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Corridors based on Principal Component Analysis

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## A Method for Developing Biomechanical Response Corridors based on Principal Component Analysis

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### Abstract

The standard method for specifying target responses for human surrogates, such as crash test dummies and human computational models, involves developing a corridor based on the distribution of a set of empirical mechanical responses. These responses are commonly normalized to account for the effects of subject body shape, size, and mass on impact response. Limitations of this method arise from the normalization techniques, which are based on the assumptions that human geometry linearly scales with size and in some cases, on simple mechanical models. To address these limitations, a new method was developed for corridor generation that applies principal component (PC) analysis to align response histories. Rather than use normalization techniques to account for the effects of subject size on impact response, linear regression models are used to model the relationship between PC features and subject characteristics. Corridors are generated using Monte Carlo simulation based on estimated

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