, it is essential to closely examine the personality attribute of neuroticism as a predictor of stress in nurses. However, with regard to the high perceived stress among nurses with openness to experience and conscientiousness in our study, it could be explained by the emotional exhaustion [42] and self-oriented perfectionist attitude [43] that is often experienced by these types of personalities, respectively. These inverse consequences could also be explained by the average variance explained (AVE) of lower than 0.5 for these latent variables as portrayed by the measurement model of our PLS-SEM, indicating that the latent variance may not be completely captured by their respective items. As for agreeableness, higher job satisfaction was reported in individuals with agreeableness which often results in low job stress [44]. High agreeableness scores may encompass the stereotype of the ideal nurse because this attribute is marked by altruism, nurturing, and a caring persona. These individuals are more likely to be given kind treatment by others and to elicit positive reactions from the workplace. As a result, individuals with these attributes reported greater work satisfaction [44]. Thus, no conclusion could be drawn as to why those with agreeableness had high odds to have high levels of perceived stress in our study except for the fact that Cronbach's alpha statistics indicated poor internal consistency reliability for personality traits, particularly, the latent variables—extraversion, agreeableness, conscientiousness, neuroticism, and openness [45]. However, these items were not dropped as they are conceptually important to the questionnaire.

6.2. Understanding Chronotype Profile and Stress Among Nurses

The chronotype profile is another factor contributing to perceived stress ($\beta = 0.45$). Our one-way ANOVA revealed that the population percentage for high perceived stress levels was significantly highest for nurses with the evening chronotype (62%). This analysis is in line with prior studies where they reported that an evening chronotype was associated with a higher level of perceived stress compared to a morning chronotype [46,47]. An evening chronotype has been linked with increased rumination, characterized by passive, repetitive, and negative thoughts, which contributes to an increased individual's vulnerability to stressors [48]. This could also be explained by a lower sense of personal accomplishment reported by eveningness nurses, together with higher scores for depersonalization, emotional exhaustion, and a higher score on the Pittsburgh Sleep Quality Index (PSQI) and its subscales which could indicate poor sleep quality [47]. These findings were similar to a previous study where they concluded that nurses with a morning chronotype had better sleep quality [49]. However, we did not explore the relationship between chronotype and sleep quality which may have added additional value to our study. Next, the results of our study showed that the population percentage of those working in the hospital was highest for nurses with an evening chronotype (64%), and the population percentage of those working in the community was highest for nurses with an intermediate chronotype (82%). This could be because of the relatively young age of nurses aged less than 30 years old (42%) working in the hospital compared to the community where 49% of the nurses are more than 40 years old. According to Roenneberg et al. [50], younger age in adults was connected to social jetlag that is associated with the evening chronotype. Adults in their early 20s had a remarkably high social jetlag of approximately twice that of adults in their 40s and thrice that of adults in their 60s [51]. Another possible explanation could be that the rotating shifts experienced by hospital nurses resulted in phase delay in the circadian

rhythm compared with day workers [52], resulting in a tendency for more evening types in rotating shift workers [53].

6.3. Understanding Eating Behaviour and Stress Among Nurses

The next finding of our PLS-SEM showed that stress is a factor affecting eating behaviour (β = 0.719), accounting for 51.5% (R-square = 0.516) of the variance explained for eating behaviour among nurses in Brunei. The Cronbach's alpha for both perceived stress and eating behaviour exceeded 0.7 which indicated that the constructs had excellent internal consistency reliability. Our multiple logistic regression revealed that those with worse eating rhythm abnormalities, feelings of satiety, and cognition of constitution have 1.19 (p = 0.006), 0.74 (p > 0.001), and 0.71 (p > 0.001) times the odds to have high levels of perceived stress, respectively. This finding is aligned with previous studies, especially for eating rhythm abnormalities being the ones with the highest odds to have high perceived stress out of the seven categories of Sakata's eating behaviour. This is because of the five components in the eating rhythm abnormalities category—eating at all different times, do not have time to eat leisurely, often eating snack foods, snacks after dinner, and often drinking canned soft drinks, canned coffee, sports drinks, or nutritional drinks. According to Samhat, Attieh, and Sacre [54], nurses who are working night shifts tend to consume high-fat and sugary foods during their shifts when they feel stressed. They are also inclined to drink caffeinated drinks like tea and coffee in order to make them feel awake and alert throughout their night shifts [55]. Nurses working shifts do not have fixed and proper break times due to their job demands, therefore they often take breaks hurriedly which disrupts their eating habits. They fill their pockets with snacks for convenient eating during their shifts [56]. In addition, the workplace environment in the hospitals promotes unhealthy eating among nurses as they avail fatty foods, snacks, and canned soft drinks from the vending machines due to insufficient break times and unsuitable canteen opening hours. Social factors such as free food in the form of snacks and fast food from colleagues, patients' relatives, and hospital management for the purpose of appreciating nurses' work, motivating, and celebrating special occasions were other factors that promoted unhealthy eating habits among nurses [57]. This finding is consistent with a study by Cheong, Lopez, and Tam [58] in which they reported that nurses face difficulties in maintaining healthy eating practices due to the unhealthy eating culture in the workplace. Another explanation for worse eating rhythm abnormalities among nurses could be due to the feeling of fatigue during the long duty hours; thus, they tend to opt for fast foods which are rich in calories rather than fruits and vegetables [55]. As for high perceived stress related to the worse feeling of satiety and cognition of constitution, this could be due to meal skipping and mental and physical tiredness which is common among nurses. This behaviour made them feel fatigued and hungrier, resulting in them eating much more than needed which could lead to obesity. Furthermore, a study by Almajwal [31] reported that nurses with high stress levels had 52% higher abnormal restrained eating behaviour, leading to the intake of unhealthy diets associated with obesity—eating more junk food and consuming fewer fruits and vegetables. However, our study did not consider body mass index as part of our demographic data to conclude the relationship between eating behaviour and obesity, which could have added more value to our study.

6.4. Demographic Profiles and Stress Among Nurses

Our multiple logistic regression revealed that nurses who are more than 40 years old have 4.58 times the odds of having high perceived stress compared to those who are less than 30 years old (p = 0.003) and nurses who have been employed for more than 15 years have 0.16 times the odds of having high perceived stress compared to those

who have been employed for less than 5 years ($p < 0.001$). This finding is opposed to a study by Ang et al. [39], which stated that the experience to handle jobs and organization increases with age, thus increasing older nurses' ability to manage stress better than younger nurses. Older employees have reached a stage where career development is no longer their priority [59]. In our study, stress in older nurses could be related to the high risk of anxiety [60] and a decrease in mental and physical stamina [39]. Older nurses prefer to be reassigned to less mentally and physically demanding jobs with flexible work arrangements [61]. Our multiple logistic regression also revealed that nurses who are single have 3.75 times the odds of having high perceived stress compared to those who are married ($p > 0.001$). The single or unmarried had significantly higher perceived stress due to emotional distress [62]. This is because married men or women tend to have someone to aid in stress relief [63]. However, Osei-Mireku et al. [64] argued that individuals' marital status may not be enough to analyse and calculate stress as the quality of marriage must also be considered.

6.5. Study Limitations

As with any other study, there were several limitations to this study. This study used a cross-sectional study design where variables such as perceived stress, personality, chronotype, and eating behaviour were self-reported. Though the cross-sectional study design may be effective in comparing subgroups of a population at a particular point in time, it cannot measure change in populations. Continuous monitoring such as using a longitudinal study design may be needed in future research.

The other limitation of this study is generalization bias. The participants were from Brunei, where the majority of the population is Malay. Studies in other populations regarding the subject may be required to clarify to what extent the present results can be generalized.

Next is an unbalanced sample size of participants between hospital and community settings. This may have contributed to a decrease in the statistical power to detect significant differences in perceived stress, personality, chronotype, and eating behaviour between the groups.

7. Conclusions

This study explores the links between nurses' stress, personality traits, chronotype, and eating behaviour in Brunei. It highlights that neuroticism is a significant predictor of stress, with individuals scoring high in this trait more likely to experience stress. Evening chronotype is also linked to higher stress levels, potentially due to poor sleep quality and increased rumination. This study finds that stress impacts eating behaviours, with stressed nurses showing poor eating habits. Additionally, older nurses and single individuals report higher stress.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: All data underlying the results are available upon reasonable request from the corresponding author.

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