

Determinants of Child Restraint System Compliance among Malaysian Parents: A Health Belief Model Approach

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ABSTRACT

This study examined the behavioural and practical factors associated with Child Restraint System (CRS) compliance among Malaysian parents using the Health Belief Model. A cross-sectional online survey was conducted among 500 parents or primary caregivers with at least one child aged 12 years or younger and access to a private passenger vehicle. Respondents were classified as CRS users or non-users based on their self-reported frequency of CRS use. Descriptive statistics and Mann–Whitney U tests were used to compare Health Belief Model constructs between the two groups. Overall, 67% of respondents were classified as CRS users, while 33% were non-users. CRS users reported significantly higher perceived susceptibility, perceived severity, perceived benefits, and self-efficacy than non-users ($p < 0.001$), although the effect sizes were generally small. In contrast, non-users reported significantly greater financial and usability barriers, including CRS cost, installation difficulty, child discomfort, and limited vehicle space ($p < 0.001$). Child discomfort showed the largest effect size, though only moderate ($r = 0.35$). Significant differences were also observed for selected enforcement-related and financial cues, but the effect sizes were small, while campaign- and social norm-related cues did not differ significantly between the groups. These findings indicate that improving CRS compliance requires more than increasing awareness or relying on enforcement alone. Interventions should prioritise affordability, practical installation support, user guidance, and strategies that strengthen parents' confidence in selecting and using an appropriate CRS. Addressing both behavioural and structural barriers may support more consistent use of CRS and improve child occupant safety in Malaysia.

Keywords: Child restraint system; road safety; child traffic safety; Health Belief Model

INTRODUCTION

Road traffic injuries remain a major public health concern and are among the leading causes of death and serious injury among children worldwide. According to the World Health Organization (2023), road traffic crashes are one of the leading causes of mortality among children aged 5–14 years, with the greatest burden occurring in low- and middle-income countries (LMICs). Similarly, Song et al. (2026) analyzed road traffic injury burden among children aged 0–19 years across 129 LMICs from 1990–2023, found that motor vehicle-related injuries accounted for the largest share of disability-adjusted life years (DALYs) across all income groups. In Malaysia, child occupants continue to be at considerable risk of road traffic injuries, highlighting the importance of effective injury prevention strategies.

Child Restraint Systems (CRS) are widely recognised as one of the most effective interventions for protecting child occupants during motor vehicle crashes. When correctly selected, installed, and used, CRS can reduce the risk of fatal injury by up to 70% and serious injury by up to 80% (Durbin et al., 2003; Klinich et al., 2014). Consequently, many countries, including Malaysia, have introduced mandatory CRS legislation to improve child occupant safety.

Malaysia implemented mandatory CRS regulations in 2020, requiring children below specified age, height, or weight thresholds to travel in an appropriate restraint system. Despite this legislation, evidence indicates that compliance remains inconsistent. Previous studies have shown that although many Malaysian parents are aware of the regulations, regular CRS use remains suboptimal, particularly during short journeys (Ang et al., 2020; Ramli & Mohd Yunus, 2020; Paiman et al., 2016). This discrepancy suggests that legislation alone may be insufficient to promote sustained compliance.

Several factors have been identified as barriers to CRS use in Malaysia and other LMICs. Financial constraints, limited knowledge of CRS selection and installation, perceived inconvenience, child discomfort, and misconceptions regarding child safety continue to discourage consistent use (Paiman et al., 2016; Faradila et al., 2021; Brown et al., 2013). In addition, incorrect CRS installation and inappropriate restraint selection reduce the protective benefits of CRS and remain common issues (Klinich et al., 2014).

International evidence further suggests that effective CRS programmes require more than legislation alone. Studies have demonstrated that sustained compliance is supported by a combination of visible enforcement, public education, financial assistance, and practical support for parents (Nazif-Muñoz et al., 2018; Puvanachandra et al., 2020). Although Malaysia has introduced initiatives such as CRS subsidy programmes, their effectiveness may be limited by low public awareness and inconsistent enforcement.

Behavioural theories provide valuable insight into why parents choose to comply with CRS regulations. The Health Belief Model (HBM) proposes that preventive behaviours are influenced by perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Rosenstock, 1974). The model has been widely applied to explain road safety behaviours, including seatbelt and helmet use (Aghamolaei et al., 2011; Tavafian et al., 2011). More recent studies have also demonstrated its usefulness in understanding CRS adoption among parents in low- and middle-income countries, particularly the influence of perceived barriers and parental confidence (Champahom et al., 2023; Liu & Huo, 2023; Yang et al., 2024).

Although CRS compliance has been examined in several Malaysian studies, limited research has comprehensively investigated the behavioural factors associated with compliance using the Health Belief Model following the implementation of mandatory CRS legislation. Understanding these factors is essential for developing interventions that address practical barriers while strengthening parents' confidence in selecting and using CRS correctly.

Therefore, this study aimed to identify the behavioural factors associated with Child Restraint System compliance among Malaysian parents using the Health Belief Model. Specifically, the study compared behavioural perceptions between CRS users and non-users to identify key barriers and facilitators influencing compliance. The findings are intended to inform evidence-based strategies that strengthen child occupant safety through improved education, targeted interventions, and more effective policy implementation.

RESEARCH METHODOLOGY

Study Design

A cross-sectional survey design was employed to examine factors associated with Malaysian parents' compliance with Child Restraint System (CRS) regulations. This design is appropriate for examining attitudes, perceptions, and self-reported safety behaviours at a single point in time and has been widely used in public health and injury prevention research (Champahom et al., 2023; Paiman et al., 2016). The study was guided by the Health Belief Model (HBM), a well-established behavioural framework used to explain preventive health behaviours, including road safety compliance (Rosenstock, 1974).

The HBM conceptualises behaviour as being influenced by perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. This model has been successfully applied in studies examining seatbelt use, helmet use, and CRS adoption (Aghamolaei et al., 2011; Champahom et al., 2023; Tavafian et al., 2011).

Study Population and Sampling

The study population consisted of parents or primary caregivers residing in Malaysia who had at least one child aged 12 years or younger and access to a private passenger vehicle. These criteria ensured that respondents were directly responsible for decisions regarding CRS use. A convenience sampling approach was adopted, consistent with previous CRS-related surveys conducted in Malaysia and other low- and middle-income countries (Ang et al., 2020; Paiman et al., 2016).

Participants were recruited through online distribution of the survey link via social media platforms, including Facebook, WhatsApp, and Instagram. In addition, Child Occupant Safety Instructors (COSI), who are involved in child restraint system (CRS) retail and education, helped share the survey with parents within their customer networks. This approach allowed the study to reach a wide group of respondents efficiently, especially those who are active online. However, as a convenience sampling method was used, there is a possibility of selection bias. In particular, parents connected to COSI networks may have higher awareness or prior exposure to CRS, which could lead to an overrepresentation of safety-conscious respondents. Similar recruitment strategies have been applied in previous CRS and road safety studies, although such limitations should be considered when interpreting the findings (Champahom et al., 2023; Faradila et al., 2021).

The inclusion criteria were parents or caregivers residing in Malaysia, having at least one child aged 12 years or younger, and regular use of a private passenger vehicle. Responses that did not meet these criteria or were incomplete were excluded from analysis. The minimum sample size was estimated using a 95% confidence level, a 5% margin of error, and an assumed population proportion of 50%, resulting in a required sample of approximately 385 respondents. A total of 500 valid responses were collected and included in the final analysis.

Questionnaire Development

The questionnaire was developed based on existing literature on CRS usage and behavioural safety research and structured according to the constructs of the Health Belief Model (Champahom et al., 2023; Rosenstock, 1974). The survey consisted of sections covering sociodemographic characteristics, CRS usage behaviour, perceptions of enforcement, and HBM constructs, including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy.

All perception-based items were measured using a five-point Likert scale ranging from strongly disagree to strongly agree, a format commonly used in behavioural and public health studies to assess attitudes and beliefs (Aghamolaei et al., 2011; Tavafian et al., 2011). The questionnaire was prepared in both English and Malay to ensure clarity and accessibility among Malaysian respondents.

Content validity was reviewed by experts in road safety and public health. A pilot test involving 30 participants was conducted to assess clarity, comprehension, and internal consistency. Minor revisions were made based on pilot feedback before full deployment.

Data Collection

Data collection was conducted over 65 days from 23 August to 27 October 2024 using an online survey platform. Before participation, respondents were provided with an information sheet and informed consent statement outlining the study objectives, voluntary participation, and confidentiality of responses. To encourage participation, a small incentive was offered to the first 300 respondents in the form of an electronic wallet token. Contact details collected for incentive distribution were stored separately and were not linked to survey responses.

Ethical Considerations

This study involved a non-interventional, anonymous online survey and was reviewed and approved by the Ethical Committee of the Malaysian Institute of Road Safety Research (MIROS), approval reference VS102227.

Electronic informed consent was obtained from all participants before participation. Participation was voluntary, and respondents were informed of the study objectives, confidentiality of their responses, and their right to withdraw before submitting the questionnaire.

Data Analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 29. Descriptive statistics were used to summarise respondents' sociodemographic characteristics and CRS usage patterns. Respondents were categorised as CRS users if they reported using a CRS "most of the time" or "all the time." Those who reported using a CRS "sometimes," "rarely," or "never" were categorised as non-users, consistent with previous CRS behavioural studies (Champahom et al., 2023; Liu & Huo, 2023; Yang et al., 2024).

The internal consistency of the questionnaire was assessed using Cronbach's alpha for each Health Belief Model construct. All constructs demonstrated acceptable to excellent reliability, with alpha values ranging from 0.749 to 0.902.

Data normality was assessed using the Shapiro–Wilk and Kolmogorov–Smirnov tests. Most variables deviated significantly from a normal distribution ($p < 0.05$). Therefore, the Mann–Whitney U test was used to compare HBM item scores between CRS users and non-users. This non-parametric test was considered appropriate given the ordinal nature of the Likert-scale responses and the overall non-normal distribution of the data. Effect sizes for the Mann–Whitney U tests were calculated as $r = Z/\sqrt{N}$, where Z represents the standardised test statistic and N represents the total number of observations. Effect sizes of approximately 0.10, 0.30, and 0.50 were interpreted as small, moderate, and large, respectively.

RESULTS

A total of 500 valid responses were included in the final analysis. All respondents were parents or primary caregivers residing in Malaysia with at least one child aged 12 years or younger and regular access to a private passenger vehicle. The majority of respondents were within the economically active age group and reported being the primary decision-makers for child travel safety.

Child Restraint System Usage

Overall, 67% of respondents were classified as CRS users, while 33% were categorised as non-users. The distribution of CRS usage frequency is presented in Table 1. A total of 41% of respondents reported always using CRS, followed by 26% who used CRS most of the time. In contrast, 14% reported never using CRS, while 9% and 10% reported rarely and sometimes using CRS, respectively. These findings indicate that although the majority of parents reported regular CRS use, a substantial proportion demonstrated inconsistent or non-compliant behaviour. This suggests that achieving consistent CRS use remains a significant concern despite the relatively high prevalence of reported use. Further investigation is therefore needed to identify the factors influencing parents' adherence to CRS use.

For analytical purposes, respondents were categorised into CRS users (those reporting CRS use "most of the time" or "all the time") and non-CRS users (those reporting CRS use "sometimes", "rarely", or "never"). This categorisation was used to examine differences in behavioural constructs and factors associated with CRS use and non-compliance.

Table 1: Distribution of child restraint system usage frequency among respondents

CRS usage frequency	n	(%)	New categorization	(%)
Never	70	14	Non-CRS users	33
Rarely	45	9		
Sometimes	50	10		
Most of the time	130	26	CRS users	67
All the time	205	41		

Perceptions on Enforcement

Respondents' perceptions of the likelihood of being fined for not using a child restraint system (CRS) were measured using a 10-point Likert scale, where higher scores indicate a stronger perception of enforcement. CRS users reported a mean score of 4.99 (SD = 3.37), while non-users reported a slightly higher mean score of 5.33 (SD = 2.73). Overall, both groups demonstrated low to moderate perceptions of enforcement.

A Mann–Whitney U test showed no statistically significant difference between CRS users and non-users ($U = 25715.50$, $p = 0.309$), with a negligible effect size ($r = 0.05$). This suggests that perceived likelihood of being fined is similar across both groups and may not be an important factor associated with CRS use.

Health Belief Model Constructs

Table 2 presents the comparison of Health Belief Model item scores between CRS users and non-users. Comparative analysis using the Mann–Whitney U test demonstrated statistically significant differences between CRS users and non-users across most Health Belief Model constructs, with effect sizes ranging from small to moderate ($r = 0.12 - 0.35$).

CRS users reported higher perceived susceptibility and severity of child injury risk when CRS was not used ($p < 0.001$), with small effect sizes ($r = 0.20 - 0.26$). They also reported higher perceived benefits of CRS use, including improved child safety and ease of managing children during travel ($p < 0.001$; $r = 0.24 - 0.29$).

In contrast, CRS non-users reported higher perceived barriers across all items ($p < 0.001$ with effect sizes ranging from small to moderate ($r = 0.16 - 0.35$). Child discomfort when using CRS showed the largest and the only moderate effect ($r = 0.35$), indicating a meaningful difference between groups.

For cues to action, significant differences were observed for enforcement-related and financial cues ($p < 0.01$), although the effect sizes were small ($r = 0.12 - 0.15$). In contrast, campaign- and social influence-related cues showed no statistically significant differences ($p > 0.05$) and negligible effect sizes ($r < 0.10$).

CRS users also demonstrated higher self-efficacy compared to non-users ($p < 0.001$), with small effect sizes ($r = 0.22 - 0.26$), indicating greater confidence in selecting and using appropriate CRS.

Overall, the findings suggest that CRS users were characterised by stronger risk perceptions, greater recognition of the benefits of CRS, and higher confidence in their ability to select and use an appropriate restraint. Conversely, non-users experienced greater practical barriers, particularly those related to child discomfort. The comparatively small effects observed for cues to action indicate that external prompts, such as enforcement and financial incentives, may distinguish users from non-users to a lesser extent than individual beliefs, perceived barriers, and self-efficacy.

Table 2: Comparison of Health Belief Model Item Scores Between CRS Users and Non-Users

	Variable	CRS USER		CRS NON-USER		Mann-Whitney U Test	
		Mean	SD	Mean	SD	p	r
	Perceived Susceptibility						
Sus1	My child is at risk of serious injury if not placed in a CRS while traveling.	4.87	0.37	4.57	0.71	<0.001	0.26
Sus2	Not using a CRS increases the risk of my child experiencing serious injury even in minor crashes.	4.77	0.52	4.47	0.76	<0.001	0.23
Sus3	During short trips, my child is still at risk if not using a CRS.	4.72	0.55	4.43	0.80	<0.001	0.20
	Perceived Severity						

Sev1	Road traffic accidents can cause permanent disability to my child if not using a CRS.	4.82	0.45	4.47	0.82	<0.001	0.25
Sev2	Injuries from road accidents can cause physical and emotional trauma to my child.	4.84	0.40	4.54	0.72	<0.001	0.25
Perceived Benefits							
Ben1	Using CRS helps me manage my child in the car.	4.52	0.76	3.92	1.10	<0.001	0.29
Ben2	CRS can protect my child from car accidents.	4.84	0.41	4.51	0.74	<0.001	0.27
Ben3	CRS improves my child's safety during travel.	4.83	0.44	4.55	0.71	<0.001	0.24
Perceived Barriers							
Bar1	CRS is too expensive compared to the benefits offered.	2.79	1.28	3.55	1.11	<0.001	0.28
Bar2	High-quality CRS exceeds my affordability.	3.43	1.25	4.10	0.98	<0.001	0.26
Bar3	It's difficult to install CRS in the car.	2.49	1.16	3.15	1.09	<0.001	0.26
Bar4	My child is not comfortable using CRS.	2.71	1.17	3.60	1.00	<0.001	0.35*
Bar5	I face difficulty in understanding how to install CRS properly	2.19	1.06	2.81	1.10	<0.001	0.27
Bar6	Limited space in the car.	3.08	1.23	3.51	1.14	<0.001	0.16
Cues to Action							
CTA1	Campaigns and advertisements on CRS should be increased.	4.20	0.89	4.07	0.90	0.113	0.07
CTA2	My close friends and family always use CRS for their children.	4.12	0.90	3.98	0.95	0.092	0.08
CTA3	CRS laws are strictly enforced.	4.36	0.85	4.08	0.99	0.001	0.15
CTA4	There is a high possibility of being fined.	4.20	0.99	3.95	1.08	0.007	0.12
CTA5	Receiving subsidies from the government.	4.57	0.77	4.38	0.83	0.002	0.14
Self-Efficacy							
SE1	I am confident in choosing the correct type of CRS for my child based on their age and size.	4.66	0.62	4.32	0.84	<0.001	0.22
SE2	I am aware that children are required to use CRS in cars until a certain age.	4.67	0.62	4.27	0.88	<0.001	0.26

*Indicates the largest effect size observed.

DISCUSSION

This study examined the behavioural factors associated with Child Restraint System (CRS) compliance among Malaysian parents using the Health Belief Model. Although 67% of respondents were classified as CRS users, one-third reported using a CRS only sometimes, rarely, or never. The findings therefore indicate that inconsistent CRS use remains an important child occupant safety concern despite the introduction of mandatory CRS regulations in Malaysia. Differences between CRS users and non-users were observed across most HBM dimensions, with perceived barriers, perceived benefits, and self-efficacy showing more meaningful group differences than perceptions of enforcement.

CRS Use and Perceived Injury Risk

CRS users reported significantly higher perceived susceptibility and perceived severity than non-users. In particular, users were more likely to recognise that children remain vulnerable to serious injury when travelling without an appropriate restraint, including during minor crashes and short journeys. These findings are consistent with previous research showing that parents who recognise both the likelihood and potential consequences of child occupant injury are more likely to adopt protective travel behaviours (Champahom et al., 2023; Durbin et al., 2003).

Nevertheless, perceived susceptibility and severity were relatively high in both groups. This suggests that many non-users may already understand the risks of travelling without a CRS but remain unable or unwilling to use one consistently. Similar gaps between safety knowledge and actual CRS use have been reported in Malaysia, where awareness of the importance of child restraints does not necessarily translate into regular or correct use (Ang et al., 2020; Faradila et al., 2021; Paiman et al., 2016). Risk awareness is therefore important, but it may not be sufficient to overcome the practical difficulties experienced by parents.

Perceived Benefits and Self-efficacy

CRS users reported significantly stronger perceptions of the safety and practical benefits of CRS use. They were more likely to believe that a CRS protects children during crashes and helps parents manage their children while travelling. These findings suggest that compliance may be influenced not only by an understanding of injury prevention but also by whether parents perceive CRS use as practical and beneficial during everyday journeys. Previous studies have similarly found that parents who recognise the protective and functional value of a CRS are more likely to use one consistently (Champahom et al., 2023; Liu & Huo, 2023). These findings indicate that parents' perceived benefits of CRS use are positively associated with CRS adoption and consistent use, supporting the findings of previous research.

Self-efficacy also differed significantly between the two groups. CRS users expressed greater confidence in selecting an appropriate restraint based on the child's age and size and greater awareness of CRS requirements. This finding is consistent with the HBM, which proposes that individuals are more likely to adopt a preventive behaviour when they believe they are capable of performing it correctly (Rosenstock, 1974). Parental confidence has also been identified as an important factor in CRS adoption and use in previous studies (Liu & Huo, 2023; Yang et al., 2024). These findings reinforce the importance of parental self-efficacy in CRS adoption and use, with greater confidence in selecting and using an appropriate CRS being associated with more consistent CRS use.

These results suggest that information campaigns should extend beyond communicating the consequences of non-use. Parents may also require practical knowledge and skills related to CRS selection, installation, adjustment, and everyday use. Demonstrations, installation clinics, retailer-based guidance, and accessible instructional materials could help strengthen parental self-efficacy and reduce uncertainty regarding correct CRS use.

Perceived Barriers Among Non-users

Perceived barriers produced some of the most notable differences between CRS users and non-users. Non-users reported greater concerns regarding cost, the affordability of high-quality restraints, installation difficulty, child discomfort, limited vehicle space, and difficulty understanding installation procedures. Child discomfort produced the largest observed effect size, indicating that it was one of the most important factors differentiating the two groups.

These findings are consistent with earlier Malaysian and international research identifying affordability and usability as persistent obstacles to CRS adoption (Faradila et al., 2021; Paiman et al., 2016; Puvanachandra et al., 2020). Although parents may recognise the safety benefits of CRS use, financial constraints can limit their ability to purchase a suitable restraint, particularly when more than one CRS is required or when a child outgrows an existing restraint.

Installation-related difficulties may further discourage consistent use. Parents who are uncertain about installation procedures may perceive CRS use as inconvenient or may lack confidence that the restraint has been installed correctly. Incorrect installation can also reduce the protective effectiveness of a CRS during a collision (Klinich et al., 2014). These findings highlight the importance of combining financial assistance with practical installation support.

The identified barriers may also interact rather than operate independently. For example, affordability may limit the range of CRS options available to a family, which may subsequently affect vehicle compatibility, ease of installation, seating space, and child comfort. Installation difficulties may also reduce parental confidence and increase perceptions of inconvenience. Although the present bivariate analysis cannot determine these interrelationships, the findings suggest that inconsistent CRS use may reflect a combination of practical and structural constraints rather than a single isolated barrier.

Child discomfort should also be addressed as a practical concern rather than dismissed as parental resistance. Perceived discomfort may arise from an unsuitable restraint, incorrect harness adjustment, poor compatibility between the CRS and vehicle seat, or the child's unfamiliarity with restraint use. Interventions should therefore help parents identify an appropriate CRS and manage common comfort-related concerns without compromising safety.

Further qualitative studies may further clarify how financial constraints, installation difficulties, child comfort, vehicle compatibility, and family circumstances interact in parents' everyday decisions regarding CRS use. Such research could help explain how parents weigh these competing considerations in real-world situations, including decisions about purchasing an appropriate CRS, installing and using it correctly, and maintaining its use as the child grows. It may also identify context-specific challenges and coping strategies that are not fully captured through quantitative measures, thereby providing a more comprehensive understanding of the factors that facilitate or hinder consistent CRS use.

Cues to Action and Perceptions of Enforcement

The findings concerning enforcement were mixed. CRS users expressed significantly stronger agreement with selected enforcement-related cues, including the perception that CRS laws are strictly enforced and that there is a possibility of being fined. However, the effect sizes for these differences were small. Moreover, when the perceived likelihood of being fined was measured separately using a 10-point scale, no statistically significant difference was found between CRS users and non-users.

Taken together, these findings suggest that perceived enforcement was not a major factor distinguishing CRS users from non-users in this sample. Mean ratings of approximately five on a 10-point scale in both groups also indicate that respondents did not perceive a particularly high likelihood of being fined for CRS non-use. One possible interpretation is that the perceived visibility or certainty of enforcement may be insufficient to create a strong deterrent effect. However, the present study did not examine respondents' experiences with enforcement or the reasons underlying these perceptions; therefore, this explanation cannot be confirmed from the current data. Although enforcement remains an important component of road safety policy, international evidence suggests that legislation is most effective when combined with visible enforcement, public education, and practical support that enables families to comply (Nazif-Muñoz et al., 2018; Puvanachandra et al., 2020). Future research should examine enforcement exposure, perceived certainty of detection, knowledge of penalties, and previous enforcement experiences to better understand how enforcement may influence CRS behaviour.

A significant difference was also observed for the government subsidy cue, although the effect size was small. Both CRS users and non-users expressed high levels of agreement regarding the importance of financial support, suggesting that subsidy programmes may be broadly acceptable among Malaysian parents. Previous programmes providing free or subsidised restraints have shown potential to improve access, particularly among lower-income households, although their effectiveness may be strengthened when financial assistance is combined with education and installation support (Goldstein et al., 2008; Brixey et al., 2009).

Campaign- and social norm-related cues did not differ significantly between CRS users and non-users. This suggests that these factors did not clearly differentiate the two groups in the present sample. However, the absence of a statistically significant difference should not be interpreted as evidence that campaigns are ineffective. Both groups reported relatively high agreement that CRS campaigns should be increased. Campaigns may therefore remain valuable, particularly when they address practical barriers, correct CRS use, and available support rather than relying solely on general safety messages.

Implications for Policy and Practice

The findings indicate that CRS compliance is associated with both behavioural perceptions and practical constraints. Although most respondents recognised the risks associated with CRS non-use and the benefits of CRS, these beliefs did not necessarily overcome barriers related to affordability, installation, child comfort, and vehicle space.

Interventions should therefore adopt a coordinated approach. Targeted subsidies could improve access among families facing financial constraints, while practical installation support could strengthen parental confidence and reduce difficulties associated with CRS use. CRS retailers, healthcare providers, Child Occupant Safety Instructors, and relevant government agencies could provide consistent guidance on selecting an appropriate restraint according to a child's size, understanding installation requirements, and managing common comfort-related concerns.

Policy efforts should also ensure that subsidy or distribution programmes are accessible to families most likely to experience financial barriers. Their effectiveness should be evaluated not only by the number of restraints distributed but also by continued use, parental knowledge, confidence, and, where possible, correct installation practices. Enforcement should remain part of the broader strategy but should complement, rather than replace, education, financial assistance, and practical support.

Viewed within the Health Belief Model, the findings suggest that CRS use reflects both parents' motivation to protect their children and their perceived ability to act on that motivation. Perceived susceptibility, severity, benefits, and self-efficacy were generally higher among CRS users, whereas perceived barriers were greater among non-users. Cues to action showed comparatively smaller differences between the groups. This pattern suggests that increasing risk awareness or reinforcing external cues alone may have limited influence when parents continue to experience substantial practical barriers. Interventions may therefore be more effective when risk communication is combined with measures that reduce barriers and strengthen parents' confidence and capability to use CRS consistently.

Study Limitations

Several limitations should be considered when interpreting the findings. First, the cross-sectional design does not allow causal relationships to be established. The observed differences between CRS users and non-users may reflect either the influence of HBM perceptions on CRS use or, conversely, the effect of prior CRS experience on these perceptions.

Second, CRS use was self-reported and may be affected by recall and social desirability bias, particularly because CRS use is legally expected. The study also assessed frequency of use rather than actual installation quality or correct restraint use. Therefore, respondents classified as CRS users may not necessarily have been using an appropriate CRS or using it correctly. In addition, barriers may differ according to CRS type and child developmental stage, which were not examined in this study.

Third, convenience sampling and online recruitment may limit generalisability. Recruitment through social media and COSI networks may have overrepresented safety-conscious parents and those with greater CRS awareness. Rural parents and those with limited internet access may also have been underrepresented. Therefore, the reported CRS use rate and HBM perceptions should not be interpreted as nationally representative estimates.

Fourth, the bivariate analysis did not account for potential confounding factors such as household income, parental education, child age, number of children, vehicle characteristics, or previous CRS experience. Therefore, the observed differences between CRS users and non-users should not be interpreted as independent predictors of CRS use. Further analyses using multivariable modelling are needed to determine the independent contribution of behavioural, socioeconomic, and structural factors to CRS use.

Finally, grouping respondents into CRS users and non-users may have obscured differences across the full range of usage behaviour. Future research should examine CRS use in greater detail, including frequency, restraint type, child age group, and correct installation and usage practices.

CONCLUSION

This study identified behavioural and practical factors associated with CRS compliance among Malaysian parents using the Health Belief Model. Although 67% of respondents reported regular CRS use, the remaining one-third demonstrated inconsistent or non-compliant behaviour. CRS users reported stronger perceptions of injury risk, greater recognition of CRS benefits, and higher self-efficacy. In contrast, non-users reported greater financial and usability barriers, particularly those related to affordability, installation difficulty, child discomfort, and limited vehicle space. These findings suggest that CRS use is influenced by multiple factors. While stronger perceptions of risk and benefits may encourage CRS use, financial and practical constraints they encounter in everyday life may hinder consistent adoption, even when parents recognise the importance of child occupant safety.

Meanwhile, perceptions of enforcement showed relatively small and inconsistent differences between users and non-users, suggesting that enforcement alone may not be sufficient to promote sustained CRS compliance. The findings instead highlight the importance of enabling parents to comply by improving affordability, strengthening practical knowledge, and increasing confidence in selecting and using an appropriate CRS.

Effective child occupant safety interventions should therefore combine targeted financial support, practical installation assistance, clear user guidance, and appropriately designed enforcement and education strategies. While the HBM offers a useful framework for understanding parental beliefs, the findings also demonstrate that safety behaviour is constrained by material and practical circumstances. Addressing both behavioural and structural barriers is therefore essential for improving consistent CRS use and strengthening child occupant protection in Malaysia.

Conflict Of Interest

The authors declare no conflicts of interest.

Data Availability

The data supporting the findings of this study are not publicly available because of participant confidentiality and institutional data-governance requirements.

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