CONCLUSION: We observed a decrease in MMG_{QAMP} during submaximal isometric contractions performed at the same absolute torques following 3 and 6 weeks of 80% 1RM, but not 30% 1RM resistance training. These decreases are similar to the reductions in voluntary activation that we observed previously at submaximal torques following 3 and 6 weeks of high-, but not low-load training. Therefore, we suggest that MMG amplitude is sensitive to training-induced changes in motor unit activation during high- versus low-load training.

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Prediction of Ground Reaction Forces of Flexible Barbells using their Bar End Displacement

Mehmood Mallick, Sunyeop Lee, Randolph E. Hutchison, Anthony Caterisano, FACSM. *Furman University, Greenville, SC.* (Sponsor: Anthony Caterisano, FACSM)

(No relevant relationships reported)

PURPOSE: The Flexible Barbell (FB) has been used in various strength and conditioning programs at levels from high school athletics to professional programs such as the National Football League. Yet, fundamental characteristics of the various models of the barbell are unknown. The purpose of this study was to investigate if flexible bar end displacement could predict peak ground reaction forces (GRFs) to aid in training applications.
METHODS: Six models of flexible barbells at nine different loading conditions were lifted by a machine set atop a force platform with barbell motion recorded by an eight- camera 3-D motion capture system. Typical exercises such as the bench press and squat were simulated lifting the barbell a total displacement of 30.5 cm up and 30.5 cm down per repetition at a range of lifting velocities from 0.15 m/s to 1.55 m/s. Linear regression models were run to predict measured GRFs from FB bar end displacements.
RESULTS: Significant linear regression models predicted peak GRFs for all models of the FB and the associated loading conditions based upon maximal bar end displacements (Table 1).
CONCLUSIONS: Although these results will require follow-up confirmation studies with human subjects, coaches in training programs can use bar end displacement to predict peak external loading from lifting the FB. These predictions are useful among a large range of physiologically relevant lifting velocities typically seen in athletic training programs.

Prediction of peak ground reaction force based on bar end displacement linear regression model at ea

Bar Type	Loading (kg)	R^{2*}
Ultra Light	6.56	0.938
Golf SS	10	0.922
Light	15	0.899
Light	28.6	0.988
Light Plus	28.6	0.915
Level 1	28.6	0.976
Level 1	46.7	0.944
Level 3	28.6	0.954
Level 3	46.7	0.942
*denotes statistical significance (p<0.005)		

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Comparison of Peak Ground Reaction Forces at Natural Frequencies of a Flexible Barbell

Randolph E. Hutchison, Sunyeop Lee, Anthony Caterisano, FACSM. *Furman University, Greenville, SC.* (Sponsor: Anthony Caterisano, FACSM)

(No relevant relationships reported)

PURPOSE: The Flexible Barbell (FB) has been used in various strength and conditioning programs at levels from high school athletics to professional programs such as the National Football League. Yet, fundamental characteristics of the various models of the barbell are unknown. The purpose of this study was to compare peak ground reaction force (GRF) response at natural frequencies (NF) of various models of the FB at typical loading conditions.
METHODS: Six models of FBs and a steel Olympic barbell (SB) at nine different loading conditions were lifted by a machine set atop a force platform with barbell motion recorded by an eight-camera 3-D motion capture system. Typical exercises such as the bench press and squat were simulated lifting the barbell a total displacement of 30.5 cm up and 30.5 cm down per repetition at a range of lifting velocities from 0.15 m/s to 1.55 m/s. Two NFs were identified at the lifting velocity in which both the previous and following lifting velocities showed a decrease in bar end displacement. Independent-samples t-tests were used to compare the FB to a similarly loaded and lifted SB at the FB's NFs. Effect sizes were calculated using Cohen's *d*.
RESULTS: All models and loading conditions of the FB had significantly higher peak GRFs than the SB at all NFs (Table 1).
CONCLUSIONS: Although these results will require follow-up confirmation studies with human subjects, coaches in training programs can use bar end displacement to predict peak external loading from lifting the FB. These predictions are useful among a large range of physiologically relevant lifting velocities typically seen in athletic training programs.

Comparison of ground reaction forces at first two fundamental frequencies of flexible barbell (FB)

FB Type (Loading)	Fundamental Frequency	Lifting Velocity (m/s)	Peak GRF (N)	Peak GRF (N) of Equivalently loaded Steel Bar	Effect Size, d
Ultra Light (6.56 kg)	1st	0.62	190±2*	167±2	11.5
Light (6.56 kg)	2nd	1.01	527±6*	337±5	34.4
Golf SS (10.0 kg)	1st	0.54	262±2*	191±4	22.5
Golf SS (10.0 kg)	2nd	0.91	418±3*	355±6	13.3
Light (15.0 kg)	1st	0.67	858±4*	310±4	137
Light (15.0 kg)	2nd	1.14	889±6*	651±8	33.7
Light (28.0 kg)	1st	0.49	680±12*	396±8	27.8
Light (28.0 kg)	2nd	0.78	1033±2*	666±5	96.4
Light Plus (28.6 kg)	1st	0.52	963±36*	402±6	21.7
Light Plus (28.6 kg)	2nd	0.83	1020±3*	723±5	72
Level 1 (28.6 kg)	1st	0.67	1232±5*	513±6	130.2
Level 1 (28.6)	2nd	1.09	1754±18*	1006±32	28.8
*Significance at p<0.05					