Model search

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Contents

TODO:

- Reconsider which variables belong in which category of Panter et al.
- Figure out why correlates that are significant in the multivariate model aren't significant in univariate models.

Introduction

This document contains the results of the "univariate" models, i.e. each potential covariate, with interaction terms for each of the three moderators. The classification of variables into the categories defined by Panter et al. is shown in Table 1 on page 5.

Variables that we have that don't fit into the categories defined by Panter et al. include:

- some household characteristics (e.g. number of siblings)
- regwalk, i.e. the frequency of using walking for general mobility

The **R** code below is just to show which data file is being used. All analyses were performed using **R** version 3.2.1, with package rms version 4.3.1 for logistic regression modelling.

```
file_n <- "BEATS_SS_ForWalk2School_150507.sav"
dat <- read_spss(fname(dir_n, file_n))
rm(dir_n, file_n)
```

The correlates are being examined in this way (rather than entering all variables at once) beause of numerical problems with the estimation algorithm. But even with this reduced approach, not all moderators could be tested simultaneously. These problems are noted in the rightmost column in the table below.

Block	Variable	Main effect	Moderators			All
			Distance	Age	Sex	
1. **Physical environment**						
1.1 Neighbourhood	nothing?					
1.2 Destination	nothing?					
1.3 Route	distance	y				
2. **Individual factors**						
2.1 *Parental factors*						
2.1.1 Characteristics	nothing?					
2.1.2 Attitudes*	parents_say	n	n	n	n	n
	parents_safe	y	n	n	y	y
	school_says	n	n	n	n	y
2.2 *Perceptions of environmental factors*						
2.2.1 Parental perceptions	nothing					
2.2.2 Youth perceptions*	onway	n	n	n	n	y
	time	n	n	n	n	y
	stuff	n	y	n	n	n
	weather	n	n	n	n	n
	hills	n	y	n	n	n
	boring_r	n	n	n	n	y
	NEStConnect	n	n	n	n	n
	NGEsthetics	y	y	n	y	n
2.3 *Youth factors*						
2.3.1 Characteristics	BMI	y				
2.3.2 Attitudes*	interesting	n	y	n	y	n
	pleasant	y	n	n	y	n
	boring	n	y	n	n	y
	healthy	n	n	n	n	n
	useful	y	n	n	y	n
	safe	y	n	n	n	n
	exercise	n	n	n	n	n
	schedule	n	n	n	n	y
	planning	n	n	n	n	y
	sweaty	n	n	n	n	y
	unsafe	n	n	n	n	y
	tired	n	n	n	n	y
	desire	y	n	y	n	y
	confident	n	n	n	n	n
	intention	n	n	n	n	n
	cool	n	n	n	n	y
	friends_dont	n	n	n	n	y
	TSlike	n	n	n	n	y
2.4 *The decision process**						
	whodecides	n	n	n	n	y
	control	y	n	n	y	y
3 **External factors**	*none*					
4 Other	regwalk	y				
	schiclose	n				

So, the following moderated factors will be included:

1. Youth attitudes: parents_safe*Sex, stuff*Dist, hills*Dist, NGEsthetics*Dist, NGEsthetics*Sex, weather*Dist, interesting*Dist, interesting*Sex, pleasant*Sex, boring*Dist, useful*Sex, desire*Age
2. Other: parents_safe*Sex, control*Sex

The results of the multivariate models can be found in Section 5 on page 43.

	name	label	slot	desc	mod	done
ID	ID					
School	School	School				
W2S	W2S					
Sex	Sex	Sex				
BMI_f	BMI_f	BMI	2.3.1	Youth characteristics		
HMcars	HMcars	Number of cars at home	2.1.1	Parent characteristics		
NZDepCat3	NZDepCat3	NZ Deprivation Category	1.1	Attributes of neighbourhood		
PAGuideQ	PAGuideQ	Meets physical activity guidelines	2.3.1	Youth characteristics		
ScrGuide	ScrGuide	Meets screen time guidelines	2.3.1	Youth characteristics		
whodecides	whodecides	Who decides how you travel	2.4	Decision process	Y	y
schiclose	schiclose	I initially enrolled at the closest school	4	Other	?	
Dist	Dist	Distance to school from home				
closest	closest	My school is the closest to my home	1.3	Attributes of route		
siblings	siblings	Number of siblings at home	2.1	Parent characteristics		
Age	Age	Age in years				
school_decile_n	school_decile_n	School decile	1.2	Attributes of destination		
interesting	interesting	Walking to school is interesting	2.3.2	Youth attitudes	Y	y
pleasant	pleasant	Walking to school is pleasant	2.3.2	Youth attitudes	Y	y
boring	boring	Walking to school is boring	2.3.2	Youth attitudes	Y	y
healthy	healthy	Walking to school is healthy	2.3.2	Youth attitudes	Y	y
useful	useful	Walking to school is useful	2.3.2	Youth attitudes	Y	y
safe	safe	Walking to school is safe	2.3.2	Youth attitudes	Y	y
exercise	exercise	Walking is a way to get exercise	2.3.2	Youth attitudes	Y	y
onway	onway	School is on the way to somewhere	2.3.2	Youth attitudes	Y	y
time	time	Walking takes too much time	2.3.2	Youth attitudes	Y	y
stuff	stuff	I have too much stuff	2.3.2	Youth attitudes	Y	y
sched	sched	After-school schedule	2.3.2	Youth attitudes	Y	y
planning	planning	Takes too much planning	2.3.2	Youth attitudes	Y	y
sweaty	sweaty	Makes me sweat	2.3.2	Youth attitudes	Y	y
unsafe	unsafe	Not safe	2.3.2	Youth attitudes	Y	y
tired	tired	Often too tired	2.3.2	Youth attitudes	Y	y
desire	desire	I want to walk to school	2.3.2	Youth attitudes	Y	y
confd	confd	I am confident I can walk	2.3.2	Youth attitudes	Y	y
control	control	I am in control of travel mode	2.4	Decision process	Y	y
intention	intention	I intend to walk to school	2.3.2	Youth attitudes	Y	y
adults	adults	Number of adults at home	2.1.1	Parental characteristics		
n_cars	n_cars	Number of cars at home	2.1.1	Parental characteristics		
parents_walk	parents_walk	My parents walk regularly	2.1.1	Parental characteristics		
parents_safe	parents_safe	My parents think its not safe	2.1.2	Parental attitudes	Y	y
parents_say	parents_say	My parents enourage me to walk	2.1.2	Parental attitudes	Y	y
friends_say	friends_say	My friends enourage me to walk	2.3.2	Youth attitudes	Y	y
school_says	school_says	My school enourages me to walk	2.3.2	Youth attitudes	Y	y
cool	cool	It's not cool to walk	2.3.2	Youth attitudes	Y	y
friends_dont	friends_dont	My friends don't walk	2.3.2	Youth attitudes	Y	y
weather	weather	The weather is too bad	2.2.2	Youth perceptions	Y	y
boring_r	boring_r	The route to school is boring	2.2.2	Youth perceptions	Y	y
hills	hills	There are too many hills on the route	2.2.2	Youth perceptions	Y	y
regwalk	regwalk	Walking for general mobility	4	Other	?	
NEStConnect	NEStConnect	Connectivity	2.2.2	Youth perceptions	Y	y
NGEsthetics	NGEsthetics	Aesthetics	2.2.2	Youth perceptions	Y	y
eth3	eth3	Ethnic category	2.3.1	Youth characteristics		
TscWalk	TscWalk	Travel to School: Walk				
TscCarOth	TscCarOth	Travel to School: Car (others)				
TscCarMy	TscCarMy	Travel to School: Car (mine)				
TscBusPub	TscBusPub	Travel to School: Bus (public)				
TscBusSc	TscBusSc	Travel to School: Bus (school				
TSlike	TSlike	Do you like the way you usually travel to school?	2.3.2	Youth attitudes	Y	y
ATS	ATS	ATS (3 categories)				
BMI_4cat	BMI_4cat	BMI (4 categories)				
cars3	cars3	Cars at home (3 categories)	2.1.1	Parental characteristics		
tsdecision	tsdecision	Who decides how you travel to school?				

Table 1: Classification of variables into the Panter et al. framework

1 Physical environment

We have very few measures of the environment.

1.1 Aspects of the neighbourhood

Nothing.

1.2 Aspects of the destination

Nothing.

1.3 Aspects of the route

1.3.1 Distance to school from home

```
lrm(formula = W2S ~ Dist, x = T, y = T)
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1077	LR χ^2	513.25	R^2	0.533	C	0.891
Don't walk	741	d.f.	1	g	3.090	D_{xy}	0.782
Walk	336	$\Pr(>\chi^2)$	< 0.0001	g_r	21.981	γ	0.783
Cluster on	`School`			g_p	0.334	τ_a	0.336
Clusters	12			Brier	0.123		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	5×10^{-4}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	2.3013	0.1678	13.71	< 0.0001
Dist	-0.0014	0.0001	-12.96	< 0.0001

2 Individual factors

2.1 Parental factors

2.1.1 Parental characteristics

2.1.2 Parental attitudes

2.1.2.1 My parents enourage me to walk

```
lrm(formula = W2S ~ parents_say * Dist + parents_say * Sex, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S parents_say        Dist         Sex
  0           8           0           0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1069	LR χ^2	621.90	R^2	0.621	C	0.922
Don't walk	736	d.f.	5	g	5.282	D_{xy}	0.844
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	196.790	γ	0.845
Cluster on	School			g_p	0.359	τ_a	0.362
Clusters	12			Brier	0.106		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	1×10^{-4}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	2.6396	1.4366	1.84	0.0661
parents_say	-0.0364	0.2673	-0.14	0.8918
Dist	-0.0025	0.0003	-8.98	< 0.0001
Sex	-0.8318	1.1218	-0.74	0.4584
parents_say * Dist	0.0003	0.0001	4.93	< 0.0001
parents_say * Sex	0.1271	0.1917	0.66	0.5073

```
lrm(formula = W2S ~ parents_say * Sex + parents_say * Age, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S parents_say         Sex         Age
  0           8           0           0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1069	LR χ^2	366.55	R^2	0.408	C	0.843
Don't walk	736	d.f.	5	g	2.074	D_{xy}	0.685
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	7.954	γ	0.692
Cluster on	School			g_p	0.287	τ_a	0.294
Clusters	12			Brier	0.142		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	3×10^{-9}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-4.9831	3.5091	-1.42	0.1556
parents_say	0.8468	0.7004	1.21	0.2267
Sex	-0.7277	1.1267	-0.65	0.5184
Age	0.0985	0.2564	0.38	0.7010
parents_say * Sex	0.1299	0.1984	0.65	0.5126
parents_say * Age	-0.0112	0.0496	-0.23	0.8216

2.1.2.2 My parents think its not safe

```
lrm(formula = W2S ~ parents_safe * Dist + parents_safe * Sex +
    parents_safe * Age, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

W2S	parents_safe	Dist	Sex	Age
0	3	0	0	0

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	549.47	R^2	0.564	C	0.903
Don't walk	741	d.f.	7	g	3.745	D_{xy}	0.805
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	42.290	γ	0.806
Cluster on	School			g_p	0.342	τ_a	0.345
Clusters	12			Brier	0.116		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	5×10^{-6}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	1.7524	1.6547	1.06	0.2896
parents_safe	1.8464	0.9215	2.00	0.0451
Dist	-0.0011	0.0002	-5.52	< 0.0001
Sex	1.0164	0.4199	2.42	0.0155
Age	-0.0422	0.1189	-0.35	0.7227
parents_safe * Dist	-0.0002	0.0001	-1.80	0.0724
parents_safe * Sex	-0.8536	0.2979	-2.87	0.0042
parents_safe * Age	-0.0553	0.0669	-0.83	0.4085

2.2 Perceptions of the environment

2.2.1 Parental perceptions

2.2.2 Youth perceptions

2.2.2.1 School is on the way to somewhere

```
lrm(formula = W2S ~ onway * Dist + onway * Sex + onway * Age,
    x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S onway  Dist   Sex   Age
  0     3     0     0     0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	605.51	R^2	0.607	C	0.915
Don't walk	741	d.f.	7	g	3.526	D_{xy}	0.831
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	33.972	γ	0.832
Cluster on	`School`			g_p	0.356	τ_a	0.356
Clusters	12			Brier	0.108		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	4×10^{-5}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	1.8217	2.7240	0.67	0.5037
onway	0.4833	0.8626	0.56	0.5752
Dist	-0.0010	0.0003	-3.04	0.0024
Sex	0.7444	0.5499	1.35	0.1759
Age	0.0292	0.1815	0.16	0.8722
onway * Dist	-0.0001	0.0001	-0.90	0.3705
onway * Sex	-0.3065	0.2245	-1.37	0.1721
onway * Age	-0.0370	0.0570	-0.65	0.5163

2.2.2.2 Walking takes too much time

```
lrm(formula = W2S ~ time * Dist + time * Sex + time * Age, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
 W2S time Dist  Sex  Age
   0    3    0    0    0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	597.54	R^2	0.601	C	0.914
Don't walk	741	d.f.	7	g	3.245	D_{xy}	0.827
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	25.658	γ	0.828
Cluster on	School			g_p	0.354	τ_a	0.354
Clusters	12			Brier	0.109		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	4×10^{-4}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	0.6176	2.8169	0.22	0.8265
time	0.7601	1.0641	0.71	0.4750
Dist	-0.0011	0.0003	-4.19	< 0.0001
Sex	-0.2595	0.2991	-0.87	0.3855
Age	0.2316	0.1928	1.20	0.2296
time * Dist	0.0000	0.0001	0.13	0.8940
time * Sex	0.1207	0.1413	0.85	0.3931
time * Age	-0.1212	0.0725	-1.67	0.0946

2.2.2.3 The weather is too bad

```
lrm(formula = W2S ~ weather * Dist + weather * Sex, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S weather    Dist     Sex
  0       3       0       0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	534.44	R^2	0.552	C	0.897
Don't walk	741	d.f.	5	g	3.226	D_{xy}	0.795
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	25.175	γ	0.796
Cluster on	`School`			g_p	0.339	τ_a	0.340
Clusters	12			Brier	0.118		
$\max\lvert\frac{\partial \log L}{\partial \beta}\rvert$	6×10^{-8}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	3.0452	0.7828	3.89	0.0001
weather	-0.2993	0.3159	-0.95	0.3434
Dist	-0.0013	0.0004	-3.47	0.0005
Sex	0.1931	0.3555	0.54	0.5870
weather * Dist	0.0000	0.0001	-0.19	0.8519
weather * Sex	-0.0851	0.1710	-0.50	0.6187

```
lrm(formula = W2S ~ weather * Sex + weather * Age, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S weather    Sex    Age
  0       3       0       0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	77.22	R^2	0.098	C	0.667
Don't walk	741	d.f.	5	g	0.665	D_{xy}	0.334
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	1.944	γ	0.339
Cluster on	`School`			g_p	0.137	τ_a	0.143
Clusters	12			Brier	0.199		
$\max\lvert\frac{\partial \log L}{\partial \beta}\rvert$	1×10^{-9}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	-2.0150	1.7604	-1.14	0.2524
weather	-0.0970	0.7536	-0.13	0.8976
Sex	0.6445	0.3227	2.00	0.0458
Age	0.1222	0.0968	1.26	0.2067
weather * Sex	-0.1765	0.0967	-1.83	0.0680
weather * Age	-0.0175	0.0454	-0.39	0.6994

2.2.2.4 There are too many hills on the route

```
lrm(formula = W2S ~ hills * Dist + hills * Sex + hills * Age,
    x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S hills  Dist   Sex   Age
  0     3     0     0     0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	524.49	R^2	0.544	C	0.896
Don't walk	741	d.f.	7	g	3.370	D_{xy}	0.792
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	29.090	γ	0.793
Cluster on	`School`			g_p	0.336	τ_a	0.339
Clusters	12			Brier	0.120		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	1×10^{-4}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	3.0333	1.1660	2.60	0.0093
hills	0.2510	0.4461	0.56	0.5736
Dist	-0.0010	0.0002	-5.88	< 0.0001
Sex	0.1943	0.3950	0.49	0.6227
Age	-0.0753	0.0952	-0.79	0.4288
hills * Dist	-0.0001	0.0001	-2.19	0.0284
hills * Sex	-0.1819	0.1592	-1.14	0.2531
hills * Age	0.0026	0.0310	0.08	0.9328

2.2.2.5 Connectivity

```
lrm(formula = W2S ~ NEStConnect * Dist + NEStConnect * Sex, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S NEStConnect        Dist         Sex
  0          77           0           0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1000	LR χ^2	497.04	R^2	0.549	C	0.895
Don't walk	682	d.f.	5	g	3.168	D_{xy}	0.790
Walk	318	$\Pr(>\chi^2) < 0.0001$		g_r	23.768	γ	0.791
Cluster on `School`				g_p	0.342	τ_a	0.343
Clusters	12			Brier	0.121		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.003						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-0.1221	1.9153	-0.06	0.9492
NEStConnect	1.0448	0.7467	1.40	0.1617
Dist	-0.0006	0.0005	-1.29	0.1958
Sex	0.3560	0.8259	0.43	0.6664
NEStConnect * Dist	-0.0003	0.0002	-1.53	0.1263
NEStConnect * Sex	-0.2125	0.2950	-0.72	0.4713

```
lrm(formula = W2S ~ NEStConnect * Sex + NEStConnect * Age, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S NEStConnect         Sex         Age
  0          77           0           0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1000	LR χ^2	18.26	R^2	0.025	C	0.584
Don't walk	682	d.f.	5	g	0.332	D_{xy}	0.168
Walk	318	$\Pr(>\chi^2)$	0.0026	g_r	1.393	γ	0.171
Cluster on	`School`			g_p	0.070	τ_a	0.073
Clusters	12			Brier	0.213		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	1×10^{-12}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-1.5823	2.6570	-0.60	0.5515
NEStConnect	0.1879	1.0107	0.19	0.8525
Sex	0.3602	0.6366	0.57	0.5716
Age	-0.0595	0.1863	-0.32	0.7493
NEStConnect * Sex	-0.1330	0.2366	-0.56	0.5740
NEStConnect * Age	0.0292	0.0692	0.42	0.6730

2.2.2.6 Aesthetics

```
lrm(formula = W2S ~ NGEsthetics * Dist + NGEsthetics * Sex, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S NGEsthetics        Dist         Sex
  0         102           0           0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	975	LR χ^2	485.74	R^2	0.549	C	0.896
Don't walk	662	d.f.	5	g	3.205	D_{xy}	0.792
Walk	313	$\Pr(>\chi^2) < 0.0001$		g_r	24.652	γ	0.793
Cluster on `School`				g_p	0.343	τ_a	0.346
Clusters	12			Brier	0.122		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.008						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	0.2406	1.0550	0.23	0.8196
NGEsthetics	0.9514	0.4013	2.37	0.0177
Dist	-0.0011	0.0003	-3.69	0.0002
Sex	0.9296	0.4747	1.96	0.0502
NGEsthetics * Dist	-0.0001	0.0001	-0.81	0.4184
NGEsthetics * Sex	-0.4360	0.1475	-2.96	0.0031

```
lrm(formula = W2S ~ NGEsthetics * Sex + NGEsthetics * Age, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S NGEsthetics         Sex         Age
  0         102           0           0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	975	LR χ^2	5.34	R^2	0.008	C	0.530
Don't walk	662	d.f.	5	g	0.173	D_{xy}	0.061
Walk	313	$\Pr(>\chi^2)$	0.3759	g_r	1.188	γ	0.062
Cluster on	`School`			g_p	0.037	τ_a	0.026
Clusters	12			Brier	0.217		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	3×10^{-7}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-4.2869	4.0171	-1.07	0.2859
NGEsthetics	1.3249	1.3616	0.97	0.3305
Sex	1.0811	0.3509	3.08	0.0021
Age	0.1139	0.2466	0.46	0.6441
NGEsthetics * Sex	-0.4174	0.1222	-3.41	0.0006
NGEsthetics * Age	-0.0412	0.0847	-0.49	0.6266

2.2.2.7 Walking to school is interesting

```
lrm(formula = W2S ~ interesting * Dist + interesting * Sex, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S interesting        Dist         Sex
  0           3           0           0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	543.91	R^2	0.560	C	0.901
Don't walk	741	d.f.	5	g	3.505	D_{xy}	0.802
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	33.294	γ	0.803
Cluster on	School			g_p	0.341	τ_a	0.344
Clusters	12			Brier	0.116		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	4×10^{-6}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	1.2759	1.1363	1.12	0.2615
interesting	0.2912	0.2444	1.19	0.2334
Dist	-0.0020	0.0003	-7.17	< 0.0001
Sex	0.4291	0.4698	0.91	0.3610
interesting * Dist	0.0001	0.0001	1.96	0.0497
interesting * Sex	-0.1271	0.1004	-1.27	0.2058

```
lrm(formula = W2S ~ interesting * Sex + interesting * Age, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S interesting         Sex         Age
  0           3           0           0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	50.42	R^2	0.065	C	0.629
Don't walk	741	d.f.	5	g	0.545	D_{xy}	0.257
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	1.725	γ	0.261
Cluster on	School			g_p	0.109	τ_a	0.110
Clusters	12			Brier	0.204		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	5×10^{-8}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-1.9169	2.2569	-0.85	0.3957
interesting	0.1650	0.4438	0.37	0.7100
Sex	0.8222	0.4176	1.97	0.0489
Age	-0.0906	0.1443	-0.63	0.5301
interesting * Sex	-0.1908	0.0867	-2.20	0.0278
interesting * Age	0.0271	0.0276	0.98	0.3259

2.2.2.8 Walking to school is pleasant

```
lrm(formula = W2S ~ pleasant * Dist + pleasant * Sex, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S pleasant     Dist      Sex
  0        3        0        0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	539.71	R^2	0.556	C	0.899
Don't walk	741	d.f.	5	g	3.248	D_{xy}	0.798
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	25.730	γ	0.799
Cluster on	School			g_p	0.340	τ_a	0.342
Clusters	12			Brier	0.117		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	5×10^{-7}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-1.4764	1.8452	-0.80	0.4236
pleasant	0.8317	0.3938	2.11	0.0347
Dist	-0.0014	0.0005	-2.53	0.0115
Sex	1.5576	0.7585	2.05	0.0400
pleasant * Dist	0.0000	0.0001	0.04	0.9707
pleasant * Sex	-0.3551	0.1548	-2.29	0.0218

```
lrm(formula = W2S ~ pleasant * Sex + pleasant * Age, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S pleasant      Sex      Age
  0        3        0        0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	77.19	R^2	0.098	C	0.659
Don't walk	741	d.f.	5	g	0.698	D_{xy}	0.318
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	2.011	γ	0.321
Cluster on	School			g_p	0.134	τ_a	0.136
Clusters	12			Brier	0.199		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	1×10^{-5}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-3.2458	2.2323	-1.45	0.1459
pleasant	0.3774	0.4270	0.88	0.3768
Sex	1.5685	0.5025	3.12	0.0018
Age	-0.1093	0.1639	-0.67	0.5049
pleasant * Sex	-0.3267	0.0935	-3.49	0.0005
pleasant * Age	0.0325	0.0314	1.04	0.3001

2.2.2.9 Walking to school is boring

```
lrm(formula = W2S ~ boring * Dist + boring * Sex + boring * Age,
    x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S boring  Dist   Sex   Age
  0      3     0     0     0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	545.63	R^2	0.561	C	0.902
Don't walk	741	d.f.	7	g	3.531	D_{xy}	0.804
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	34.166	γ	0.805
Cluster on	School			g_p	0.341	τ_a	0.344
Clusters	12			Brier	0.117		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	2×10^{-6}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	4.9431	3.6789	1.34	0.1791
boring	-0.2164	0.8127	-0.27	0.7900
Dist	-0.0020	0.0002	-8.23	< 0.0001
Sex	0.2945	0.5436	0.54	0.5880
Age	-0.2153	0.1841	-1.17	0.2423
boring * Dist	0.0001	0.0001	2.05	0.0403
boring * Sex	-0.1047	0.0940	-1.11	0.2651
boring * Age	0.0289	0.0422	0.69	0.4932

2.2.2.10 The route to school is boring

```
lrm(formula = W2S ~ boring_r * Dist + boring_r * Sex + boring_r *
    Age, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S boring_r      Dist       Sex       Age
  0         3         0         0         0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	521.15	R^2	0.541	C	0.895
Don't walk	741	d.f.	7	g	3.228	D_{xy}	0.789
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	25.223	γ	0.790
Cluster on	`School`			g_p	0.335	τ_a	0.338
Clusters	12			Brier	0.120		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	6×10^{-8}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	3.4327	1.8512	1.85	0.0637
boring_r	0.3242	0.7935	0.41	0.6828
Dist	-0.0012	0.0004	-3.22	0.0013
Sex	0.0508	0.4706	0.11	0.9140
Age	-0.0711	0.1272	-0.56	0.5764
boring_r * Dist	-0.0001	0.0002	-0.64	0.5235
boring_r * Sex	-0.1128	0.2458	-0.46	0.6464
boring_r * Age	-0.0131	0.0532	-0.25	0.8054

2.2.2.11 Walking to school is healthy

```
lrm(formula = W2S ~ healthy * Dist + healthy * Sex, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S healthy    Dist     Sex
  0       3       0       0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	517.78	R^2	0.539	C	0.893
Don't walk	741	d.f.	5	g	3.171	D_{xy}	0.786
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	23.838	γ	0.787
Cluster on `School`				g_p	0.335	τ_a	0.337
Clusters	12			Brier	0.121		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.01						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-0.1760	1.6947	-0.10	0.9173
healthy	0.4726	0.3135	1.51	0.1317
Dist	-0.0009	0.0004	-2.02	0.0438
Sex	0.5486	0.8005	0.69	0.4931
healthy * Dist	-0.0001	0.0001	-1.02	0.3091
healthy * Sex	-0.1175	0.1314	-0.89	0.3713

```
lrm(formula = W2S ~ healthy * Sex + healthy * Age, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S healthy     Sex     Age
  0       3       0       0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	2.99	R^2	0.004	C	0.526
Don't walk	741	d.f.	5	g	0.121	D_{xy}	0.051
Walk	333	$\Pr(>\chi^2)$	0.7010	g_r	1.129	γ	0.053
Cluster on	`School`			g_p	0.026	τ_a	0.022
Clusters	12			Brier	0.213		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	2×10^{-6}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-2.7624	3.6106	-0.77	0.4442
healthy	0.2452	0.5938	0.41	0.6797
Sex	0.7485	0.4759	1.57	0.1157
Age	0.0357	0.2180	0.16	0.8700
healthy * Sex	-0.1273	0.0665	-1.91	0.0557
healthy * Age	-0.0002	0.0366	-0.01	0.9957

2.2.2.12 Walking to school is useful

```
lrm(formula = W2S ~ useful * Dist + useful * Sex, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S useful   Dist    Sex
  0      3      0      0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	537.25	R^2	0.554	C	0.899
Don't walk	741	d.f.	5	g	3.313	D_{xy}	0.799
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	27.476	γ	0.800
Cluster on	`School`			g_p	0.339	τ_a	0.342
Clusters	12			Brier	0.117		
$\max\lvert\frac{\partial \log L}{\partial \beta}\rvert$	2×10^{-6}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	-1.0537	1.1110	-0.95	0.3429
useful	0.7024	0.2166	3.24	0.0012
Dist	-0.0015	0.0003	-5.05	< 0.0001
Sex	1.4091	0.6646	2.12	0.0340
useful * Dist	0.0000	0.0001	0.26	0.7965
useful * Sex	-0.3018	0.1128	-2.67	0.0075

```
lrm(formula = W2S ~ useful * Sex + useful * Age, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S useful    Sex    Age
  0      3      0      0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	55.73	R^2	0.071	C	0.633
Don't walk	741	d.f.	5	g	0.593	D_{xy}	0.266
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	1.810	γ	0.269
Cluster on	`School`			g_p	0.117	τ_a	0.114
Clusters	12			Brier	0.204		
$\max\lvert\frac{\partial \log L}{\partial \beta}\rvert$	5×10^{-7}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	-4.0193	3.3757	-1.19	0.2338
useful	0.5032	0.6440	0.78	0.4346
Sex	1.0594	0.4280	2.48	0.0133
Age	0.0093	0.2068	0.04	0.9642
useful * Sex	-0.2028	0.0623	-3.26	0.0011
useful * Age	0.0069	0.0400	0.17	0.8638

2.2.2.13 Walking to school is safe

```
lrm(formula = W2S ~ safe * Dist + safe * Sex, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S safe Dist  Sex
  0    3    0    0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	526.56	R^2	0.546	C	0.895
Don't walk	741	d.f.	5	g	3.086	D_{xy}	0.790
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	21.886	γ	0.791
Cluster on	`School`			g_p	0.337	τ_a	0.338
Clusters	12			Brier	0.119		
$\max\lvert\frac{\partial \log L}{\partial \beta}\rvert$	7×10^{-8}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	0.4276	0.7710	0.55	0.5792
safe	0.4024	0.1475	2.73	0.0064
Dist	-0.0011	0.0002	-4.35	< 0.0001
Sex	0.1817	0.6215	0.29	0.7700
safe * Dist	-0.0001	0.0000	-1.34	0.1810
safe * Sex	-0.0600	0.1020	-0.59	0.5567

```
lrm(formula = W2S ~ safe * Sex + safe * Age, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S safe  Sex  Age
  0    3    0    0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	73.03	R^2	0.093	C	0.667
Don't walk	741	d.f.	5	g	0.694	D_{xy}	0.334
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	2.002	γ	0.340
Cluster on	`School`			g_p	0.135	τ_a	0.143
Clusters	12			Brier	0.199		
$\max\lvert\frac{\partial \log L}{\partial \beta}\rvert$	5×10^{-7}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	-4.5629	3.2372	-1.41	0.1587
safe	0.7436	0.6131	1.21	0.2252
Sex	-0.1231	0.6284	-0.20	0.8447
Age	0.1490	0.1977	0.75	0.4510
safe * Sex	0.0426	0.1023	0.42	0.6772
safe * Age	-0.0305	0.0369	-0.83	0.4086

2.2.2.14 Walking is a way to get exercise

```
lrm(formula = W2S ~ exercise * Dist + exercise * Sex, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S exercise     Dist      Sex
  0        3        0        0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	519.54	R^2	0.540	C	0.894
Don't walk	741	d.f.	5	g	3.220	D_{xy}	0.788
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	25.034	γ	0.789
Cluster on	School			g_p	0.335	τ_a	0.337
Clusters	12			Brier	0.121		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	1×10^{-8}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	2.7236	1.9957	1.36	0.1723
exercise	-0.0092	0.5532	-0.02	0.9867
Dist	-0.0022	0.0006	-3.88	0.0001
Sex	-0.0646	1.2877	-0.05	0.9600
exercise * Dist	0.0002	0.0002	1.28	0.1998
exercise * Sex	-0.0485	0.3373	-0.14	0.8856

```
lrm(formula = W2S ~ exercise * Sex + exercise * Age, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S exercise      Sex      Age
  0        3        0        0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	8.38	R^2	0.011	C	0.554
Don't walk	741	d.f.	5	g	0.204	D_{xy}	0.107
Walk	333	$\Pr(>\chi^2)$	0.1364	g_r	1.226	γ	0.112
Cluster on	School			g_p	0.042	τ_a	0.046
Clusters	12			Brier	0.212		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	3×10^{-11}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-7.8311	3.9202	-2.00	0.0458
exercise	1.9198	1.1006	1.74	0.0811
Sex	-0.2432	0.8502	-0.29	0.7749
Age	0.4479	0.2579	1.74	0.0825
exercise * Sex	0.0703	0.2118	0.33	0.7401
exercise * Age	-0.1219	0.0719	-1.70	0.0900

2.3 Youth factors

2.3.1 Youth characteristics

2.3.1.1 BMI

```
lrm(formula = W2S ~ BMI_f, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S BMI_f
  0    81
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	996	LR χ^2	7.21	R^2	0.010	C	0.542
Don't walk	682	d.f.	1	g	0.174	D_{xy}	0.084
Walk	314	Pr($>\chi^2$)	0.0073	g_r	1.190	γ	0.199
Cluster on	`School`			g_p	0.036	τ_a	0.036
Clusters	12			Brier	0.214		
max $\lvert\frac{\partial \log L}{\partial \beta}\rvert$	5×10^{-8}						

	Coef	S.E.	Wald Z	Pr($>\lvert Z\rvert$)
Intercept	-0.6561	0.1638	-4.01	<0.0001
BMI_f=Unhealthy	-0.4042	0.1719	-2.35	0.0187

2.3.2 Youth attitudes

2.3.2.1 I have too much stuff

```
lrm(formula = W2S ~ stuff * Dist + stuff * Sex + stuff * Age,
    x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S stuff  Dist   Sex   Age
  0     3     0     0     0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	569.00	R^2	0.579	C	0.907
Don't walk	741	d.f.	7	g	3.695	D_{xy}	0.815
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	40.265	γ	0.816
Cluster on	School			g_p	0.347	τ_a	0.349
Clusters	12			Brier	0.113		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	2×10^{-4}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	3.1415	2.1643	1.45	0.1466
stuff	0.0096	0.8302	0.01	0.9908
Dist	-0.0009	0.0002	-3.50	0.0005
Sex	0.6059	0.3515	1.72	0.0847
Age	-0.0847	0.1536	-0.55	0.5815
stuff * Dist	-0.0002	0.0001	-2.21	0.0274
stuff * Sex	-0.2541	0.1906	-1.33	0.1824
stuff * Age	0.0097	0.0592	0.16	0.8694

2.3.2.2 After-school schedule

```
lrm(formula = W2S ~ sched * Dist + sched * Age + sched * Sex,
    x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S sched  Dist   Age   Sex
  0     3     0     0     0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	599.20	R^2	0.602	C	0.915
Don't walk	741	d.f.	7	g	3.559	D_{xy}	0.829
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	35.138	γ	0.830
Cluster on	`School`			g_p	0.354	τ_a	0.355
Clusters	12			Brier	0.107		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	9×10^{-4}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	1.5522	1.9623	0.79	0.4290
sched	0.5724	0.9060	0.63	0.5275
Dist	-0.0011	0.0003	-4.42	< 0.0001
Age	0.1339	0.1271	1.05	0.2922
Sex	-0.0212	0.3834	-0.06	0.9559
sched * Dist	-0.0001	0.0001	-0.72	0.4698
sched * Age	-0.0803	0.0607	-1.32	0.1855
sched * Sex	-0.0548	0.1862	-0.29	0.7687

2.3.2.3 Takes too much planning

```
lrm(formula = W2S ~ planning * Dist + planning * Age + planning *
    Sex, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S planning     Dist      Age      Sex
  0        3        0        0        0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	576.59	R^2	0.585	C	0.910
Don't walk	741	d.f.	7	g	3.595	D_{xy}	0.820
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	36.426	γ	0.820
Cluster on	School			g_p	0.349	τ_a	0.351
Clusters	12			Brier	0.112		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	7×10^{-8}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	0.7928	2.9723	0.27	0.7897
planning	1.4464	2.0562	0.70	0.4818
Dist	-0.0012	0.0002	-4.82	< 0.0001
Age	0.0969	0.1613	0.60	0.5480
Sex	0.6949	0.4358	1.59	0.1108
planning * Dist	-0.0001	0.0001	-0.53	0.5944
planning * Age	-0.0951	0.1099	-0.87	0.3865
planning * Sex	-0.5158	0.3448	-1.50	0.1347

2.3.2.4 Makes me sweat

```
lrm(formula = W2S ~ sweaty * Dist + sweaty * Age + sweaty * Sex,
    x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S sweaty  Dist   Age   Sex
  0      3     0     0     0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	525.36	R^2	0.545	C	0.895
Don't walk	741	d.f.	7	g	3.016	D_{xy}	0.789
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	20.413	γ	0.790
Cluster on `School`				g_p	0.337	τ_a	0.338
Clusters	12			Brier	0.120		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.04						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	2.7902	2.8171	0.99	0.3220
sweaty	0.2133	1.4268	0.15	0.8812
Dist	-0.0015	0.0002	-6.21	< 0.0001
Age	0.0474	0.1664	0.29	0.7756
Sex	-0.2396	0.2979	-0.80	0.4212
sweaty * Dist	0.0001	0.0001	1.07	0.2852
sweaty * Age	-0.0547	0.0806	-0.68	0.4976
sweaty * Sex	0.0692	0.1957	0.35	0.7236

2.3.2.5 Not safe

```
lrm(formula = W2S ~ unsafe * Dist + unsafe * Age + unsafe * Sex,
    x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S unsafe   Dist    Age    Sex
  0      3      0      0      0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	533.43	R^2	0.551	C	0.899
Don't walk	741	d.f.	7	g	3.291	D_{xy}	0.798
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	26.877	γ	0.799
Cluster on `School`				g_p	0.339	τ_a	0.342
Clusters	12			Brier	0.118		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.004						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	2.5828	1.3718	1.88	0.0597
unsafe	1.0144	1.2512	0.81	0.4175
Dist	-0.0014	0.0002	-5.73	< 0.0001
Age	-0.0323	0.1066	-0.30	0.7622
Sex	0.5920	0.4639	1.28	0.2019
unsafe * Dist	0.0000	0.0001	0.00	0.9984
unsafe * Age	-0.0497	0.0888	-0.56	0.5759
unsafe * Sex	-0.5131	0.3853	-1.33	0.1830

2.3.2.6 Often too tired

```
lrm(formula = W2S ~ tired * Dist + tired * Sex + tired * Age,
    x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
  W2S tired  Dist   Sex   Age
    0     3     0     0     0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	569.61	R^2	0.580	C	0.907
Don't walk	741	d.f.	7	g	3.376	D_{xy}	0.814
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	29.258	γ	0.815
Cluster on	`School`			g_p	0.348	τ_a	0.349
Clusters	12			Brier	0.112		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	3×10^{-6}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	4.9586	3.1941	1.55	0.1206
tired	-0.7033	1.2567	-0.56	0.5757
Dist	-0.0013	0.0004	-3.52	0.0004
Sex	-0.4157	0.6015	-0.69	0.4895
Age	-0.0417	0.1977	-0.21	0.8330
tired * Dist	0.0000	0.0001	-0.24	0.8080
tired * Sex	0.2040	0.2914	0.70	0.4839
tired * Age	-0.0163	0.0790	-0.21	0.8361

2.3.2.7 I want to walk to school

```
lrm(formula = W2S ~ desire * Dist + desire * Age + desire * Sex,
    x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S desire   Dist    Age    Sex
  0      3      0      0      0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	599.12	R^2	0.602	C	0.916
Don't walk	741	d.f.	7	g	4.012	D_{xy}	0.832
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	55.235	γ	0.833
Cluster on `School`				g_p	0.354	τ_a	0.356
Clusters	12			Brier	0.107		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.03						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-1.7648	1.5460	-1.14	0.2536
desire	2.9441	0.9622	3.06	0.0022
Dist	-0.0009	0.0003	-3.71	0.0002
Age	0.3342	0.1183	2.82	0.0047
Sex	-0.1551	0.4222	-0.37	0.7133
desire * Dist	-0.0002	0.0001	-1.88	0.0606
desire * Age	-0.2194	0.0724	-3.03	0.0025
desire * Sex	-0.0078	0.2308	-0.03	0.9731

2.3.2.8 I am confident I can walk

```
lrm(formula = W2S ~ confd * Dist + confd * Sex, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S confd  Dist   Sex
  0     8     0     0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1069	LR χ^2	561.02	R^2	0.574	C	0.906
Don't walk	736	d.f.	5	g	3.685	D_{xy}	0.813
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	39.838	γ	0.813
Cluster on	School			g_p	0.346	τ_a	0.349
Clusters	12			Brier	0.114		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	3×10^{-5}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	1.1075	2.0268	0.55	0.5848
confd	0.1961	0.3638	0.54	0.5897
Dist	-0.0014	0.0005	-2.85	0.0044
Sex	-0.7481	1.3129	-0.57	0.5688
confd * Dist	0.0000	0.0001	0.27	0.7860
confd * Sex	0.1453	0.2229	0.65	0.5145

```
lrm(formula = W2S ~ confd * Sex + confd * Age, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S confd   Sex   Age
  0     8     0     0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1069	LR χ^2	226.56	R^2	0.269	C	0.764
Don't walk	736	d.f.	5	g	1.575	D_{xy}	0.528
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	4.829	γ	0.543
Cluster on	School			g_p	0.220	τ_a	0.227
Clusters	12			Brier	0.175		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	6×10^{-10}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-0.9377	2.7867	-0.34	0.7365
confd	0.0219	0.4732	0.05	0.9630
Sex	-0.7287	1.2161	-0.60	0.5491
Age	-0.1428	0.1690	-0.85	0.3980
confd * Sex	0.1897	0.1988	0.95	0.3399
confd * Age	0.0253	0.0280	0.90	0.3656

2.3.2.9 I intend to walk to school

```
lrm(formula = W2S ~ intention * Dist + intention * Sex, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S intention      Dist       Sex
  0         8         0         0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1069	LR χ^2	833.32	R^2	0.762	C	0.963
Don't walk	736	d.f.	5	g	5.292	D_{xy}	0.926
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	198.729	γ	0.926
Cluster on	School			g_p	0.396	τ_a	0.398
Clusters	12			Brier	0.071		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.05						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-0.3238	1.6769	-0.19	0.8469
intention	0.6301	0.3567	1.77	0.0774
Dist	-0.0015	0.0003	-5.45	< 0.0001
Sex	-0.8725	0.9122	-0.96	0.3388
intention * Dist	0.0001	0.0001	1.43	0.1534
intention * Sex	0.1333	0.1903	0.70	0.4838

```
lrm(formula = W2S ~ intention * Sex + intention * Age, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S intention       Sex       Age
  0         8         0         0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1069	LR χ^2	695.66	R^2	0.673	C	0.932
Don't walk	736	d.f.	5	g	3.121	D_{xy}	0.864
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	22.671	γ	0.868
Cluster on	School			g_p	0.370	τ_a	0.371
Clusters	12			Brier	0.089		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	6×10^{-5}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-2.1481	3.5241	-0.61	0.5422
intention	0.4293	0.7274	0.59	0.5551
Sex	-0.8180	0.6745	-1.21	0.2252
Age	-0.1154	0.2700	-0.43	0.6692
intention * Sex	0.1336	0.1428	0.94	0.3495
intention * Age	0.0313	0.0547	0.57	0.5673

2.3.2.10 My school enourages me to walk

```
lrm(formula = W2S ~ school_says * Dist + school_says * Sex +
    school_says * Age, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

W2S	school_says	Dist	Sex	Age
0	3	0	0	0

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	518.17	R^2	0.539	C	0.894
Don't walk	741	d.f.	7	g	3.176	D_{xy}	0.787
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	23.960	γ	0.788
Cluster on School				g_p	0.335	τ_a	0.337
Clusters	12			Brier	0.121		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.004						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	3.8454	3.0869	1.25	0.2129
school_says	-0.0651	1.2859	-0.05	0.9596
Dist	-0.0016	0.0003	-5.62	< 0.0001
Sex	0.4663	0.5062	0.92	0.3569
Age	-0.1429	0.1728	-0.83	0.4084
school_says * Dist	0.0001	0.0001	0.74	0.4573
school_says * Sex	-0.3169	0.2101	-1.51	0.1314
school_says * Age	0.0347	0.0776	0.45	0.6546

2.3.2.11 It's not cool to walk

```
lrm(formula = W2S ~ cool * Dist + cool * Age + cool * Sex, x = T,
    y = T)
```

Frequencies of Missing Values Due to Each Variable

```
 W2S cool Dist  Age  Sex
   0    3    0    0    0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	518.38	R^2	0.539	C	0.893
Don't walk	741	d.f.	7	g	3.095	D_{xy}	0.787
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	22.093	γ	0.788
Cluster on `School`				g_p	0.335	τ_a	0.337
Clusters	12			Brier	0.121		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.01						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	5.1070	1.4354	3.56	0.0004
cool	-0.8121	1.1272	-0.72	0.4713
Dist	-0.0016	0.0002	-6.85	< 0.0001
Age	-0.1542	0.0939	-1.64	0.1008
Sex	0.1554	0.3510	0.44	0.6579
cool * Dist	0.0001	0.0001	1.11	0.2652
cool * Age	0.0454	0.0718	0.63	0.5273
cool * Sex	-0.2506	0.2781	-0.90	0.3674

2.3.2.12 My friends don't walk

```
lrm(formula = W2S ~ friends_dont * Dist + friends_dont * Age +
    friends_dont * Sex, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

W2S	friends_dont	Dist	Age	Sex
0	3	0	0	0

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1074	LR χ^2	552.95	R^2	0.567	C	0.903
Don't walk	741	d.f.	7	g	3.220	D_{xy}	0.806
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	25.027	γ	0.807
Cluster on	School			g_p	0.344	τ_a	0.345
Clusters	12			Brier	0.115		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	7×10^{-5}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	6.6197	2.6234	2.52	0.0116
friends_dont	-1.8359	1.4527	-1.26	0.2063
Dist	-0.0014	0.0002	-5.74	< 0.0001
Age	-0.1768	0.1505	-1.17	0.2402
Sex	-0.3893	0.2624	-1.48	0.1379
friends_dont * Dist	0.0000	0.0001	0.27	0.7887
friends_dont * Age	0.0681	0.0859	0.79	0.4277
friends_dont * Sex	0.0655	0.1442	0.45	0.6494

2.3.2.13 Do you like the way you usually travel to school?

```
lrm(formula = W2S ~ TSlike * Dist + TSlike * Age + TSlike * Sex,
    x = T, y = T)
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1077	LR χ^2	526.83	R^2	0.544	C	0.894
Don't walk	741	d.f.	7	g	3.175	D_{xy}	0.789
Walk	336	$\Pr(>\chi^2) < 0.0001$		g_r	23.927	γ	0.790
Cluster on `School`				g_p	0.337	τ_a	0.339
Clusters	12			Brier	0.120		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.002						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	4.2338	4.0572	1.04	0.2967
TSlike	-0.3682	3.8494	-0.10	0.9238
Dist	-0.0014	0.0004	-3.14	0.0017
Age	-0.1649	0.2659	-0.62	0.5351
Sex	-0.5532	0.5122	-1.08	0.2801
TSlike * Dist	-0.0001	0.0003	-0.20	0.8426
TSlike * Age	0.0817	0.2477	0.33	0.7416
TSlike * Sex	0.3616	0.5569	0.65	0.5161

2.4 The decision process

2.4.1 Who decides how you travel

```
lrm(formula = W2S ~ whodecides * Dist + whodecides * Age + whodecides *
    Sex, x = T, y = T)
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1077	LR χ^2	523.80	R^2	0.542	C	0.892
Don't walk	741	d.f.	7	g	3.105	D_{xy}	0.785
Walk	336	$\Pr(>\chi^2) < 0.0001$		g_r	22.311	γ	0.786
Cluster on `School`				g_p	0.337	τ_a	0.337
Clusters	12			Brier	0.122		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.001						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	2.9545	1.8132	1.63	0.1032
whodecides	0.7001	1.0067	0.70	0.4868
Dist	-0.0018	0.0003	-5.64	< 0.0001
Age	-0.0029	0.1387	-0.02	0.9835
Sex	0.2014	0.4763	0.42	0.6724
whodecides * Dist	0.0002	0.0002	1.53	0.1250
whodecides * Age	-0.0613	0.0801	-0.76	0.4443
whodecides * Sex	-0.2281	0.2316	-0.99	0.3246

2.4.1.1 I am in control of travel mode

```
lrm(formula = W2S ~ control * Dist + control * Sex + control *
    Age, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S control    Dist     Sex     Age
  0       8       0       0       0
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1069	LR χ^2	519.18	R^2	0.541	C	0.894
Don't walk	736	d.f.	7	g	3.165	D_{xy}	0.788
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	23.686	γ	0.788
Cluster on `School`				g_p	0.336	τ_a	0.338
Clusters	12			Brier	0.121		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.008						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	0.4760	2.5402	0.19	0.8514
control	0.7426	0.5032	1.48	0.1400
Dist	-0.0014	0.0001	-9.78	< 0.0001
Sex	0.6445	0.3530	1.83	0.0679
Age	0.0794	0.1631	0.49	0.6265
control * Dist	0.0000	0.0000	-0.21	0.8335
control * Sex	-0.2079	0.0563	-3.69	0.0002
control * Age	-0.0335	0.0320	-1.05	0.2952

3 External factors

We do not have any measures of external factors as described by Panter et al.

4 Other factors

These are factors that don't obviously fit into one of the categories described by Panter et al.

4.1 Walking for general mobility

```
lrm(formula = W2S ~ Dist + regwalk, x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
W2S    Dist regwalk
  0       0     199
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	878	LR χ^2	565.24	R^2	0.663	C	0.932
Don't walk	595	d.f.	2	g	4.079	D_{xy}	0.864
Walk	283	$\Pr(>\chi^2) < 0.0001$		g_r	59.096	γ	0.865
Cluster on	`School`			g_p	0.378	τ_a	0.378
Clusters	12			Brier	0.098		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	4×10^{-8}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-1.9678	0.3947	-4.99	< 0.0001
Dist	-0.0014	0.0002	-8.64	< 0.0001
regwalk	1.2787	0.1298	9.85	< 0.0001

4.2 I initially enrolled at the closest school

`lrm(formula = W2S ~ Dist + schiclose, x = T, y = T)`

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1077	LR χ^2	513.42	R^2	0.533	C	0.891
Don't walk	741	d.f.	2	g	3.082	D_{xy}	0.783
Walk	336	$\Pr(>\chi^2) < 0.0001$		g_r	21.807	γ	0.784
Cluster on	`School`			g_p	0.334	τ_a	0.336
Clusters	12			Brier	0.123		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	5×10^{-4}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	2.3810	0.2527	9.42	< 0.0001
Dist	-0.0014	0.0001	-12.43	< 0.0001
schiclose	-0.0821	0.2038	-0.40	0.6870

5 Multivariate models

5.1 Physical Environment

Block 1

```
lrm(formula = W2S ~ Dist, x = T, y = T)
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1077	LR χ^2	513.25	R^2	0.533	C	0.891
Don't walk	741	d.f.	1	g	3.090	D_{xy}	0.782
Walk	336	$\Pr(>\chi^2)$	< 0.0001	g_r	21.981	γ	0.783
Cluster on	`School`			g_p	0.334	τ_a	0.336
Clusters	12			Brier	0.123		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	5×10^{-4}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	2.3013	0.1678	13.71	< 0.0001
Dist	-0.0014	0.0001	-12.96	< 0.0001

5.2 Individual Factors

5.2.1 Parental factors

When `parents_safe` was added to Block 1, the interaction term with Distance was not significant, and was hence removed.

Block 2

```
lrm(formula = W2S ~ Dist + parents_safe + Sex + parents_safe:Sex,
    x = T, y = T)
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1069	LR χ^2	541.44	R^2	0.559	C	0.900
Don't walk	736	d.f.	4	g	3.346	D_{xy}	0.800
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	28.380	γ	0.801
Cluster on `School`				g_p	0.342	τ_a	0.344
Clusters	12			Brier	0.117		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.002						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	1.6871	0.6964	2.42	0.0154
Dist	-0.0013	0.0001	-12.17	< 0.0001
parents_safe	0.4724	0.4206	1.12	0.2614
Sex	0.8978	0.4466	2.01	0.0444
parents_safe * Sex	-0.7203	0.2829	-2.55	0.0109

There are 8 fewer cases in this model because of missing values for `parents_safe`. The likelihood ratio test shows that this model has significantly less deviance than the previous model.The C index, i.e. area under the ROC, is 0.891 for Block 1 vs. 0.900 for Block 2.

```
Model 1: W2S ~ Dist
Model 2: W2S ~ Dist + parents_safe + Sex + parents_safe:Sex

L.R. Chisq       d.f.          P
   2.8e+01    3.0e+00    3.3e-06
```

5.2.2 Perceptions of the environment

There was a dramatic reduction in sample size due to the large number of missing values for `NGEsthetics` (down to $n = 975$), however neither the main effect of that variable nor any of its moderators were significant, hence it was removed and the model was run again. Terms that were no longer significant in this block are `interesting` and its moderators, and `boring*Dist`.

Block 3

```
lrm(formula = W2S ~ Dist + parents_safe + Sex + hills + weather +
    pleasant + parents_safe:Sex + Dist:hills + Sex:pleasant,
    x = T, y = T)
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1069	LR χ^2	584.85	R^2	0.593	C	0.911
Don't walk	736	d.f.	9	g	3.710	D_{xy}	0.822
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	40.850	γ	0.823
Cluster on	`School`			g_p	0.352	τ_a	0.353
Clusters	12			Brier	0.111		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	4×10^{-4}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-2.0422	1.0772	-1.90	0.0580
Dist	-0.0010	0.0002	-6.48	< 0.0001
parents_safe	0.6875	0.3170	2.17	0.0301
Sex	3.0127	0.5657	5.33	< 0.0001
hills	0.0708	0.1339	0.53	0.5969
weather	-0.3378	0.0931	-3.63	0.0003
pleasant	0.8165	0.2667	3.06	0.0022
parents_safe * Sex	-0.8011	0.2416	-3.32	0.0009
Dist * hills	-0.0001	0.0001	-2.10	0.0353
Sex * pleasant	-0.3997	0.1416	-2.82	0.0048

The C index is 0.900 for Block 3 vs. 0.911 for Block 3, and the likelihood ratio test confirms the reduction in deviance is significant.

```
Model 1: W2S ~ Dist + parents_safe + Sex + parents_safe:Sex
Model 2: W2S ~ Dist + parents_safe + Sex + hills + weather + pleasant +
    parents_safe:Sex + Dist:hills + Sex:pleasant

L.R. Chisq       d.f.          P
   4.3e+01    5.0e+00    3.0e-08
```

5.2.3 Youth factors

5.2.3.1 Characteristics BMI

Block 4

```
lrm(formula = W2S ~ Dist + parents_safe + Sex + hills + weather +
    pleasant + BMI_f + parents_safe:Sex + Dist:hills + Sex:pleasant,
    x = T, y = T)
```

Frequencies of Missing Values Due to Each Variable

```
     W2S         Dist parents_safe          Sex        hills      weather
       0            0            0            0            0            0
pleasant        BMI_f
       0           81
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	988	LR χ^2	537.04	R^2	0.589	C	0.909
Don't walk	677	d.f.	10	g	3.606	D_{xy}	0.819
Walk	311	$\Pr(>\chi^2) < 0.0001$		g_r	36.816	γ	0.819
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	1×10^{-4}			g_p	0.353	τ_a	0.353
				Brier	0.112		

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	-2.1500	1.3557	-1.59	0.1128
Dist	-0.0011	0.0002	-4.24	<0.0001
parents_safe	0.7755	0.3990	1.94	0.0519
Sex	3.2873	0.7826	4.20	<0.0001
hills	0.0540	0.2177	0.25	0.8040
weather	-0.3444	0.1109	-3.10	0.0019
pleasant	0.8409	0.2189	3.84	0.0001
BMI_f=Unhealthy	-0.2742	0.2197	-1.25	0.2121
parents_safe * Sex	-0.8920	0.2748	-3.25	0.0012
Dist * hills	-0.0001	0.0001	-0.86	0.3887
Sex * pleasant	-0.4317	0.1312	-3.29	0.0010

Block 5

5.2.3.2 Attitudes

```
lrm(formula = W2S ~ Dist + parents_safe + Sex + pleasant + desire +
    Age + parents_safe:Sex + Sex:pleasant + desire:Age, x = T,
    y = T)
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1069	LR χ^2	621.17	R^2	0.620	C	0.919
Don't walk	736	d.f.	9	g	3.686	D_{xy}	0.839
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	39.869	γ	0.839
Cluster on	`School`			g_p	0.360	τ_a	0.360
Clusters	12			Brier	0.105		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	2×10^{-9}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	-4.8946	2.9593	-1.65	0.0981
Dist	-0.0013	0.0001	-11.39	< 0.0001
parents_safe	0.7523	0.3651	2.06	0.0393
Sex	2.8370	0.5777	4.91	< 0.0001
pleasant	0.7070	0.2621	2.70	0.0070
desire	2.0985	1.1884	1.77	0.0774
Age	0.2750	0.1427	1.93	0.0540
parents_safe * Sex	-0.7837	0.2803	-2.80	0.0052
Sex * pleasant	-0.3928	0.1392	-2.82	0.0048
desire * Age	-0.1849	0.0828	-2.23	0.0256

The C indices are 0.911 for Block 3 vs. 0.919 for Block 5. The likelihood ratio test cannot be performed because the models are not nested.

5.3 The decision process

Block 6

```
lrm(formula = W2S ~ Dist + parents_safe + Sex + pleasant + desire +
    Age + control + parents_safe:Sex + Sex:pleasant + desire:Age +
    Sex:control, x = T, y = T)
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	1069	LR χ^2	639.36	R^2	0.633	C	0.924
Don't walk	736	d.f.	11	g	3.816	D_{xy}	0.848
Walk	333	$\Pr(>\chi^2) < 0.0001$		g_r	45.438	γ	0.849
Cluster on	`School`			g_p	0.364	τ_a	0.364
Clusters	12			Brier	0.101		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	6×10^{-9}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z \rvert)$
Intercept	-5.8096	3.3326	-1.74	0.0813
Dist	-0.0013	0.0001	-11.11	< 0.0001
parents_safe	0.7428	0.3657	2.03	0.0422
Sex	3.4935	0.6831	5.11	< 0.0001
pleasant	0.6832	0.2690	2.54	0.0111
desire	2.1771	1.3026	1.67	0.0946
Age	0.3223	0.1572	2.05	0.0404
control	0.1351	0.1412	0.96	0.3388
parents_safe * Sex	-0.7793	0.2810	-2.77	0.0055
Sex * pleasant	-0.3650	0.1415	-2.58	0.0099
desire * Age	-0.1943	0.0907	-2.14	0.0321
Sex * control	-0.2096	0.0757	-2.77	0.0056

```
Model 1: W2S ~ Dist + parents_safe + Sex + pleasant + desire + Age + parents_safe:Sex +
    Sex:pleasant + desire:Age
Model 2: W2S ~ Dist + parents_safe + Sex + pleasant + desire + Age + control +
    parents_safe:Sex + Sex:pleasant + desire:Age + Sex:control

L.R. Chisq       d.f.          P
  1.82e+01   2.00e+00   1.12e-04
```

The likelihood ratio test is significant, and the difference is substantial (e.g. the C indices 0.909 for Block 5 vs. 0.924 for Block 6.

5.4 Other factors

Block 7a

```
lrm(formula = W2S ~ Dist + parents_safe + Sex + pleasant + desire +
    control + regwalk + parents_safe:Sex + Sex:pleasant, x = T,
    y = T)
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	878	LR χ^2	631.83	R^2	0.717	C	0.949
Don't walk	595	d.f.	9	g	4.744	D_{xy}	0.898
Walk	283	$\Pr(>\chi^2) < 0.0001$		g_r	114.915	γ	0.898
Cluster on	School			g_p	0.393	τ_a	0.393
Clusters	12			Brier	0.083		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	9×10^{-6}						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	-4.1599	1.4910	-2.79	0.0053
Dist	-0.0014	0.0002	-8.75	< 0.0001
parents_safe	1.0262	0.5534	1.85	0.0637
Sex	3.1436	1.0536	2.98	0.0028
pleasant	0.7461	0.3144	2.37	0.0176
desire	-0.6155	0.1821	-3.38	0.0007
control	-0.1787	0.0634	-2.82	0.0049
regwalk	1.1989	0.1320	9.08	< 0.0001
parents_safe * Sex	-1.0485	0.4712	-2.23	0.0261
Sex * pleasant	-0.4499	0.1750	-2.57	0.0101

Block 7b

```
lrm(formula = W2S ~ rcs(Dist, 3) + parents_safe * Sex + pleasant *
    Sex + desire + control + regwalk, x = T, y = T)
```

		Model Likelihood Ratio Test		Discrimination Indexes		Rank Discrim. Indexes	
Obs	878	LR χ^2	636.59	R^2	0.721	C	0.950
Don't walk	595	d.f.	10	g	4.230	D_{xy}	0.900
Walk	283	$\Pr(>\chi^2) < 0.0001$		g_r	68.724	γ	0.900
Cluster on	School			g_p	0.394	τ_a	0.394
Clusters	12			Brier	0.082		
$\max \lvert \frac{\partial \log L}{\partial \beta} \rvert$	0.03						

	Coef	S.E.	Wald Z	$\Pr(>\lvert Z\rvert)$
Intercept	-3.5804	1.4785	-2.42	0.0154
Dist	-0.0018	0.0002	-9.39	< 0.0001
Dist'	0.0012	0.0003	3.85	0.0001
parents_safe	1.0331	0.5653	1.83	0.0676
Sex	3.0588	1.0578	2.89	0.0038
pleasant	0.7192	0.3167	2.27	0.0232
desire	-0.6366	0.1920	-3.32	0.0009
control	-0.1760	0.0634	-2.78	0.0055
regwalk	1.2225	0.1348	9.07	< 0.0001
parents_safe * Sex	-1.0512	0.4763	-2.21	0.0273
Sex * pleasant	-0.4329	0.1758	-2.46	0.0138

```
            Effects             Response : W2S

 Factor       Low    High   Diff.  Effect    S.E.    Lower 0.95 Upper 0.95
 Dist         1364.8 4306.2 2941.5 -3.664700 0.31357 -4.279300  -3.050100
  Odds Ratio  1364.8 4306.2 2941.5  0.025612      NA  0.013853   0.047355
 parents_safe    1.0    2.0    1.0 -0.018064 0.15121 -0.314430   0.278310
  Odds Ratio     1.0    2.0    1.0  0.982100      NA  0.730200   1.320900
 Sex             1.0    2.0    1.0  0.275940 0.31759 -0.346530   0.898410
  Odds Ratio     1.0    2.0    1.0  1.317800      NA  0.707140   2.455700
 pleasant        4.0    6.0    2.0  0.572500 0.30183 -0.019085   1.164100
  Odds Ratio     4.0    6.0    2.0  1.772700      NA  0.981100   3.203000
 desire          1.0    3.0    2.0 -1.273300 0.38393 -2.025800  -0.520800
  Odds Ratio     1.0    3.0    2.0  0.279910      NA  0.131890   0.594050
 control         3.0    6.0    3.0 -0.528030 0.19005 -0.900520  -0.155530
  Odds Ratio     3.0    6.0    3.0  0.589770      NA  0.406360   0.855960
 regwalk         2.0    4.0    2.0  2.445000 0.26962  1.916500   2.973400
  Odds Ratio     2.0    4.0    2.0 11.530000      NA  6.797400  19.559000

Adjusted to: parents_safe=1 Sex=1 pleasant=4
```

The likelihood ratio test is significant, and in substantive terms the difference is also significant (e.g. the *C* indices 0.92 for Block 6 vs. 0.95 for Block 7b).

```
Model 1: W2S ~ Dist + parents_safe + Sex + pleasant + desire + Age + control +
    parents_safe:Sex + Sex:pleasant + desire:Age + Sex:control
Model 2: W2S ~ rcs(Dist, 3) + parents_safe * Sex + pleasant * Sex + desire +
    control + regwalk

L.R. Chisq       d.f.          P
     2.770      1.000      0.096
```

6 The final model

Summary:

```
**** Summarising model in a way that I prefer ****
Setting datadistDon't walk       Walk          n
       595        283        878

lrm(formula = W2S ~ rcs(Dist, 3) + parents_safe * Sex + pleasant *
    Sex + desire + control + regwalk, x = T, y = T)
                Wald Statistics          Response: W2S

 Factor                                             Chi-Square d.f. P
 Dist                                               139.2       2   <.0001
  Nonlinear                                          14.8       1   0.0001
 parents_safe  (Factor+Higher Order Factors)          6.7       2   0.0346
  All Interactions                                    4.9       1   0.0273
 Sex  (Factor+Higher Order Factors)                  11.9       3   0.0076
  All Interactions                                   10.8       2   0.0045
 pleasant  (Factor+Higher Order Factors)              6.4       2   0.0412
  All Interactions                                    6.1       1   0.0138
 desire                                             11.0       1   0.0009
 control                                             7.7       1   0.0055
 regwalk                                            82.2       1   <.0001
 parents_safe * Sex  (Factor+Higher Order Factors)   4.9       1   0.0273
 Sex * pleasant  (Factor+Higher Order Factors)       6.1       1   0.0138
 TOTAL INTERACTION                                  10.8       2   0.0045
 TOTAL NONLINEAR + INTERACTION                      22.7       3   <.0001
 TOTAL                                             326.8      10   <.0001

            Model Summary
----------------------------------------
Nagelkerke R2      72%        AIC  489
Area under ROC     95%        BIC  542
Balanced accuracy  89%          n 878
Sensitivity        89%         LR  637
Specificity        90%         df    10
----------------------------------------
```

Expressed as *simple* odds ratios (i.e. non-comparable):

```
         Intercept              Dist             Dist'       parents_safe
             0.028             0.998             1.001              2.810
               Sex          pleasant            desire           control
            21.302             2.053             0.529              0.839
          regwalk parents_safe * Sex     Sex * pleasant
             3.396             0.350             0.649
```

7 Summary

The final model should be compared with the final model developed by me, using the opposite approach, i.e. entering all potential covariates first and then removing them one-by one.

Variable	JW	JS
Distance	y	y
regwalk	y	y
pleasant	n	y
desire	n	y
control	n	y
Sex	n	y
parents safe	n	y
parents say	y	n
BMI	y	n
onway	y	n
sched	y	n
planning	y	n
cool	y	n

We can see that the models are very dissimilar. This happens when there is multicollinearity, and when a small number of variables have very large effects, and the rest of the effects are relatively small. Standard diagnostic tests (i.e. examination of VIFs did not indicate excessive multicollinearity), but the possiblility remains, as many of the IVs have at least moderate correlation.

But because the results obtained depend on the order in which variables are entered or removed, only tentative conclusions should be drawn at this stage. To me, the overwhelming effect is the—somewhat theoretically trivial—effect of being a walker for general mobility. All other effects should be interpreted with caution, and substantiated by additional analysis, if possible.

However a crucial difference in the modelling, apart from the order effect, is the use of interaction terms in John Spence's approach. However this is non-trivial to implement in a step-down procedure, as the huge number of terms in a single model leads almost invariably to numerical problems.

These issues are, unfortuately, part and parcel of social science modelling: large measurement error compounding the curse of dimensionality.

One way to address this problem is to compare the models based on explanatory power, either by information measures (AIC, BIC), classification measures (the C index (AUC) or correlational measure of estimates with true values (R^2 or τ_a). (I wrote this before I conducted the comparison, so I can truly claim to be unbiased.) The results are:

Criterion	JW	JS	Better
AIC	421	492	JW
BIC	467	540	JW
R^2	0.75	0.72	JW
τ_a	0.40	0.39	JW
C	0.96	0.95	JW
Brier	0.08	0.08	–

My model is better on all measures, *statistically*, however the JS model may be superior on theoretical grounds. I do not have the knowlwedge to make this judgement, however.