

THE COMPARISON STUDY OF THE USE OF STEEL AND CARBON FIBER SELF-CONTAINED BREATHING APPARATUS (SCBA) AMONG FIREFIGHTERS: THE EVALUATION OF EFFECTS

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ABSTRACT

SCBA (Self-Contained Breathing Apparatus) is an air containing unit which is used in a limited amount of air area, in toxic gas contaminated atmospheres or for rescue operations. In the past, SCBA air cylinders were made from steel which was heavy and inconvenient for use. Later on, due to the development of material technology the lighter material came to replace them for weight reduction and the most modernized SCBA's air cylinders were made from carbon fiber.

The purpose of this study was to compare the use of steel and carbon fiber SCBA among firefighters. Firefighters performed the practice training under the simulated rescue operation in test stations. The results from this study show that the heart rate before and after using steel SCBA was statistically significantly different at 95 % confidence interval level ($p < 0.001$) where the heart rate after using SCBA was increased from before using SCBA. The heart rate before and after using carbon fiber SCBA was statistically significantly different at 95 % confidence interval level ($p < 0.001$) where the heart rate after using SCBA was increased from before using SCBA. The difference (Delta) of heart rate between steel and carbon fiber SCBA was not statistically significantly different at 95 % confidence interval level ($p = 0.237$). The sweat loss before and after using steel SCBA was statistically significantly different at 95 % confidence interval level ($p < 0.001$) where the body weight (nude) after using SCBA was decreased from before using SCBA. The sweat loss before and after using carbon fiber SCBA was statistically significantly different at 95 % confidence interval level ($p < 0.001$) where the body weight (nude) after using SCBA was decreased from before using SCBA. The difference (Delta) of sweat loss between steel and carbon fiber SCBA was not statistically significantly different at 95 % confidence interval level ($p = 0.580$). The fatigue in all body parts between using steel and carbon fiber SCBA was statistically significantly different at 95 % confidence interval level ($p = 0.006$) where the using steel SCBA caused more fatigue.

The results from this study show that the use of steel and carbon fiber SCBA had no different effects on heart rate and sweat loss, but found the differences on fatigue when using different types of SCBA, because in this study the rescue operation was done within only 10 minutes which is a shorter duration than the duration in actual rescue or firefighting operation.

KEY WORDS: SELF-CONTAINED BREATHING APPARATUS (SCBA) / FIREFIGHTERS / HEART RATE / SWEAT LOSS / FATIGUE

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