

Design Development of Customized First Aid and Rescue Gloves for
the Improvement of Work Efficiency of fire department Paramedics

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Introduction As the modern society becomes more complex, various disasters and accidents are occurring. After the 9/11 terrorist attacks and radioactive leakage accidents, proper correspondence of disasters and emergency situations has become a global interest, and disaster factors such as mass urbanization and overpopulation, enlargement of buildings, increase of dangerous facilities, and so on have rapidly increased, which has led to yearly increases of accidents and emergency situations (Shin et al., 2013). In Korea, when human life is at stake in emergency situations such as terrorist attacks, fires, and disasters, fire department paramedics provide first aid, and not only transport people to medical facilities but also carry out important tasks of controlling the area through close contact with HQ (Ham et al., 2014). However, the only gloves provided for the fire department paramedics for rescue activities are latex gloves, and as our previous study on fire fighters' equipment showed, this study mainly focuses on fire fighting or rescue activities which lack a design development for gloves that reflects the needs for specific roles required of the paramedics. Hence, the purpose of this study is to derive the needs of key designs required during rescue activities for enhancing the safety of the fire department paramedics and their work efficiency, to create a design improvement index that satisfies these needs, and to develop a customized glove design for first aid and rescue workers can use other than latex gloves.

Methods This study adopted the Living Lab concept and conducted research with the cooperation of actual fire department paramedics. The processes for carrying out the study are as follows: first of all, based on preceding studies, information websites about fire fighting, press releases, and such, and the work situations of the paramedics in accordance with work classifications were categorized and examined. Secondly, a survey was conducted on 449 paramedics through Survey Monkey, an online survey website, for 25 days from November 27th to December 21st 2015, and required participants to state current matters of performance and expected improvements in the design of first aid and rescue gloves in accordance with various work situations and work classifications. Thirdly, in-depth interviews were carried out over three visits to a fire fighting center with six currently working paramedics, and the design needs for first aid and rescue gloves in work situations in three major categories including patient transfer,

contact with HQ or hospital, and emergency first aid were derived and specifically analyzed. Finally, this study developed a prototype of a customized glove design for the improvement of work efficiency of the paramedics through discussions on design development with a special materials company and a glove manufacturing company.

Finding & Discussion The design needs in the main tasks of the paramedics were as follows: first of all, when transferring patients, the slipperiness of the inside of the gloves was the greatest problem, and in situations when having to contact HQ or the hospital, they were experiencing difficulties having to take off the gloves to control their smart devices. Also, in immediate emergency situations, wearability without distraction to hand movements was shown to be the most important problem. Reflecting these needs, this study presents a design prototype that improves on the following functions in way of developing professional gloves specialized for rescue activities: firstly, a silicon coating on the palm area of the gloves have been added for holding stretchers when transferring patients and to enhance gripping. Secondly, smart touch functions have been affixed to the thumb, index finger, and middle finger of the glove to get rid of the inconvenience of having to take off the gloves when controlling smart devices. This is to promote efficiency when contacting HQ or a hospital. Thirdly, an E-band is applied to the wrist area to keep the gloves on tight and prevent them from falling off easily. Especially, a gusset has been inserted to give some space so that the gloves can be taken off easily when intended.

Conclusions and Further Research The purpose of this study was to develop customized gloves for first aid and rescue by reflecting the needs of fire department paramedics by considering the various work situations of rescue and first aid, and in order to do so, this study suggests a design solution based on in-depth interviews and surveys. Based on the results of the study, continuous global research is anticipated through status analysis and regional comparison analysis of fire department paramedics in various countries and regions in the future.

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