

Sports Safety Instruments on the Field Based Model ADDIE

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Abstract This study aimed to determine the validity and reliability of sports safety level instruments on the field based on the ADDIE Model. This study used a field sports safety level instrument that assesses the level of safety on the school field including the level of environmental safety, control, information, field maintenance and records management. The measuring instrument of this study was built based on the ADDIE Model. Dan Petersen's Accident Theory and Domino's Accident Cause Theory were used as a basis for the construction of this instrument and adapted to the school situation in Malaysia based on several circulars issued by the Ministry of Education Malaysia. All resources were used as a guide and reference so that the assessment instruments developed are in accordance with the needs and requirements of the school situation in Malaysia. The results of the study found that the validity of the sports safety level instrument on the field was $r = 0.91$ ($N = 3$) for the first process of validity and $r = 0.92$ ($N = 5$) for the second process of validity. This indicates a high validity value for both validation processes carried out. The value of Cronbach's alpha reliability coefficient used in determining the reliability of sports safety instruments on the field was high $\alpha = 0.84$. Based on the findings, this field sports safety level instrument is suitable to be used as a standard instrument to assess the field sports safety level. The implication of the study is that this instrument as a realistic, holistic assessment instrument can measure the level of sports safety on the field in line with the Safe

Schools Policy (2002).

Keywords Sports Safety Instruments, Sports Safety, Safety Instruments, Safety, Field, Validity, Reliability

1. Introduction

Schools are the earliest places to provide formal education to students. The growing number of students in a school, especially in the city center, has made the field of education a challenge for educators. In addition to trying to provide new knowledge according to the curriculum provided, there are many other areas that need the attention of teachers and school managers. The safety of students during teaching and learning activities is one of the responsibilities of the school management.

A safe school is a place where students can learn and teachers can teach in a comfortable environment without any danger. It is also a place where the teaching environment can promote energy acceptance and protection among students [1]. [2] defines a safe school as a quiet place where for students and teachers to be independent in the process of teaching and learning without the problem of social danger of physical persons. The key to a safe school is an environment that emphasizes friendliness, caring, with clear guidelines on appropriate

behavior and the school itself should be fair to students [1]. Therefore, the safety of students in sports and Physical Education activities must be emphasized following various accidents involving students recently while doing sports and physical education activities like a fatal female student was hit by a lawn mower blade, form two students died after being hit by a fallen goal post [3] form two students died after being hit by a fallen goal post [4] this thing was increasingly underestimated by some school management.

Safety practices are so important in influencing the learning environment in schools especially for students, this is because students need to feel safe from distractions or the risk of accidents [31] The provision of safe sports facilities is important to encourage students to be active in physical activities [32]. [33] concluded that teachers should play a role as true teachers or sports coaches who not only conduct effective teaching in the classroom but also provide continuous guidance outside the classroom by using all available sports facilities. [34] stated that the performance, confidence and satisfaction of athletes are based on the ergonomic quality of sports.

The formation and implementation of security policy is one of the main steps that need to be created in every organization. To further strengthen security efforts, security campaign practices need to be implemented to create awareness that the organization takes the matter seriously [35]. One of the efforts towards strengthening the standard operating procedures (SOPs) of existing outdoor and risky activities, plus a much -needed risk management element is produced [36] sports management needs to formulate service governance so that the training environment is in a good and safe condition [37]. Facilities management is one of the important elements in determining the success of a building to achieve their objectives [38].

The Ministry of Education Malaysia is so concerned

about the safety of students during Physical Education activities and issued several (SPI) Professional Circular Letters since 1995 including SPI No. 1/1995: Safety of students during the teaching of Physical Education and Health and Co -curricular activities and sports inside and outside school area [5], and SPI No. 9/2000: Guidance on personal safety of students during the teaching of Physical Education and Health as well as co -curricular activities and sports inside and outside the school area [6]. Latest, SPI KPM No. 5/2016: Safety guide during the teaching of Physical Education and Health and Co -curricular activities [7]. Through the Professional Circular Letter issued by the Ministry of Education Malaysia in detail emphasizes that the school is always alert to the possibility that can cause the occurrence of unwanted incidents on students and take certain measures to prevent it.

1.1. Sports Safety Issues in Schools

News of accidents that occur in school areas is regularly broadcast through the mass media every year. Frequent accidents are being hit by a goal post while playing ball, falling into a sewage pit, falling from a coin and being bitten by a snake in the school grounds. Table 1 shows the chronology of students who died as a result of being hit by a goal post while playing football at school based on sources from the mass media.

The news of the incident of a student falling from the ceiling of the hall occurred in October, 2014 where a male form three student died after falling from the ceiling of the hall while trying to pick up a takraw ball at a Kangar district school [8]. Apart from that, the tragedy of a student falling into a sewer hole occurred in February, 2016 where a first year student died after falling into a sewer hole behind a school in Jasin district [9].

Table 1. Chronology of Accidents Due to Goal Post Crash

Year of Accident	Location	Fact of Accident
March 2000	Kuantan, Pahang	A form two students of a secondary school in the kuantan district died after being hit by a goal post made of iron while playing on his school field.
January 2008	Sungai Petani, Kedah	A fourth-year student died after being hit by a goal post while playing on the side of the field at Sekolah Kebangsaan Taman Sri Wang (SKTSW) after school hours while waiting for his father to arrive.
November 2010	Kepala Batas, Pulau Pinang	A second-year student of Sekolah Kebangsaan Kepala Batas here, died at the Penang Hospital (HPP) due to serious injuries after being hit by a goal post on his school field.
September 2011	Klang, Selangor	A fifth-year student of Sekolah Kebangsaan (SK) Kampung Jawa 2 here died after suffering severe head injuries as a result of being hit by a goal post while playing football.
July 2013	Klang, Selangor	A form two male students of Sekolah Menengah Kebangsaan Raja Mahadi died after suffering severe bleeding and cracked skull as a result of being hit by a goal post on the school field after clinging to the goal post before it fell and hit the victim.
July 2016	Gua Musang, Kelantan	A form two students, Sekolah Menengah Kebangsaan Tengku Indera Petra 2 (SMKTIP2), died after being hit by a fallen goal post.
September 2018	Besut, Terengganu	A form two students of Madrasah Moden Maidam, Kampung Padang Landak here died after being hit by a goal post.

Table 2. The process of formation of the Sports Safety Instruments on the Field based on the ADDIE Model (Rosset, 1987)

Model Addie (Rossett, 1987)				
Analysis	Design	Development	Implementation	Evaluation
Professional Circular Letter No. 1/1995, Professional Circular Letter No. 9/2000, Professional Circular Letter No. 4/2002	<ul style="list-style-type: none"> Theory of the Causes of Domino Accidents (1950) Persen's Accident Theory (1982) 	Field Sports Safety Audit Instrument	<ul style="list-style-type: none"> Field Study, Sports Safety Audit On The Field 	Level of Sports Safety on the Field

In April 2016, Malaysians were informed of an accident involving a first year student who died because he was believed to have been bitten by a snake while playing with friends on the school grounds [9] and followed by an incident in Rembau, a second year student fainted and was sent to the hospital for treatment of snake bites in the school area and an incident in Seremban of a form three student being bitten by a snake in the school area [10].

There are various potential and risk risks that can occur at sports facilities, during sports and Physical Education activities. The risk is likely to result in injury, disability or even death. Safety factors need to be emphasized in an effort to reduce the number of accidents involving sports activities and Physical Education. In February 2018 a female student who died while two of her friends were injured due to being hit by the blade of a lawnmower tractor at Sekolah Menengah Kebangsaan (SMK) Tuanku Abd Rahman, Gemas [11]. This accident incident has opened the eyes of various parties that safety management is very important in providing a safe and conducive environment to the pupils in the school [12].

Safety management is an important aspect in dealing with injuries and accidents during Physical Education subjects. Safety can be defined as freedom from any accident, pain, injury or fear which needs to be addressed and taken care of by all parties. A committee has been formed to act and collect data to implement various programs in an effort to reduce the rate of accidents involving workers (Ministry of Human Resources, 2010). However, various efforts have been made to address the problem of accidents or those related to safety at work, but the accident rate in our country is still at a rather alarming level.

1.2. Model ADDIE

The ADDIE design model cycle [13] which consists of the phases of Analysis, Design, Development, Implementation, and Evaluation is used as a guide in building the Sports Safety Instruments on the Field. Table 2 illustrates the formation of the Sports Safety Instruments on the Field based on the ADDIE Model [13].

Researchers have chosen the ADDIE model in developing the Sports Safety Instruments on the Field because the ADDIE model is a major systematic design

model and is the source of the emergence of other models [14]. This can be evidenced when almost all systematic design models have five levels of ADDIE model namely; (i) Analysis; (ii) Design; (iii) Development; (iv) Implementation; and (v) Evaluation [15], [16], [17]. There are various theories and models put forward by systemic design researchers, but the ADDIE model is the choice in the process of designing the Sports Safety Instruments on the Field because the process put forward by the ADDIE model is seen as very thorough and system-oriented in producing a good system design.

1.3. Purpose of Study

The model [18] was used as a guide by researchers.

In general, the study conducted was to identify the effectiveness of the Sports safety level Instrument on the field based on the KAI Model.

Here are the research questions:

- To what extent is the validity of sports safety instruments on the field based on the KAI Model?
- What is the reliability value of sports safety instruments on the field based on the KAI Model?

To obtain the reliability value of sports safety instruments on the field, a pilot study was conducted in five different schools and the schools were of different backgrounds and school categories and the important thing that school should have was the field. The field sports safety level instrument will be used by the head teacher of the physical education committee to assess the level of sports safety on the selected school field. The study sample involved five committee head teachers from five different schools. There were eight expert panellists involved in determining the validity of the content of this study instrument. The process of validation of sports safety instruments on the field was carried out twice. This procedure was used in the study [19] as further strengthening the validity of the study instrument. The validity of sports safety instruments on the field was first given to three selected panel of experts. The validity of sports safety instruments on the field for the second time was given to five selected panel of experts. A sample of teachers and a panel of experts were selected using a purposive sampling technique.

2. Methodology

2.1. Instrument Development

The model [18] was used as a guide by researchers during the development stage of sports safety instruments on the field. Figure 1 is a flow chart of steps for the development of sports safety instruments on the field based on the Model [18].

The best evaluation criteria are the main points studied in the process of building a sports safety level instrument on the field based on the KAI Model. The assessment criteria in the field sports safety level instrument are formed based on Professional Circular Letter No. 4/2002, Professional Circular Letter No. 1/1995, Professional Circular Letter 9/2000, Circular Letter No. 8/2011 and Professional Circular Letter No. 5/2016. Dan Petersen's Accident Theory [20] and Domino's Accident Cause Theory [21] are the mainstays in shaping the instrumental criteria of the level of sports safety on the field. Document Analysis method is used to form the best criteria in sports safety management instruments on the field.

The next process is to design criteria and rubric items for sports safety management instruments on the field based on the Occupational Safety and Health Act (AKKP 1994), Ikhtisas Circular Letter No. 4/2002, Professional Circular Letter No. 1/1995, Professional Circular Letter No. 9/2000

and Professional Circular Letter No. 8/2011. Table 3 shows the number of instrument items constructed

Table 3. Number of items of Sports Safety Audit instruments on the Field

Section	Aspect	No. Question	No. Item
A	Field demographic information	1 - 6	6
B	Security Audit		
	Environment	1 - 8	8
	Control	9 - 11	3
	Information	12 - 16	5
C	Management Audit		
	Maintenance	17 - 21	5
	Records Management	22 - 25	4
	Total		31

The criteria and rubrics that have been constructed are referred to three expert panels to evaluate the content in terms of safety techniques, safety content and sports safety for sports safety management instruments (Attachment A). As a result of the comments and recommendations from the appointed expert panels, action was taken and the sports safety instruments on the field were refined based on the information provided by the experts.

Table 4. Instrument Validity Evaluation Form

No.	Things	Value 1-10	Comment
1.	The statements presented in the instrument are relevant to measurements of sports safety audits on the field.		
2.	The statements presented in the instrument can accurately measure what is to be known.		
3.	The statements presented in the instrument cover the breadth of factors / elements related to sports safety audits on the field.		
4.	The statements presented in the instrument contain a detailed description of the sports safety audit on the field.		
5.	The content of the statement in Part A: Demographics is appropriate to what is to be known.		
6.	The content of the statement in Part B: Security Audit is in line with what is to be known.		
7.	The content of the statement in Part C: Management Audit is in line with what is to be known.		
8.	The statement for the Assessment Rubric in Part B: Security Audit is clear.		
9.	The measurement values for the Assessment Rubric in Part B: Security Audit are accurate.		
10.	The statement for the Evaluation Rubric in Part C: Management Audit is clear.		
11.	The measurement values for the Assessment Rubric in Part C of the Management Audit are accurate.		
12.	Giving a value of 1 (lowest) to 5 (highest) to measure the audit aspect of sports safety on the field is sufficient.		
13.	The content of the instrument is focused on sports safety audits on the field.		
14.	The order of the sentences / words presented in the instrument is clear.		
15.	The order of the sentences / words presented in the instrument is understandable.		

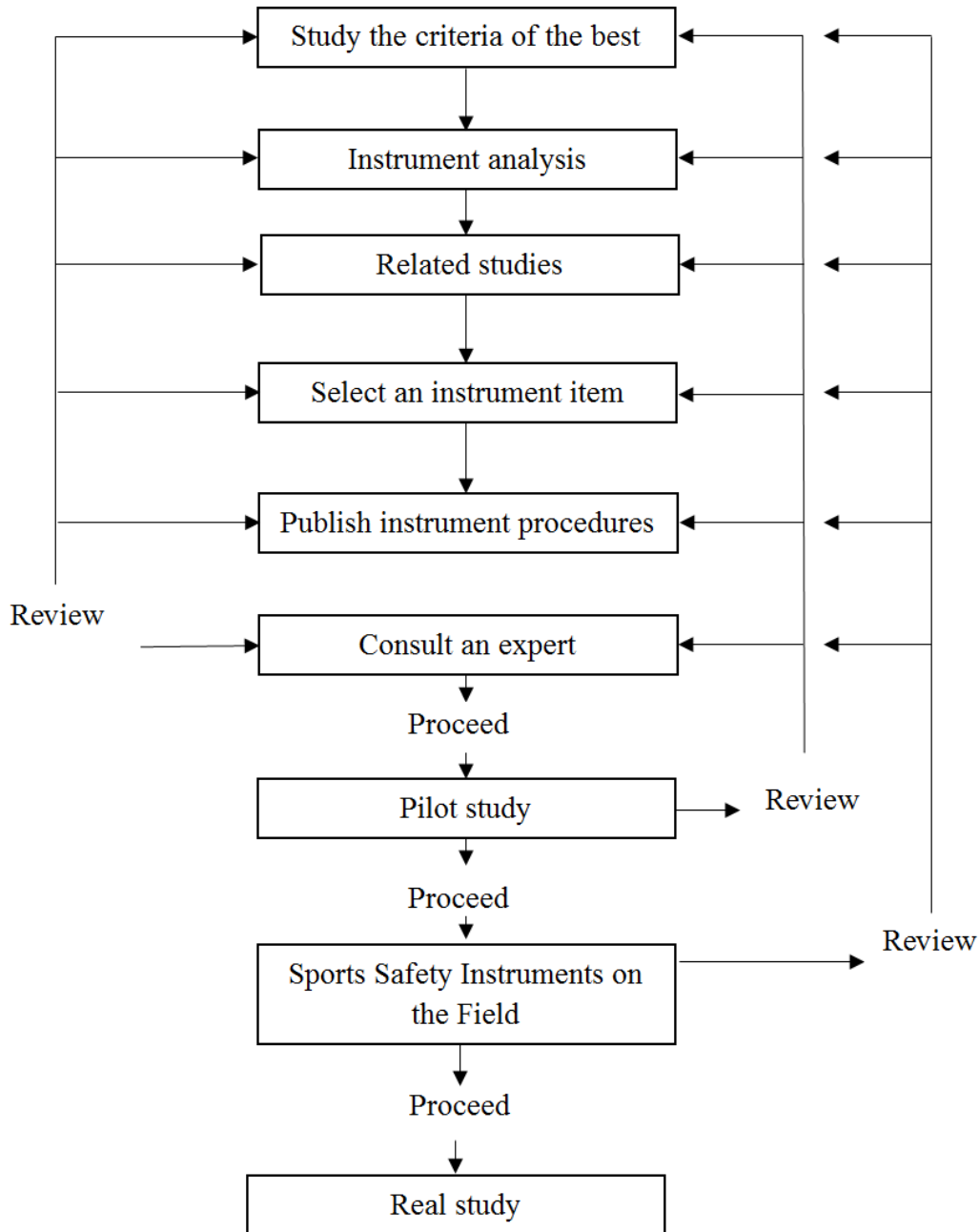


Figure 1. Flowchart for the Development of Sports Safety Instruments on the Field

The refined on -field sports safety instruments were given to five panel of experts appointed according to their areas of expertise for the second validation process. Sports safety instruments on the field were refined once again as per the reviews and comments given by the expert panel. Instruments that have been refined and achieved consistent validity will be forwarded to a pilot study process testing the level of reliability of sports safety instruments on the field.

Researchers used content validity questionnaires constructed guided (Sidek & Jamaluddin, 2005). Question in the form of a semantic scale that contains 11 points, namely the rightmost point with a value of 10 (strongly

agree), the leftmost point, marked 0 (strongly disagree) and the middle point marked with 5. Based on [22], this questionnaire can be used as an instrument to test the validity of the contents of the instrument based on expert references. Table 4 shows Instrument Validity Evaluation Form.

The next process is to conduct a pilot study. A pilot study was conducted in five different schools and the schools were of different backgrounds and school categories and the important thing that school should have was the field. A pilot study was conducted to obtain the reliability value of sports safety instruments on the field. The value of Cronbach alpha reliability coefficient is used

in this method to determine the reliability value of the study instrument in this pilot study, the researchers used internal consistency to obtain the Cronbach alpha reliability value.

After obtaining the value of validity and reliability, then the sports safety instrument on the field can be used as a standard assessment instrument in assessing the level of sports safety on the field.

3. Results

3.1. Validity of Sports Safety Instruments

Researchers have obtained instrument content expert consent for the first pilot study from a lecturer namely the Head of the Research and Innovation Department of Teacher Professionalism Institute of Teacher Education and a safety officer from the NIOSH Consulting, Research and Development Department. Apart from that, the researchers also obtained expert consent from a teacher of Physical Education and Health Education, namely the National Head Coach of Physical Education and Health Education. The selection of three experts is in line with Lynn's (1986) recommendation, which states that three experts are sufficient to evaluate a research instrument. Yet it is not recommended until more than 10 experts [23]. Based on expert feedback and advice, the instrument was refined and all expert panel content validity data were

calculated using the following formula:

$$\frac{\text{Total expert scores}}{\text{Maximum score}} \times 100\% \\ = \text{Content Validity Achievement.}$$

Based on Table 3, content validity through expert consent techniques in the pilot study was $r = 0.91$ ($N = 3$). According to [22], [24] and [19], that a value of 0.70 indicates that the instrument has a good validity value.

The next step, the researchers implemented again the content validation procedure by obtaining panel expertise with a minimum Doctor of Philosophy qualification from a local university, Institute of Teacher Education, National Institute of Occupational Safety and Health (NIOSH) Technical Officer, and National Head Coach of Physical Education and Education Health. Accordingly, the improved instruments were again evaluated by five experts to evaluate the content in terms of safety techniques, safety content and sports safety for sports safety management instruments. This procedure was used in the study of [19] as further strengthening the validity of the study instrument.

Based on Table 4, it shows the validity of the content of the second round obtained from five experts. Findings show that the mean agreement for the five experts is more than 80 percent agreement. Thus, the mean value for the validity of this sports safety management instrument is $r = 0.92$ ($N = 5$). Based on [25], [22] and [26], an r value of at least 70 percent (0.7) is adequate and allows the instrument to be adopted in a study.

Table 5. Content Validity by expert panel ($N = 3$)

Item	Expert panel 1	Expert panel 2	Expert panel 3	Σ	M
Item 1	9	9	9		
Item 2	9	8	9		
Item 3	8	9	10		
Item 4	9	9	9		
Item 5	9	9	9		
Item 6	9	10	9		
Item 7	9	9	9		
Item 8	9	10	10		
Item 9	9	9	9		
Item 10	9	9	10		
Item 11	8	10	10		
Item 12	9	9	10		
Item 13	9	9	9		
Item 14	9	9	8		
Item 15	9	10	10		
Σ	133	138	140	411	0.91
M	0.89	0.92	0.93	2.74	0.91

3.2. Reliability of Sports Safety Instruments on the Field

A pilot study was conducted aimed at obtaining the value of reliability, sports safety instruments on the field. To obtain the reliability value of sports safety instruments on the field, a pilot study was conducted in five different schools and the schools were of different backgrounds and school categories and the important thing that school should have was the field. The field sports safety level instrument will be used by the head teacher of the physical education committee to assess the level of sports safety on the selected school field. To obtain the reliability of the questionnaire, an efficient and often used method is internal consistency. The value of Cronbach alpha reliability coefficient is used in this method to determine the reliability value of the study instrument in this pilot study, the researchers used internal consistency to obtain the Cronbach alpha reliability value. According to [27] when the study data is in ordinal form then Cronbach alpha analysis method should be done to identify the reliability of the study instrument. [28] stated that the value of reliability according to the test conducted is different according to each type of test selected and conducted.

The result on the pilot study, the reliability of the field sports safety instrument was $\alpha = 0.84$ using Cronbach-Alpha. According to [29] that the level of $\alpha = 0.71$ to 0.99 is the best level while (Fraenkel and Wallen,

2006) putting the value of the reliability of the items received is at the level of $\alpha = 0.70$ to 0.99 . However, [30] provides a more specific definition by stating that the value of $\alpha = 0.89$ indicates the best internal consistency value of the instrument. This means, sports safety level instruments on the field have the best consistency value.

4. Conclusions and Recommendations

Based on the findings of the study, the sports safety level instrument based on the KAI Model is suitable to be used as a standard assessment instrument in assessing the level of sports safety on the school field. These findings are also in line with the decision by [35] that the formation and implementation of safety policies in ensuring a highly necessary workplace environment are implemented. The findings of the study [36] show an effort towards strengthening the standard operating procedures (SOP) of existing outdoor and risky activities plus risk management elements that are very necessary to produce. The findings of the study [38] stated that facility management is one of the important elements in determining the success of a building to achieve their objectives. It is hoped that the field sports safety level instrument based on the KAI Model will be a more realistic, holistic assessment instrument and can measure the field sports safety level in line with the Safe Schools Policy (2002).

Table 6. Content Validity by expert panel (N = 3)

Item	Expert panel 1	Expert panel 2	Expert panel 3	Expert panel 4	Expert panel 5	Σ	M
Item 1	9	9	9	9	9		
Item 2	9	9	10	9	10		
Item 3	10	9	9	9	10		
Item 4	9	8	9	9	9		
Item 5	9	10	9	9	10		
Item 6	9	9	9	9	9		
Item 7	10	10	9	9	9		
Item 8	9	9	9	9	9		
Item 9	9	9	10	9	9		
Item 10	9	9	9	9	9		
Item 11	9	10	10	9	10		
Item 12	9	9	9	9	9		
Item 13	9	9	9	9	10		
Item 14	8	10	9	9	10		
Item 15	9	9	10	9	10		
Σ	136	138	139	135	142	690	0.92
M	0.91	0.92	0.93	0.90	0.94	4.60	0.92

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