Manuscript

1 Introduction

- Producing successful athletes are result of repeated selection process, not an initial selection and then long term intervention.
- The turnover/survival rate has been analyzed for example in soccer. But few studies looking at what influence the reelection.

2 Method

2.1 Sample

2.2 Variables and procedure

2.3 Statistical analysis

- RC – Relative Chance (Relative risk)
- CI – Compatibility interval
- LOO-IC – Leave-one-out cross validation information criteria

3 Results

The proportion of players reselected are presented in Table 1. Model 3 showed the lowest relative LOO-IC of the four models compared. All following results are therefore based on Model 3. The model coefficients are presented in Table 2, for full table of model coefficients and LOO-IC, see Supplementary Material 1.

The model coefficients and the effects excluded suggest that the chance of reselection vary between debut and player ages; that there is a positive relationship between later birth quarter and higher chance of reselection, with equal effect across debut and player age; and that there is a positive relationship between higher ranking points and higher chance of reselection for women, and possibly for men, with different effect for different debut and player ages.

When taking into account the influence of the other variables, it is unclear if there is a difference in reselection chance between genders (intercept). It is likely that the relationship between ranking points and reselection chance is stronger in women than men. The relationship between birth quarter and reselection is similar for both genders.

Table 1: Season-to-season and cumulative reselection proportion by debut and age

		Reselection percentage						Cumulative percentage				
Debut	n	16	17	18	19	20	Mean	16	17	18	19	20
Men												
15	397	94.0	85.3	92.8	78.0	82.2	87.1	94.0	80.1	74.3	57.9	47.6
16	3075		60.1	95.3	71.8	79.5	73.9		60.1	57.2	41.1	32.7
17	202			84.2	77.1	80.9	80.9			84.2	64.9	52.5
18	1093				54.3	82.0	64.1				54.3	44.6
19	271					57.9	57.9					57.9
Mean	5038	94.0	62.8	94.0	66.8	78.1	74.2	94.0	62.4	60.6	46.5	38.6
Women												
15	714	92.9	91.7	92.3	82.4	81.4	88.8	92.9	85.2	78.6	64.7	52.7
16	1795		67.2	92.0	78.1	80.5	78.0		67.2	61.9	48.4	38.9
17	250			70.4	79.5	80.0	75.6			70.4	56.0	44.8
18	426				52.6	81.2	62.5				52.6	42.7
19	139					43.9	43.9					43.9
Mean	3324	92.9	73.8	89.5	74.5	78.0	79.7	92.9	72.3	67.0	53.2	43.0

Table 2: Coefficient of Model 3 and difference between genders

				Women - Men		
		95% CI			95% CI	
	Coef	LL	UL	Diff	LL	UL
Fixed Effects						
Men: Intercept	1.32	0.86	1.73			
Women: Intercept	1.26	0.83	1.69	-0.06	-0.69	0.50
Men: Ranking Points	0.25	-0.08	0.54			
Women: Ranking Points	0.70	0.34	1.11	0.45	-0.06	0.93
Men: Birth Quarter	0.11	0.07	0.16			
Women: Birth Quarter	0.09	0.04	0.13	-0.02	-0.09	0.04
Random Effects						
Category	0.78	0.43	1.23			
Category × Ranking Points	0.26	0.02	0.57			

3.1 Debut age

The relative chance of remaining selected until age 20 between different debut ages are presented in Table 3. For men, the chance of remaining selected until the age of 20 is lower for players debuting at age 16 compared to all other ages. In general, there tend to be a higher chance for players debuting at 15, 17 and 19 compared to 16 and 18. For women, the chance for players debuting at 15 is higher compared to all other ages. The chance for debut ages 17, 18 and 19 seem to be similar to each other. The chance of remaining selected over the years for each debut age can be seen in Figure 1.

3.2 Ranking points

The estimated marginal chance of remaining selected until 20 in top and bottom ranked countries, together with the relative chance are presented in Table 4. For men, players in top ranked countries have a higher

Table 3: Relative chance of remaining selected until age 20 between different debut ages

		95% CI	
Debut	RC	LL	UL
Men			
16 / 15	0.65	0.57	0.74
17 / 15	1.06	0.88	1.26
17 / 16	1.64	1.38	1.89
18 / 15	0.93	0.81	1.05
18 / 16	1.43	1.28	1.57
18 / 17	0.88	0.73	1.02
19 / 15	1.09	0.91	1.28
19 / 16	1.68	1.45	1.94
19 / 17	1.03	0.84	1.24
19 / 18	1.18	0.99	1.37
Women			
16 / 15	0.72	0.65	0.80
17 / 15	0.86	0.73	1.00
17 / 16	1.19	1.01	1.37
18 / 15	0.79	0.67	0.90
18 / 16	1.09	0.95	1.25
18 / 17	0.92	0.76	1.08
19 / 15	0.84	0.65	1.00
19 / 16	1.16	0.92	1.40
19 / 17	0.98	0.74	1.21
19 / 18	1.06	0.82	1.32

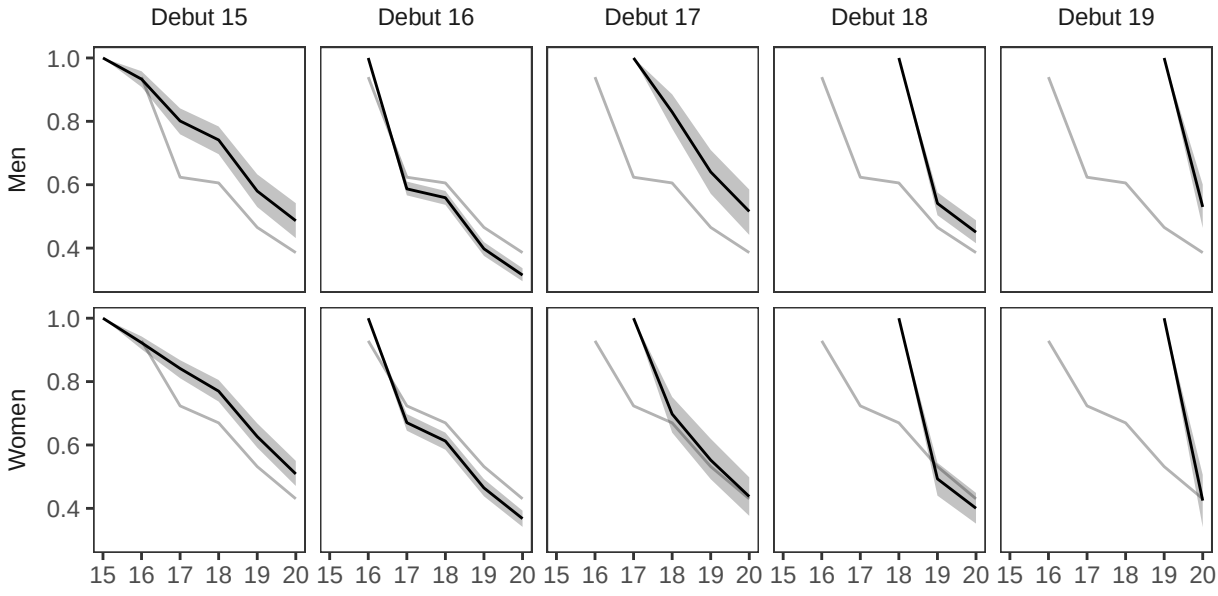

Figure 1: Chance of remaining selected by debute age, with 95% compatibility interval. Gray line indicate chance of remaining for all players.

Table 4: Relative chance of remaining selected until age 20 between top and bottom ranked countries

	Top			Bottom			Top / Bottom		
		95% CI			95% CI			95% CI	
Debut	Est	LL	UL	Est	LL	UL	RC	LL	UL
Men									
15	0.52	0.42	0.62	0.49	0.43	0.54	1.09	0.83	1.33
16	0.41	0.37	0.45	0.31	0.29	0.34	1.32	1.16	1.48
17	0.57	0.44	0.70	0.51	0.44	0.58	1.11	0.82	1.38
18	0.45	0.39	0.51	0.45	0.41	0.49	1.01	0.82	1.18
19	0.75	0.65	0.87	0.53	0.46	0.60	1.43	1.15	1.75
Women									
15	0.71	0.62	0.79	0.49	0.45	0.53	1.45	1.22	1.71
16	0.52	0.45	0.59	0.35	0.33	0.38	1.48	1.21	1.71
17	0.59	0.45	0.72	0.42	0.36	0.49	1.39	1.00	1.78
18	0.57	0.46	0.68	0.39	0.33	0.44	1.49	1.10	1.87
19	0.63	0.43	0.79	0.41	0.32	0.50	1.55	1.02	2.20

chance of remaining selected until 20 than players from bottom ranked teams when debuting at age 16 or 19. For women, the higher players in top ranked countries have a higher chance of remaining selected until 20 than players from bottom ranked teams for all debut ages. The chance of remaining selected over the years in top and bottom ranked countries can be seen in Figure 2.

3.3 Birth quarter

For men, the estimated marginal chance of remaining selected until 20 for players born in quarter 1 is 0.41 95% CI [0.25, 0.53], and for players born in quarter 4 0.51 95% CI [0.35, 0.62]. Players born in quarter 4 have 1.25 times 95% CI [1.11, 1.45] higher chance of remaining selected compared to players born in quarter 1. For women, the estimated marginal chance of remaining selected until 20 for players born in quarter 1 is 0.39 95% CI [0.30, 0.49], and for players born in quarter 4 0.47 95% CI [0.38, 0.58]. Players born in quarter 4 have 1.20 times 95% CI [1.07, 1.35] higher chance of remaining selected compared to players born in quarter 1. The chance of remaining selected over the years in top and bottom ranked countries can be seen in Figure 3.

4 Discussion

4.1 Debut age

Two patterns:

- Later debut = higher probability remain until 20. (Later initial selection = more sure about talent? Or, later initial selection = fewer seasons to get kicked out?)
- Debut as underaged (15, 17, 19) = higher probability to remain selected until 20. (Initial selection when younger requires more talent? Players making debut as oldest in agegroup (16, 18) are "utfyllnadsspelare"?)

4.2 Player age

- Highest reselection from underage to oldest in agegroup (15 to 16, 17 to 18). 90% of players that participated first year in a agegroup were reselected the year after. (In line with results about debut age).

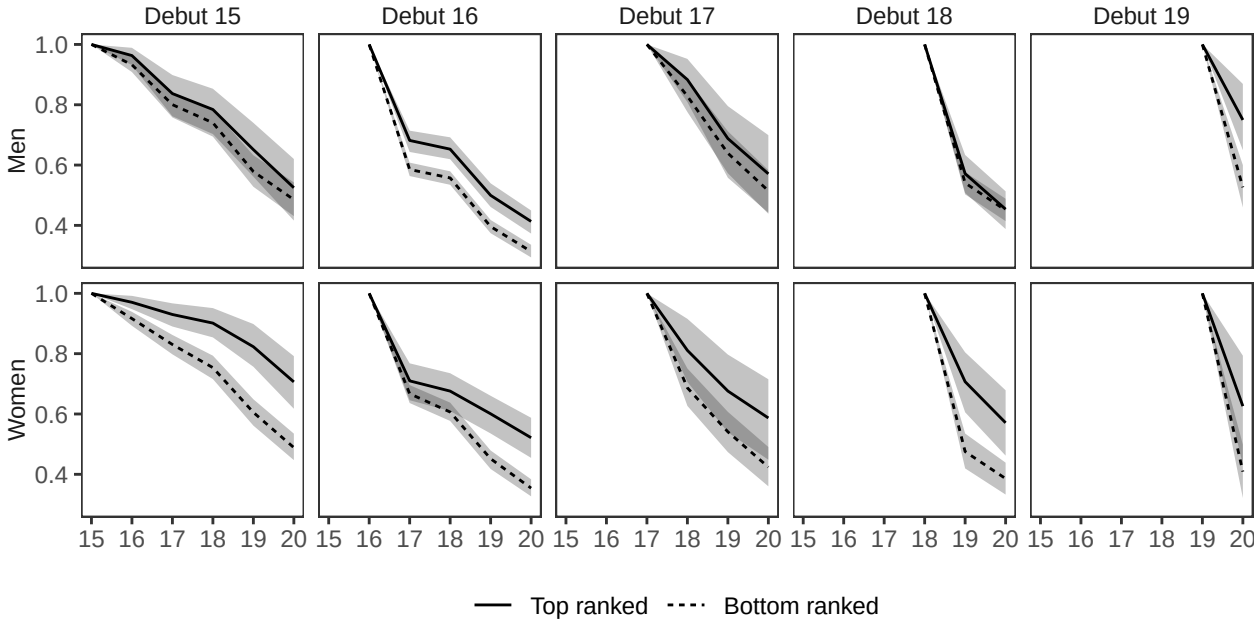

Figure 2: Chance of remaining selected in top and bottom ranked countries by debute age, with 95% compatibility interval.

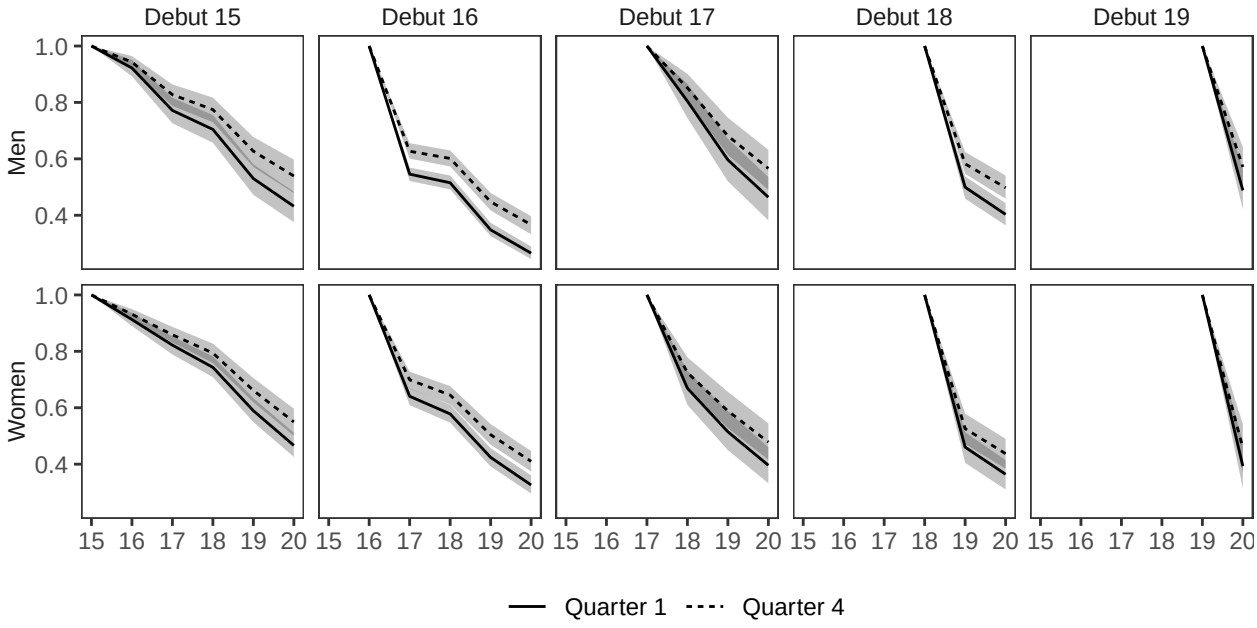

Figure 3: Chance of remaining selected for players born in quarter 1 and 4, with 95% compatibility interval.

- Less differences in women.

Supplementary material 1

Table 5: Coefficients and cross-validation for all models

	Model 1			Model 2			Model 3			Model 4		
		95% CI			95% CI			95% CI			95% CI	
	Est	LL	UL	Est	LL	UL	Est	LL	UL	Est	LL	UL
Fixed Effects												
Men: Intercept	1.31	0.92	1.73	1.31	0.87	1.74	1.32	0.86	1.73	1.31	0.86	1.70
Women: Intercept	1.27	0.80	1.66	1.27	0.81	1.69	1.26	0.83	1.69	1.28	0.87	1.70
Men: Ranking Points	0.28	0.16	0.41	0.27	0.14	0.40	0.25	-0.08	0.54	0.29	0.16	0.41
Women: Ranking Points	0.59	0.40	0.82	0.60	0.38	0.81	0.70	0.34	1.11	0.59	0.37	0.80
Men: Birth Quarter	0.11	0.07	0.15	0.12	0.06	0.17	0.11	0.07	0.16	0.11	0.05	0.15
Women: Birth Quarter	0.09	0.04	0.14	0.08	0.02	0.13	0.09	0.04	0.13	0.09	0.04	0.15
Men: Birth Quarter × Ranking Points				-0.03	-0.16	0.10						
Women: Birth Quarter × Ranking Points				0.03	-0.17	0.24						
Random Effects												
Category	0.76	0.40	1.19	0.77	0.39	1.24	0.78	0.43	1.23	0.75	0.40	1.19
Category × Ranking Points							0.26	0.02	0.57			
Category × Birth Quarter										0.00	0.00	0.00
Cross-Validation												
Relative LOO-IC (SE)	23.37	9.23		26.30	9.23		0.00	0.00		24.93	9.27	