Constructing a Stress Index for Teachers in Malaysia: A Fuzzy Delphi Approach

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Abstract: Stress among teachers is a debilitating issue that has been plaguing the educational landscape in Malaysia for a long time. Past studies have investigated this issue, and most studies focused on identifying the causes of stress among teachers. However, recent studies have looked at stress as a process that involves a threat (stressors), an appraisal and defence mechanism against the threat (coping mechanism) and the breakdown of the defence (effect). Therefore, it is essential to look at teachers' stress from these three angles. This study aims to introduce a new stress index for Malaysian teachers that seeks to identify teachers' stressors, coping mechanisms and effects of stress. The Fuzzy Delphi method was employed in constructing the stress index as this method used both experts' opinions and analytics that produced an index with high validity and reliability. A proposed stress index with 101 items was evaluated by a panel of experts from linguistics medicine, psychology, linguistics and counselling. Their inputs were then analysed using the Fuzzy Delphi method. The items were then refined with experts' consultation. Furthermore, the finalised stress index proposed a new indicator of stressor, financial problem, an indicator absent in the previously developed stress index. This study has shown the effectiveness of using the Fuzzy Delphi method in developing a new stress index to help teachers, school administrators, and the Ministry of Education understand teacher stress in Malaysia.

Keywords: Coping Mechanism, Fuzzy Delphi, Stress Index, Stressors, Symptoms of Stress

1. Introduction

In 2015, The United Nations General Assembly introduced The Sustainable Development Goals (SDGs) to achieve a better and more sustainable future for all (United Nations, 2015). The Sustainable Development Goals (SDGs) are aimed to be achieved in 2030. In the blueprint, SDG 4 is dedicated to improving the global education landscape through several oriented targets such as quality education and universal literacy and numeracy. These goals are vital to ensure that global citizens are provided with basic and quality education to help them survive and thrive. Teachers are instrumental in ensuring that these goals are met and need to be in their absolute best forms to carry out their duties at school. However, teachers are susceptible to experience stress in their lives and workplace. If this stress is not addressed, it could open the gate to other issues that could dampen the education process, such as

ineffective teaching, poor classroom management and teachers' unethical and misconduct behaviours (Montgomery & Rupp, 2005).

Past studies have suggested that teachers in Malaysia suffer from some forms of stress. Jamian et al. (2020) found that teachers are overworked and prone to experience stress and burnout. A study by Hadi et al. (2009) revealed that teachers in Kota Bharu, Kelantan were susceptible to stress by 38%, based on their samples of nearly six hundred teachers. In a more recent study by Othman and Sivasubramaniam (2019), among teachers in the Klang Valley area, teachers showed a high prevalence of stress at 32%. Among them,7 % showed symptoms of severe stress. These reports highlight that Malaysian teachers are in dire need of good stress management, and the first step towards help is for teachers to recognise stress in their lives. One of the tools for recognising stress is a stress index.

A stress index is constructed to measure stress levels among interested groups of people in a stress study. In terms of teacher stress, several stress indexes have been developed, namely the Teacher Stress Inventory (TSI) by Fimian (1984); the Index of Teaching Stress (ITS) by Greene et al. (1997); the Teacher Occupational Stress Factor Questionnaire (TOSFQ) by Moracco et al. (1982); and the Teaching Events Stress Inventory by Cichon and Koff, (1980). However, upon looking at the indexes above, there are some limitations found in these indexes.

The first limitation of these indexes was found in their focus. These indexes only looked at the stressors or causes of stress in their index, ignoring other aspects of stress, such as the symptoms of stress and coping mechanisms. However, stress is viewed as a process, meaning that stress looks at how a person appraises a situation or threat and uses resources to deploy coping mechanisms to deal with the threat (Lazarus & Launier, 1978). Therefore, ignoring the handling of threats (coping mechanism) and the effects of the breakdown of resources (stress symptoms) are major misses in understanding teacher stress. Secondly, a limitation of the current teacher indexes was found in the specification. ITS, for example, only looked at the context of teaching stress, ignoring other aspects of teachers' responsibilities such as administrative jobs, non-academic burdens, and parent outreach programs. Therefore, it cannot capture an accurate picture of teacher stress, especially for teachers in Malaysia who are known to be burdened with both academic and non-academic burdens (Ab Aziz et al., 2019). Lastly, the third limitation of these indexes is their relevancy. These indexes were developed in the 1980s and the 1990s, and since then, the facets of education have changed tremendously, bringing new challenges that could simultaneously change the landscape of teacher stress. As Kalimullina et al. (2021) posit, education must soar above tradition to answer the modern economy and labour market needs. Education has always kept up with the global trend, and what is relevant in the 1980s and 1990s might not be applicable in the 21st century. Moreover, in the current pandemic situation, teachers are faced with the unique challenge of navigating their work as online teaching is forced to replace the classic face-to-face classroom. Other than online teaching, teachers are compelled to convert the usual application, monitoring, and evaluation into numerous forms of e-learning, and these sudden changes could cause stress among teachers (Wong et al., 2021).

Based on the absence of an effective stress index for Malaysian teachers, this study aims to develop a new stress index for Malaysian teachers using the Fuzzy Delphi method. The rationale for applying Fuzzy Delphi is first; the Fuzzy Delphi method is an effective measurement tool to solve an unknown and imprecise research issue (Manakandan et al. 2017), and secondly, compared to its predecessor, the Delphi method, the Fuzzy Delphi would save more time and be more cost-effective (Mohd Jamil & Mat Noh, 2020). For this study, one research question is posed, which is:

1. Based on the Fuzzy Delphi method, what are the indicators for the Stress Index for Malaysian teachers?

2. Literature review

In literature, the study of stress began its momentum after World War II. The term stress was used by Selye (1950) to describe the breakdown of the human adaptation system as a response to a threat. Meanwhile, another scholar Lazarus (1966), posited that stress rather stems from the perception of stressors and the failure of coping mechanisms to deal with the stressors. Pearlin et al. (1981) also emphasised that stress is a series of processes of threat and reaction, and the breakdown of the process would be seen in the effect of stress. Although different scholars have different opinions on how stress

is manifested among humans, it can be seen that in studying stress, one must look at three elements, stressors (the causes of stress), symptoms (the effect of stress) and coping mechanisms (the defence mechanisms).

Numerous studies have been conducted to study teachers' stress in Malaysia. Although different studies often concluded with different results, some common stark findings were found in these studies. Looking at stressors, it can be seen that job demand was seen as one of the significant findings in teachers' stressors (Ambotang & Bayong, 2018; Hadi et al., 2009; Ambotang et al., 2014; Raman & Othman, 2017), followed by the school administrators (Abu & Aziz, 2010; Halim et al., 2006; Yap & Siow, 2016)**,** school and educational policies (Hadi et al., 2009; Halim et al., 2006) and, workplace environment (Ghani et al., 2013; Marmaya & Wafa, 2009; Yaacob & Abdullah, 2015). In a study by Hadi et al. (2009), a point to note was that age and duration of work played a pertinent role in contributing to stress in general. Based on the literature review, most studies tended to look at teachers' stressors from a workplace perspective. Although far and in between, some studies have looked at teachers' stressors from the non-workplace perspective and found that teachers' stressors could stem from personal problems, such as teachers' incompetence (Tamin & Mohamad, 2020), maintaining a work-life balance (Yaacob & Choi, 2015) and lack of familial and spousal support (Yaacob & Abdullah, 2015).

Numerous studies have also looked into the effects of stress among teachers. Due to job demands such as teaching a large number of students, assignments and administrative work that are constantly changing, teachers are highly risky to suffer from depression (Burhanuddin & Ahmad, 2018). Similarly, Zahiruddin and Vevehkanandar's (2019) study revealed that teachers have a high prevalence of depression, anxiety and stress symptoms. A study by Masilamani et al. (2012) suggested that prolonged stress among teachers can reduce immunity, making them more susceptible to illness, while Zamri et al. (2017) showed neck/shoulder pain and lower back pain among stressed teachers. Salahuddin et al. (2007) and Yaacob and Choi (2015) looked at the effect of stress from the professional perspective and noted that stress could cause job dissatisfaction and encourage job turnover. Stress could disrupt behavioural patterns among teachers by suggesting that teachers' sleep pattern is disrupted due to stress (Musa et al., 2018). Past studies have suggested that stress could cause several devastating effects among teachers, and teachers could be affected by various sources such as physical, mental and behavioural.

When humans appraise a potential threat, a coping mechanism is employed to deal with the imminent threat (Lazarus, 1966). Therefore, understanding coping mechanism strategies employed by teachers is vital to understanding teachers' stress. Some studies have looked into Malaysian teachers' coping mechanisms and found that some of the strategies used are appraisal coping mechanisms (Karunanithi & Suberamaniam, 2015; Parahakaran, 2021; Hashim & Kayode, 2010), social support (Jamaludin & Ghazali, 2012; Gurnam & Aziz, 2015), adaptive behavioural coping (Alizadegani et al., 2014; Mohamad & Jais, 2016; Mahmud et al., 2018), and maladaptive coping behaviour (Al-Naggar et al. 2012; Mohamad Hisham, 2017; Naing & Ahmad, 2001). Although studies looking at coping mechanisms among teachers are scarce, these studies showed that Malaysian teachers employ specific strategies in dealing with stress. Teachers can handle workloads if there is positive social support (Yang et al., 2016). It is imperative to provide social support to teachers as they need support, encouragement, and effective communication from their school leaders (Yaacob et al., 2010).

Based on the literature, it was seen that the studies of teachers' stress were conducted through the use of an adapted questionnaire or self-administered survey. The two most adapted questionnaires are the DASS-21 questionnaire by Lovibond and Lovibond (1995) and the Job Content Questionnaire (JCQ) by Karasek et al. (1998). DASS-21 is a powerful instrument to measure stress among teachers, and its reliability and validity have been proven to be effective in measuring stress in a non-clinical sample (Henry & Crawford, 2005). Meanwhile, the JCQ questionnaire is also a notable questionnaire to look into workplace stress and its reliability in past studies (Demerouti et al., 2001).

This study was founded on the understanding that Malaysian teachers are suffering from a high level of stress, and a stress index for Malaysian teachers is needed. Introducing a new stress index does not undermine the contribution of DASS-21 and JCQ in recognising stress among teachers. Since DASS-21 aims to gauge the level of stress in an individual and JCQ looks at factors that contribute to job dissatisfaction in general, a stress index for teachers can fulfil the gap in teacher stress. The proposed stress index aimed to examine teacher stress from its three perspectives, the stressors, effect, and coping

mechanism; it could help researchers look deeper into the issue and outline effective stress management guidelines for helping teachers manage stress. It is also worth noting that this study also looked at teacher stress using the Fuzzy Delphi method, which develops indicators that would align the research objectives (Tsai et al., 2020) and group consensus (Lee et al., 2017). It is believed that the Fuzzy Delphi method would help uncover new findings that would enhance the understanding of teacher stress better, and this could help interested parties employ more effective strategies in managing teacher stress.

3.   Methodology

3.1   Research Design

This study aims to introduce a new stress index for Malaysian teachers, using the Fuzzy Delphi method. This paper presents the findings during phase 2 of the Fuzzy Delphi method, as shown in Figure 1.1.
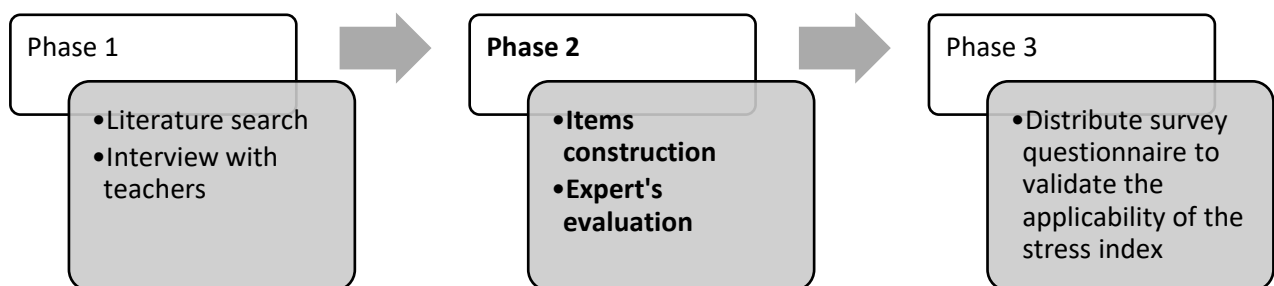

Fig. 1 Steps of the Fuzzy Delphi method

As shown in the figure, in phase 1 literature review and interview with teachers were conducted to identify the initial stress indicators. In phase 2, the items were constructed for the questionnaire. Semi-structures interviews with open ended questions were used to explore the experts' experiences in dealing with stress or other indicators related to stress. Subsequently, Fuzzy Delphi method was used to develop the weight of each stress indicator. The teacher stress indicators were refined based on expert consensus. The experts checked for the content validity and question clarity. In the final phase, the survey questionnaire will be distributed to teachers to validate the applicability of the constructed stress index.

The Fuzzy Delphi method was used to develop the stress index. The fuzzy Delphi method was utilised to gain the experts' consensus in designing the stress index as suggested by Mohd Jamil et al. (2020). There are several benefits of using the Fuzzy Delphi method, including it saves time and cost (Mohamed Yusoff et al. 2021), consistency (Mohd Jamil et al. 2020) and its ability to produce an index with justified validity and reliability (Tsai et al. 2020). According to the Fuzzy Delphi method, a minimum of ten experts is needed to ensure high uniformity among experts (Adler & Ziglio, 1996; Jones & Twiss, 1978). In this study, sixteen experts were selected in the expert consensus stage. As this study was conducted during the Covid-19 pandemic, experts' selection was hampered because most medical and psychologist experts were busy handling the surplus cases of medical cases that arose during the pandemic. Therefore, the study had to adapt by selecting experts who have i) at least a bachelor's degree and ii) a minimum of three years of experience in their respective fields. This criterion was against the recommendation by Berliner (2004), who suggested a minimum of five years' experience and Gambatese et al. (2008), who suggested experts with doctorate degrees. However, due to the pandemic situation and time constraints, the study resorted to using the above criteria. The experts were sought from four fields: psychology, medicine, counselling, and linguistics in this study. The experts were also chosen from academic backgrounds and practising backgrounds to balance academic and field perspectives. Table 1 presents the demography of the experts in the study.

Table 1. Experts' demography

Experts	Field	Academic level	Work Experience
1	Psychology (Academic)	PhD	15 years
2	Psychology (Academic)	PhD	10 years
3	Psychology (Academic and Field)	PhD	22 years
4	Medical (Field)	MBBS	16 years
5	Psychology (Field)	Bachelor	3 years
6	Psychology (Field)	Bachelor	5 years
7	Counsellor (Field)	Master	10 years
8	Counsellor (Academic)	Master	12 years
9	Psychology (Academic)	Master	8 years
10	Psychology (Field)	Bachelor	7 years
11	Psychology (Academic)	Master	7 years
12	Linguistics (Field)	Bachelor	6 years
13	Counsellor (Field)	Master	8 years
14	Counsellor (Field)	Master	9 years
15	Counsellor (Field)	Bachelor	8 years
16	Psychology (Academic)	PhD	16 years

3.2 Proposed stress index

The proposed stress index was developed following the Fuzzy Delphi method. Before experts evaluated the proposed stress index in the Fuzzy Delphi round, the index was built based on literature research and interview with a focus group of Malaysian teachers. The proposed stress index was divided into three constructs: A) Stressors, B) Symptoms, and C) Coping Mechanisms. Under stressors, three subconstructs reside i) Organisational stressors, ii) Social stressors, and iii) Personal stressors. The second construct, Symptoms, has three subconstructs: i) Physical symptoms, ii) Emotional symptoms, and iii) Behavioural symptoms. For the last construct, Coping Mechanism, four subconstructs were developed: i) Appraisal coping, ii) Adaptive behavioural coping, iii) Social support, and iv) Maladaptive coping. Table 2 below defines and explains the constructs and subconstructs under the proposed stress index.

Table 2. Proposed Stress Index

Constructs / Subconstructs	Items in the proposed index	Indicators
Construct A: Stressors **Definition:** Conditions to encourage stress and test adaptive capabilities. **References:** Selye (1950); Lazarus (1966); Pearlin et.al, (1981); Pearlin (1989); Forlin (2001).	A1 – A44	Organisational stressors Social stressors Personal stressors

<u>Subconstruct A1: Organisational stressors</u> **Definition:** Emotional, cognitive, behavioural and physiological response to the aggressive and harmful aspects of work. **References:** Ambotang and Bayong (2018); Hadi et al. (2009); Ambotang et al. (2014); Raman and Othman (2017).	A1 – A18	Job demand Job role Work environment Work resources Policy changes Lack of recognition Academic burden Non-academic burden
<u>Subconstruct A2: Social stressors</u> **Definition:** Stressors caused by weak social interactions with direct supervisors, co-workers, and others at work. **References:** Abu & Aziz (2010); Halim et al. (2006); Hadi et al. (2009); Ghani et al. (2013); Marmaya and Wafa (2009); Yaacob and Abdullah (2015); Yap and Siow (2016).	A19 – A33	School Administrators Colleagues Workplace politics Students' behaviour Parents' behaviour Family
<u>Subconstruct A3: Personal stressors</u> **Definition:** Personal stressors include elements specific to the individual teacher, such as teacher lifestyle/personality, locus of control, coping skills, and career goals. **References:** Tamin & Mohamad (2020); Yaacob and Choi (2015); Yaacob et al., (2010).	A37 – A44	Intrapersonal conflict Work-family balance Financial problem Job abilities
<u>Construct B: Symptoms</u> **Definition:** A physical or mental problem that a person experiences that may indicate stress **References:** Selye (1950); Lazarus (1966); Pearlin et.al, (1981); Pearlin (1989).	B1 – B 26	Physical symptoms Mental symptoms Behavioural symptoms
<u>Subconstruct B1: Physical symptoms</u> **Definition:** Stress signs exhibited by physical conditions. **References:** Masilamani et al. (2012); Zamri et al. (2017); Musa et al., (2018).	B1 – B8	Joint pain Headaches Lethargy Insomnia Health Decline
<u>Subconstruct B2: Mental symptoms</u> **Definition:** Stress signs exhibited by a change in mental and emotional states.	B9 – B17	Restlessness Sadness

References: Burhanuddin and Ahmad (2018); Zahiruddin and Vevehkanandar, (2019).		Irritability Anxiety Mental breakdown Depressed
Subconstruct B3: Behavioural symptoms **Definition:** Stress signs exhibited by a change of behaviour. **References:** Salahuddin et al. (2007) and Yaacob and Choi (2015)	B18 – B26	Low productivity Job turnovers Loss of passion Appetite change
Construct C: Coping Mechanism **Definition:** Investing one's own conscious effort to solve personal and interpersonal problems to try to master, minimise, or tolerate stress. **References:** Selye (1950); Lazarus (1966); Pearlin et.al, (1981); Pearlin (1989)	C1 – C31	Appraisal coping Adaptive behavioural coping Social support Maladaptive coping
Subconstruct C1: Appraisal coping **Definition:** Strategies that employ changing the thought about the stressors. **References:** Karunanithi & Suberamaniam, (2015); Parahakaran, (2021); Hashim and Kayode, (2010)	C1 – C7	Releasing emotion Self-control Meditation
Subconstruct C2: Adaptive Behavioural Coping **Definition:** Strategies try to deal with the cause of their problem. **References:** Alizadegani et al. (2014); Mahmud et al. (2018); Mohamad and Jais (2016).	C8 – C18	Upgrading skills Hobbies Seeking expertise Self-reflection Time management Encourage participation Lifestyle change Avoidance
Subconstruct C3: Social Support **Definition:** Seeking support from social groups to manage the stress. **References:** Jamaludin and Ghazali (2012); Gurnam and Aziz (2015); Lee, Moy and Hairi (2017).	C19 – C 28	Family support Spousal support Colleagues support Administrative support Peer support

		Social circle support
Subconstruct C4: Maladaptive coping	C29 – C31	Smoking
Definition:		
The coping technique (also termed non-coping) will reduce symptoms while maintaining or strengthening the stressor.		Excessive buying
		Excessive eating (binge eating)
References:		
Al-Naggar et al., 2012; Mohamad Hisham, 2017; Naing & Ahmad, 2001).		

3.3   The Fuzzy Delphi process

In this study, the experts were given an expert validation form to rate their agreement on the items in the proposed stress index. The expert validation form was designed using a seven Likert scale agreement. The seven Likert scales were chosen to correspond with the 7-point Fuzzy scale, as suggested by Kamarulzaman and Alsibai (2018) and Mohemed Yusof et al., (2021). Table 2 below shows the details of the 7-point Fuzzy scale.

Table 3. 7-point Fuzzy scale

Scale	Level of Agreement	Fuzzy Scale
1	Extremely strongly disagree	(0.0,0.0,0.1)
2	Strongly disagree	(0.0,0.1,0.3)
3	Disagree	(0.1,0.3,0.5)
4	Moderately agree	(0.3,0.5,0.7)
5	Agree	(0.5,0.7,0.9)
6	Strongly agree	(0.7,0.9,1.0)
7	Extremely Strongly Agree	(0.9,1.0,1.0)

Source: Mohemed Yusof et al., (2021).

After obtaining the experts' consensus, the data were analysed systematically using Microsoft Excel, as suggested by Ramlie et al. (2014) and Mohd Jamil and Mat Noh (2020). Two prerequisites must be fulfilled in the Fuzzy Delphi process: the Triangular Fuzzy Number and the Defuzzification Process. For the Triangular Fuzzy Number, two conditions must be fulfilled. The first condition is that the value of the Threshold must be smaller or equal to 0.2 (Threshold (d) ≤ 0.2) (Chen, 2000). To determine the Threshold value, the following formula was used:

$$d(\bar{m}, \bar{n}) = \sqrt{\frac{1}{3}[(m1 - n1)^2 + (m2 - n2)^2 + (m3 - n3)^2]}$$

The second condition in the Fuzzy Delphi method is ensuring that the percentage of experts' agreement follows the traditional Delphi formula. An item will be accepted when the percentage of experts' agreement reaches a minimum of 75% (Chu & Hwang, 2008; Murray et al., 1985). For the Fuzzy Delphi method, the fuzzy score (A) is determined from the α-cut value of 0.5 (Cheng & Lin, 2002). If the A value is equal to or greater than 0.5 (A≥.05), the item is accepted, while the A value less than 0.5 (A<0.5) is rejected. The fuzzy score (A) was determined using the formula below:

$$A = (1/3)*(m1 + m2 + m3)$$

4.   Results and discussion

4.1   Analysis of teachers' stressors

Table 4 shows the results of the Fuzzy Delphi analysis on the stressors subconstruct. The result shows the threshold value (d), experts consensus percentage, Fuzzy score (A) and expert consensus. Based on the table, out of forty-four (44) proposed items, twenty-eight (28) items were accepted by the experts and sixteen (16) items were rejected by the experts.

Table 4. Findings on Expert Consensus on Teachers' Stressors

Item	Indicators	Condition of Triangular Fuzzy Numbers		Condition of Defuzzification process	Expert Consensus
		Threshold value, d	**Percentage of Experts Group Consensus, %**	**Fuzzy Score (A)**	
A1	Job demand	0.057	100%	0.942	Accepted
A2	Job demand	0.174	67%	0.878	Rejected
A3	Job role	0.165	92%	0.886	Accepted
A4	Job demand	0.201	92%	0.881	Rejected
A5	Policy change	0.122	83%	0.897	Accepted
A6	Policy change	0.183	75%	0.883	Accepted
A7	Work environment	0.068	100%	0.933	Accepted
A8	Job role	0.163	92%	0.894	Accepted
A9	Job demand	0.156	92%	0.861	Accepted
A10	Work environment	0.371	8%	0.778	Rejected
A11	Work resources	0.122	83%	0.897	Accepted
A12	Work resources	0.095	92%	0.919	Accepted
A13	Job demand	0.279	50%	0.778	Rejected
A14	Academic burden	0.074	100%	0.908	Accepted
A15	Academic burden	0.074	100%	0.925	Accepted
A16	Job recognition	0.366	8%	0.717	Rejected
A17	Job recognition	0.464	17%	0.672	Rejected
A18	Non-academic burden	0.214	75%	0.850	Rejected
A19	Administrators	0.134	75%	0.867	Accepted
A20	Colleagues	0.161	92%	0.869	Accepted
A21	Students	0.097	92%	0.903	Accepted
A22	Students	0.341	17%	0.731	Rejected
A23	Students	0.202	75%	0.833	Rejected
A24	Parents	0.167	75%	0.850	Accepted
A25	Family	0.354	8%	0.708	Rejected

Item	Indicators	Condition of Triangular Fuzzy Numbers		Condition of Defuzzification process	Expert Consensus
		Threshold value, d	Percentage of Experts Group Consensus, %	Fuzzy Score (A)	
A26	Administrators	0.122	83%	0.897	Accepted
A27	Parents	0.258	33%	0.789	Rejected
A28	Colleagues	0.139	92%	0.836	Accepted
A29	Colleagues	0.241	58%	0.772	Rejected
A30	Workplace politics	0.175	83%	0.839	Accepted
A31	Workplace politics	0.182	75%	0.875	Accepted
A32	Workplace politics	0.128	92%	0.903	Accepted
A33	Job abilities	0.098	92%	0.911	Accepted
A34	Job abilities	0.167	75%	0.850	Accepted
A35	Job abilities	0.092	92%	0.894	Accepted
A36	Work-family balance	0.087	92%	0.928	Accepted
A37	Financial problem	0.158	92%	0.903	Accepted
A38	Financial problem	0.252	75%	0.844	Rejected
A39	Intrapersonal conflict	0.097	92%	0.903	Accepted
A40	Job abilities	0.411	17%	0.711	Rejected
A41	Job abilities	0.150	83%	0.872	Accepted
A42	Work-family balance	0.442	25%	0.653	Rejected
A43	Intrapersonal conflict	0.154	83%	0.881	Accepted
A44	Intrapersonal conflict	0.451	25%	0.611	Rejected

Condition:

Triangular Fuzzy Numbers   Defuzzification Process
1) Threshold value (d) ≤ 0.2 3) Fuzzy Score (A) $\geq \alpha$ – cut value = 0.5
2) Percentage of Experts Consensus > 75%

The experts fully rejected one indicator, job recognition (item A16 and A17 from the proposed stress index) under the occupational stressors' subscale. Regarding job recognition, two studies (Hadi et al., 2009; Ghani et al., 2013) have shown that job recognition is an indicator of teachers' stressors. Other indicators such as job demands, work resources, and academic and non-academic burdens were accepted by the experts. Although some experts rejected items that share indicators, the rejection was made not due to the suggested indicators being weak. The rejections were mostly raised by the technicality of the statements, such as redundancy and unclear statements. One interesting discovery made is the experts agreed to include financial problems as one of the indicators for stressors. This indicator was added after it was unanimously mentioned during teachers' interviews before the construction of the proposed stress index. A noteworthy point is that finance contributes to stress among teachers, and this was acknowledged by the experts in this study. However, this indicator was not reported in previous studies. This discovery further attested to the ability of the Fuzzy Delphi method

to produce a substantial index for teachers' stress, as it considers not only the literature on the subjects but also the experts' expertise, opinions and field experiences.

4.2   Analysis of teachers' symptoms of stress

Table 5 shows the results of the Fuzzy Delphi analysis for the symptoms of stress subconstruct. The result shows the threshold value (d), experts consensus percentage, Fuzzy score (A) and expert consensus. Based on the table, from twenty-six (26) proposed items, eighteen (18) items were accepted by the experts and eight (8) items were rejected by the experts.

Table 5. Findings on Expert Consensus on Teachers' symptoms of stress

Item	Indicators	Condition of Triangular Fuzzy Numbers		Condition of Defuzzification process	Expert Consensus
		Threshold value, d	Percentage of Experts Group Consensus, %	Fuzzy Score (A)	
B1	Muscle pain	0.087	92%	0.904	Accepted
B2	Headaches	0.128	92%	0.933	Accepted
B3	Health decline	0.174	75%	0.878	Accepted
B4	Lethargy	0.057	100%	0.933	Accepted
B5	Lethargy	0.250	50%	0.909	Rejected
B6	Health decline	0.087	92%	0.873	Accepted
B7	Insomnia	0.189	83%	0.891	Accepted
B8	Restlessness	0.154	83%	0.873	Accepted
B9	Depressed	0.122	83%	0.849	Accepted
B10	Mental breakdown	0.468	8%	0.860	Rejected
B11	Mental breakdown	0.154	83%	0.853	Accepted
B12	Irritability	0.218	75%	0.909	Rejected
B13	Anxiety	0.098	92%	0.880	Accepted
B14	Anxiety	0.122	83%	0.916	Accepted
B15	Sadness	0.190	83%	0.860	Accepted
B16	Withdrawn	0.521	0%	0.902	Rejected
B17	Depressed	0.068	100%	0.753	Accepted
B18	Low productivity	0.147	75%	0.873	Accepted
B19	Loss of passion	0.095	92%	0.909	Accepted
B20	Loss of passion	0.214	75%	0.891	Rejected
B21	Low productivity	0.437	17%	0.902	Rejected
B22	Appetite change	0.462	8%	0.933	Rejected
B23	Appetite change	0.087	92%	0.836	Accepted
B24	Loss of passion	0.190	83%	0.916	Accepted

Item	Indicators	Condition of Triangular Fuzzy Numbers		Condition of Defuzzification process	Expert Consensus
		Threshold value, d	Percentage of Experts Group Consensus, %	Fuzzy Score (A)	
B25	Job turnovers	0.214	75%	0.824	Rejected
B26	Job turnovers	0.190	83%	0.813	Accepted

Condition:

Triangular Fuzzy Numbers   Defuzzification Process

1) Threshold value (d) ≤ 0.2   3) Fuzzy Score (A) ≥ α – cut value = 0.5

2) Percentage of Experts Consensus > 75%

      The analysis showed that experts agreed on all items in the proposed stress index regarding physical symptoms of stress. These symptoms have also been observed in numerous past studies, such as Masilamani et al. (2012), Musa et al. (2018) and Zamri et al. (2017). Likewise, these symptoms were also evident in other studies involving other professions, such as in nursing (Leiter, 2005), the police force (Dowler & Arai, 2008) and lecturers (Zhong et al., 2009). However, under the subconstruct mental symptoms, one of the indicators 'depression' for items B9 and B17, after further discussion with the experts revealed that depression must be diagnosed by medical experts, thus the statements in B9 and B17 were deemed unsuitable to be rated by teachers. Therefore, items B9 and B17 were rephrased to ensure that when teachers respond to these items, they do not self-diagnose depression.

      Table 6 shows the results of the Fuzzy Delphi analysis for the coping mechanism subconstructs. The result shows the threshold value (d), experts consensus percentage, Fuzzy score (A) and expert consensus. Based on the table, from thirty-one (31) proposed items, thirty (30) items were accepted by the experts, and the experts rejected only one item (1).

Table 6. Findings on Expert Consensus on Teachers' Coping Mechanism

Item	Indicators	Condition of Triangular Fuzzy Numbers		Condition of Defuzzification process	Expert Consensus
		Threshold value, d	Percentage of Experts Group Consensus, %	Fuzzy Score (A)	
C1	Self-control	0.019	100%	0.960	Accepted
C2	Meditation	0.035	100%	0.953	Accepted
C3	Meditation	0.000	100%	0.967	Accepted
C4	Self-control	0.000	100%	0.967	Accepted
C5	Self-control	0.000	100%	0.967	Accepted
C6	Self-control	0.035	100%	0.953	Accepted
C7	Releasing emotion	0.049	100%	0.947	Accepted
C8	Time management	0.076	100%	0.913	Accepted
C9	Hobbies	0.035	100%	0.953	Accepted
C10	Hobbies	0.130	80%	0.907	Accepted
C11	Avoidance	0.074	93%	0.936	Accepted
C12	Self-reflection	0.068	100%	0.933	Accepted

Item	Indicators	Condition of Triangular Fuzzy Numbers		Condition of Defuzzification process	Expert Consensus
		Threshold value, d	Percentage of Experts Group Consensus, %	Fuzzy Score (A)	
C13	Seeking expertise	0.068	100%	0.933	Accepted
C14	Self-reflection	0.049	100%	0.947	Accepted
C15	Encourage participation	0.238	53%	0.802	Rejected
C16	Seeking expertise	0.132	80%	0.900	Accepted
C17	Seeking expertise	0.049	100%	0.947	Accepted
C18	Upgrading skills	0.092	93%	0.902	Accepted
C19	Family support	0.089	93%	0.922	Accepted
C20	Spousal support	0.173	93%	0.884	Accepted
C21	Peer support	0.093	93%	0.916	Accepted
C22	Colleague support	0.093	93%	0.916	Accepted
C23	Administrative support	0.111	87%	0.898	Accepted
C24	Experts support	0.112	87%	0.904	Accepted
C25	Administrative support	0.132	80%	0.893	Accepted
C26	Colleague support	0.073	100%	0.927	Accepted
C27	Students support	0.093	93%	0.916	Accepted
C28	Social support	0.074	93%	0.936	Accepted
C29	Smoking	0.068	100%	0.933	Accepted
C30	Excessive eating	0.073	100%	0.927	Accepted
C31	Excessive shopping	0.073	100%	0.927	Accepted

Condition:

Triangular Fuzzy Numbers

1) Threshold value (d) ≤ 0.2

2) Percentage of Experts Consensus > 75%

Defuzzification Process

3) Fuzzy Score (A) $\geq \alpha$ – cut value = 0.5

Based on the analysis, the experts reached a unified consensus for all items under the coping mechanism subconstruct, except for item 15. Item 15 suggested that encouraging students' participation is one of the ways to cope with the pressure in the classroom. However, the reason for the rejection was that the experts did not find substantial literature to back this statement. The proposed stress index was developed based on literature review and focus group interviews; hence, some items were formulated based on the interviews with teachers. For the other coping mechanisms, the literature provides evidence of such coping practices among teachers (Karunanithi & Suberamaniam, 2015; Parahakaran, 2021; Hashim and Kayode, 2010; Alizadegani et al., 2014). Even though past studies showed that these

teachers were not aware of the technicality of coping mechanisms, they were aware of their state of stress and formulated their ways to cope with it. Therefore, studies need to look at how teachers deploy their coping mechanisms to help them be aware of the other strategies to help them manage their stress better.

5.   Recommendation

The study was conducted amid the pandemic, and it faced several challenges and limitations. Future studies should involve more experts to look into the proposed stress index. The analysis showed that some items were rejected due to ambiguity, redundancy or lack of corroborating evidence. Therefore, it is wise for future studies to seek more experts, especially in the psychometrics and linguistics field, to ensure the items are clear and free from ambiguities. It is also recommended that face to face meetings be held with the experts to sort out ambiguities as in the case of the present study where some of the experts were invited for online meetings in google meet. Moreover, reminders were given to the experts to give their feedback as time was limited and they were busy due to the pandemic situation too. Therefore, time for experts is another factor to consider. Also, in terms of the stress index, this index has introduced a new indicator under stressors, that is 'financial problem'. Financial problem has yet to appear in the previous stress index for teachers. This discovery further solidifies the importance of applying the Fuzzy Delphi method in studying teacher stress. By combining teachers' and experts' voices, it can help develop a robust index. This study has demonstrated that listening to teachers and their struggles to manage their stress is vital to unearth this complex issue better. By emphasising their voice, teachers might be willing to open up and share their burdens without the fear of judgement or ridicule. Thus, it might also compel them to step forward and seek help to manage their stress before it becomes worse.

6.   Conclusion

This study aimed to develop a stress index for Malaysian teachers using the Fuzzy Delphi method. Sixteen experts were consulted using an expert validation form to rate their agreement on the items under the proposed stress index. The responses were analysed using the Fuzzy Delphi method to determine the suitability of the items. Based on the analysis, most experts agreed with the indicators in the proposed stress index, and this has shown that the Fuzzy Delphi method is an effective technique to be employed to study stress among teachers, and more studies that use the Fuzzy Delphi method to look at teachers' stress should be conducted in the future. Table 7 outlines the stress index for Malaysian teachers based on the Fuzzy Delphi method.

In conclusion, this study has shown the importance of developing a stress index for Malaysian teachers to help teachers, administrators, medical communities, and other interested parties understand how stress is manifested among Malaysian teachers. The findings from this index can be useful in designing a stress management strategy for teachers to help them manage stress more effectively and efficiently. Teachers in Malaysia need to be supported in managing their stress to help them carry their work and function more effectively and ultimately be an asset that helps shape the future of this nation.

Table 7. Proposed Stress Index

Constructs	Subconstructs	Indicators	No of items for indicators
Stressors	Organisational stressors	Job demand	2
		Job role	2
		Work environment	1
		Work resources	2
		Policy change	2
		Academic burden	2
	Social stressors	Administration	2
		Colleagues	2
		Students	1
		Parents	1
		Workplace politics	3
	Personal stressors	Job abilities	4
		Work-family balance	1
		Financial problem	1
		Intrapersonal conflict	2
Symptoms	Physical symptoms	Muscle pain	1
		Headaches	1
		Health decline	2
		Lethargy	1
		Insomnia	1
	Mental symptoms	Restlessness	1
		Mental breakdown	1
		Anxiety	2
		Sadness	1
		Depressed	2
	Behavioural symptoms	Low productivity	2
		Loss of passion	1
		Appetite change	1
		Job turnovers	1
Coping mechanism	Appraisal coping	Releasing emotion	1
		Self-control	4
		Meditation	2
	Adaptive behavioural coping	Time management	1
		Hobbies	2
		Lifestyles change	2
		Avoidance	1
		Self-reflection	2
		Seeking expertise	3
		Upgrading skills	1
	Social support	Family support	1
		Spousal support	1
		Peer support	1
		Colleague support	1
		Administrative support	1
		Experts support	1
		Students support	1
		Social support	1
	Maladaptive coping	Smoking	1
		Excessive eating	1
		Excessive shopping	1

6.   Acknowledgement

7.   References

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