RESEARCH STATISTICS

Binary logistic regression analysis

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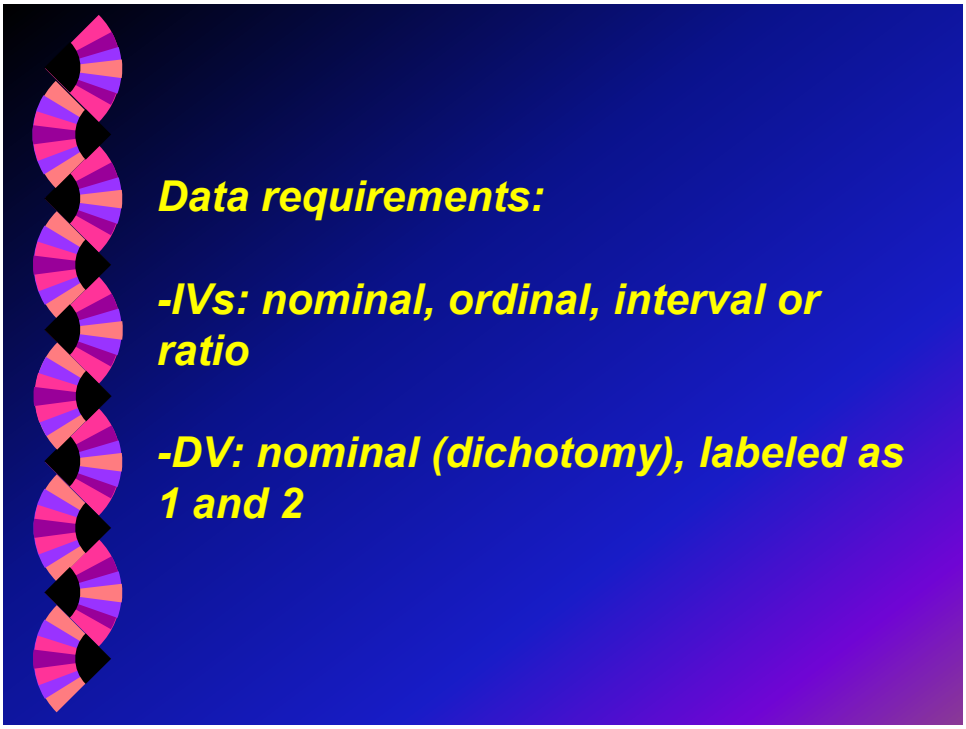
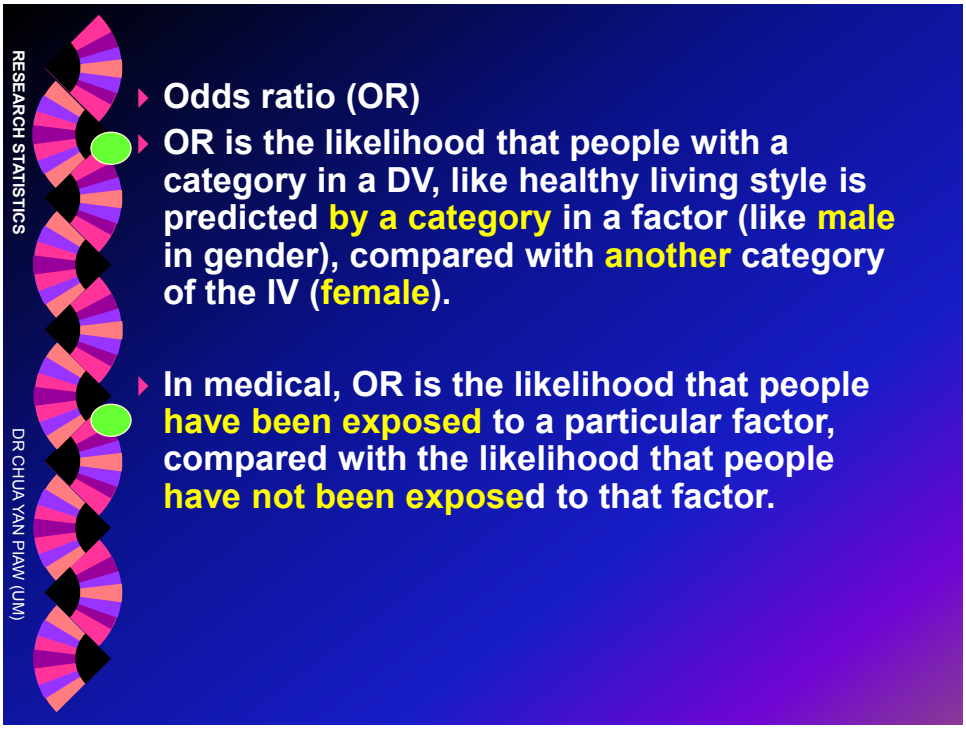
Logistic Regression Analysis

-Identify the effects of several IV (factors or predictors) on a DV (predicted variable).

Example:
Effects of** gender, body strength, motivation level, age, races **on performance in sports.

Example:
Effects of** race, education, age, thinking style and personality **on sport management skill.


Data requirements:
-IVs: nominal, ordinal, interval or ratio
-DV: nominal (dichotomy), labeled as 1 and 2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Odds ratio (OR)
OR is the likelihood that people with a category in a DV, like healthy living style is predicted by a category in a factor (like male in gender), compared with another category of the IV (female).
In medical, OR is the likelihood that people have been exposed to a particular factor, compared with the likelihood that people have not been exposed to that factor.

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Odds ratio calculation

$$OR = \frac{a/b}{c/d} = \frac{ad}{bc}$$ where

Exposure	Cancer ✔	Cancer ✖
✔	a	b
✖	c	d

Example

$$OR = \frac{354/143}{293/511}$$

$$OR = 4.32$$ where

Exposure	Cancer ✔	Cancer ✖
✔	354	143
✖	293	511

- The odds in the group **exposed** to 'risk factor A' is **4.32 times** the odds in the group **not** exposed to 'risk factor A'.

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- **OR = 1: no difference** in odds of having cancer between people exposed to the risk factor and people not exposed to it.
- **OR > 1:** exposure to the risk factor ***increases the odds*** of developing cancer. Example: OR = 5.4
- The chance is 5.4 times higher.
- **OR < 1:** exposure to the risk factor ***decreases the odds*** of developing cancer.

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A researcher conducts a study to identify factors of Performance in sports. Respondents (athletes) answered a questionnaire concerning the DV and IVs

Dependent variable: performance in sports (1. low; 2. high)

Independent variables:

1. Gender (1. Male; 2. Female)
2. Intrinsic motivation (1. low; 2. high)
3. Personality (1. Introvert; 2. Extrovert)
4. Mental strength (1. high; 2. low)
5. Family member (1. Less than 3; 2. three and above)
6. Types of sport (1. individual; 2. group)

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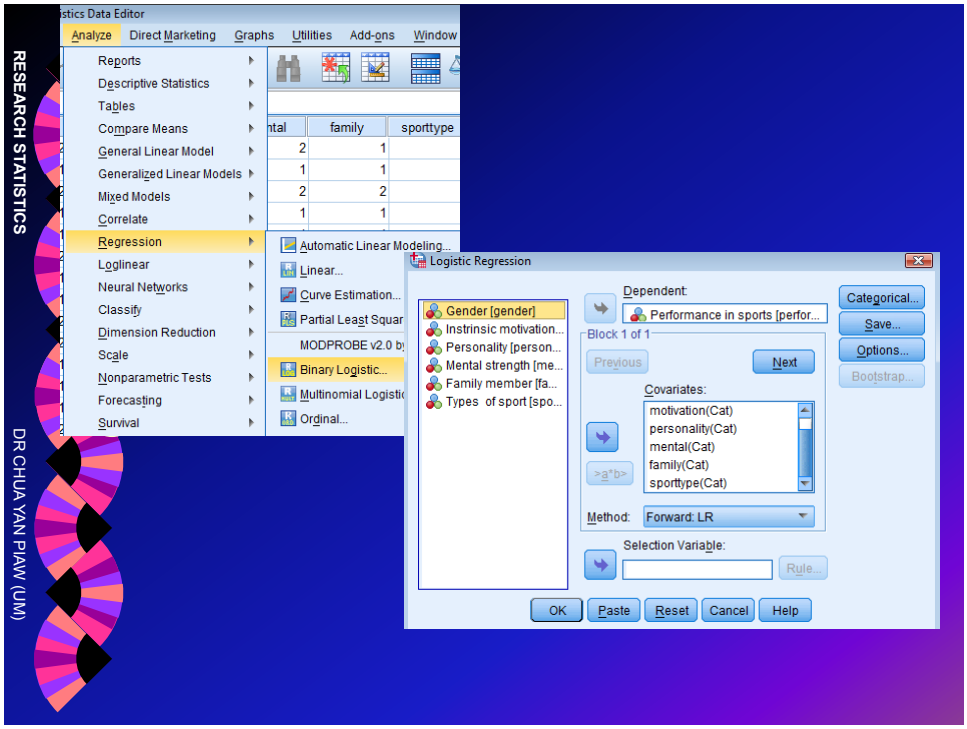
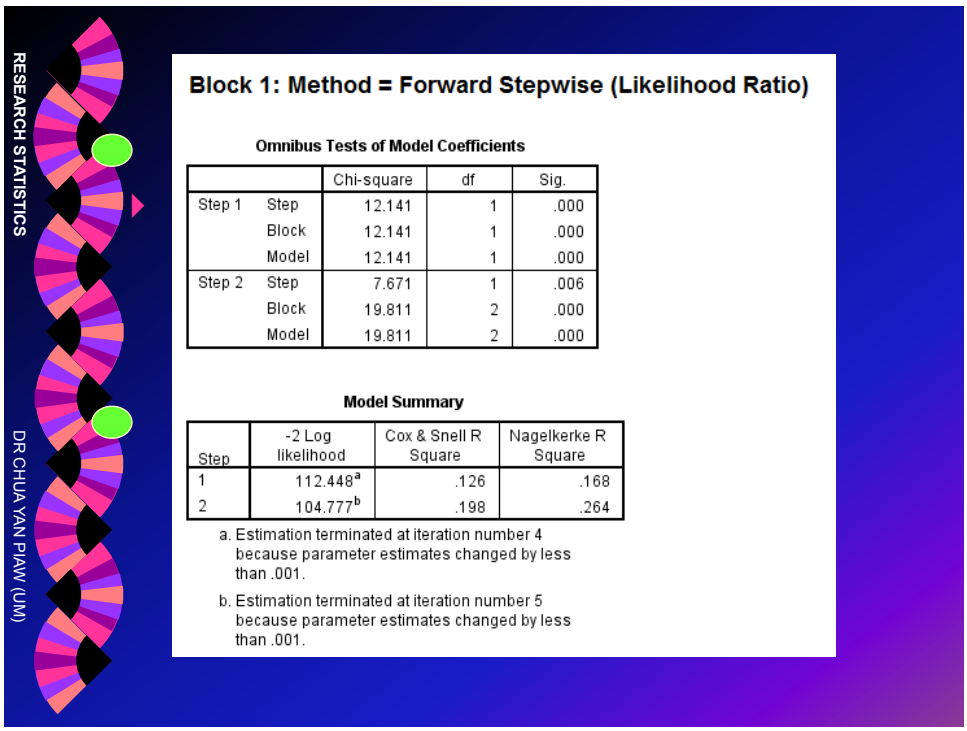
Nul hypothesis: Gender, intrinsic motivation, personality, mental strength, number of family members and types of sport are not significant factors of performance in sports.

Research Hypothesis: Gender, intrinsic motivation, personality, mental strength, number of family members and types of sport are significant factors of performance in sports.





Block 1: Method = Forward Stepwise (Likelihood Ratio)

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	12.141	1	.000
	Block	12.141	1	.000
	Model	12.141	1	.000
Step 2	Step	7.671	1	.006
	Block	19.811	2	.000
	Model	19.811	2	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	112.448[a]	.126	.168
2	104.777[b]	.198	.264

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

b. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

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Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	112.448	.126	.168
2	104.777	.198	.264

- **Percentage of prediction of IVs on the DV.**

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- **2 Log likelihood is the value of difference in the logistics model. The larger this value, the greater the variance (unstandardised Cox & Snall R2) in the dependent variable predicted by the independent variables of the study.**

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Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	motivation(1)	-2.061	.677	9.269	1	.002	.127	.034	.480
	Constant	1.609	.632	6.476	1	.011	5.000		
Step 2[b]	motivation(1)	-3.446	1.126	9.363	1	.002	.032	.004	.290
	mental(1)	2.303	1.076	4.585	1	.032	10.006	1.215	82.385
	Constant	.879	.693	1.607	1	.205	2.407		

a. Variable(s) entered on step 1: motivation.

b. Variable(s) entered on step 2: mental.

- SE < 2.0, multi-collinearity does not exist
- Wald = 9.27, p <.05 for Motivation indicates that it is a significant predictor performance of performance. Low intrinsic motivation athletes [motivation (1)] educes performance in sports, with OR [Exp (B)] =.127, it reduces 1 - .127 = .873 or 87.3% of the chance to achieve high performance compared with high motivation(2) athletes.
- *Motivation(1) = low motivation athletes*
- *Motivation(2) = high motivation athletes*

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Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
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Step 2[b]	motivation(1)	-3.446	1.126	9.363	1	.002	.032	.004	.290
	mental(1)	2.303	1.076	4.585	1	.032	10.006	1.215	82.385
	Constant	.879	.693	1.607	1	.205	2.407		

a. Variable(s) entered on step 1: motivation.

b. Variable(s) entered on step 2: mental.

- When Mental strength is entered into the model, Wald = 4.585, p <.05 for mental(1) indicates that mental strength is a significant predictor of performance in sports, that increases the performance of the athletes, with OR [Exp (B)] =10.006. It means the high mental strength athletes [mental(1) possess more than 10.006 times change of achieving high performance compared to the low mental strength athletes [mental(2)].
- *Mental(1) = High mental strength athletes*
- *Mental(2) = Low mental strength athletes*

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Correlation Matrix

		Constant	motivation(1)	mental(1)
Step 1	Constant	1.000	-.934	
	motivation(1)	-.934	1.000	
Step 2	Constant	1.000	-.393	-.242
	motivation(1)	-.393	1.000	-.771
	mental(1)	-.242	-.771	1.000

- **Correlation between the two predictors Motivation(1) and Mental(1) is negative and strong (r = -.77).**

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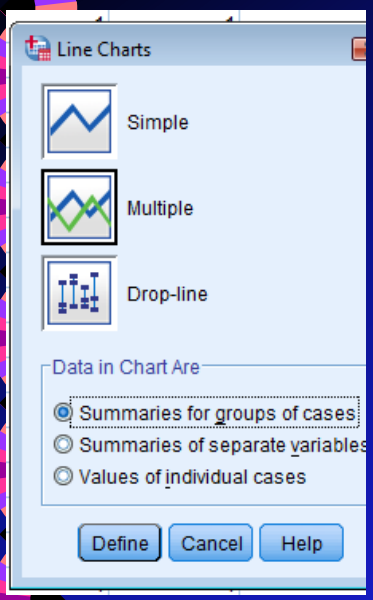
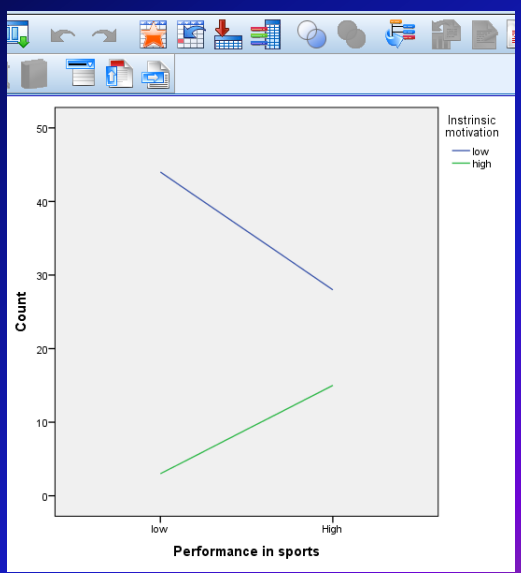




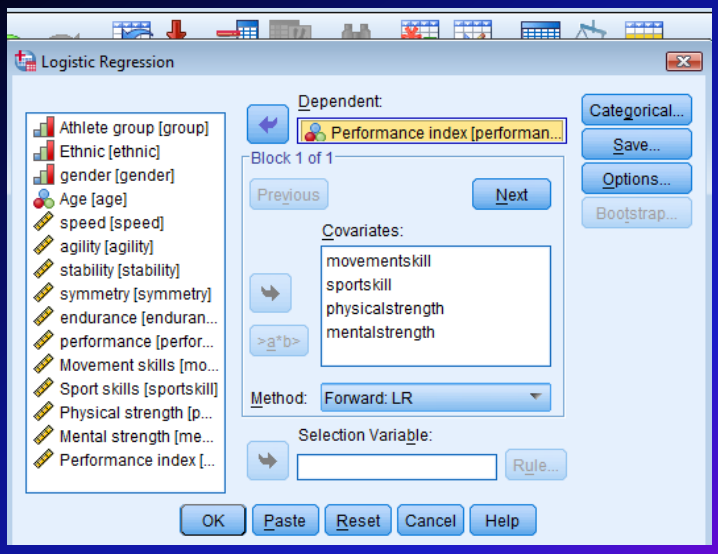
- **Report:**
- Two sig. factors intrinsic motivation and mental strength contribute to performance in sports.
- Low intrinsic motivation athletes reduces 87.3% of the chance of achieving high performance compared to high intrinsic motivation athletes.
- High mental strength increases 10 times of the chance of achieving high performance compared to low mental strength athletes.

Exercise:

A researcher conducts a study to identify whether movement skills, sport skills, physical strength and mental strength are significant factors of performance index of rhythmic gymnastic athletes.

Null Hy:
Movement skills, sport skills, physical strength and mental strength are not significant factors of performance index of rhythmic gymnastic athletes.

Research hy:
Movement skills, sport skills, physical strength and mental strength are significant factors of performance index of rhythmic gymnastic athletes.



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Block 1: Method = Forward Stepwise (Likelihood Ratio)

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	42.297	1	.000
	Block	42.297	1	.000
	Model	42.297	1	.000
Step 2	Step	43.090	1	.000
	Block	85.386	2	.000
	Model	85.386	2	.000
Step 3	Step	25.304	1	.000
	Block	110.690	3	.000
	Model	110.690	3	.000
Step 4	Step	23.274	1	.000
	Block	133.964	4	.000
	Model	133.964	4	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	193.350[a]	.220	.294
2	150.260[b]	.395	.526
3	124.956[b]	.479	.638
4	101.682[c]	.545	.727

a. Estimation terminated at iteration number 5

- **Four sig, predictors contributed 72.7% of performance in RG.**

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Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	sportskill	.067	.012	29.012	1	.000	1.069
	Constant	-6.661	1.243	28.698	1	.000	.001
Step 2[b]	sportskill	.086	.015	31.832	1	.000	1.090
	mentalstrength	.074	.014	27.750	1	.000	1.076
	Constant	-16.097	2.480	42.120	1	.000	.000
Step 3[c]	sportskill	.097	.018	28.634	1	.000	1.102
	physicalstrength	.060	.013	19.591	1	.000	1.061
	mentalstrength	.075	.015	24.382	1	.000	1.078
	Constant	-23.376	3.499	44.629	1	.000	.000
Step 4[d]	movementskill	.067	.016	17.223	1	.000	1.069
	sportskill	.090	.020	20.327	1	.000	1.094
	physicalstrength	.065	.015	18.839	1	.000	1.067
	mentalstrength	.083	.017	23.932	1	.000	1.087
	Constant	-30.686	4.579	44.906	1	.000	.000

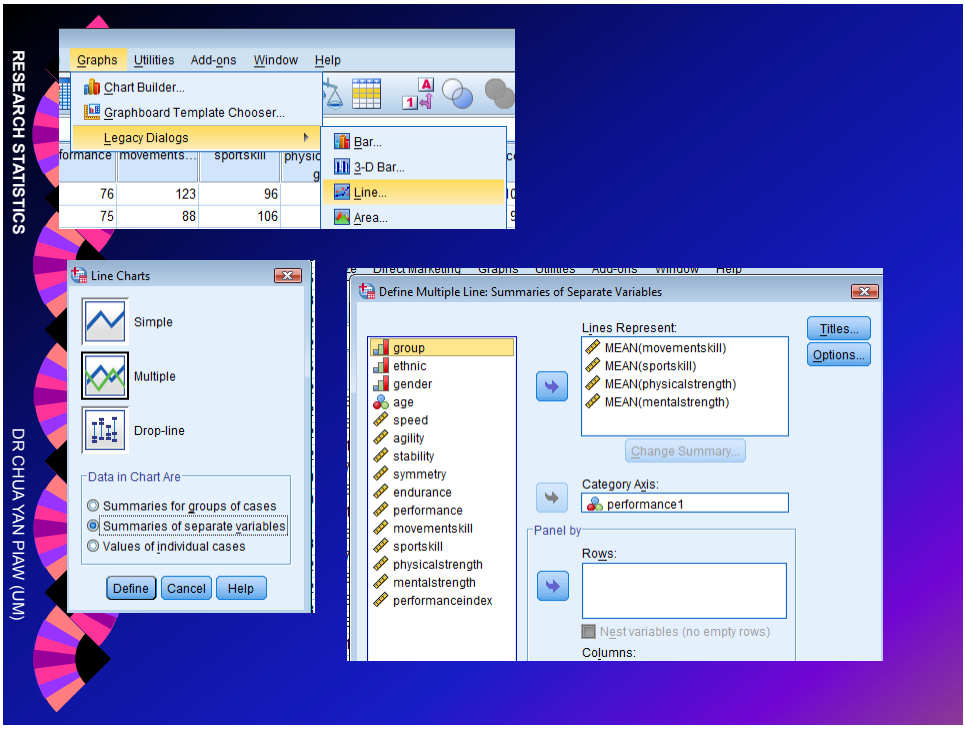
a. Variable(s) entered on step 1: sportskill.

b. Variable(s) entered on step 2: mentalstrength.

c. Variable(s) entered on step 3: physicalstrength.

d. Variable(s) entered on step 4: movementskill.

Movement skills, sport skills, physical strength and mental strength are significant factors of performance index of rhythmic gymnastic athletes.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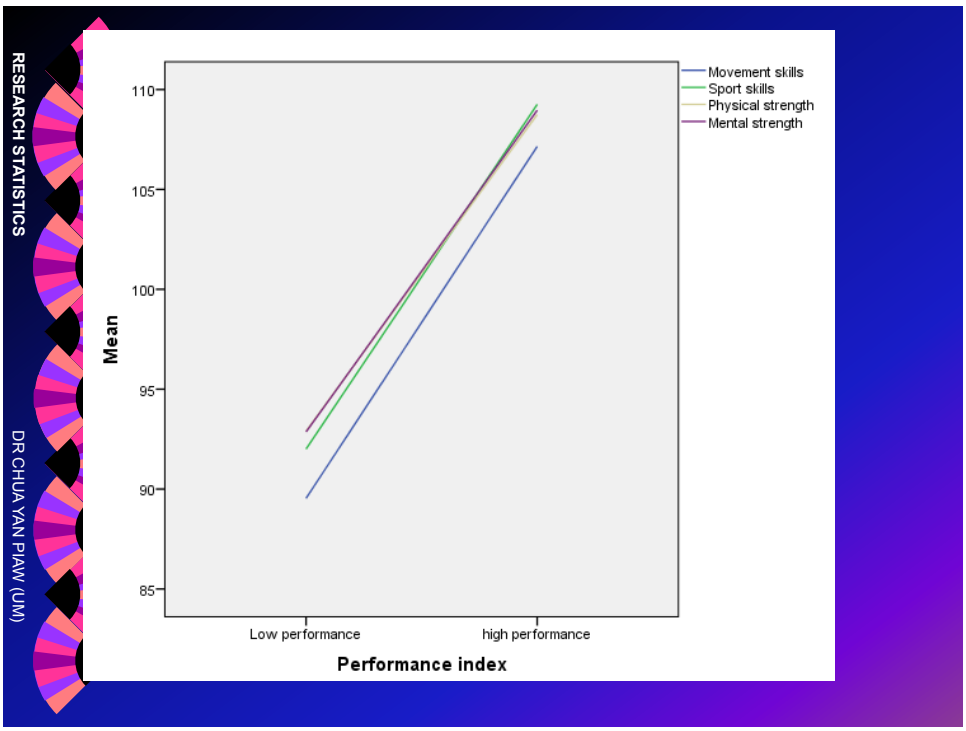
Graphs
Utilities
Add-ons
Window
Help
Chart Builder...
Graphboard Template Chooser...
Legacy Dialogs
Bar...
3-D Bar...
Line...
Area...
76
123
96
75
88
106
Line Charts
Simple
Multiple
Drop-line
Data in Chart Are
Summaries for groups of cases
Summaries of separate variables
Values of individual cases
Define
Cancel
Help
Define Multiple Line: Summaries of Separate Variables
group
ethnic
gender
age
speed
agility
stability
symmetry
endurance
performance
movementskill
sportskill
physicalstrength
mentalstrength
performanceindex
Lines Represent:
MEAN(movementskill)
MEAN(sportskill)
MEAN(physicalstrength)
MEAN(mentalstrength)
Titles...
Options...
Change Summary...
Category Axis:
performance1
Panel by
Rows:
Nest variables (no empty rows)
Columns: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Movement skills
Sport skills
Physical strength
Mental strength
110
105
100
95
90
85
Mean
Low performance
high performance
Performance index

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- Use the data for all tests for mote exercises.

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