

UNIVERSITI TEKNOLOGI MARA

**THE EFFECTS OF
MOTORCYCLING NOISE ON
PHYSIOLOGICAL STRESS
REACTIVITY, HEARING AND
COGNITIVE FUNCTION AMONG
UNDERGRADUATES IN PUNCAK
ALAM**

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ABSTRACT

Noise is an environmental stressor. Chronic exposure of noise deteriorates the health. Literature revealed an acute gap in auditory and non-auditory health profiling of young (19 to 25 years) motorcyclists. This study examined it through cross-sectional and experimental setups, which consisted of Four *Phases* of health profiling. *Phase I*, riders' noise sensitivity (NS) and Health-related Quality of Life (HRQOL) was determined through survey-based study ($n = 301$). Participants were categorised into three groups of NS index: Low-Noise Sensitivity (L-NS: $M = 65.72$, 15.3%), Moderate-Noise Sensitivity (M-NS: $M = 82.5$, 66.8%) and High-Noise Sensitivity (H-NS: $M = 101.8$, 17.9%). HRQOL index consisted of Physical, Psychological, Social, and Environmental domain with mean scores of 64.0, 69.1, 65.7, and 67.6 respectively. No gender differences were observed with respect to NS ($p = 0.075$) and HRQOL ($p = 0.0802$). However, motorcycle riding experience (< 4 years) was significantly related ($p = 0.017$) to H-NS while HRQOL decreasing trend was observed between L-NS, M-NS and H-NS groups ($p = 0.004$). *Phase II*, the prevalence of Hearing Loss (HL) and Hearing Impairment (HI) of riders ($n = 174$) was conducted by using Pure-Tone Audiometry test. HL was found among all riders (94.3% bilateral, 5.7% non-bilateral) while HI was 58.6% (34.5% bilateral, 24% non-bilateral). The significant association was also observed between HI and distanced travelled per day ($p = 0.034$). *Phase III* determined the noise-induced salivary cortisol concentration ($\mu\text{g/dl}$) among L-NS and H-NS motorcyclists ($n = 57$) from field motorcycling exposure. Saliva samples were collected *before* and *after* the ride through passive drool technique and cortisol concentration ($\mu\text{g/dL}$) levels were measured in triplicates using high sensitivity human salivary cortisol-ELISA kits (Salimetrics, USA). H-NS group cortisol concentration *after ride* ($M = 0.163 \mu\text{g/dl}$, $SD = 0.1$) was found significantly higher ($p = 0.008$) than *before ride* ($M = 0.119 \mu\text{g/dl}$, $SD = 0.08$). Average sound levels and Time-Weighted (TWA) were measured using personal dosimeter based on OSHA-HC (93.64 dBA, TWA: 76.82 dBA), OSHA-PEL (92.51 dBA, TWA: 75.69 dBA) and ACGIH/NIOSH (95.29 dBA, TWA: 85.16 dBA) standards. *Phase IV* determined the effects of noise on cortisol concentration, cognitive function, and reaction time ($n = 60$) in controlled experiment where noise-exposed group (≤ 90 dBA) showed significantly higher ($p = 0.010$) cortisol levels ($\mu\text{g/dL}$) *after* ($M = 0.21 \mu\text{g/dl}$, $SD = 0.11$) than *before* ($M = 0.16 \mu\text{g/dl}$, $SD = 0.10$) noise exposure. Moreover, the control group (≤ 65 dBA) showed significantly better performance ($p < 0.01$) in overall Lowenstein Occupational Therapy Cognitive Assessment test and reaction-time (seconds) compared to the noise-exposed group (≤ 90 dBA). Conclusively, motorcyclists with H-NS tend to have lower HRQOL and higher stress reactivity from motorcycling, also suffer from affected auditory health with Hearing Loss and Hearing Impairment, while cognitive performance also decreased with the noise exposure (≤ 90 dBA). It is recommended to investigate the chronic health effects from motorcycling by undertaking longitudinal research and explore its relation to accidents.

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