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# Construction Safety Simulations and Students' Perception of Stress

**M. Jaeger**[1]
Senior Lecturer
Australian College of Kuwait
Kuwait
m.jaeger@ack.edu.kw

**D. Adair**
Associate Professor
University of Tasmania
Tasmania
d.adair@utas.edu.au

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It has been stated that safety education, as a priority for construction management students, often has not been high [1]. Safety education can be fairly unreal in that it focuses exclusively on safety issues and safety training, which is primarily based on safety rules, and does not lead to the required improvement [2]. Therefore, the authors of this paper propose to supplement safety education with simulations of real world construction situations, which include social aspects such as communication with other project members, tasks not directly related to safety issues, and stress caused by time pressure. However, how do students perceive an increased level of stress caused by the simulation?

The study is based on a quasi-experimental post-test design, which compares the perceived stress levels of an experimental group (i.e. a group of students exposed to a simulator with stress), with the perceived stress level of a control group (i.e. a group of students exposed to the same simulator, but without stress). The stress for the experimental group was caused by time-pressure, generated by the count-down of a given time limit and re-occurring on-screen messages which commanded the student to speed up.

ANOVA and Regression Analysis revealed that the perceived stress level of students who applied the simulator with stress has been shown to be insignificantly higher than the perceived stress level of students who applied the simulator without stress. Since the stress produced by time pressure was 'intrin-

[1] M. Jaeger, m.jaeger@ack.edu.kw

sic' in nature (i.e. related to the time limitation of the cognitive process of realizing safety issues and developing adequate responses to it), this result seems to confirm earlier findings [3, 4, 5] in that students perceive the stress's facilitating effect on learning and, therefore, do not perceive it as negatively as one may have expected. Furthermore, the results indicate an interesting phenomenon. The highest correlation between influencing variables and the perceived stress level for both simulator types was for the variable *motivation*. The motivation of students to score high seems to have a higher influence on perceived stress than the number of attempts it took to derive an acceptable answer, the ease of simulator use, or the perceived necessity to learn new aspects. Looking at the different stressors, which are related to learning and which were found earlier [6], the students' own motivation does not seem to be a much considered stress factor. The negative correlation of the variable ease of use with the perceived stress level for the students who applied the simulator with stress was to be expected: The easier the application of the simulator, the less stress it will cause. The result of the Regression Analysis seems to indicate that the *ease of use* is the strongest predictor of all (although negatively correlated), followed by *motivation, attempts* and *new aspects*.

The results and findings of this study seem to contribute to simulator based learning of construction safety in different ways. First, this research confirms earlier findings that 'intrinsic' stress does not seem to impair learning. The difference in perceived stress was insignificant between the experimental and the control groups. Secondly, the influence of students' motivation on perceived stress has been shown to be higher for both simulators (with and without stress) than the number of attempts it took to derive an acceptable answer, the ease of simulator use, or the perceived necessity to learn new aspects. Students' motivation as a stressor may have been under-estimated in the past.

This study can encourage engineering educators and institutions of engineering education to explore and implement ways to include stress in simulations since it helps to prepare students for real world situations and does not seem to impede their learning by adding an unreasonable level of stress. ■

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