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**Title:** Optimal length for tongue protrusion force in humans

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**Body:** Purpose There have been relatively few investigations of the length–tension curves for tongue protrusion (e.g. 1). Resting (not optimal) length is usually used with the tongue tip near the incisors to measure peak tongue protrusion force (e.g. 2). As the human tongue is a unique structure with intrinsic and extrinsic muscles in a hydrostat, its force generating capacity in protrusion likely reflects the interaction of several muscles. Methods Quasi–isometric maximum voluntary contractions of tongue protrusion were measured in 10 healthy subjects (n=10; 6F; 27.5±1.1 years). Tongue force was recorded with the tongue tip at 8 different positions relative to the incisors, at 12 and 4mm protrusion, 0 position, and 4, 12, 16, 24 and 32mm retraction. Measurements were made at FRC. Results from each subject were normalised to the maximal value. Results given as Mean±SEM. Results Mean peak force displayed a typical length–tension curve over the range of positions, increasing from 24±2N, at 32mm retraction, to a peak of 28±3N, at 24mm retraction. When the tongue was protruded by 12mm, mean peak force was 15±2N. Subjects generated greater forces when the tongue was retracted than when protruded (p<0.05). Normalised percentage of maximum force was highest at 24mm retraction (91±3%) and lowest at 12mm protrusion (47±3%). Maximum force for each subject ranged between 12–32mm retraction with the median at 16mm retraction. Conclusion These results describe voluntary protrusion forces across a wide range of tongue positions. Further studies are needed to assess the physiological relevance of these findings. 1. BuSha, et al. Resp Physiol Neurobiol (2002). 2. Eckert, et al. J Appl Physiol (2011).