Establishing Injury Risk Cut-Offs for Bone Density and Body Composition in Professional Female Ballet Performers

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INTRODUCTION:

Dual energy X-ray absorptiometry (DEXA) is a common tool for quantifying bone mineral density (BMD), bone mineral content (BMC), and body composition (lean mass, LM; fat mass, FM) in a wide range of populations for the purpose of screening and monitoring of total or regional bone and soft tissue over time or following injury. Criteria for low bone density (osteopenia / osteoporosis) are typically based on z- and t-score calculations, which score an individual's BMD against the mean of the general population using the following formulas:

Z-score = (BMD – Mean Age Matched General Population BMD) / General Population Standard Deviation.

T-Score = (BMD – Mean General Population BMD for Age 30) / General Population Standard Deviation.

Z/T < -1 = Osteopenia | Z/T < -2.5 = Osteoporosis

However, these criteria do not incorporate factors such as physical activity (particularly in athletes) or body mass that influence bone loading and physiologic BMD requirements for injury prevention. These criteria are also not based on direct injury data but rather an assumption that certain degrees below the population mean increase non-specific fracture risk. Female professional ballet performers are a unique population that undergo substantial physiologic stresses related to training, performance, and, at times, reduced energy availability that can result in elevated incidences of injury relative to their male counterparts and, even more so, the general population. However, there are currently no population-specific cut-offs based on DEXA as it relates to injury risk to appropriately screen and identify those who might benefit from nutritional or activity-based interventions for injury prevention. Therefore, the **purpose** of this study was to develop population-specific DEXA cut-offs for BMD and body composition in professional female ballet performers based on injury risk.

METHODS:

All procedures for this investigation were approved by the institutional review board for research involving human subjects. Data for one-hundred-thirty-two (25p>

FEMALES: Injury Thresholds
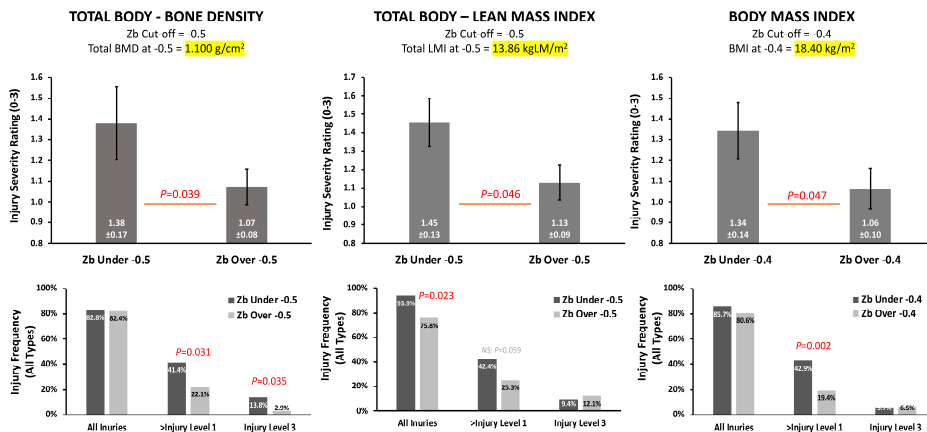
Data are presented as means±95%CI for injury severity (TOP) and injury frequencies (BOTTOM) for those under vs. above the specific Zb-score injury cut-off for each measurement. *P*-values are provided for all significant pair-wise comparisons. Type-I error set at ∝=0.05.