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Green Cross: Application for analyzing School injuries

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Abstract

Unintentional injuries are a major cause of untimely deaths among children and adolescents. Violence and injuries in the schools have raised the need to collect the injury data routinely and to find ways to analyze the potential risks of the near-miss cases. The aim of this study is to explore the injury data collection method piloted with the Green Cross software and to describe the characteristics of the school injuries (n=88). The qualitative data consisted of user-interviews and data reports.

As the main result of this study, the Green Cross software provides a decent way to monitor the injuries in the school context in such a way that the accidents, incidents, injuries and near-miss cases become more visible. A novel finding was that many school injuries were unpredictable, connected to human factor issues, persons acting against norms and regulations or using structures or products in a way they are not supposed to be used.

Keywords: injury, safety, risk, injury monitoring, accident

Introduction

Pupils´ right to safety, security, and welfare in Finland is mandated in the Basic Education Act "A pupil participating in education shall be entitled to a safe learning environment". [1] A pupil's wellbeing concerns everyone working in the school community as well as the authorities responsible for pupil's welfare services. Extreme violence and unintentional injuries at schools have raised the need of more developed measures to analyze potential risks. At the same time society is getting rapidly digitalized. This has happened extremely fast in the learning environment in schools, and concepts such as smart learning, E-learning, and virtual classrooms have been established. [2] The aim of this study is to explore the injury data collection method piloted with the Green Cross software and to describe the characteristics of the school injuries.

Safety and security have remained basic values for decades in the Finnish society [3] and therefore the safety culture should be visible also during the school day. In this study, safety and security are seen from a safety pedagogic point of view. This concept includes the structured learning environment, people and practical safety and security solutions made in the school as well as the curriculum all of which create a functional context for teachers' actions. In this study, the emphasis is put on the structured learning environment, social issues and practical safety solutions. [4]

In the social service and healthcare organizations, the injury reporting system HaiPro reporting system is used. Also, preventing occupational injuries "Zero injuries forum" for organizations is established in Finland [5] [6]. However, these systems are not used in the schools and the data on school injuries is not routinely collected. This is why the picture of the injury and risk situation at schools remains somewhat unclear and weak.

Injury is a leading cause of death among children and adolescents aged 0–19 years and annually about 2800 Finns die accidentally [7]. Around 122 Finnish children and young people under the age of 25 die annually in accidental injuries and 13,500 persons are hospitalized [8]. The child and adolescent injury death rates in Finland have decreased during the last decades, nevertheless, the figures still remain twice as high as rates in the Netherlands, one of the safest countries in Europe [9]. The most common types of accidents leading to death among children aged less than 15 years are traffic accidents, drownings, and other suffocations. In general, school is a relatively safe place for children and adolescents. [10] However, the attitudes toward safety are developing in the course of early school years and therefore it is important to study the process that leads to an injury. We need to know exactly where, when and to whom these injuries happen. [11] Safety is mostly defined as a condition where nothing goes wrong or more cautiously as a condition where the number of things that go wrong is small - "freedom from danger and risks". Safety is also defined by injury prevention researchers as "a state or situation characterized by adequate control of physical, material, or moral threats" or being sheltered from danger. [12] Due to the multitude of views on the definition of safety, the World Health Organisation (WHO) published a shared definition of safety. The definition has two dimensions: objective, the external dimension that consists of environmental factors; and subjective, the internal dimension, such as person´s feeling of being safe. Safety can be seen as a condition where factors that are a threat to a society are managed in such a way that the citizens have the feeling of wellbeing and prosperity. It has to be noted that safety is typically defined and measured more by its absence than its presence. [13-15]. Also, some language-related issues have to be noted – in English, there are two separate concepts: safety that implies a human aspect, while security implies deliberateness and protection from dangers. The word safety is generally used in connection with incidents and the word security refer to protection against the undesirable threat. In Finnish, the concept turvallisuus covers both concepts. [16]

The concept of risk is widely used in this paper. The classic definition of risk is the probability of occurrence of an unwanted event multiplied by the consequence or loss of the event. In general there are three types of loss: people, property and efficacy. Sometimes, such as here, the concept is also used to describe danger or uncertain conditions that may cause accident or injury. [17] As mentioned earlier, safety is typically defined and measured more by its absence than its presence. Such unwanted events or uncertain conditions can be named risks. Accident is an event in which a person dies, is severely injured or sustains a less serious injury. The concept contains two components: the event (the cause) and the injury (the effect). Accident prevention consists of working towards being accident-free. There will be something to measure when safety is missing, but paradoxically nothing to measure when safety is present. [18] Freedom from an accident, a non-event, can always be deemed to be a successful end result. Accidents can be prevented through a top-down approach, for instance from an administrative level, or through a bottom-up approach, for instance on the local or individual level. [19] Hollnagel [17] argues that the focus should be on what goes right and to ensure that as much as possible goes right. This proactive attitude he calls "Safety II" and the reactive measures in turn as "Safety I". The Green Cross application here is an example of Safety I – a reactive measure to study "what goes wrong". For each serious accidental injury, there is a number of milder injuries. Only the part of accidents that result in serious physical or material injuries is usually recorded in the statistics [21]. The focus in the application explored in this study is at the school level. At the moment there is no nationwide monitoring system that would cover school injuries and near miss cases. [20] The Green Cross application that is

explored in this study, is seen as a reactive (Safety I) example of how to prevent accidents and how to make non-events visible for the individuals who work at the school, as well as for the parents and students.

Description of the Green Cross injury reporting application

When developing the software the aim was to design a tool for reporting accidents, injuries and near-miss cases in such way that the safety information could be visually shared in the school. The principal and school administration are in an essential role when bringing safety culture into practice. In this case, the staff is encouraged to make the injury and near-miss reports about the injuries in the school context. So far injuries in the schools involved in this study, have been reported on a paper form or with the student administration messaging system. These reporting methods contain student´s individual information and it has been challenging to get an overall picture of the injury situation without endangering the privacy of the students. Especially the near-miss cases have remained unreported.

The software was originally designed in cooperation with school authorities as part of regional quality assurance work in five communities around Pirkanmaa district. The aim was to design an application that contains visual elements, such as easily understandable icons and colours.

Green Cross visualizes the incidents of one calendar month in an interpretable format. There are three basic phases in the Green Cross safety improvement process: incident reporting; cause analyses and problem-solving. The quick incident reporting phase takes approximately 2–3 minutes, in which a basic description of the case is noted. This data, the reported cases, are dangers, injuries, accidents, violence, bullying or problems at work processes.

The Green Cross screen indicates one calendar month at a time, divided into 30/31 units (days). This view is made available to all users so that the whole community can easily see the safety situation in one view. If no reports are made and no incidents have happened, the units in Green Cross remain green.

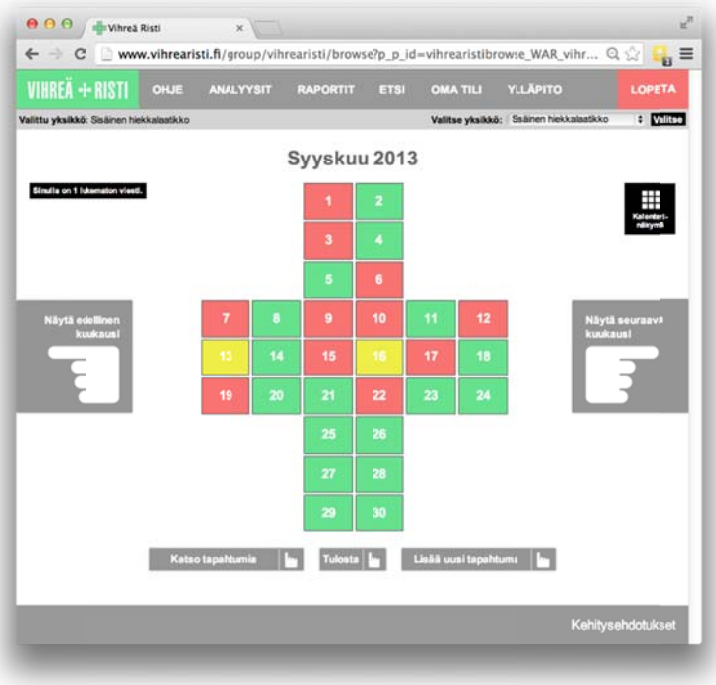

Figure 1. Screenshot of the basic Green Cross screen.

Figure 2. Screenshot for cause and risk analysis of the Green Cross tool.

When an incident has occurred and is reported, the units change color according to the classification of the incident. The color will turn red if the reported case is an actualized event such as an injury or accident, or alternatively yellow in a near miss case. This color-symbolized visual form provides a picture of the safety situation in one glimpse (Fig. 1).

During the ´cause and risk analysis´ phase the working methods, people, machines and other physical environments, as well as material and knowledge matters are discussed and analyzed in a team consisting of teachers and other employees in order to understand how the event happened (Fig. 2). Once the reported incident has been analyzed and the agreed safety improvement measures implemented, the analysis is marked complete. The software also provides injury reporting capabilities of all the school units at the municipal level.

Material and Methods

The aim of this study is to explore the injury data collection method piloted with the Green Cross software and to describe the characteristics of the school injuries with the available data. The analysis phase is not discussed deeper in this study. The sample consisted of injury reports in three (3) Finnish comprehensive schools (total 2200 pupils). Since the main approach of this pilot study was qualitative, in addition, structured open-response telephone interviews were carried out. Persons interviewed included teachers, principals as well as preschool and school administration staff, who had been using the application for two years. Permission for research was asked from the city´s school administration department, the principals and the game designer. For the injury data monitoring a permanent study permission exists in the school involved in this study. The study is done without any personal data, excluded the name of the person, who made the report. The average age of the responders was 51.8 years, average working years within education being 22. The data was studied separately with the mixed-methods approach and content-based analysis.

The study question was: Based on the phase of the Green Cross injury reporting system: What can we tell about the injuries and near-miss cases that are reported in the school? What is the dominating type of a school injury? Is the Green Cross application suitable for injury data monitoring in the school context? The injury reporting tool can be used for the analysis as well, but the

analysis phase is not studied deeper in this paper. The classification of the injuries will be based on a modification of the injury reporting system of the Finnish Rescue Services (PRONTO). [21]

Results

The data was collected in two ways: there were 102 (N=102) cases as reported Green Cross software data, of which 14 (14%) were near-miss cases. In addition, 38 cases (n=38) were mentioned at the interview of 10 respondents. 21 % (8) of them were near-miss cases. The data sources are presented here distinguished.

In the Green Cross software data, total amount of reported injuries was 88 (N=88) (Table 1). Of these 42 % (f=37) consisted of injuries caused by acting against norms or regulations, such as running through the door class or climbing on the school roof. In the themed interview of end-users, 38 cases were mentioned (N=38) (Table 2).

Examples of the cases reported distinguished above with the Green Cross tool and are here classified in five groups (Table 3).

Table 1. General characteristics of the reported injuries with Green Cross software (Data I).

General characteristics, Data I	f	% injuries (n=88)
acting against norms or regulations	37	42
physical education injuries	16	18
during recess	29	33
environment:physical learning environment	44	50
environment:social learning environment	14	16
environment:pedagogical learning environment	18	20
environment:psychological learning environment	7	8
more serious injuries	7	8

Table 2. Cases reported at the responder interview (Data 2).

Injury, accident or near-miss	f	%
trips, falls, risk-taking behavior	4	11
slips	4	11
violence, aggressive behavior	5	13
unsuitable object	1	3
structure, property	10	29
illness	6	16
traffic	3	8
other	4	11

Table 3. The reported Green Cross injuries, accidents and near miss cases classified in five groups (Data I + Data II).

Report type	Examples
Violence	violent behavior, a knife found in student´s clothing, bullying, student throwing objects, aggressive behavior, a student escapes from the school, throwing objects, student pushing other students
Injuries	pupil fell with skates, icy or slippery surface, a head hit to a stone wall, student fell down at a playground, finger injured by door, teacher was hit by hard baseball, student ran through window glass, student jumped down from storage building roof, allergic reaction, student´s head got stuck between the wall and the staircase, got injured at sports
Structural or technical failures	bad acoustics, broken handrail, school door was open, cleaner´s school keys were stolen, electrical appliance was broken, loose object in the door, indoor air pollution issues, loose door
Accidents	car or bicycle accident, student´s work jacket caught fire during the crafts lesson
Near miss[1]	hand was about to get injured in the angle grind machinery, allergic child got wrong food, speeding at the school yard, dusty air in the classroom

[1]These cases are reported as near miss cases by the person, who was reporting.

The responders reported about the repetitive individual violent behavior among the students, such as aggressive pushing, fight or carrying a knife at school. In the injuries group (Table 3), the winter time injuries are typical, and also the unpredictable happenings with a human factor. It has to be noted that here the person who makes the report also chooses between the options (see Figure 1) injury (the unit turns red) or near-miss case (the unit turns yellow). It seems, that most of the cases reported are physical or visible and happen to the pupils rather than injuries happening to the teacher or other school staff.

Discussion

As a conclusion, this study examined an application of web-based technology to report the injuries and near-miss cases in the school context. Findings here indicate that injuries in the school can be monitored, analyzed and collected with the help of a web-based software that contains visualized elements for quick reporting. However, some further development and design should be considered to motivate teachers to report all the incidents, injuries, and near-miss cases. [22]

In the light of this study, a novel finding was that many school injuries were unpredictable, connected to human factor issues, persons acting against norms and regulations or using structures or products in a way they are not supposed to be used. This makes predicting injuries challenging. The Green Cross solution provided equally and efficiently a documentation of the whole safety situation in the learning environment. About one-fifth of the reported injuries were near-miss cases. Without the Green Cross tool, these cases would remain totally unreported. According to the responders the typical injury during the school day was related to structural issues, for instance, broken or malfunctioning property.

Green Cross provided a roadmap and an analyzing method for monitoring and preventing the injuries and near-miss cases. Based on this study it looks clear that the Green Cross software works quite well for monitoring physical or structural injury cases in the school context. Yet there are certain weaknesses in the reporting system that should be developed further. For instance, there is no possibility to choose the gender or age of the injured person. Further on, the person, who makes the report, makes the preference between near miss and injury. This may cause some contradictions in the analysis phase. Also, if an systematic process for school bullying needs to be reported with the Green Cross tool, the issue should be better supervised and mentored. Practical measures can be seen essential for enhancing safety culture [14,15]. Yet, the software was not very useful when reporting repeatedly happening or escalating accidents, such as aggressive behavior, where no new measures in the classroom could be taken anymore.

This software provides a decent way to monitor the injuries in the school context so that the accidents, incidents, injuries and near-miss cases will become more visible. In this study, it was found that structural dimension, unpredictability and the human factors dominate the risks at the school. To be able to get the more holistic picture of the injury situation, it is necessary to get a bigger data of the injury cases. However, based on the user interviews, the injuries in schools are assumed to remain under-reported. Compared to previous injury monitoring methods, the Green Cross application provides a whole picture of the injuries day by day and in one glance. The reporting tool is designed with visual elements such as colors and symbols instead of using a traditional reporting form. There are still challenges to support the school staff in reporting the injuries and near miss cases. The process is not yet well-established in the school context, and more effort should be put to engage and motivate teachers to report more actively. For instance, gamification characteristics could be added to the application such as personal scoring or pictures.

By monitoring the injuries it is possible to enhance the safety culture in a reactive way. This phase looks essential and enables learning from accidents and near-miss cases and not by shocks. Yet it would be even more important to create a proactive safety culture in such way that these incidents would not happen at all. As Hollnagel [10] puts it: “the primary phenomena are the adverse outcomes and how they come out, and safety is a name for the condition that exists when the adverse outcomes do not happen.” To share Hollnagel´s statement, further studies are needed for making a deeper analysis, to find the root reason and to support the preventive efforts.

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