Effects of High- and Low-Velocity Resistance Training

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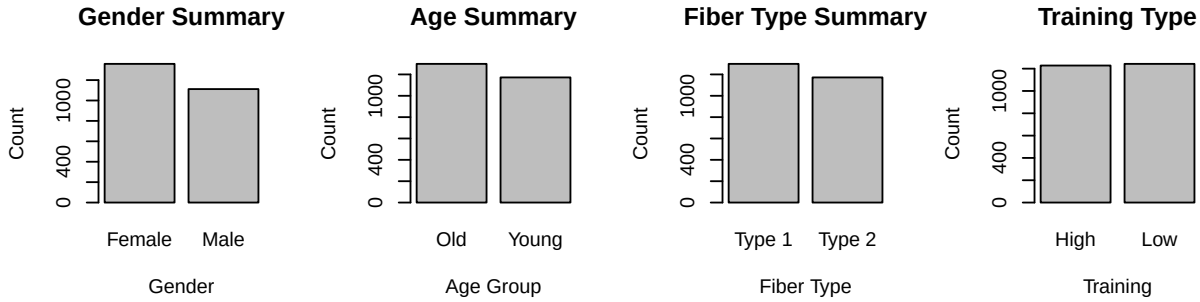
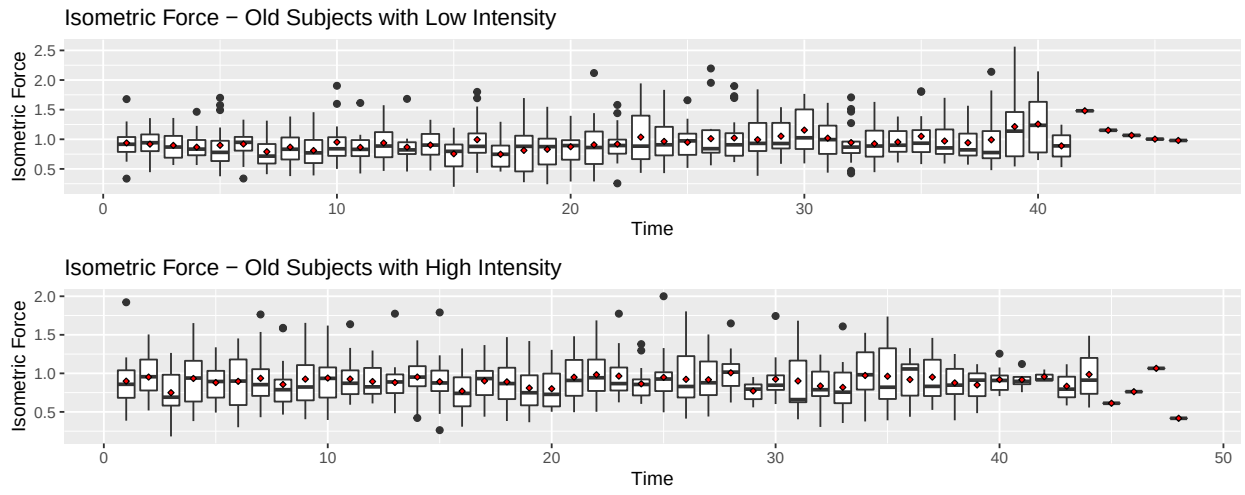
Since this is regarding physical activity, I feel that age will carry significant importance along with gender. One concern that I have immediately is how often the measurements are taken and any other outside conflicts that could be impacting peoples ability to perform some of the activities. I will assume that all subjects have a similar schedule of measurements and exercise frequency.Immediately, data from both data sets is merged using the 'id' variable and the merge.data.frame() function. Second, subsets are made for young vs old and subsets are then made for low vs high intensity. To verify balance of data, basic plots were made to compare counts of gender, age group, fiber type, and training type. There are slightly more females but I believe the data is well-balanced.



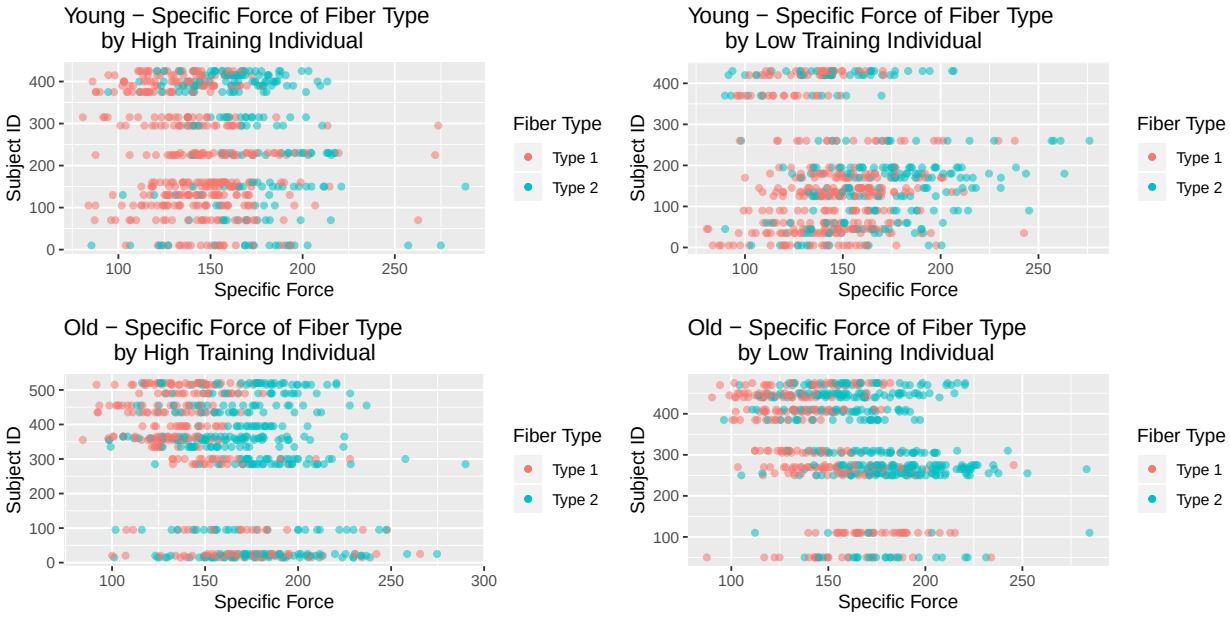
Force Changes Over Time

Grouping by individuals, we can see the measurements of Isometric Force over time by age and training intensity. This didn't show as much difference as I had expected so I commented out the plots of Specific Force since they don't give much more insight. A couple things we can pull from these plots are that there are more measurements for old subjects in comparison to young subjects. There may have been some dropouts or possibly more training sessions.

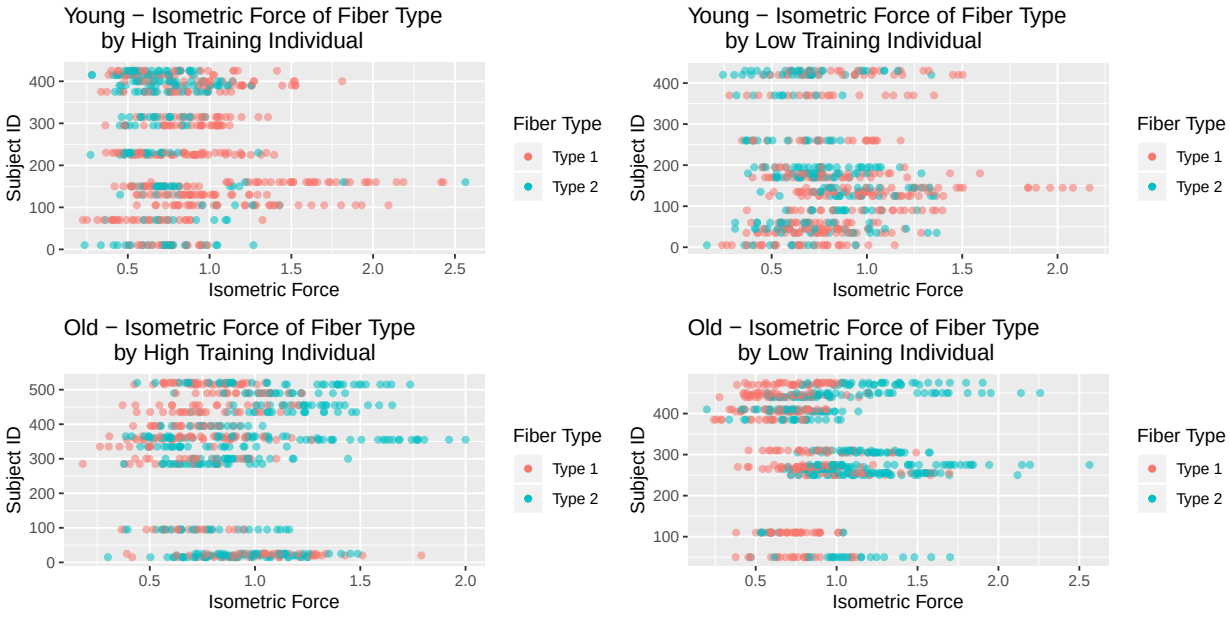


Force Change Relative to Fiber Type, Training Velocity, and Age

Specific Force



Isometric Force



The other variable that came to mind to dig into was fiber type since certain exercise types focus on different muscle fiber types. With young subjects, we see that fiber type isn't clearly separated like it is for older individuals. Also, type2 muscle fibers have higher force measurements in older individuals, but seems to be the opposite with young subjects where type1 measurements are on the higher end. However regarding specific force, both age groups have higher measures of force with type 2 fibers in comparison to type 1 fibers.

Isometric Force Model Comparison

Table 1: Isometric Force Model Summary

	Estimate	Std. Error	t value	Pr(>|t|)
Specific Force	0.0032658	0.0002097	15.5753872	0.0000000
Pre/Post	-0.0387841	0.0119611	-3.2425272	0.0012006
Intensity	0.0041234	0.0119302	0.3456285	0.7296514
BMI	0.0195707	0.0018213	10.7454257	0.0000000
Gender	0.1396490	0.0120605	11.5790300	0.0000000
Age	-0.0725879	0.0122514	-5.9248696	0.0000000
Fiber Type	-0.0269500	0.0133208	-2.0231457	0.0431660

Table 2: ANOVA Comparison - LM vs. LMER

	Df	AIC	BIC	logLik	deviance	Chisq	Chi Df	Pr(>Chisq)
LM	9	1001.095	1053.407	-491.5476	983.0952	NA	NA	NA
LMER	11	1003.653	1067.589	-490.8264	981.6528	1.442417	2	0.4861644

Specific Force Model Comparison

Table 3: Specific Force Model Summary

	Estimate	Std. Error	t value	Pr(>|t|)
Isometrice Force	27.4553706	1.7627408	15.5753872	0.0000000
Pre/Post Measure	-3.8245428	1.0963381	-3.4884703	0.0004943
Intensity	0.1793458	1.0938985	0.1639511	0.8697831
BMI	-0.1549665	0.1708357	-0.9071081	0.3644384
Gender	-8.9635362	1.1210654	-7.9955512	0.0000000
Age	-1.9799390	1.1305968	-1.7512336	0.0800301
Fiber Type	24.1585126	1.1212877	21.5453295	0.0000000

Table 4: ANOVA Comparison - LM vs. LMER

	Df	AIC	BIC	logLik	deviance	Chisq	Chi Df	Pr(>Chisq)
LM	9	23331.07	23383.38	-11656.53	23313.07	NA	NA	NA
LMER	11	23332.50	23396.44	-11655.25	23310.50	2.566646	2	0.277115

When comparing results between the two models with differing dependent variables, we can see that more variables are seen as statistically significant when it comes to impact on isometric force in comparison to Specific Force. Neither model sees intensity level as significant, but both see gender, age, and the opposing force as signficant. BMI is significant regarding Isometric Force, but not Specific Force. At significance level of .05, both forces see fiber type as significant but only Specific Force would see it as signficant at a lower threshold. Lastly, analyzing AIC, BIC, and P-values, applying the linear-mixed model showed significance when used for Specific Force, but not regarding Isometric Force.

Outside Resources: rdocumentation.com, sthda.com, Linear-Mixed Models with Examples in R