

# Part 5

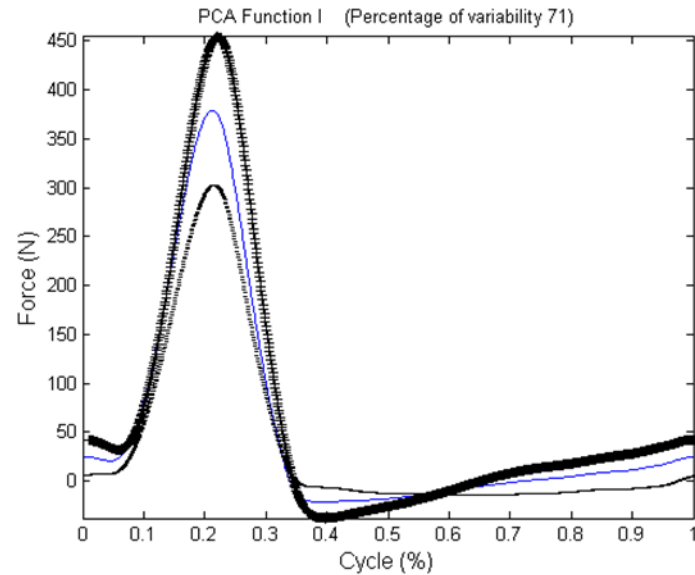
Considerations for choosing techniques

# Considerations for Choosing Techniques

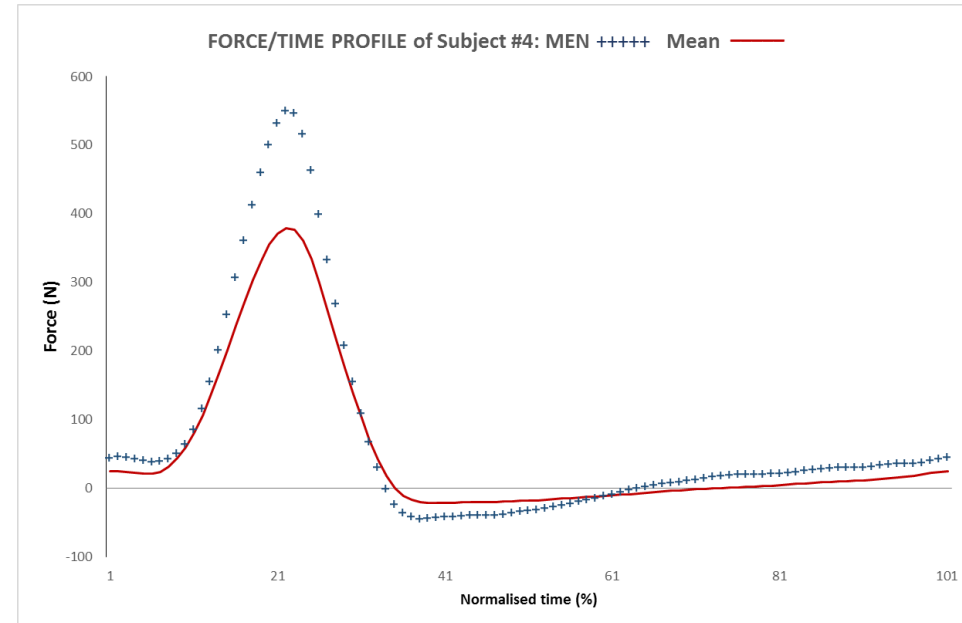
## FDA and *f*PCA vs SPM/ SPnM

- In FDA The smallest data entity is the curve (considers curve as a whole)
- Can be used for exploratory analysis or descriptive analysis (No specific hypothesis)
- The *f*PC scores *describe* the curves
  - The scores can be linked to individual curves
- FDA uses *f*PC scores for statistical analyses (e.g. hypotheses tests, discriminant analysis, effect sizes)

# fPC1 and mean force function for subject #4



fPC1: high scorers represented by +marks; low scorers by - marks



fPC scores relate to real subjects:  
Male subject #4 has highest fPC1 score

# fPC scores and real subjects

	fPC1	fPC2	fPC3
Male	2.134078	-28.8862	14.40326
	29.6124	1.449802	-3.05844
	8.108196	1.554195	1.554195
	45.63799	-6.45741	-1.82911
	32.86823	1.898335	7.02683
Female	-9.00321	8.545193	-2.72248
	-29.8595	-2.47577	-13.1602
	-35.9693	-20.343	-5.75385
	-15.4052	15.00169	4.344112
	-28.1237	13.72799	8.307957
t-test male v female	<i>p=0.001</i>	<i>p=0.580</i>	<i>p= 0.524</i>

**fPC scores relate to real subjects:**

- **Male subject #4 has highest fPC1 score**

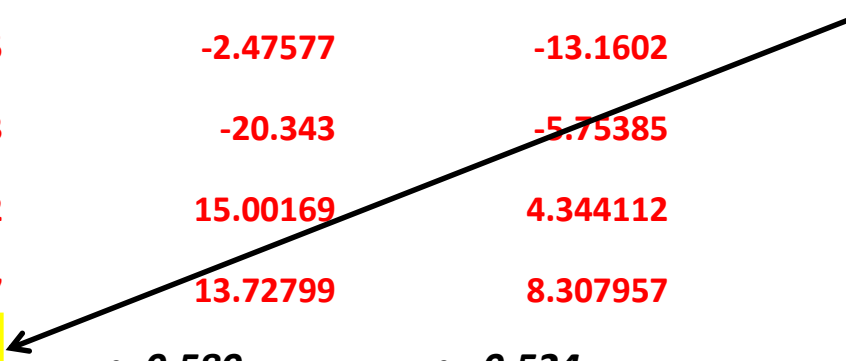
# fPC scores male vs female

	fPC1	fPC2	fPC3
Male	2.134078	-28.8862	14.40326
	29.6124	1.449802	-3.05844
	8.108196	17.53892	6.56476
	45.63799	-6.45741	-1.82911
	32.86823	1.898835	-7.09603
Female	-9.00321	8.545193	-2.72248
	-29.8595	-2.47577	-13.1602
	-35.9693	-20.343	-5.75385
	-15.4052	15.00169	4.344112
	-28.1237	13.72799	8.307957

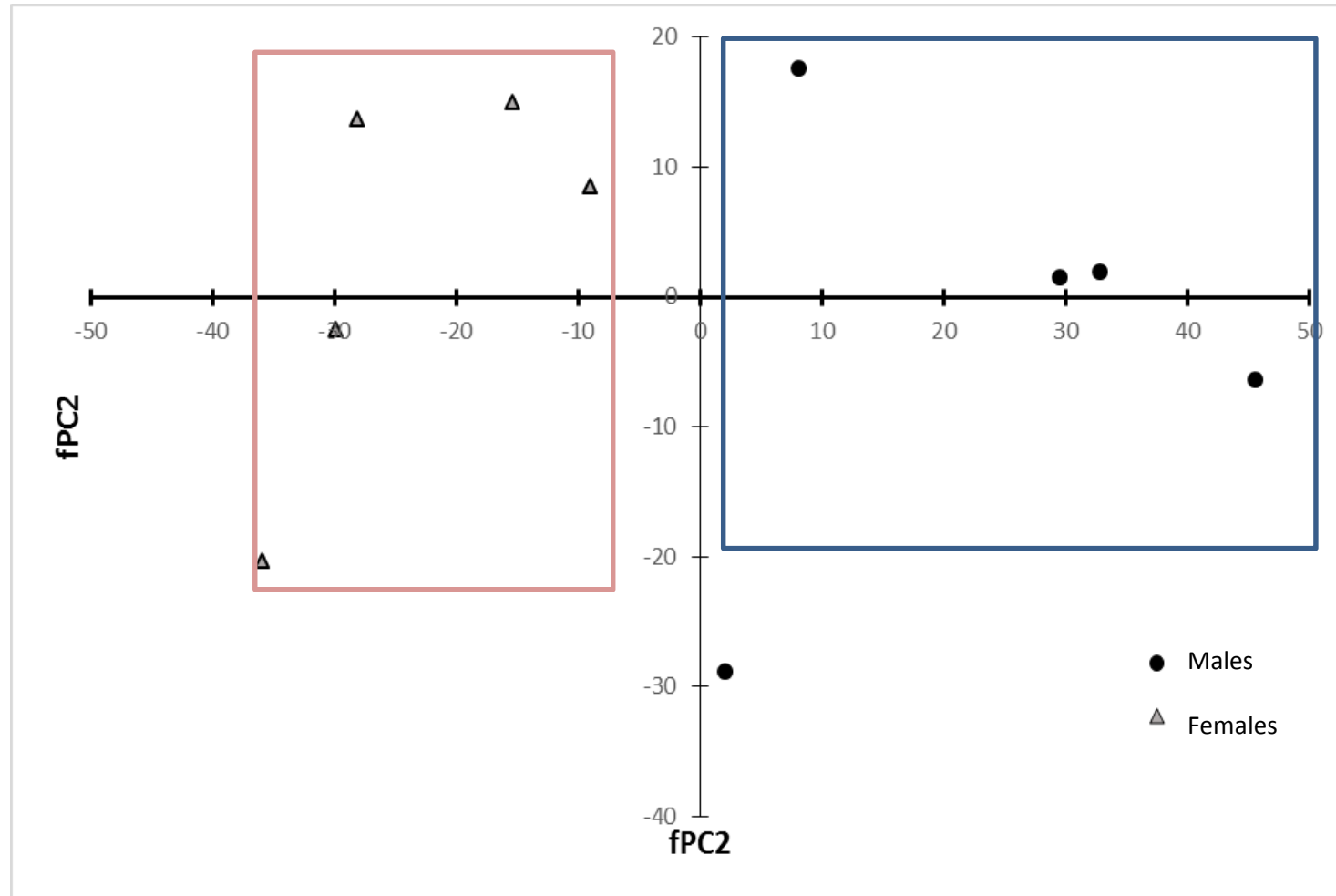
# fPC scores male vs female

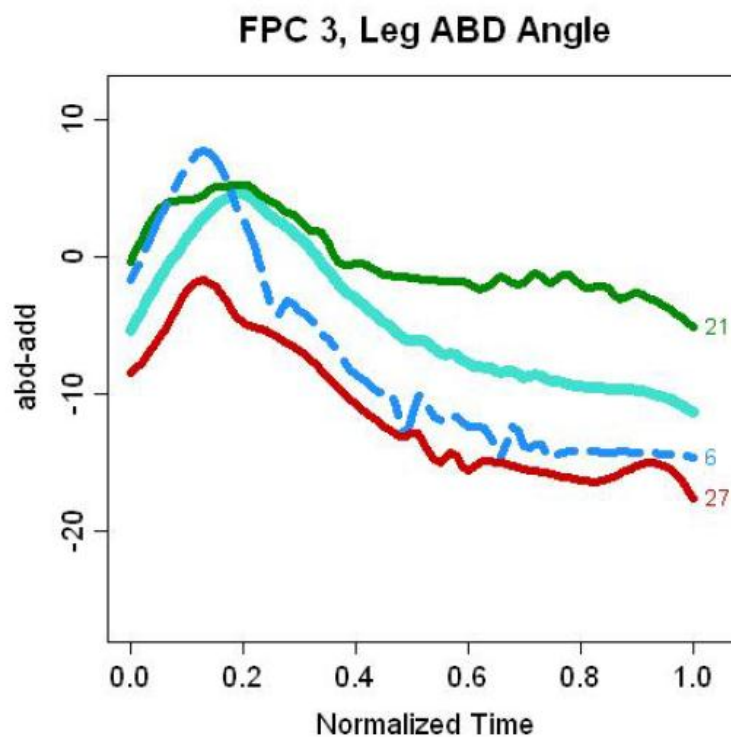
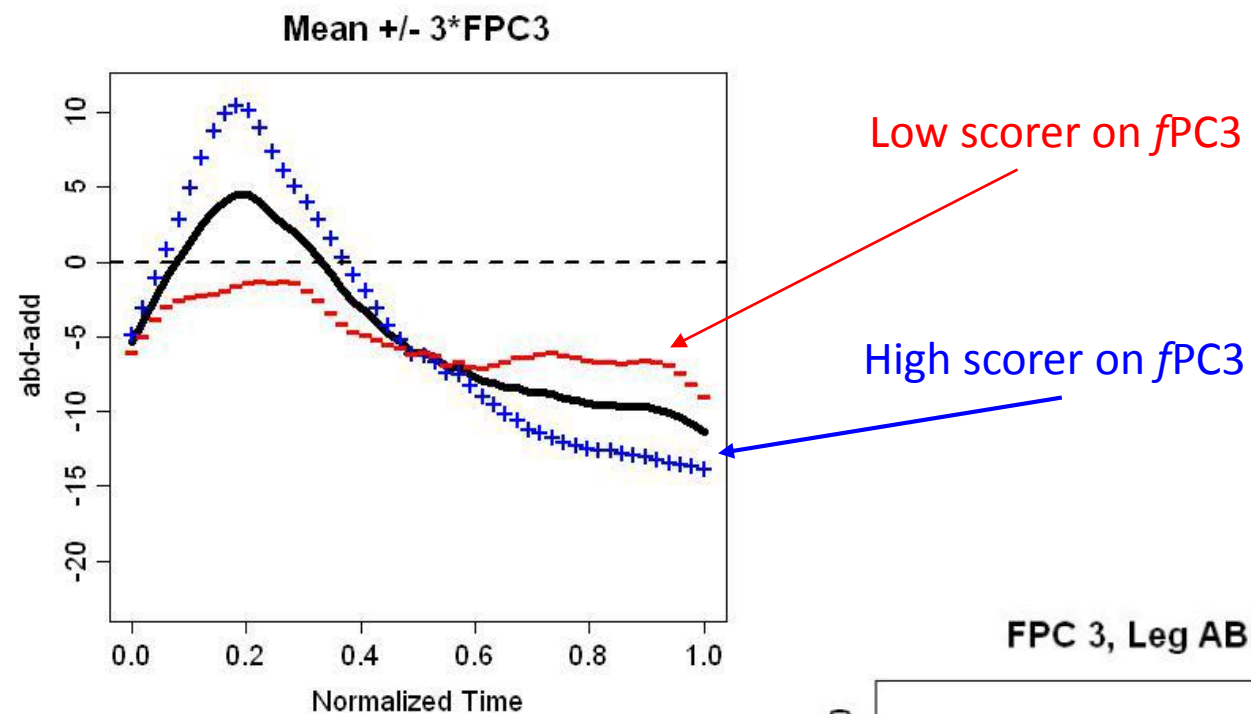
	fPC1	fPC2	fPC3
Male	2.134078	-28.8862	14.40326
	29.6124	1.449802	-3.05844
	8.108196	17.53892	6.53478
	45.63799	-6.45741	1.11111
	32.86823	1.898835	7.09603
Female	-9.00321	8.545193	1.62111
	-29.8595	-2.47577	-13.1602
	-35.9693	-20.343	-5.75385
	-15.4052	15.00169	4.344112
	-28.1237	13.72799	8.307957
t-test male v female	<b>p=0.001</b>	p=0.580	p= 0.524

fPC scores can be compared by group using t-tests or ANOVA etc..



# Scatterplot of fPC1 vs fPC2





Subject	FPC 1	FPC 2	FPC 3
23	3.0502	-3.3871	-0.1296
17	7.6099	-0.9098	-0.0030
28	-13.2772	-1.1054	-0.4858
15	5.0255	2.1885	0.3120
21	4.5706	1.3409	-1.6725
19	-2.9107	0.4518	0.8848
24	-1.9652	1.6254	-0.0518
26	2.4018	-0.4971	0.5116
14	-0.9837	-2.1859	0.9669
6	-3.8834	2.5169	1.2048
27	-6.7618	0.1459	-1.2579
22	7.1241	-0.1842	-0.2795

Curve #6 Looks similar shape  
to high scorer in *f*PC3



# Considerations for Choosing Techniques

- Functional t-test can identify portions of curves that are different
- Similar outcome to SPM and SPnM t test
- FDA routines is not easily accessible to non-programmers
  - Steep learning curve to select apply routines
  - Need to invest considerable time to understand FDA concepts
- SPM/SPnM has better accessibility in Biomechanics applications than FDA
  - Availability of code
  - Accessibility of supporting documentation

# Suitability based on the desired outcome

- For comparison of differences in ensemble curves (SPM or SPnM is very effective)
- Statistical comparisons of groups: either approach will work but SPM/SPnM may be easier
- For exploratory analysis FDA and linking patterns to individual participants (FDA may be more effective)
- Sample size, especially small sample sizes can be challenging for all methods, but especially for permutation methods (FDA t test & SnPM), and perhaps even more difficult for *f*PCA