

EXPLORING ASPECTS OF DESIGN AND SAFETY OF CHILDREN PLAYGROUNDS IN MALAYSIA

AHMAD SID HIJAZ BIN MD. SAAID

UNIVERSITI SAINS MALAYSIA

2016

EXPLORING ASPECTS OF DESIGN AND SAFETY OF CHILDREN PLAYGROUNDS IN MALAYSIA

by

AHMAD SID HIJAZ BIN MD. SAAID

**Thesis submitted in fulfilment of the requirements
for the degree of
Master of Science**

November 2016

ACKNOWLEDGEMENT

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

In the name of **الله**, the Most Gracious and the Most Merciful. May peace be upon His messenger Muhammad صلى الله عليه وسلم. Alhamdulillah, all praises for His blessings and strengths that enabling me to complete this thesis. As a son, I owe a lot to my mother; Pn. Hajjah Che Su Binti Yup. I cannot recompense all her hard times endured in raising me up, since the loss of my late father when I was only two years old, at least, this success will be a reason for her to cheer. I would like to express my appreciation to the Ministry of Higher Education of Malaysia for awarding me the HLP scholarship (Hadiah Latihan Persekutuan) to pursue this research. Next, I would like to extend my sincere gratitude to my supervisor Prof. Dr. Ahmad Sanusi Hassan for the support and guidance he had given me to ensure the smoothness of my research plan. I also place on record, my sense of gratitude to one and all who directly or indirectly lent a helping hand in this thesis and lastly, not forgetting to my wife and children; thanks for keeping me company in this long walk. This research will not end here. A new beginning for my ultimate PhD research journey has been laid. May **الله** give me the patience and strength I need to carry on. **أَمِين**

TABLE OF CONTENTS

ACKNOWLEDGEMENT	II
TABLE OF CONTENTS	III
LIST OF TABLES	IX
LIST OF FIGURES	XI
LIST OF PLATES	XIII
LIST OF ABBREVIATIONS	XIV
ABSTRAK	XV
ABSTRACT	XVI
CHAPTER 1 ~ INTRODUCTION	1
1.1 Introduction	1
1.2 Research Background	1
1.2.1 Playground Related Injuries	3
1.2.2 Equipment Related Injuries	4
1.2.3 Playground Safety and Injuries in Malaysia	5
1.3 Rationale of the Study	6
1.4 Problem Statement	7
1.4.1 Global Scenario on Children Playgrounds	8
1.4.2 The Problem of Malaysian Made Playgrounds	10
1.5 Research Objectives	11
1.6 Research Questions	12
1.7 Research Approach	13
1.8 Scope of the Study	14
1.9 Limitation of the Study	15
1.10 Research Framework	16

1.11	Structure of the Thesis	17
	CHAPTER 2 ~ LITERATURE REVIEW	21
2.1	Introduction	21
2.2	Definitions of Terms	21
2.2.1	Definitions of Children Playground	22
2.2.2	Definitions of Playground Design	23
2.2.2(a)	The Importance of Playground Design	24
2.2.2(b)	Age-Appropriate Design	26
2.2.3	Definitions of Injury and Safety	27
2.2.3(a)	Playground Injury	28
2.2.3(b)	Playground Safety	30
2.3	A Brief History of Children Playgrounds	31
2.4	Types of Children Playgrounds	33
2.4.1	The Quest for Innovative Playground Project	38
2.4.2	Composite Play Structure	39
2.4.3	Classification Types	41
2.4.4	The Coding System	43
2.5	Playground Equipment Types	44
2.5.1	Slide	45
2.5.2	Swing	48
2.5.3	Seesaw	50
2.5.4	Spring Rocker	51
2.6	Playground Related Checklist Factors	52
2.6.1	Design, Injury and Safety Factors	53
2.6.2	Surfacing Materials and Equipment Factors	55
2.6.3	Activity, Planning and Landscape Factors	56
2.7	Summary of Playground Related Checklist Factors	57

2.8	Summary of the Chapter	61
	CHAPTER 3 ~ METHODOLOGY	62
3.1	Introduction	62
3.1.1	The Importance of Mixed Methods Research Survey	63
3.2	Methods of Research Surveys	64
3.2.1	Pilot Study	65
3.2.2	Qualitative Survey	65
3.2.3	Quantitative Survey	66
3.3	Methods of Qualitative Research Surveys	67
3.3.1	Case Study	67
3.3.2	Observation	68
3.4	The Combined Methods of Qualitative Surveys	70
3.4.1	The Dichotomous Questions	71
3.4.2	The Qualitative Measureable Scales	75
3.5	Methods of Quantitative Research Surveys	76
3.5.1	Internet Questionnaire	77
3.5.2	Conventional Questionnaire	78
3.6	Method of Research Analysis	78
3.6.1	Qualitative Analysis	79
3.6.2	Quantitative Analysis	79
3.7	Method of Research Findings	80
3.7.1	The Framework	80
3.7.2	The Revised Framework	81
3.8	Questionnaire Set 1: The Internet Survey	82
3.8.1	The Build-up Process	84
3.8.2	Sample Size Determination	90
3.8.3	Redefining the Thematic Questionnaires	91

	3.8.3(a)	General Interests	91
	3.8.3(b)	Climate Factors	92
	3.8.3(c)	Playground Utilisation	93
	3.8.3(d)	Safety and Comfort	93
	3.8.3(e)	Safety Surface, Signage and Maintenance	94
	3.8.3(f)	Standard and Design	95
	3.8.3(g)	Key points and Suggestions	96
	3.8.3(h)	Independent Variable: The Child's Age Factor	97
	3.8.4	Piloting the Questionnaire	97
3.9		Questionnaire Set 2: The Main Survey	99
	3.9.1	Questionnaire's Preparation Techniques	99
	3.9.2	Preparation of the Demographic Items	100
	3.9.3	Preparation of the Main Items	101
	3.9.4	Questionnaire Instrument	109
	3.9.5	Sampling Population	110
	3.9.5(a)	Non-probability Sampling	110
	3.9.5(b)	Power Value and the Sample size	111
	3.9.5(c)	Number of Predictors	111
	3.9.5(d)	A Priori Power Analysis	112
3.10		Summary of the Chapter	113
		CHAPTER 4 ~ RESULTS & ANALYSES	115
4.1		Introduction	115
4.2		Qualitative Survey Analysis	116
	4.2.1	General Survey Results	116
	4.2.1(a)	Simplified Playground Codes	116

	4.2.1(b)	Qualitative Grading Keys	118
	4.2.1(c)	The Survey Playground Plates	118
	4.2.1(d)	General Condition Results	122
4.2.2		Elemental Case Study Results	124
	4.2.2(a)	Playground Surfaces	125
	4.2.2(b)	Drainage Problems	128
	4.2.2(c)	General Hazards	130
	4.2.2(d)	Security and Durability	131
4.2.3		A Summary of Qualitative Findings	134
4.3		Quantitative Survey Analysis	134
	4.3.1	Internet Survey's Questionnaire Analysis	135
	4.3.2	Cronbach's Alpha	135
	4.3.3	Internet Survey's Factor Analysis	135
	4.3.3(a)	FA1: General Interest	136
	4.3.3(b)	FA2: Climate Factors	139
	4.3.3(c)	FA3: Playground Utilisation	141
	4.3.3(d)	FA4: Safety and Comfort	142
	4.3.3(e)	FA5: Surface and Signage	144
	4.3.3(f)	FA6: Standard and Design	145
4.3.4		Main Survey's Questionnaire Analysis	147
	4.3.4(a)	Convenience Sampling Method	147
	4.3.4(b)	Post Hoc Power Analysis	148
	4.3.4(c)	Scree Plot	149
	4.3.4(d)	Reliability Test	150
4.3.5		Factor Analysis of the Main Survey	151
4.3.6		Important Results and Factor Analyses	151
	4.3.6(a)	FA1: General Conditions	152

	4.3.6(b)	FA2: Users' Perception on Safety & Design	154
	4.3.6(c)	FA3: Environmental Design	156
	4.3.6(d)	FA4: Safety Design	157
	4.3.6(e)	FA5: Equipment Safety	158
4.4		Summary of the Chapter	159
		CHAPTER 5 ~ CONCLUSION	161
5.1		Interpretation	161
	5.1.1	Qualitative Interpretation	161
	5.1.2	Quantitative Interpretation	162
5.2		The Key Findings (KF)	163
	5.3.1	KF1: Adequate Maintenance	165
	5.3.2	KF2: Playground Safety	167
	5.3.3	KF3: Hazard Awareness	172
	5.3.4	KF4: Injury Prevention	174
	5.3.5	KF5: Playground Shades	178
	5.3.6	KF6: Excellent Criteria	182
5.3		Research Contributions	186
5.4		Future Research Study	187
		REFERENCES	189
		APPENDICES	221
		LIST OF PUBLICATIONS	221
		SAMPLE OF QUESTIONNAIRE	222

LIST OF TABLES

		Page
Table 1.1	Comparative percentages of playground related injuries	9
Table 2.1	Summary of studies investigating risks on playgrounds	58
Table 3.1	Checklist items for the aspect of Design	72
Table 3.2	Checklist items for the aspect of Surface	73
Table 3.3	Checklist items for the aspect of Security of Hardware	73
Table 3.4	Checklist items for the aspect of General Upkeep	74
Table 3.5	Checklist items for the aspect of General Hazards	74
Table 3.6	The quantitative grading scales of playground quality	75
Table 3.7	The playground questionnaires (page 84-88)	88
Table 3.8	Respondent's interest on playground equipment	92
Table 3.9	The internet survey~ climatic factors	92
Table 3.10	The internet survey~ playground utilisation	93
Table 3.11	The internet survey~ safety and comfort	94
Table 3.12	The internet survey~ safety surface, signage and maintenance	95
Table 3.13	The internet survey~ standard and design	96
Table 3.14	The internet survey~ key points and suggestions	96
Table 3.15	The internet survey~ child's age	97
Table 3.16	The Demographic questions and their references	101
Table 3.17	The Questionnaire Items 10-19	103
Table 3.18	The Questionnaire Items 20-33	104
Table 3.19	The Questionnaire Items 34-50	105
Table 3.20	The Questionnaire Items 51-63	106
Table 3.21	A partial content of the internet survey form	107
Table 4.1	The qualitative grading keys	118

Table 4.2	Playground equipment favouritism	136
Table 4.3	Descriptive statistics for the questionnaire: Climatic factors	139
Table 4.4	Descriptive statistics for the questionnaire: Safety and comfort	143
Table 4.5	Descriptive statistics for the questionnaire: Surface and signage	145
Table 4.6	Descriptive statistics for the questionnaire: Standard and design	146
Table 4.7	The reliability statistics of the main survey	150
Table 4.8	The validity and reliability of the main survey	152
Table 4.9	Descriptive statistics for general conditions	153
Table 4.10	Descriptive statistics for users' perceptions	154
Table 4.11	Users' perception correlations analysis	155
Table 4.12	Descriptive statistics for environmental design	156
Table 4.13	Descriptive statistics for safety design	157
Table 4.14	Descriptive statistics for equipment safety	158
Table 4.15	Playground surface correlation analysis	159
Table 5.1	Descriptive statistics for equipment safety	170
Table 5.2	The limitation of children's playtime during a weekday	178

LIST OF FIGURES

		Page
Figure 1.1	Research questions framework	13
Figure 1.2	The four phases of research framework	17
Figure 2.1	Five different types of Children Playgrounds	33
Figure 2.2	Sketch of children on playground play with loose parts	37
Figure 2.3	A playground at Glumslöv, Sweden	37
Figure 2.4	A typical composite play structure (CPS)	40
Figure 2.5	The classification of children playgrounds in Malaysia	42
Figure 2.6	Examples of the coding system	44
Figure 2.7	The family of playground slides	47
Figure 2.8	The types of swings	49
Figure 2.9	The types of seesaws	50
Figure 2.10	Safety measurements for a central board spring rocker	51
Figure 2.11	Spring Rockers and their surrounding hazards	52
Figure 2.12	The thematic checklist factors that related to a children playground	53
Figure 3.1	The methods of research surveys	64
Figure 3.2	The research findings framework	81
Figure 3.3	The revised research findings framework	82
Figure 3.4	The sample size calculators	90
Figure 3.5	Promotion of the survey via the Facebook	98
Figure 3.6	The final item of the questionnaire	109
Figure 3.7	A Priori Power Analysis	113
Figure 3.8	The exploratory sequential design	114
Figure 4.1	Interpreting the samples of playground codes	117

Figure 4.2	The children playground conditions (N= 80)	122
Figure 4.3	Playground grading chart (n=57)	123
Figure 4.4	The harmful conditions in playgrounds	124
Figure 4.5	The types of surfacing materials	126
Figure 4.6	Types of playground surfaces	127
Figure 4.7	Drainage problems on three playgrounds	128
Figure 4.8	General hazards on a playground	130
Figure 4.9	The types of playground equipment	137
Figure 4.10	A bar chart for Factor 1: General Interest	138
Figure 4.11	The analysed data of the climatic factors and the idea of a shade	140
Figure 4.12	Feedback on playground utilisation	141
Figure 4.13	The post hoc power analysis	149
Figure 4.14	The scree plot factor analysis	150
Figure 4.15	Three Types of Surveys	160
Figure 5.1	The relationship of the research phases	164
Figure 5.2	The use zones for playground equipment	176
Figure 5.3	The shade provides climatic protection	181
Figure 5.4	A composite play structure at KLCC Park	184
Figure 5.5	Twelve criteria of excellent children playground	185

LIST OF PLATES

		Page
Plate 2.1	An example of straight slide on a traditional playground, Quarry Hills	34
Plate 2.2	Examples of potential hazards on playground equipment	98
Plate 4.1A	The coding and images of the surveyed playgrounds (1-28)	119
Plate 4.1B	The coding and images of the surveyed playgrounds (29-56)	120
Plate 4.1C	The coding and images of the surveyed playgrounds (57-80)	121
Plate 4.2	The appropriate and inappropriate unitary surfaces	126
Plate 4.3	Hazardous materials on equipment	131
Plate 4.4	Children of various ages flocked a playground	132
Plate 4.5	Broken equipment commonly found in playgrounds	132
Plate 4.6	Broken slide exits at different locations in Ipoh	133
Plate 4.7	Broken swings in several locations in Alor Setar and Jitra	133
Plate 5.1	Examples of playgrounds in Singapore	166
Plate 5.2	Old and new playground structures at Taman Aman, Jitra	168
Plate 5.3	Playground equipment requires some revision	171
Plate 5.4	Observations detects rough use of playground equipment	172
Plate 5.5	Some children did not enjoy playing on the spring-centred seesaws	173
Plate 5.6	Two children sustained broken arms due to monkey bar falls	175
Plate 5.7	Empty children playgrounds during their afternoon 'resting hours'	179
Plate 5.8	The Mesa Verde Elementary School's playground	180
Plate 5.9	A contemporary playground at Setia Ecohill in Semenyih, Selangor	182
Plate 5.10	Playground Inspection kit	188

LIST OF ABBREVIATIONS

A	Average
ACT	Australian Capital Territory
AS	Alor Setar
ASC	Australian Sport Commission
B	Bad
CPS	Composite play Structure
CPSC	Consumer Product Safety Commission
CPSI	Certified Playground Safety Inspector
CR	Cement Render
FRT	Full-rubber Tiles
G	Good
HPPS	Handbook of Public Playground Safety
IAS	Impact Absorbing Surface
IP	Ipoh
JT	Jitra
KL / KLCC	Kuala Lumpur/ Kuala Lumpur City Centre
KN	Kuala Nerang
LASS	Leisure Accident Surveillance System
MPQSA	Malaysian Playground Safety and Quality Assessment
MRT	Minimal Rubber Tiles
MS	Malaysian Standard
NCA	the National Center on Accessibility
NEISS	National Electronic Injury Surveillance System
NPPS	National Program for Playground Safety
NPSI	National Playground Safety Institute
NRPA	National Recreation and Park Association
OSBIE	Ontario School Board Insurance Exchange
PIP	Poured-in-place Rubber
PJ	Putrajaya
PPSP	Putrajaya Playground Safety Program
R&D	Research and Development
RT	Rubber Tiles
SA	Shah Alam
SPSS	Statistical Package for the Social Sciences
USAB	United States Access Board
VB	Very Bad
VG	Very Good

PENEROKAAN ASPEK REKA BENTUK DAN KESELAMATAN TAMAN PERMAINAN KANAK-KANAK DI MALAYSIA

ABSTRAK

Taman permainan merupakan sebuah tempat untuk kanak-kanak membina pengalaman serta memperoleh keseronokan bermain di persekitaran luar. Ia dapat membantu meningkatkan kompetensi fizikal dan pengurusan emosi kanak-kanak. Justeru, kemudahan awam ini perlu direka bentuk dengan sempurna, kreatif dan selamat berdasarkan piawaian keselamatan yang diperakukan. Kajian semasa tentang isu keselamatan dan reka bentuk pada taman permainan kanak-kanak di Malaysia adalah kurang memberangsangkan. Namun, terdapat banyak artikel telah melaporkan tentang kualiti taman permainan kita yang tidak memuaskan. Selain mempunyai reka bentuk yang tidak sesuai, kebanyakan taman permainan ini berkeadaan tidak selamat kerana kelemahan penyelenggaraan. Keadaan ini boleh mengundang bahaya dan kecederaan terhadap kanak-kanak. Pengkaji telah mengambil tanggungjawab untuk meningkatkan kesedaran awam terhadap aspek keselamatan dan reka bentuk taman permainan dengan menjalankan kajian kualitatif terhadap 80 buah taman permainan di beberapa buah bandar di Semenanjung Malaysia. Kaji selidik kualitatif ini telah menggunakan kaedah pemerhatian berstruktur dan kajian kes elemen. Selepas itu, explorasi taman permainan ini telah bertukar menjadi sebuah kajian kuantitatif bagi memperoleh dapatan yang lebih jitu. Dengan kaedah persampelan mudah, sebanyak 172 orang responden yang dipilih untuk menjawab soal-selidik mengenai tahap keselamatan di taman permainan di kawasan perumahan mereka. Data dapatan kualitatif telah direkodkan secara kuantitatif, manakala data daripada soal-selidik kuantitatif telah dianalisa secara deskriptif. Gabungan penganalisan kualitatif dan kuantitatif ini telah membentuk satu triangulasi yang menghasilkan enam penemuan kajian berupa idea serta cadangan berdasarkan isu keselamatan dan reka bentuk taman permainan masa kini. Di negara-negara maju, setiap taman permainan diterapkan dengan program penyelenggaraan yang berkesan. Para responden turut bersetuju dengan elemen positif perbandingan kajian. Taman permainan memerlukan penyelenggaraan yang baik bagi mengurangkan kerosakan serta menghidar sebarang bentuk kecederaan terhadap kanak-kanak. Kajian ini boleh digunakan sebagai rujukan untuk memperoleh reka bentuk yang lebih baik serta membantu meningkatkan tahap keselamatan di taman permainan kanak-kanak di Malaysia.

EXPLORING ASPECTS OF DESIGN AND SAFETY OF CHILDREN PLAYGROUNDS IN MALAYSIA

ABSTRACT

A playground is a place to give children some excitement of outdoor playfulness and provides essential childhood experiences. It helps in developing their physical and emotional competencies. Therefore, this public amenity should be adequately designed, creative and safe according to its appropriate safety standards. Current studies about safety and design aspects of children playgrounds in Malaysia are not very encouraging. However, there were a lot of articles condemning about unsatisfactory quality in our playgrounds. Many common playgrounds had an insufficient design and unsafe conditions due to poor maintenance. Such conditions produced hazards and may lead to child injuries. The researcher took this responsibility to raise public awareness on safety and design aspects of children playgrounds. Eighty public playgrounds had been surveyed in several cities in Peninsular Malaysia. There were structured observations and elemental case studies in this qualitative survey. Subsequently, the playground explorations had been switched into a quantitative survey to have a comprehensive finding. Through a convenient sampling method, a social survey was conducted on 172 respondents. They were asked to submit their opinions about safety features in their neighbourhood playgrounds. The qualitative data collections had been summarised into simple quantitative figures, and the researcher had conducted some descriptive analysis on the main quantitative data set. The combined qualitative and quantitative analyses had formed a conclusive triangulation. This process had produced six key findings in the form of ideas and suggestions pertaining to safety and design issues. In developed countries, the playground owners practice adequate maintenance programmes to preserve their playground satisfactory conditions. The surveyed respondents had agreed to this comparative statement. Our playgrounds should be maintained adequately to eliminate general hazards and to reduce risks of child injuries. This study can be used as a reference point in the continuous development to upgrade the safety standards and appropriate designs of Malaysian children playgrounds.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The Government of Malaysia has made a national vision to become a developed country by the year 2020. To achieve this status, the wave of development should spread to every aspect, including the safety and design of children playground. Being a developed country, every component of the children playground needs to be developed as well. This development will lead to the provision of excellent playground facilities. Some examples of excellent children playgrounds can be found in the United States, Canada and European countries such as Germany, Denmark and the Netherlands. However, the children playgrounds in Malaysia have not changed much in the past 20 years. They did not reflect the stringent safety standards that are supposed to be used in the children playgrounds (Maniam, 2016, January 18; Yeen, 2014, May 1). This chapter introduces the problems of children playgrounds in Malaysia in relation to the aspect of safety and design. There are eleven subtopics in this chapter to explain the necessity of the research.

1.2 Research Background

Children playground is a facility of leisure for every child. It is normally seen as a colourful structural landmark either in an urban space or a neighbourhood community or housing estate or any public recreational areas. A playground is a play space equipped with many types of playing equipment for the children under their parents' supervision (Dewi, 2012). A place of leisure is a place where children can

develop their intelligence and personality in social life. They can also make contact, and interact with their social environment. All these things ultimately help to shape the children's character (Hurlock, 1978). The playground activities can enhance children's cognitive, physical and psychosocial skills (Howard et al., 2005).

Originally, children playgrounds have been developed during the nineteenth century to offer them play opportunities in an increasingly industrialised society (Hesletine & Holborn, 1987). A good playground offers protection from less suitable location and provides a good place for children's self-development (Mani et al., 2012; Jansson & Persson, 2010). A pioneering philosopher and child psychologist, Jean Piaget (1932) suggested that children may acquire experience while playing. His simple suggestion had been implanted into a brief childish thought among playgrounds designers to promote more exploration in their playground designs. The most dominant structure in the playgrounds nowadays is the integrated play equipment or the composite play structure (CPS), this name was mentioned in the *Handbook for Public Playground Safety*, endorsed by the United States, Consumer Product Safety Commission (US CPSC, 2010). The CPS is arguably the centre of attraction of today's playgrounds.

Too many schools place a huge burden on young children; therefore they may need some room for creative play (Miller & Almon, 2009). This is why playground is very important for children; it is not just an outdoor learning centre (Spencer & Wright, 2014). It helps the children in better learning of social rules, regulations and in acquiring control over their feelings (Amouzegar, Naeini & Jafari, 2010). Playing is more than a natural activity to happen freely. Through discovery and free play; the learning process is provided at the very best (Stoecklin, 2000). Good children playgrounds give us plenty of benefits, but, the real facts about these playgrounds are

not always good. Their sites were known as a place where accidents were frequently occurred. (Yeen, 2014, May 1, Bernama, 2013, October 22).

The playground facilities in Malaysia is not up to the latest safety standards because we still relied on the obsolete Malaysian playground standard; the MS 966 (2001). In contrast, the public playgrounds in Australia for example were built based on their latest safety standard published in 2014; the AS 4685 (Kidsafe, 2015).

1.2.1 Playground Related Injuries

Children playgrounds may give the children an opportunity to play in an outdoor environment and develop their physical and psychological competency (Zeece & Graul, 1993; Gordon, 1981). Though the playing excitement is memorable, but when accident occurs, that moment will become unforgettable. Playground injuries are uninvited and they should be avoided. No playground can be claimed as absolutely safe (Deconinck, 2009). However, unintentional injuries can be subsided if appropriate safety measures are put in practice.

Playground injuries are common childhood injury in most countries in developed world (Mitchell et al., 2007; Fiissel, Pattison & Howard, 2005; MacKay, 2003; Roseveare et al., 1999). Developed countries like the United States, United Kingdom, Canada, Australia, New Zealand and Europe (the European Committee for Standardization) compete among themselves in developing the most up-to-date safety standards as the means to reduce injury risks in their playgrounds (Uskun et al., 2008). A study on playground safety was first carried out by David Aaron (1965), through his statistics, it is learnt that almost 30% of childhood accidents occurred in school and public playgrounds.

The records of playground related injuries were significant in many countries. In New Zealand, about 7400 children aged less than 15 years had to attend their hospital emergency departments annually (Chalmers et al., 1996). In Ontario, there were more than 8,000 children and 28,500 children all across Canada were recorded by their emergency departments having sustained unintentional injuries on playgrounds (Fiissel et al., 2010). In Sweden, they estimated about 19,000 injury cases occurred to their children due to playground mishaps (Konsument Verket, 2008)

Another research done in 1993 by the Arizona Department of Health Studies found that only 72 % of students with reportable injuries were actually taken to the emergency room or to a doctor. This means the actual number of playground injuries is actually much higher and it is arguably the leading cause of injuries to students in the school environment (Mack, Hudson & Thompson, 1997). Improvement in playground quality may be an effective strategy to prevent those injuries (Allen et al., 2013; Macpherson et al., 2010).

1.2.2 Equipment Related Injuries

Studies on playground injuries will at the end pointing towards the playground equipment. Actually, there is no playground without equipment and no wonder equipment is deemed as the most unsafe element in the playground (Macpherson et al., 2010). More than 213,700 children were treated in the United States emergency departments annually for playground equipment injuries (US CPSC, 2010; Howard et al., 2009). 75 % of children were injured by falling and 50% of all injuries on playgrounds were equipment related (Van Weperan & Rogmans, 1991). A study by Mott et al. (1994) showed that 90% of all playground injuries in Wales had visited emergency departments and their injuries were all equipment related.

In the worst cases, the failure of negotiating a playground structure could cause the children severe injuries or even lead to fatality (Howard, 2010). Researcher Nixon et al. (1981) was the first team to study about playground deaths among children. The study revealed that fourteen children had died from injuries in Brisbane playgrounds over the period of five years. Two of their cases, were caused by playground equipment. The equipments were not attached firmly to the ground, fell and fatally crushed the child.

1.2.3 Playground Safety and Injuries in Malaysia

Although most of best playgrounds with high-end designs, stringent rules of maintenance, latest standards and adequate safety measures were practiced in the developed worlds, but many scholars were stunned to learn about the high rates of child injuries recorded in their playgrounds. This is the real turning point, why there are a lot of studies pertaining to the safety of children playgrounds were originated from their countries.

Nevertheless, this does not mean that playgrounds in the other parts of the world are safe and sound. The biggest problem in this issue is because the injury data and their statistics are insufficiently not up to date. Finding epidemiological statistics and scholarly articles under this topic from abroad countries are much easier than to find similar materials from the local source of Malaysia. Informally, there were a lot newspaper articles concerning this issue as well as estimating for the unofficial statistics of playground injuries that happened in Malaysia. According to the record of Epidemiology Accidents Cases in Malaysia, they had estimated about 3000 accidents involving children of five to nine years old occurred in Malaysian children

playgrounds at every three months and these accidents usually related to playground surfacing materials (Md Zain & Ismail Mokhtar, 2012).

In the worst case scenario, playground injuries may be ended up with fatalities. A case in Batu Pahat, Johore on April 10, 2014; a boy was dead on his neighbourhood playground. He was actually crushed by a falling goalpost. In March, 2011 another boy was electrocuted at Taman Batu Tiga playground area in Shah Alam (Yeen, 2014, May 1).

1.3 Rationale of the Study

The researcher believes this research will contribute important findings to the country and our society. Therefore, the significance of this research will be justified in the following paragraphs:-

Presently, there are very few researches pertaining to playground safety and design done by Malaysian scholars or focussed on this country's tropical climate. From the researcher's reading; most developed countries have built modern playground facilities and apart from that, their researchers have also produced a lot of studies related to this topic. Indirectly, this scenario helps the improvement of the design and safety of the children playgrounds in their countries.

Developing more research concerning the topic of playground safety and design will create positive impact towards the only local guideline available for Malaysian playgrounds; the obsolete MS 966 Playground Equipment, Part 1, 2 and 3 (2001). Malaysia has become a competitive country because we can produce and manufacture our own playground equipment products (more explanation will be given in the subchapter 1.5.2). This research focuses the local children playgrounds and will bring together some valuable inputs and feedback on the aspect of

playground safety and design. The local playground manufacturers can use the findings to improve their equipment design.

1.4 Problem Statement

The researcher recognises two types of problems. First, are the general problems of children playgrounds; this has seen many studies had proposed the improvement of safety in their children playgrounds. The second problem is owing to the current situations of Malaysian children playgrounds. Many of these facilities were built and left exposed to the environment, as if the playground structure was a kind of maintenance free equipment (Md Saaid & Hassan, 2014A).

This country did not have comprehensive statistics about the children playground problems. However, many local newspapers had reported this issue and proposed some improvement measures so that the conditions of safety and design in our playgrounds could be improved into a higher standard (Zainal, 2015, 4 May; PPSP, 2014; Yeen, 2014, May 1; Bahari, 2014, February 22; Bernama, 2013, October 22)

Until now, there are infrequent academic studies on the aspect of safety and design for Malaysian children playgrounds. This issue will be discussed in the next subchapters. After that, we will see the research objectives and research questions; the researcher will also provide a simple justification why this research is required. At the end of the following subchapter, the researcher will outline some assumption, which will also indicate the main focus of this research.

1.4.1 Global Scenarios on Children Playgrounds

There were a lot of playground studies conducted in developed countries. Their goals were to improve the designs, safety and to reduce the injury rates in their public children playgrounds. Presently, children playground studies were not focussed only in certain countries. There are problems in every playground; therefore studies have been conducted in many countries around the world. In Turkey, Uskun et al. (2008) and Caglar, Kuvvetli and Sandalli (2010) had been studied about playground equipment safety. There were also notable playground researchers in Singapore and China, namely Leung and Mahadev (2010) and Hou, Zhang and Xia (2012). However, this topic is rarely studied in Malaysia at this moment.

The percentage of child injuries sustained in the playgrounds is not significant compares to the total children population in developed countries (Table 1.1). Despite in USA alone, there are as much as fifteen fatal cases causes by playground mishaps (Playground Safety Facts, 2011). The following table is a comparative summary pertains to playground related injuries and this table will also compare with injury figures estimated in Malaysia.

Australia is a country with the lowest injuries percentage, but through literature, the researcher found that they still promoted more studies to enhance the quality of their playgrounds. With safer and better quality playgrounds, their country massive expenditure on medical treatment cost can be reduced (Sherker & Ozanne-Smith, 2004). This statement indicates the importance of playground research and why studies on the aspect of safety and design should be carried out in this country.

Table 1.1 Comparative percentages of playground related injuries

	Country	Percentage of children injury on playgrounds	Annual injury cases / Children population	Reference
1	USA	0.0028%	213,700	(US CPSC, 2010; Howard et al., 2009).
			74 million	Casey Foundation (2011)
2	New Zealand	0.0083%	7400	(Chalmers et al., 1996).
			0.89 million	Statistics New Zealand (2012)
3	Canada	0.0051%	28500	Macpherson et al., 2010; Fiissel, Pattison & Howard, 2005
			5.6 million	Statistics Canada (2010)
4	Sweden	0.0095%	19000	Konsument Verket, 2008
			2 million	Children in Sweden (2015)
5	Australia	0.0013%	6000	(Helps & Pointer, 2006).
			4.4 million	Australian Bureau of Statistics (2015)
6	Malaysia	0.0015%	12000	(Md Zain & Ismail Mokhtar, 2012).
			7.79 million	Economic Planning Unit (2013)

Most developed countries have developed their own database systems to record injury cases. For example, there are the United States' National Electronic Injury Surveillance System (NEISS) and the Consumer Safety Unit's Leisure Accident Surveillance System (LASS), the LASS system is used for the United Kingdom (Tinsworth & McDonald, 2001; Ball, 2002). This database can be used as a tool in playground research (CPSC, 2000).

According to Table 1.1; Malaysia is the country with second lowest injury percentage. However, this figure can be disputed because we do not have an accurate database system. The 12,000 injury cases are a projection from Md Zain and Ismail

Mokhtar (2012). They estimated about one thousand cases of playground related injuries occurred in Malaysia every month.

From this scenario, we can learn there are a lot of high-quality playgrounds in developed countries and they are still working on all aspects to improve their playground facilities. This can be seen by looking at a lot of scholarly studies by researchers conducted in these countries. The playground safety awareness and this scenario should be replicated in Malaysia because the previous studies had been solving problems in their countries and not specifically for our country that differs in climate and socio-culture.

1.4.2 The Problem of Malaysian Made Playgrounds

Mostly, our children playgrounds are made in Malaysia (Low, 2011). There are many big names, local playground manufacturers such as PWR, Reka Setia, Playrights and Pro-Landscape Structure. Some of them had gained international recognition because they had exported their products to other countries in South East Asia and the Middle East (Tan, 2010).

However, we cannot call this achievement a great success because our playground equipment manufacturers still could not penetrate into the developed worlds, for example to European countries. In order to produce better playground designs, they need to be more competitive yet active in research and development. Our playground products will be more recognised if we implement stricter safety standards and produce variety of interesting playground shapes. The industry of children playground equipment will not finish at manufacturing the product and engrave on its parts with the famous words; the “Made in Malaysia” signage.

Typically, contemporary playground equipment could easily attract the children because of its striking colours. But, the most important thing is we need more local research so that we can improve our playground design and replace the obsolete standard; MS966 Playground Equipment (2001) (Yeen, 2014, May 1).

Probably, our society was insusceptible with stories of children fell and sustained minor cuts or bruises while playing, but this notion should not be referred as a common incident for childhood. The real statistics and actual injury cases were enormous because many uncritical injuries had thus gone out unreported (Mack, Hudson & Thompson, 1997). From the research findings, this research will at least provide some ideas for the related playground authorities to take note, so that they can develop safer and better Malaysian playgrounds

1.5 Research Objectives

This fundamental research would incline towards exploratory approach. It would neither be conducted in a large-scale nor aim to produce any new inventions for children playground equipment. The researcher would like study about safety conditions of children playgrounds in Malaysia and he also would like to evaluate the parents' understanding regarding the aspect of safety and design in their respective neighbourhood playgrounds.

The researcher would use an exploratory research approach; this research would be conducted via two mediums, namely a series of playground investigations and a questionnaire survey upon the respondents of parents and caregivers. Further explanation regarding the approach will be shown in subchapter 1.7; Research Approaches. Hopefully, this research will help the respective authorities to improve

the children playground facilities in Malaysia. The simplified objectives of this research are as follows:-

1. To explore and to investigate the safety conditions of children playgrounds in several cities in Peninsular Malaysia
2. To survey satisfactory levels of parents and caregivers regarding the public children playgrounds in their neighbourhood areas

1.6 Research Questions

The researcher blends together all his objectives to generate six research questions. Because, he planned to use a mixed-method approach, therefore, he cannot disintegrate those objectives to form three questions for each objective. Every question would be analysed through a combination of qualitative and quantitative methods. This triangulation process would form a better quality results for this research. The research questions are focussed on the issue of safety and design of the playgrounds. These six questions will be arranged as follows:-

1. How is the condition of public children playgrounds in Malaysia?
2. What is the safety level of Malaysian children playgrounds?
3. How much do children and their parents know about playground hazards?
4. Who is responsible for playground injuries and what can we do to prevent them?
5. How much do climatic factors affect the children playground's utilisation?
And how to overcome this problem?
6. What are the criteria for excellent children playgrounds?

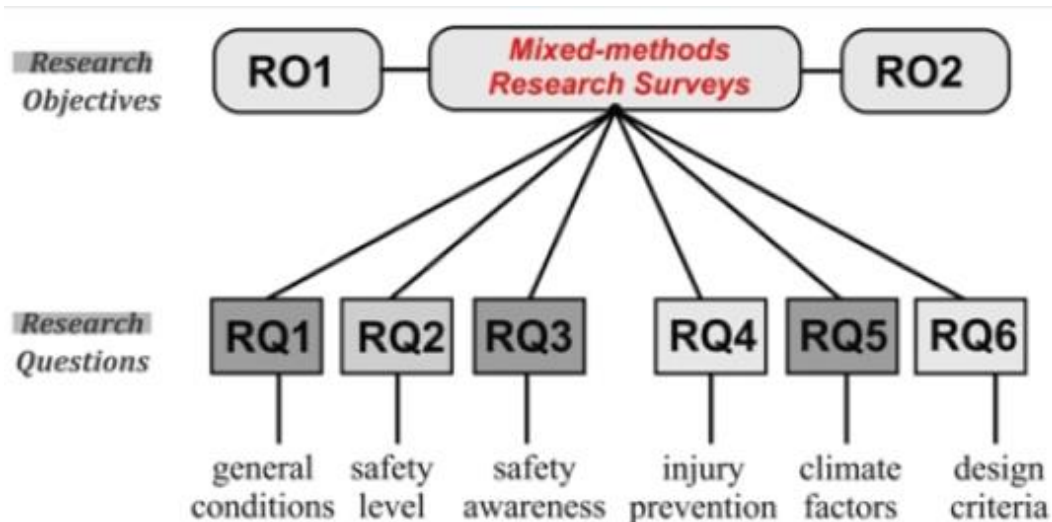


Figure 1.1 Research questions framework

A thematic keyword for every question can be explained by this simplified research framework (Figure 1.1). This framework helps to generate a systematic and effective mixed method research.

1.7 Research Approaches

In this research, the researcher decided to use the mixed methods sequential design; a notable research approach developed by Creswell & Plano Clark (2004). The study is separated into two sections consist of qualitative and quantitative approaches. The qualitative section is the researcher’s individual exploratory surveys and this process was guided by some inputs on architectural qualitative studies (Ghannam & Konow Jr., 2014; Gabr, 2010). The findings from this section was quantitatively recorded and analysed using a modified survey checklist, adapted from the United States National Program for Playground Safety (NPPS, 2006)

In quantitative section, the researcher has designed a questionnaire set to collect data from respondents. Even though, the surveyed respondents were not represented all parents and caregivers from all potential playground users in Malaysia, the data

derived from these convenience samples were perfectly adequate to be analysed and able to produce some quality findings. Next, the researcher would combine the qualitative and quantitative results to form six research findings. These findings would also become the conclusions of this mixed-method research.

1.8 Scope of the Study

Children playgrounds in several cities in Peninsular Malaysia will be used as the scope of the study. Due to logistic costs, most playgrounds would be investigated in Kedah and few playgrounds would be from Putrajaya and Klang Valley as these two cities are known to offer the best public amenities in Malaysia. They would also be a number of playgrounds inspected in Ipoh because the researcher had previously lived in this city.

This study would be divided into two sections; the qualitative and quantitative strands. The qualitative study aims to explore and to interpret the current problems of children playgrounds in Malaysia. As mentioned, the focus would address on the aspects of better playground design and stricter safety standards. Although there are fourteen states in this country, their locations are believed not to affect the playground forms and shapes. The researcher had visited every state and many public playgrounds in Malaysia. Apparently, he found most playground equipment and parts looked very common, alike and identical. By looking at this scenario, the researcher convinces that he could proceed with this research; the investigation on children playgrounds in a few cities would represent the same problems for most public children playgrounds in Malaysia.

In the quantitative phase, the researcher would conduct a survey to the respondents of parents and caregivers. Their sample size would be targeted to be

around 150 respondents. Further explanations pertaining to the sampling population will be given in the Methodology and the Results and Analyses chapters.

1.9 Limitation of the Study

The concept of playground safety studies is relatively new to this country. In 2012, the Putrajaya Corporation (PJC) had invited Mr. Kenneth Kutska, the executive director of International Playground Safety Institute (IPSA), USA. Collaboratively, they had conducted an inaugural playground safety professional course or better known as the Certified Playground Safety Inspector (CPSI). It was the first time, a certified playground safety course held in this country. The objective of the course is to produce playground professional members with CPSI international accreditation. In the long run, this project is targeted to establish a highly recognised standard of playgrounds for Putrajaya and Malaysia as a whole.

This study can be recounted among the pioneers in children playground research in Malaysia. The focus of this research would be given only on two aspects; the playground design and safety. There are so much potential for other researchers to explore. For example, they can study about the types of playground users, the suitability of materials and location of playgrounds.

Due to logistic factors like cost and time; this research would be conducted only on accessible playgrounds in Kedah, Perak, Selangor and Putrajaya. This study can be expanded into a much bigger scale to get a clearer picture of children playground problems in Malaysia. The study can also focus on playgrounds in certain states, such as a recommendation of safety study in 430 children playgrounds in Sarawak (Haroun, 2014, Feb22). The researcher hopes more research will be conducted on the

aspects of safety and to improve the standard and quality of Malaysian children playgrounds.

1.10 Research Framework

The researcher decides to use the exploratory sequential design, a mixed methods technique that is suitable for architectural research. The concept of exploratory sequential design had been discussed by Creswell and Plano Clark (2011) in their famous book entitled *Designing and Conducting Mixed Methods Research*. The researcher felt comfortable with this concept and he would like to explore the phenomenon behind the problems of children playgrounds.

This research can be developed to a large extent. At present, the researcher wants to focus only at fundamental level. The basic goal of this research is to explore children playgrounds and to investigate playground problems, especially their aspects of safety and design. The researcher would investigate about a hundred playgrounds at the mentioned locations. Data from these investigations would be recorded and analysed to form a set of questionnaire. This questionnaire would be matched with the problems of safety and design in Malaysian playgrounds. The questionnaire's data would be correlated with the previous qualitative data. This combined analysis would form the research findings. In conclusion, the theoretical framework can be summarised by the following diagram.

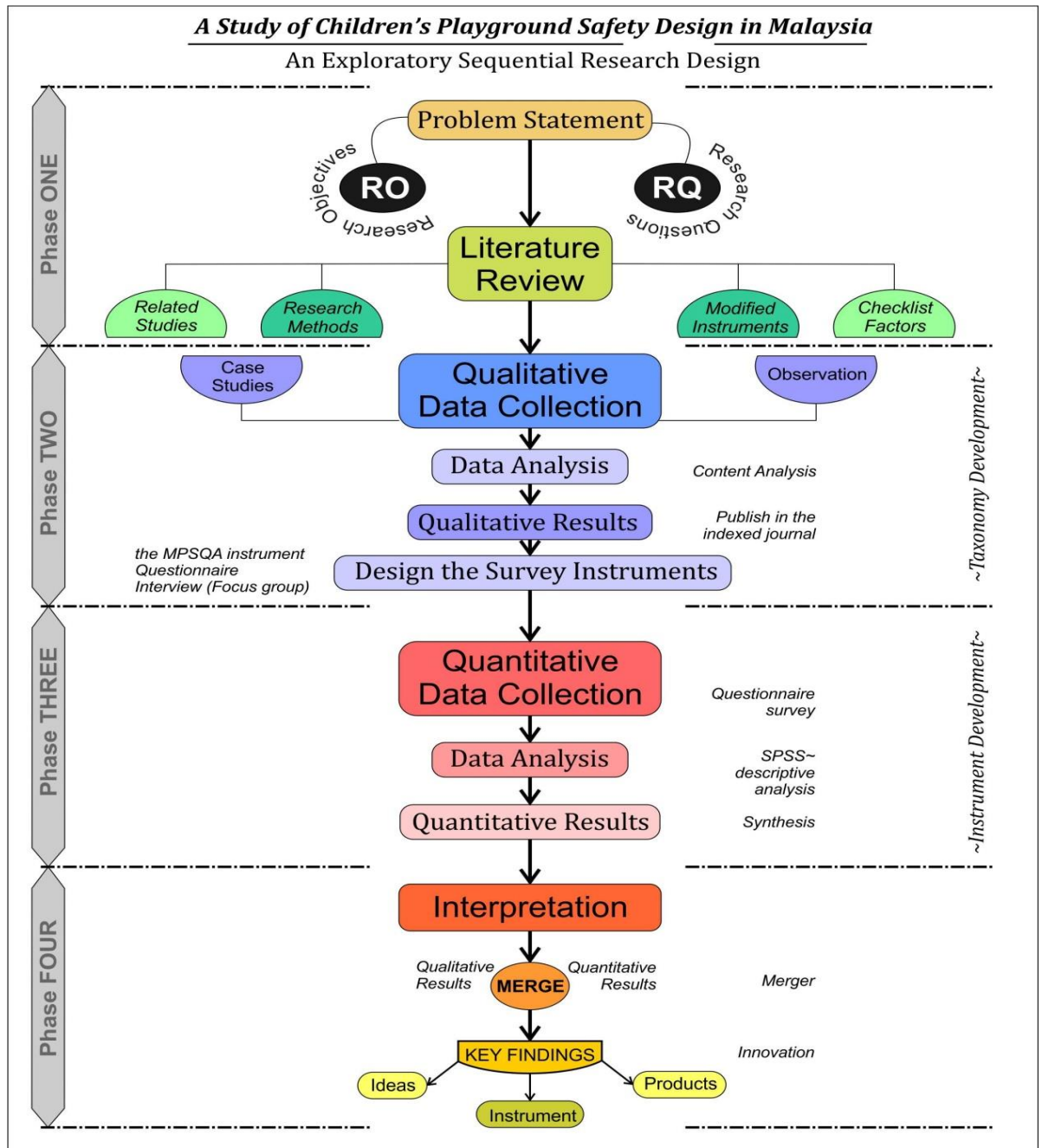


Figure 1.2 The four phases of research framework

1.11 Structure of the Thesis

Normally, a social survey research will take many chapters because all data should be analysed and transformed into a bunch of a thesis. The linguistic orders, content and formation of the thesis should be well written. A thesis is not just a lengthy academic writing. Moreover, it needs to be structurally well planned so that

the whole stories will become very interesting and effective. This research is planned to use the mixed methods sequential design. The composition of thesis will be arranged in a sequence of five chapters, it will start with the *Introduction* and subsequently follows by the *Literature Review*, *Methodology*, *Results and Analyses* and the final closing chapter will be the *Conclusion*. The synopsis of these five chapters will be described as follows:

Chapter 1: This chapter provides us a brief introduction about the title, its background, the rationale of the study, the concepts and its multiple options of approach. Basically, it is about the problems of why and how the research will be materialised. A handful of similar researches have been defined into four categories of guidance research approaches, these studies will provide good examples and enhancing a greater confidence about the viability of this research. There is also a table to synopsis the past years related theses, these theses could have given some ideas on how to conduct a playground safety research. The research framework is the penultimate item in this chapter, which has been composed to give a diagrammatic understanding about this thesis.

Chapter 2: As a chapter for literature review, what the scholars and others said about the children playground will be cited as much as possible. This chapter will also explain about the history of playgrounds, types of children playgrounds and types of play components. The playground related checklist matrix will be created to highlight the chosen checklist factors. At the end of the chapter, a conceptual framework is drawn to form a circular relationship to all important domains.

Chapter 3: This chapter will explain about the mixed-methods sequential design, and then the methodology will be divided into the qualitative and quantitative strands. Ideologically, the weightage will be greater on the qualitative strand because the study will be using three types of approaches, namely the interview, case study and observation. Even though the quantitative strand will be emphasized only in the third phase, the importance of it can never be doubted. The quantitative strand is not only providing quantitative data, it may provide the answers especially for things that could not be answered in the earlier phases of this research. The researcher has also managed to develop his own qualitative surveying instrument, which consists of 40 surveying terms and statements of playground safety, cited from the world's scholars and international playground references. Another instrument of survey will be composed in this chapter. It is a quantitative questionnaire instrument and it will be used to support of the qualitative data gathered in the earlier phase.

Chapter 4: This chapter will discuss about the results and the analyses. Given the fact that this research is brought up in dual strands; discussion of the results and their analyses in this chapter will also be divided into two parts. The qualitative and quantitative strands will be in the first and second parts respectively. In the qualitative analysis, similar with the conceptual framework (that is available in the Chapter Two), even though there were many related domains that were connectively listed (in the Subchapter 2.8), the researcher chooses to concentrate only on three domains, namely known as the equipment maintenance, playground surface and the playground design. These domains can be related with many design factors such as age-appropriate design, signage, negative space and playground shade. The second part will consist of questionnaire analysis, quantitative data will be analysed by using computer software famously known as the "Statistical Package for the Social

Sciences” (SPSS Version 20). This chapter will be concluded by descriptive analysis to show the relationship between the main factors identified by the factor analysis.

Chapter 5: This is the chapter where this research reaches its climax. For the purpose of not letting the previous discussions left in a hanging mode, all preceded chapters will be summarised with topical conclusions. Therefore, this chapter will be provided with overall interpretations based on the topical conclusions gained from the qualitative and quantitative strands. The interpretation will lead into a positive conclusion, despite if they were any negative findings (rose from the previous analysis). This means the subject will be supported by ideas and suggestions in all manner of architectural senses. At the conclusion, the thesis will summarise about the importance of playground research; the changing process for better and safer children playgrounds in Malaysia is inevitable. It is impossible to change everything at once, but ideas and suggestions that are brought up by this research will help to change the future.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The general topic of children playground has been studied from many angles (Maxwell, Mitchell & Evans, 2008). However, the playground as a place to play has received little attention in research (Jansson, 2008). In Malaysia, the public children playgrounds are also lacking in research, particularly in the aspects of safety and design (Md Saaid & Hassan, 2014; Soltani, Abbas & Awang, 2012). It is very important to have many studies about playground equipment, for example, studies about the danger of monkey bars in children playgrounds by Caglar, Kuvvetli and Sandalli (2010) and Mahadev, Soon and Lam (2004). These studies have provided inputs and feedback to local authorities to rectify equipment faults and improve the safety conditions of children playgrounds in their countries. Playground related injuries create anxieties for playground users, especially their parents and caregivers (Hudson et al., 2008; Nortan, Nixon & Sibert, 2004). Therefore, more research is required under this topic to help building safer playgrounds and reducing the number of injuries.

2.2 Definition of Terms

This subchapter will provide definitions for keywords of this research. These definitions are important because they will give ideas and help readers to understand the nature of this research. The researcher will explain the meanings of children playgrounds and terms related to playground safety and design.

2.2.1 Definitions of Children Playground

Children playground is a place in the open area where playground equipment is installed and played by many children (Beugels, 1993). The children playground is a piece of ground that contains special features for children recreation (Moore et al., 2006). A specialized open space designed for children in an urban area (Metin, 2003). It is an outdoor designated space for free play; enables them to play together and be physically active (Sutterby & Thornton, 2005; Sturm et al., 2008) and it is just as important as the classroom as a context for students' emotional, physical, intellectual and social development (Couper, 2010).

Play plays an important part in children's healthy development and the playgrounds help them to display their genius (Mackay, 2003; Metin, 2003). Children play because it comes naturally (Shier, 1984) and they do not need particular goals in mind in order to have fun (Maxwell, Mitchell & Evans, 2008). Therefore, the children playground is provided on an open space that equipped with playing facilities, but they should only play under adult supervision (Dewi, 2012).

Parents and families rely on playgrounds to provide safe, comfortable, and adventurous afternoons for their children (Hornick, 2015, May 11). It is a public recreational area that contains equipment for the use of children ages 6 months through 12 years old (U.S. Consumer Products and Safety Commission [CPSC], 2010). As the right for all children, play is essential to develop their intellectually, physically, and emotionally (Mitchell et al., 2007; Sutton, 2005; Sibert et al., 1999) and the playground is considered as a learning environment for all children (Macpherson et al., 2010). Arguably, the playground is a place where children grow (Sutterby & Thornton, 2005), develop interactive skills (Leung & Mahadev, 2010) and important for healthy lifestyle (Dotterweich, Greene & Blosser, 2012).