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Developing and Testing the Psychometric Properties of the Parental Digital Security (P-Dis) Questionnaire for Malaysian Parents

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Parental digital security is an important aspect of keeping children safe online and of curbing poor online behaviours among children. The existence of validated tools to measure parental digital security is crucial to improve parents' digital-security practices in the community. As a type of protective behaviour, parental digital security can be explored based on established protective behavioural frameworks, including Protection Motivation Theory (PMT). The objective of this study is to develop and test the psychometric properties of a novel parental digital-security (P-Dis) questionnaire based on PMT among Malaysian parents. This study involved parents whom children were both internet users. It used a method of developing an instrument that comprised three stages: item development, scale development and psychometric-properties testing. A 51-item questionnaire was produced that covered 9 factors reflecting the PMT domains. The Cronbach's alpha coefficient of these factors ranged from 0.79–0.94. The factor analysis also showed that the 9 factors accounted for 73.8% of the total variance. These findings indicated that the parental digital-security questionnaire developed fulfilled its psychometric properties and is suitable for use by Malaysian parents. Further research is needed to validate the questionnaire for other populations.

Keywords: parental digital security; questionnaire; validation; Protection Motivation Theory

I. INTRODUCTION

The present study focused on parental digital security. In the literature, the concept of digital security varied across studies. Generally, as proposed by Lorenz (2017), digital security is part of three inter-related concepts: information security, computer security and digital safety itself. Both information security and computer security focus on the technical measures taken to protect oneself from threats that include data corruption, breach of confidentiality and property theft (Lorenz, 2017). In contrast, digital safety focuses on human interaction and behaviour when dealing with people and information online (Lorenz, 2017). Digital safety refers to internet crimes, including identity theft, stalking, cyberbullying and privacy breaches (Lorenz, 2017). Terms such as 'internet safety' and 'electronic safety' have emerged in the literature, reflecting self-protection, which combines both the technical and behavioural aspects of security (Lorenz, 2017). Thus, to reflect self-protection in both its technical and behavioural aspects, digital security can be defined as the ability to maintain security and safety online.

Therefore, parental digital security refers to parents' practices aimed at keeping their children safe online, and it comprises both technical and behavioural components. Parents play a major role in empowering their children to engage in responsible online use (Cyber Security Malaysia, 2014) and to curb poor online behaviours, both of which help to reduce cyber issues among children and young

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adolescents. Parents can do this through appropriate parental digital-security practices. The existence of validated tools with which to measure parental digital security is essential to assessing and understanding parents' needs and subsequently improving their digital-security practices regarding their children.

However, very limited instruments are available for measuring parental digital-security practices, particularly in the Malaysian context. The tools available were designed mainly in Europe and North America. In Asia, the majority of studies on digital security were found to originate in China, South Korea and Japan. The focus areas of these studies also varied. Studies of parents' online mediation techniques varied in terms of the children's age groups and the types of online behaviour included (Hwang and Jeong, 2015; Sonck *et al.*, 2013; Nikken and Jansz, 2014). For instance, Sonck *et al.* (2013) explored online mediation technique in parents who had children aged 9–16 years in the Dutch context and excluded preschool children. Hwang *et al.* (2017) focused on mediation techniques related to smartphone use among children in Korea. Nikken *et al.* (2014) developed scales for online mediation techniques for children aged 2–12 years in Holland. None of these researchers' tools specifically addressed parents' cognitive processes when adopting parental digital-security practices. Exploring these cognitive processes is crucial to understanding parents and effecting behavioural changes (Willingham, 2007). Thus, there is a clear gap regarding the existence of a tool to assess parental digital-security practices that is culturally acceptable in the Malaysian context, covers general online activities, is suitable for children and adolescents at all stages and examines parents' cognitive processes. Such a tool is essential, as the cyber-parenting field is not well understood and researched in the Malaysian setting from parents' perspectives (UNICEF Malaysia, 2014).

As a type of protective behaviour, parental digital security can be explored based on established protective behavioural frameworks, including the Protection Motivation Theory (PMT), which was developed by Rogers in 1975 and revised by Maddux and Rogers (1983). PMT is a cognitive-based theory that explains individual protective behaviour (Maddux and Rogers, 1983). Central to the theory are two cognitive processes that influence a person's intention to adopt a particular protective behaviour: coping appraisal and threat appraisal (Maddux and Rogers, 1983). Coping appraisals are determined by response efficacy, self-efficacy and response costs related to a particular protective behaviour (Maddux and Rogers, 1983). Threat appraisal is based on susceptibility to risks, perceived vulnerabilities and maladaptive rewards related to not performing the protective behaviour (Maddux and Rogers, 1983). Although generally PMT has been used to explain one's own protection motivation, it has also been used to explain the motivation to protect others. For instance, Nathanson (2001) applied PMT to understand parental mediation of children's use of sexual and violent television, discovering that PMT was able to explain such protective behaviour by parents. Hence, exploring parental digital-security practices based on PMT can be valuable. Therefore, the objective of the present study was to develop and test the psychometric properties of a parental digital-security (P-Dis) questionnaire based on PMT among Malaysian parents.

II. MATERIALS AND METHOD

The target population of this scale-development study was Malaysian parents whom children were younger than 18 years old and were all internet users. Three major stages were involved in developing and testing the questionnaire's psychometric properties: item development, scale development and psychometric properties evaluation. Item development involved item generation, content validation and translation. Scale development involved cognitive debriefing and test-retest reliability. Testing the psychometric properties involved testing the factor analysis and internal consistency of the questionnaire's final version. Figure 1 depicts these stages.

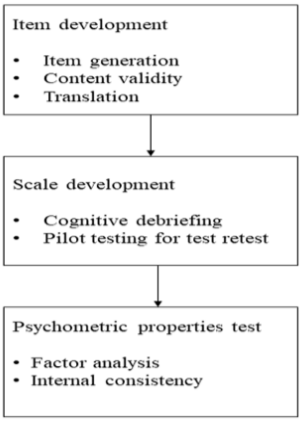

Figure 1. Questionnaire-development stages in the present study

A. Item-development Stage

In item development, the initial step, item generation, involved two types of approaches: the deductive and the inductive (Hinkin, 1995). The deductive approach was used to generate items through a review of the literature on existing questionnaires. The inductive approach was used to engage with parents through online surveys and with experts through discussions. An online survey, which used Google Survey, asked three open-ended questions: 'What are your concerns when your children are online?', 'What actions have you taken to ensure the safety of your children while they are online?' and 'What are the barriers to taking actions to keep your children safe online?'. Then, the themes that emerged from this online survey, the inventory of items from the literature review and the domains obtained from reviewing the literature were discussed by a group of experts, which comprised the researcher, stakeholders from Cybersecurity Malaysia, public-health specialists, an expert on cyber-parenting, parents' representatives and an expert on adolescent health. Based on the feedback from this group, thematic analysis was conducted on the items initially generated. A preliminary set of items was produced that reflected the initial constructs intended to be measured. Table 1 contains this initial set of constructs and their definitions.

Next, the items produced underwent content validation by experts from the fields of interest, including digital citizenship, cybersecurity, public health, child and adolescent health, cyber-parenting and anthropology. These experts examined each item using a four-scale scale that measured its clarity and relevance to the construct to be measured (Streiner and Norman, 2008). The level of agreement among these experts on content validity in terms of clarity and relevance was analysed using the Content Validity Index (CVI), with the aim of obtaining a value of individual CVI (I-CVI) that was at least 0.8 and a value for overall CVI that was at least 0.9 (Streiner and Norman, 2008; Polit and Beck, 2006; Lynn, 1986). Two rounds of content validation were conducted by experts. The first round included six experts, and feedback from this round was analysed and revisions based on the analysis were incorporated. Then, the second round of content validation involved four experts.

Table 1. Initial Constructs and Their Definitions

Initial construct	Definition
Parental digital-security practice	Parents' practice of maintaining the safety of their children online
Perceived susceptibility	Parents' perceptions of their children's likelihood of being unsafe online
Perceived severity	Parents' perceptions of the degree of harmful consequences their children will experience if they are not protected online
Perceived maladaptive reward	Parents' perceptions of the alternative benefits that they would gain if they did not use parental digital-security practices
Perceived self-efficacy	Parents' perceptions of their own abilities to protect their children online
Perceived response efficacy	Parents' perceptions of the effectiveness of parental digital-security practices to protecting children online
Perceived response cost	Parents' perceptions of the costs to them of applying digital-security practices to their children's online use

After this content validation, the questionnaire items were translated into the Malay language, using the forward-backward technique. The procedures were adapted from the guidelines by Gullemin and Beaton (Guillemin *et al.*, 1993; Beaton *et al.*, 2000). The initial step involved two independent translators proficient in both English and Malay but whose native language was Malay. They translated the questionnaire from English to Malay. Then, based on the same guidelines (Beaton *et al.*, 2000; Guillemin *et al.*, 1993), the two versions were compared and synthesised by a committee comprising the researcher, stakeholders from CyberSecurity Malaysia and a cyber-parenting expert. A single translated version of the questionnaire was produced. Next, the reverse translation was conducted: The Malay version was translated into English by two other translators working independently, both of whom were proficient in both languages. Similar to the process of forward translation, in the back-translation, the same committee compared the two versions with the original English version. A consensus was achieved, and the final version in both languages was completed.

B. Scale-development Stage

In scale development, the mental processes and respondent burden were assessed by cognitive debriefing procedure, involving 10 participants who were recruited using purposive sampling based on their age, ethnicity, gender and education level. This cognitive debriefing used the verbal probe technique (Di Lorio, 2005). Participants were first asked to answer the questionnaire, and then the debriefing session was conducted to obtain their feedback.

Next, a test-retest reliability assessment was conducted to assess the consistency of the measurements regarding each of the 36 participants when tested at different times (Vitoratou S *et al.*, 2009). This test-retest reliability assessment involved participants answering the questionnaire again after two weeks (Tafforeau *et al.*, 2005). The test-retest reliability was analysed based on the intra-class correlation coefficient (ICC) (Koo and Li, 2016). A target of 0.5 and higher was deemed as adequate test-retest reliability (Koo and Li, 2016).

C. Psychometric-properties Evaluation

The scale's psychometric properties were tested by determining the factors through Exploratory Factor Analysis (EFA) and internal consistency of the questionnaire's final version. This test was conducted using 316 parents. The recruitment process collected the parents' demographic profiles and the self-reported measures that they use. To produce the final version of the questionnaire, factors were extracted using principal axis factoring and the Promax rotation method (Worthington and Whittaker, 2006). Items with a factor load of < 0.4 or having cross-loading issues were removed and re-analysed (Hair *et al.*, 2010). The reliability of the final version of the questionnaire was measured using inter-item correlation, corrected item-total correlation and Cronbach's alpha. Values > 0.3 for the corrected item-total correlation (Cristobal *et al.*, 2007) and > 0.7 for the Cronbach's alpha were acceptable (Cortina, 1993).

This study was registered in the National Medical Research Register (NMRR) as number NMRR-17-3093-39434 (IIR). Ethical clearance was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia and the University Malaya Research Ethics Committee (UMREC) using reference number UM.TNC2/UMREC–211. Participation in the study was voluntary, consent was obtained prior to data collection and the respondents' confidentiality was maintained throughout the study.

III. RESULT

A. Item Development

During the item-generation step in the item-development stage, 69 parents responded online through the Google Survey. Table 2 shows their sociodemographic characteristics. From the parents' responses, the literature reviewed and the discussion with experts, 52 items were generated and mapped according to the PMT framework. The items regarding perceived susceptibility and perceived severity (Sections B and C, respectively) were derived from the responses on concerns about online threats. The items for perceived self-efficacy (Section D), perceived response efficacy (Section E) and digital-security practices (Section H) were derived from the responses about digital-security practices. The literature review also contributed to the generation of items, particularly about digital-security practices (Section H). The items for response cost (Section F) and maladaptive rewards (Section G) were derived from the responses about barriers to digital-security practices.

In the subsequent two-round content-validation process, all items for the respective sections were deemed relevant by all the experts in the first round, meaning that individual items had CVIs > 0.8 and that each section had an overall CVI > 0.9. However, the clarity scores for Sections B and C did not meet the threshold. Four items (B1, B2, B4 and B7) had I-CVIs < 0.8 (0.67).

The overall CVI for Section B was 0.81. In Section C, three items (C2, C4 and C7) had I-CVIs < 0.8 (0.67). The overall CVI for Section C was 0.83. After the first round of content validation, two additional items were created: B8 and C8. After additional adjustments were made based on the first round, the second round of content validation found I-CVIs of 1 and overall CVIs of 1 for all domains regarding clarity (Table 3). By the end of the content validation process, 54 items had been generated. Table 4 contains the constructs, the item numbers and the actual items.

Table 2. Sociodemographic Characteristics of Online Survey Respondents

Respondents' characteristics (n = 69)	Frequency (%)
Gender	
Male	21 (30)
Female	48 (70)
Age	
30–40	43 (62)
41–50	22 (32)
50 and older	4 (6)
Ethnicity	
Malay	51 (74)
Chinese	15 (22)
Indian	2 (3)
Others	1 (1)
Religion	
Islam	52 (75)
Christian	9 (13)
Buddhist	4 (6)
Hindu	1 (1)
Others	3 (5)
Region	
Northern (Perlis, Penang, Kedah, Perak)	2 (3)
Central (Selangor, Kuala Lumpur, Putrajaya N. Sembilan)	53 (77)
Southern (Melaka, Johor)	3 (5)
Eastern (Pahang, Kelantan, Terengganu)	10 (14)
Sabah and Sarawak	1 (1)
Occupation	
Government	32 (46)
Private	24 (35)
Self-employed	11 (16)
Unemployed/Homemaker	2 (3)
Highest education level	
No formal education	1 (1)
Primary school	3 (5)
Secondary school	2 (3)
Diploma	15 (22)
Degree	37 (53)
Master	11 (16)

Table 3. Number of Items and Overall CVIs for Constructs throughout Content Validity Process

Section	Construct	First round of content validation		Second round of content validation	
		Number of items	Overall CVI	Number of items	Overall CVI
B	Perceived susceptibility	7	0.81	8	1
C	Perceived severity	7	0.83	8	1
D	Perceived self-efficacy	7	0.95	7	1
E	Perceived response efficacy	7	0.98	7	1
F	Perceived response cost	7	0.98	7	1
G	Perceived maladaptive reward	5	0.93	5	1
H	Parental digital-security practice	12	0.97	12	1

Table 4. Final Questionnaire after Content Validation Process

Construct	Item no.	Item
Perceived susceptibility (When your child is using the internet, in your opinion, how likely or unlikely is it that he/she will)	B1	Be bullied (harassed, threatened and/or intimidated) online.
	B2	Be spending more time online than he/she should.
	B3	Be exposed to adult content (e.g. pornography, violence, gambling).
	B4	Have his/her personal information obtained without his/her knowledge or consent.
	B5	Be approached online by a person he/she does not know.
	B6	Exchange sexual messages and/or images with other people online.
	B7	Be exposed to online content promoting self-harm (e.g. websites that encourage suicide, eating disorders, drug use).
	B8	Be exposed to online content that promotes hate, extreme views or terrorism.
Perceived severity (In your opinion, how serious are these issues to you?)	C1	A child is being bullied (harassed, threatened and/or intimidated) online.
	C2	A child is spending more time online than he/she should.
	C3	A child is exposed to adult content (including pornography, violence, gambling).
	C4	A child's personal information is obtained without his/her knowledge or consent.
	C5	A child is approached online by a person he/she does not know.
	C6	A child exchanges sexual messages and/or images with other people online.
	C7	A child is exposed to online content that promotes self-harm (e.g. websites that encourage suicide, eating disorders, drug use).
	C8	A child is exposed to online content that promotes hate, extreme views or terrorism.
Perceived self-efficacy (How much do you agree or disagree with the following statement?)	D1	I am confident in discussing and giving advice to my child about online safety.
	D2	I am confident in my knowledge about keeping my child safe online.
	D3	I am comfortable with using the internet together with my child.
	D4	I am confident in imposing rules on internet use on my child.
	D5	I am confident in using filtering and monitoring software (parental control applications).
	D6	I am comfortable with restricting my child to using the internet only when I am around.
	D7	I am confident in checking my child's online activities after my child has been online.
Perceived response efficacy (How much do you agree or disagree with the following statement?)	E1	Discussing online safety with my child will keep him/her safe online.
	E2	Having the appropriate knowledge will keep my child safe online.
	E3	Using the internet together with my child will keep him/her safe online.
	E4	Imposing internet rules on my child will keep him/her safe online.
	E5	Using filtering and monitoring software (parental control applications) will keep him/her safe online.
	E6	Restricting my child to using the internet only when I am around will keep him/her safe online.
	E7	Checking my child's online activities after he/she has used the internet will keep him/her safe online.
Perceived response cost (How much do you agree or	F1	Discussing online safety with my child is troublesome for me.
	F2	It takes a lot of effort to acquire appropriate knowledge about online safety.

disagree with the following statement?)		
	F3	It takes a lot of effort to use the internet together with my child.
	F4	Ensuring that my child follows internet rules is troublesome for me.
	F5	Ensuring that filtering and monitoring software (parental control applications) are working can be troublesome for me.
	F6	Restricting my child to using the internet only when I am around requires a lot of effort.
	F7	Checking my child's online activities after he/she has been online requires a lot of effort.
Perceived maladaptive reward (How much do you agree or disagree with the following statement?)	G1	Not discussing online safety with my child will help to make him/her more independent.
	G2	Allowing my child to use the internet on his/her own will enable me to focus on my own interests.
	G3	Not imposing internet rules on my child will make him/her happy.
	G4	By not putting up filtering and monitoring software (parental control applications), my child can use the internet freely.
	G5	By not checking my child's online activities after he/she is online, I am respecting his/her rights.
Parental digital-security practice (How often do you)	H1	Discuss online safety with your child.
	H2	Have conversations with your child about how to handle unknown people online.
	H3	Discuss with your child how to protect personal information online.
	H4	Have conversations on what to do if he/she is bullied or harassed online.
	H5	Use the internet together with your child.
	H6	Tell your child when/how long to use the internet.
	H7	Tell your child which websites/social networks he/she can visit.
	H8	Tell your child what he/she can and cannot do online.
	H9	Ensure that filtering and monitoring software (parental control applications) are present.
	H10	Restrict your child to using the internet only when you are present.
	H11	Check the websites that your child has visited.
	H12	Check which friends or contacts your child has added to a social networking profile.

B. Scale Development

The cognitive debriefing of the 10 participants found that most items were well understood and suitable. However, items F2 and F3 required increased clarity, which was achieved by defining the term 'effort'. Item H12 was deleted, as it was deemed irrelevant to some parents.

The remaining 53 items underwent test-retest process involving 35 parents. The test-retest analysis found that the ICC for all items was > 0.5, except for item D1, which had an ICC of 0.44, reflecting poor stability over time. This item was deleted, leaving 52 items remaining to be further tested for their psychometric properties.

C. Psychometric Properties Test

Table 5 shows the sociodemographic characteristics of the 316 respondents involved in factor analysis and internal consistency testing. The factors of the 52 items were determined through EFA, using Principal Axis Factoring and Promax rotation. The Kaiser-Meyer-Olkin (KMO) value obtained was 0.882, and Bartlett's test of sphericity was significant, indicating that sampling adequacy was fulfilled

and that the items were suitable to be factorised. Using parallel analysis (Timmerman and Lorenzo-Seva, 2011), nine factors were recommended to be extracted. The items were rotated, and factor loadings were examined for poor loading or cross-loading. Item G1 had poor loading and was deleted. Then, the remaining 51 items were rotated again. The rotation extracted 9 factors, accounting for 73.8% of the shared variance. Examination of the pattern matrix revealed no items that had poor factor loading or cross-loading issues. Items B1–B8 were loaded under a domain labelled 'perceived susceptibility'. Items C1–C8 were loaded together and labelled 'perceived severity'. Items D2–D7 were loaded under a domain labelled 'perceived self-efficacy'. Items E1–E7 were loaded together under a domain labelled 'perceived response-efficacy'.

Items F1, F4 and F5 were loaded together and labelled 'perceived psychology cost'. Items F2, F3, F6 and F7 were loaded under a domain labelled 'perceived tangible cost'. Items G2–G5 were loaded together under a domain labelled 'perceived maladaptive reward'. Items H1–H4 were loaded together under a domain labelled 'discursive digital security practice', and items H5–H11 were loaded together and labelled 'control digital security practice' (Table 6).

Table 5. Factor Analysis and Internal Consistency of Respondents' Sociodemographic Characteristics

Respondents' characteristics (n = 316)	Frequency (%)
Gender	
Male	117 (37)
Female	199 (63)
Age	
20–30	43 (14)
31–40	164 (52)
41–50	87 (27)
50 and older	22 (7)
Ethnicity	
Malay	251 (79)
Chinese	36 (11)
Indian	22 (8)
Others	7 (2)
Religion	
Islam	258 (82)
Christian	9 (3)
Buddhism	25 (8)
Hindu	21 (6)
Others	3 (1)
Region	
Northern (Perlis, Penang, Kedah, Perak)	29 (9)
Central (Selangor, Kuala Lumpur, Putrajaya	274 (87)
N. Sembilan)	5 (2)
Southern (Melaka, Johor)	4 (1)
Eastern (Pahang, Kelantan, Terengganu)	4 (1)
Sabah and Sarawak	
Occupation	
Government	99 (31)
Private	117 (37)
Self-employed	49 (16)
Unemployed/Homemaker	51 (16)
Highest education level	
No formal education	1 (<1)
Primary school	5 (2)
Secondary School	105 (33)
Diploma	86 (27)
Degree	93 (30)
Master	26 (8)

Table 6. Factor Loading for Items According to Rotated Pattern Matrix

Component	Item no	Item	Factor loading
Perceived susceptibility (When your child is using the internet, in your opinion, how likely or unlikely is it that he/she will)	B1	Be bullied (harassed, threatened and/or intimidated) online.	0.74
	B2	Be spending more time online than he/she should.	0.60
	B3	Be exposed to adult content (e.g. pornography, violence, gambling).	0.83
	B4	Have his/her personal information obtained without his/her knowledge or consent.	0.84
	B5	Be approached online by a person he/she does not know.	0.83
	B6	Exchange sexual messages and/or images with other people online.	0.90
	B7	Be exposed to online content promoting self-harm (e.g. websites that encourage suicide, eating disorders, drug use).	0.86
	B8	Be exposed to online content that promotes hate, extreme views or terrorism.	0.81
Perceived severity (In your opinion, how serious are these issues to you?)	C1	A child is being bullied (harassed, threatened and/or intimidated) online.	0.86
	C2	A child is spending more time online than he/she should.	0.68
	C3	A child is exposed to adult content (including pornography, violence, gambling).	0.89
	C4	A child's personal information is obtained without his/her knowledge or consent.	0.92

	C5	A child is approached online by a person he/she does not know.	0.91
	C6	A child exchanges sexual messages and/or images with other people online.	0.95
	C7	A child is exposed to online content that promotes self-harm (e.g. websites that encourage suicide, promote eating disorders, drug use).	0.92
	C8	A child is exposed to online content that promotes hate, extreme views or terrorism.	0.93
Perceived self-efficacy (How much do you agree or disagree with the following statement?)	D2	I am confident in my knowledge about keeping my child safe online.	0.78
	D3	I am comfortable with using the internet together with my child.	0.56
	D4	I am confident in imposing rules on internet use on my child.	0.91
	D5	I am confident in using filtering and monitoring software (parental control applications).	0.67
	D6	I am comfortable with restricting my child to using the internet only when I am around.	0.68
	D7	I am confident in checking my child's online activities after my child has been online.	0.54
Perceived response efficacy (How much do you agree or disagree with the following statement?)	E1	Discussing online safety with my child will keep him/her safe online.	0.87
	E2	Having the appropriate knowledge will keep my child safe online.	0.91
	E3	Using the internet together with my child will keep him/her safe online.	0.75
	E4	Imposing internet rules on my child will keep him/her safe online.	0.94
	E5	Using filtering and monitoring software (parental control applications) will keep him/her safe online.	0.80
	E6	Restricting my child to using the internet only when I am around will keep him/her safe online.	0.70
	E7	Checking my child's online activities after he/she has been online will keep him/her safe online.	0.70
Perceived psychological cost (How much do you agree or disagree with the following statement?)	F1	Discussing online safety with my child is troublesome for me.	0.65
	F4	Ensuring that my child follows internet rules is troublesome for me.	0.85
	F5	Ensuring that filtering and monitoring software (parental control applications) are working can be troublesome for me.	0.81
Perceived tangible cost (How much do you agree or disagree with the following statement?)	F2	It takes a lot of effort to acquire appropriate knowledge about online safety.	0.74
	F3	It takes a lot of effort to use the internet together with my child. *effort refers to attempts to ensure using the internet together with your child (e.g. arranging daily routines or setting up a calendar to schedule time to use the internet together).	0.89
	F6	Restricting my child to using the internet only when I am around requires a lot of effort. *effort refers to attempts to ensure that your child uses the internet only when a parent is around (e.g. rules allowing use of devices only in common areas of the house).	0.76
	F7	Checking my child's online activities after he/she has been online requires a lot of effort.	0.77
Perceived maladaptive reward (How much do you agree or disagree with the following statement?)	G2	Allowing my child to use the internet on his/her own will enable me to focus on my own interests.	0.65
	G3	Not imposing internet rules on my child will make him/her happy.	0.83
	G4	By not putting up filtering and monitoring software (parental control applications), my child can use the internet freely.	0.76

	G5	By not checking my child's online activities after he/she has been online, I am respecting his/her rights.	0.52
Discursive security practice (How often do you)	H1	Discuss online safety with your child.	0.65
	H2	Have conversations with your child on how to handle unknown people online.	0.86
	H3	Discuss with your child how to protect personal information online.	0.89
	H4	Have conversations on what to do if he/she is bullied or harassed online.	0.81
Control security practice (How often do you)	H5	Use the internet together with your child.	0.64
	H6	Tell your child when/how long to use the internet.	0.76
	H7	Tell your child which websites/social networks he/she can visit.	0.73
	H8	Tell your child what he/she can and cannot do online.	0.61
	H9	Ensure that filtering and monitoring software (parental control applications) are present.	0.53
	H10	Restrict your child to using the internet only when you are present.	0.84
	H11	Check the websites that your child has visited.	0.77

The internal consistency of the factors produced was examined. All the factors exhibited good internal consistency (Table 7) with their respective items, as recommended in the literature (Mokkink *et al.*, 2010). The inter-item correlation of each domain ranged from 0.3–0.9. The corrected item-total correlation (CITC) was > 0.3, and Cronbach's alpha was > 0.7.

Table 7. Internal Consistency Summary of the Factors

Factor	No. of items	Cronbach's alpha	Minimum CITC
Perceived susceptibility	8	0.94	0.60
Perceived severity	8	0.97	0.71
Perceived self-efficacy	6	0.88	0.57
Perceived response efficacy	7	0.94	0.74
Perceived psychological cost	3	0.84	0.63
Perceived tangible cost	4	0.88	0.68
Perceived maladaptive reward	4	0.79	0.54
Discursive digital security	4	0.93	0.76
Control digital security	7	0.89	0.61

IV. DISCUSSION

In this study, we developed the P-Dis questionnaire to assess parents' digital-security practices aimed at keeping their children safe online. The final questionnaire consisted of 51 items covering 9 components. The internal consistency reliability of each component was good, with the Cronbach's alpha coefficient ranging from 0.79–0.97. The components were derived based on factor analysis and represented the themes collected from the PMT framework, discussions with experts, review of literature and an online survey of parents.

As the questionnaire developed was heavily based on the PMT framework, the factors extracted were interpreted and compared with the underlying PMT domains whenever possible. The items under the 'perceived susceptibility', 'perceived severity', 'perceived self-efficacy', 'perceived response efficacy' and 'perceived maladaptive reward' factors were consistent with the domains they were intended to represent and were in line with PMT domains. 'Perceived psychological cost' and 'perceived tangible cost' are new factors discovered in this EFA. 'Perceived psychological cost' was labelled as such because the items that loaded into this factor had a common keyword, 'troublesome', which reflects the psychological state while performing the actions described in those items. 'Perceived tangible cost' was labelled as such because the items that loaded into this factor had a common keyword, 'effort', which reflects measurable

costs, including time and physical action. Both 'perceived tangible cost' and 'perceived psychological cost' can be treated as formative components of 'perceived response cost', based on theoretical argument and content validation. From the theoretical aspect, PMT shares certain similarities with another cognitive-based model, the Health Belief Model (Prentice-Dunn and Rogers, 1986). Rogers *et al.* explicitly mentioned that the component of response cost was equivalent to the model's perceived barriers (Prentice-Dunn and Rogers, 1986). Perceived barriers in the model were defined as 'Beliefs about the tangible and psychological costs of the advised action' (Glanz *et al.*, 2008). Hence, this definition supports the argument that 'perceived psychological cost' and 'perceived tangible cost' are in line with the underlying theoretical definition and justify being labelled as such. 'Discursive digital security practice' was labelled as such because the items that loaded into this factor reflected active and discussion-based actions. 'Control digital security practice' was named as such because the items that loaded into this factor reflected a common theme of exertion of power and authority by parents in performing the actions. Based on content validity, the experts agreed that the items forming these two factors reflected digital-security practices in general. The literature also supports the grouping of these two types of digital-security practices. Wisniewski *et al.* have described two types of parental mediation practices regarding social media use by their children: direct and active mediation (Wisniewski *et al.*, 2015). According to the authors, direct interventions include actions taken by parents to directly intervene in their children's social media use, including applying rules and restrictions (Wisniewski *et al.*, 2015). Active mediation applies when parents take actions that include talking to their children but not attempting to directly control their social media use (Wisniewski *et al.*, 2015). These two types of digital-security practices described by Wisniewski *et al.* (2015) are similar to the 'discursive digital security' and 'control digital security' practices in the present study. A qualitative study by Meehan (2016) also highlighted two types of parental mediation strategies for managing children's use of internet-connected devices: control and parental experience. Parental control mediation includes 'covert and overt strategies and tactics', whereas parental experience is associated with the level of parents' trust in their children and their levels of understanding and information on internet-based devices (Meehan S., 2016). Parental control mediation is similar to 'control digital security' in the present study, and 'parental experience' is reflected in the present study's 'discursive digital security' practice. Hence, the formation of these two factors is justifiable based on the literature and the validation of the content by experts. Overall, the factors that emerged from the feedback received from both experts and parents were deemed sufficient to understand parental digital-security practice, and the items were relevant and well received by parents.

This study has some strengths that merit highlighting. First, this is the first validated questionnaire that measures parental digital-security practices from the well-established, cognitive-based PMT in the Malaysian context. The development of the questionnaire was based on best practices and underwent comprehensive measures from item development and scale development to testing the psychometric properties. The questionnaire produced is dual language, increasing its potential for use among the Malaysian population.

Although the P-Dis questionnaire fulfilled its psychometric properties, there are a few limitations to the questionnaire that need to be highlighted. The majority of the parents who participated were from the central region of Malaysia, and hence the study's findings might not represent the parent populations in other regions of Malaysia. Similarly, although there were respondents from lower social statuses, the majority of the respondents were had higher levels of education and employment. Therefore, the questionnaire's validity needs to be replicated in other regions of Malaysia and with certain population demographic characteristics, including lower social statuses. Nevertheless, this study provides a significant initial step toward introducing a validated instrument regarding parental digital-security practices in the Malaysian setting.

V. CONCLUSION

The 51-item P-Dis questionnaire underwent robust steps in its development and was proved to fulfil its psychometric

properties. As such, the questionnaire can be used in future research, particularly that involving the Malaysian population. For example, the questionnaire can be used to understand the role of parental digital-security practices regarding certain online behaviours concerning public health, including cyberbullying and internet addiction. In practical terms, the questionnaire's ability to identify the factors and practices used by parents to keep their children safe online may help stakeholders provide interventions that are suitable for parents and that efficiently improve their understanding and knowledge of cyber-parenting in general.

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