The effect of implementing new strategies to make youth cycling more accessible within Cycling Vlaanderen:
How to better deal with relative age and late maturity effects?

Amber Rombaut, UGent

Nele De Vos, UGent

Promotor: Prof. Dr. Birgitte Schoenmakers, KU Leuven

Co-promotor: Prof. Dr. Em. Werner Helsen, KU Leuven

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List of abbreviations

CV= Coefficient of variation
IQR= Interquartile range
LME= Late Maturity Effect
lnVR = ln(SDPOST/SDPRE)
lnCVR = ln(CVPOST/CVPRE)
PRE= Pre Reallocation
POST= Post Reallocation
RAE= Relative Age Effect
SD= Standard Deviation

Manuscript format

This master’s thesis is written in the format of a manuscript intended for submission to *Frontiers in Sports and Active Living* and follows the journal’s author guidelines.

Woord vooraf

In dit woord vooraf voorzien wij een korte introductie in de totstandkoming van deze masterproef. Wij zijn Amber en Nele, twee huisartsen in opleiding die elkaar voor het eerst tegen het lijf liepen tijdens onze opleiding aan de Universiteit Gent. Wat ons behalve die opleiding geneeskunde met elkaar verbindt, is onze passie voor sport. Sport is iets dat in onze beide levens een grote rol speelt en wij zijn ervan overtuigd dat dit in de huisartsenpraktijk niet anders zou mogen zijn. In een tijdperk waarin welvaartsziekten zoals obesitas en diabetes type 2 een alsmaar groter deel beginnen uitmaken van ons werkveld, groeit ook de aandacht naar preventie en behandeling hiervan. Beweging is een hoofdrolspeler op beide vlakken.
Deze masterproef is een eindproduct van een project waar we drie jaar geleden onze schouders wilden onderzetten. *Cycling Vlaanderen* was aan het nadenken over hoe ze hun wielersport meer toegankelijk en eerlijker konden maken met aandacht voor ontwikkeling en maturiteit bij jeugdrenners. Steeds vaker zien ze namelijk jonge renners vroegtijdig afhaken, omdat zij regelmatig moeten lossen uit het peloton, wedstrijden niet meer tot een goed einde kunnen brengen en gedemotiveerd geraken. Er wordt vermoed dat het *"relative age effect"* (RAE) en *"late maturity effect"* (LME) hier belangrijke beïnvloedende factoren toe zijn. Om dit het hoofd te kunnen bieden werden de "dispensatiemaatregelen" uitgewerkt. Dit zijn maatregelen waarmee renners een aanvraag kunnen doen om een categorie hoger of lager te rijden. In het proefproject werd al één dispensatiemaatregel in de praktijk in gebruik genomen, die rekening houdt met het RAE: wanneer men in de tweede helft van het jaar geboren is, kan men in een leeftijdscategorie jonger blijven rijden tot de verjaardag. Om een wetenschappelijke basis te bieden voor deze dispensatiemaatregelen, wilden wij voor onze masterproef interviews doen bij de renners die een dispensatiemaatregel gebruikten. Daarnaast mochten wij van *Cycling Vlaanderen* gebruik maken van hun dataset van alle medische keuringen bij jeugdrenners met een competitievergunning van de afgelopen 5 jaar. Deze beide kansen zorgden ervoor dat we tot een mixed-method studie kwamen waarbij we enerzijds een statistische analyse uitvoerden op de dataset en anderzijds een kwalitatieve analyse van interviews die we afnamen bij de jeugdrenners. Voor ons was dit een mooie leerschool in de verschillende methodologieën van wetenschappelijk onderzoek.

Wij zijn alleszins trots op het eindresultaat, waarbij we een basis leggen voor het mee in rekening brengen van de ontwikkelingsleeftijd van het kind en de opgroeiende jongere in het jeugdwielrennen en bij uitbreiding in jeugdsport in het algemeen. We tonen op een overzichtelijke manier aan hoe verschillend lengte en gewicht kunnen zijn in categorieën gebaseerd op geboortejaar, en hoe een methode die rekening houdt met de ontwikkelingsleeftijd (o.b.v. de groeicurves van Vlaamse kinderen/jongeren) daar verandering in kan brengen. Tevens wordt nagegaan hoe de mogelijkheid om te sporten in een categorie die op maat is van het kunnen en de ontwikkeling van de sporter ervoor kan zorgen dat sportplezier en zelfvertrouwen aanwezig blijven. Dat is dan ook wat we willen bereiken: zoals de *"active for life"* benadering uit het LTAD-model ons leert, willen we jongeren een leven lang laten sporten en bewegen door participatie in recreatieve of competitieve sport. En zoals we allemaal weten, kan dat zowel de fysieke als mentale gezondheid op lange termijn alleen maar ten goede komen. Sport als beste medicijn, wij zijn alvast voorstanders.

Amber & Nele – Gent 14/04/2026

Abstract

Background: Youth cycling within *Cycling Vlaanderen* faces increasing performance gaps and rising dropout, potentially driven by the Relative Age Effect (RAE) and Late Maturity Effect (LME). *Cycling Vlaanderen* implemented a pilot project of dispensation strategies allowing certain riders to compete in a lower age category.

Methods: A mixed-methods study was conducted. Part 1 was a cross-sectional secondary analysis of mandatory pre-participation medical screening records (11/05/2020–14/03/2025) from youth cyclists (≤18 years), comparing within-category dispersion of height and weight under the current year-of-birth system versus the reallocation system of Helsen et al. Part 2 comprised structured interviews with riders (and a parent) who used *Cycling Vlaanderen's* dispensation strategy, that were analysed via inductive thematic analysis.

Results: After data cleaning 13,614 records were preserved for analysis. Across all paired categories (U6–U19), the reallocation system consistently reduced within-category dispersion for both height and weight. The geometric mean SD ratio across categories was 0.660 for height and 0.656 for weight, corresponding to ~34% lower SD; lnVR and lnCVR were <0 in every category, with the largest reductions around mid-adolescence (~U15). 16 riders participated in interviews. Participants reported that dispensation improved meaningful race participation (staying in the peloton, fewer lap losses), learning opportunities (tactics, positioning), motivation, and self-confidence. Reported drawbacks included championship ineligibility, forced return after strong results, and disruptive mid-season category changes (birthday-related return to original category).

Discussion: The consistent compression of anthropometric dispersion suggests that the reallocation method reduces inequities created by annual age-grouping, particularly when maturation differences peak. Qualitative findings indicate that dispensation can function as an aid for less experienced or late-maturing riders providing relevant race experiences. There were still some practical constraints, indicating scope for improvement, particularly in rule design and communication.

Conclusion: Reallocation taking the developmental age into account, substantially narrows anthropometric heterogeneity within youth cycling categories, resulting in fairer competition structures. Early qualitative evidence suggests dispensation is perceived as developmentally supportive, though refinements are still required.

Introduction

Youth sports play a critical role in early talent development with the aim of achieving top-level sports performance, as well as promoting physical activity, conquering lifestyle diseases and supporting public health by an "active for life" approach (1, 2). However, within *Cycling Vlaanderen*, the official cycling federation in Flanders, growing concerns have arisen regarding the accessibility and fairness of youth cycling competitions. There are several reasons for that: the level of the best cyclists in youth competitions is rapidly increasing at younger ages, while the dropout rates in the same categories are escalating. This pattern indicates a growing disconnect between recreational and competitive cycling. *Cycling Vlaanderen* has observed alarming trends in youth road racing with up to half of the participants unable to finish the race, most likely due to the pace in the peloton being too high. For youth cyclists who experience this week after week, it could cause discouragement, a feeling of exclusion from competitive cycling and eventually drop out of the cycling sport (3-6).

Two critical factors, the relative age effect (RAE) and the late maturity effect (LME), might contribute to this imbalance. The RAE, widely documented in sports and other domains, originates from categorizing youth athletes by birth year (6-12). This system creates an age gap of up to one year within the same category, favoring athletes born earlier in the year. This results in a skewed distribution of success rates and development opportunities in favor of the early born, with first-trimester athletes consistently being overrepresented at competitive levels (13, 14). Similarly, the LME arises from variability in biological maturity, where early-maturing athletes gain an advantage in strength, size, and performance despite sharing the same chronological age as their peers (15-17). Together, the RAE and LME can create disparities equivalent to a developmental age difference of up to four years within the same competitive category (16-20).

These structural inequities not only hinder fair competition but are also suspected to be responsible for dropout rates among youth cyclists, particularly those born later in the year and/or those who are late maturing (4). Current systems disproportionately reward early developers and high performers, narrowing the talent pool and potentially overlooking future elite athletes (6-14). Moreover, the high dropout rate of youth cyclists who are not performing on an elite level is disadvantageous for the broader base of recreational participants that is essential for the sport's sustainability (21). *Cycling Vlaanderen* should aim to ensure that all youth cyclists are provided the opportunity to experience success, participate at an appropriate level, and remain engaged in the sport.

Helsen et al. developed a method to reallocate youth athletes in lower or higher age categories depending on their chronological and developmental age (22, 23). In the first part of this study, we aim to evaluate this reallocation method using anthropometric data of youth cyclists in a retrospective dataset analysis.

In the second part of the study, the recent dispensation strategy of *Cycling Vlaanderen* will be evaluated by interviews. To address the above-mentioned challenges, *Cycling Vlaanderen* initiated a pilot project to investigate if letting riders move up or down a category can create fairer competition. Riders can apply for a dispensation if they meet certain conditions. The first

implemented dispensation strategy in this pilot project allows cyclists born in the latter half of the year to compete in a younger age category. This study aims to assess the effectiveness and feasibility of these dispensation strategies in promoting equitable participation and reducing dropout rates.

Method

1. Quantitative Study of Anthropometry and Category Reallocation in Youth Cycling

For this part of the study, *Cycling Vlaanderen* provided pseudonymized records from the mandatory pre-participation sports medical screening for male youth cyclists with an upper age limit of 18 years old. All medical screenings took place between 11/05/2020 and 14/03/2025. The initial dataset consisted of 14,971 records. Each record had a unique ID.

The research goal is to determine whether the reallocation method of Helsen et al. (22, 23) reduces relative age and late-maturity effects within competitive categories in youth cycling. Specifically, we compared the current age-category system with the reallocation method and evaluated within-category anthropometric variation.

The study design is a cross-sectional secondary analysis of medical screening data from *Cycling Vlaanderen*. Primary outcomes were the distribution and within-category dispersion of height and weight under the current category system and the reallocation system of Helsen et al. (22, 23). Dispersion metrics included mean, standard deviation (SD), minimum, maximum, range, interquartile range (IQR), and coefficient of variation (CV). Differences in within-category dispersion between the reallocation (POST) and current (PRE) category systems were quantified using log-ratios: $\ln VR = \ln(SD_{POST}/SD_{PRE})$ for absolute dispersion and $\ln CVR = \ln(CV_{POST}/CV_{PRE})$, with $CV = 100*SD/mean$. Values < 0 indicate lower dispersion under reallocation.

All analyses were conducted in IBM SPSS Statistics v31. Data cleaning consisted of:

1. Duplicate removal by unique ID: 1,256 participants.
2. Exclusion of unrealistic height-for-age: 64 participants.
3. Exclusion of unrealistic weight-for-age: 31 participants.
4. Exclusion of age under 5 years (U6 is the youngest competitive age in *Cycling Vlaanderen*, specifically BMX): 6 participants.

After data cleaning, there were 13,614 records were left for analysis.

The reallocation procedure was followed as described by Helsen et al. (22, 23). For each cyclist, a developmental birth date was estimated by projecting observed height and weight onto the P50 (median) of normative Belgian growth curves. The allocation date was defined as the midpoint between the chronological and developmental birth dates. This allocation date determined the reallocated competitive category (Figure 1). Calculations were performed using a customized, open-source spreadsheet, and outputs were linked to the *Cycling Vlaanderen* records via the unique ID.

For both the current age-based method and the reallocation method distributional characteristics and within-category dispersion were compared across methods to assess whether the reallocation approach reduced anthropometric heterogeneity.

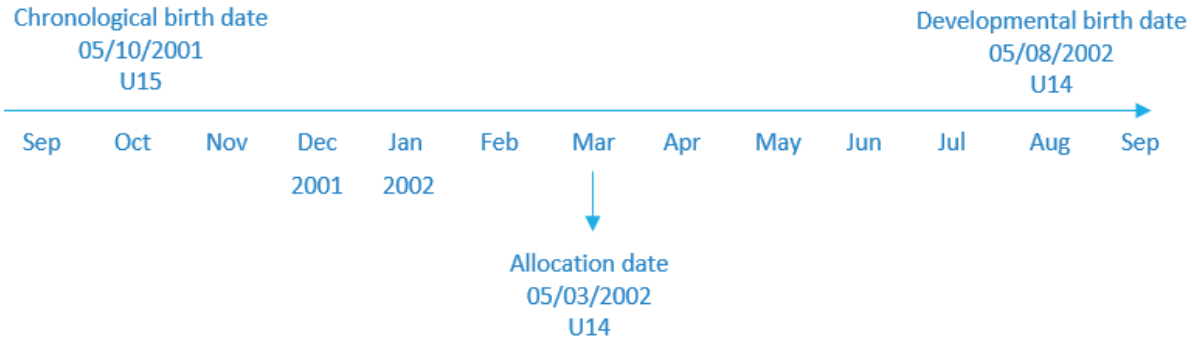


Figure 1: Example of the reallocation method by Helsen et al. (22, 23). A late mature U15 cyclist born on the 5th of October 2001 who has a developmental birth date on the 5th of August 2002, will have an allocation date of the 5th of March 2002. According to this, he will be reallocated to the U14 category.

2. Qualitative evaluation of the *Cycling Vlaanderen* dispensation strategies

In the second part of the study, we aimed to conduct a qualitative evaluation to explore the experiences of cyclists and their surrounding environment (parents, coaches) who were reclassified through *Cycling Vlaanderen's* dispensation strategies, to gain a broader understanding of the perceived impact and functioning of these measures.

These strategies enable certain riders to compete in a lower age category. The following cyclists were allowed to request dispensation:

- Cyclists within the U9 category up to and including first-year juniors (18 years old)
- Cyclists born in the second half of the year (from July 1 onward)
- Cyclists for whom developing competitive skills is challenging because the competition level is too high, resulting in consistently finishing at the back of the field

In this part of the study, we included cyclists who had been reclassified into a dispensation category according to the dispensation rules described above. These eligibility conditions also served as the inclusion criteria for this study. No additional exclusion criteria were defined.

We recruited sixteen riders and their parents who were willing to participate in the interview study. No participants withdrew from the study. *Cycling Vlaanderen* personally informed participants who had used a dispensation measure via email and invited them to participate in the study. No mailing lists were used to contact potential candidates. If the rider and their parents agreed to participate, *Cycling Vlaanderen* provided the contact details to the researchers so that they could arrange further planning. *Cycling Vlaanderen* already possessed the riders' contact details at the time of registration.

A qualitative study design was employed using structured interviews based on a predefined interview guide (Annex 1). Interviews were conducted by the primary researchers, with one parent present during each interview with a child participant. There was no pre-existing

relationship between the researchers and the participating cyclists or their parents. Interviews lasted between 25 and 40 minutes and addressed the following thematic domains:

1. Dispensation strategy and competition
2. Physical, psychological and social health
3. RAE and LME
4. General evaluation and suggestions

We provided three options for conducting the interview to ensure flexibility and convenience for the cyclist and their parents. The interview could take place online during a Microsoft Teams meeting, at the cyclist's home, or alternatively, we provided the option to interview at the *Cycling Vlaanderen* facilities, located in the Eddy Merckx Center in Ghent. All participants chose to participate in an online interview.

Transcripts of the interviews were produced from the audio recordings. After transcription, a quality check was performed: each transcript was reviewed while replaying the corresponding audio file to ensure accuracy and completeness. The validated transcripts were then imported into MAXQDA for qualitative analysis. An inductive thematic analysis was conducted, following a process of coding and grouping codes into categories. The analysis was performed per question, enabling comparison between participants and the identification of similarities, differences, and trends across the dataset.

2.1 Ethical approval

The ethical committee of UZ/KU Leuven approved this study with master's thesis number MP033195. The informed consent forms (Annexes 2 and 3) were sent to participants by email in advance. The ICF explains the purpose, methods, and implications of the study, including possible benefits and risks. It states that interviews will be audio-recorded for transcription and analysis. Participation is completely voluntary, can be stopped at any time without consequences, and data from incomplete interviews - including audio - are excluded and destroyed. At the beginning of the interview, participants were given the opportunity to ask questions. No interview was started before the ICF forms were signed.

Results

1. Quantitative Study of Anthropometry and Category Reallocation in Youth Cycling

After data cleaning 13,614 youth-cyclist records were considered for analysis. Descriptive and dispersion statistics were computed for each age category under the current year-of-birth system and the reallocation system.

Across all categories with paired data of both category systems (U6–U19) within-category dispersion of stature was significantly lower in the reallocation method compared to the current age-based method. Reductions were observed consistently for SD, range, IQR, and CV.

Absolute SD decreased in 14 out of 14 categories, with reductions ranging from 0,64 cm (U6) to 3,87 cm (U15). CV also decreased in 14 out of 14 categories by 0,5–2,5 percentage points. IQR narrowed in every paired category by 2,2–4,4 cm. The observed range narrowed in all categories except the U6 category where it stayed the same.

For each age category, sample sizes for height were substantial (typically N ≥ 300 in U8-U19) and of comparable magnitude before and after applying the reallocation method.

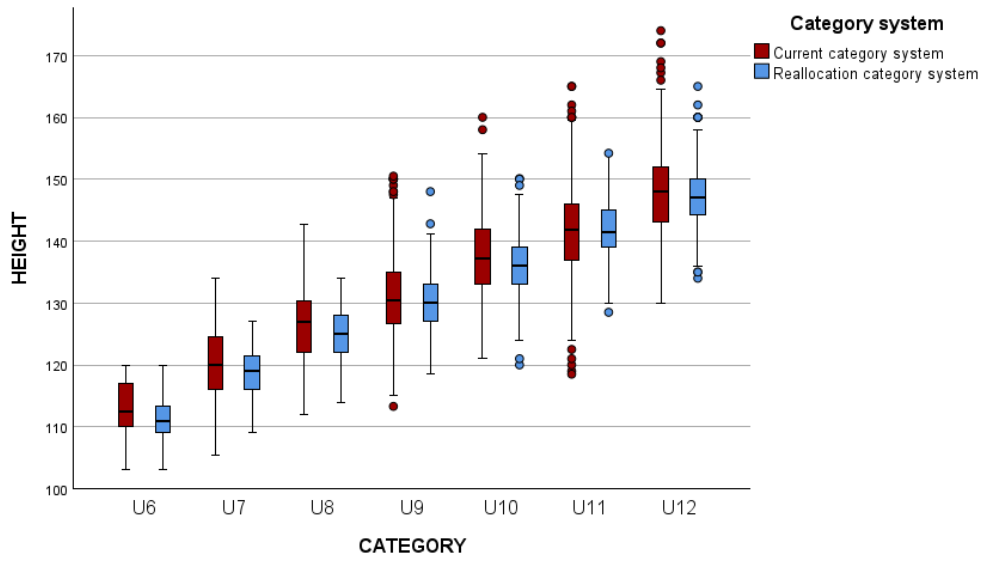


FIGURE 1
Boxplots of height in the male U6 – U12 category before (red) and after (blue) reallocation

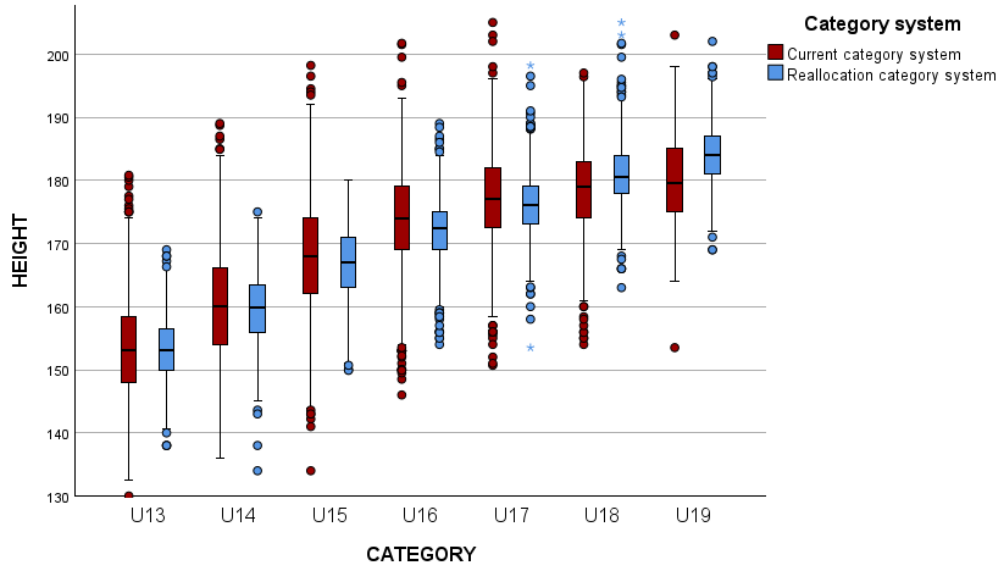


FIGURE 2
Boxplots of height in the male U13 – U19 category before (red) and after (blue) reallocation

Analogous patterns were observed for body mass. SD decreased in 14 out of 14 categories, with absolute reductions from 0,49 kg (U6) to 4,01 kg (U15) for the reallocation method compared to the current method. CV decreased in 14 out of 14 categories by 2,1–7,3 percentage points. IQR narrowed by 1,1–5,0 kg across all paired categories, with ranges also contracting in all categories.

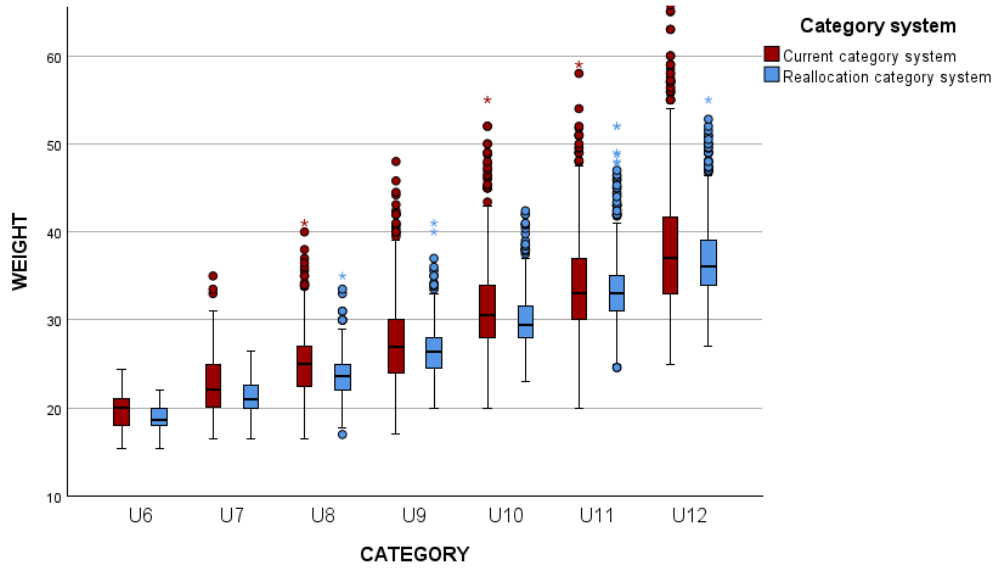


FIGURE 3
Boxplots of weight in the male U6 – U12 category before (red) and after (blue) reallocation

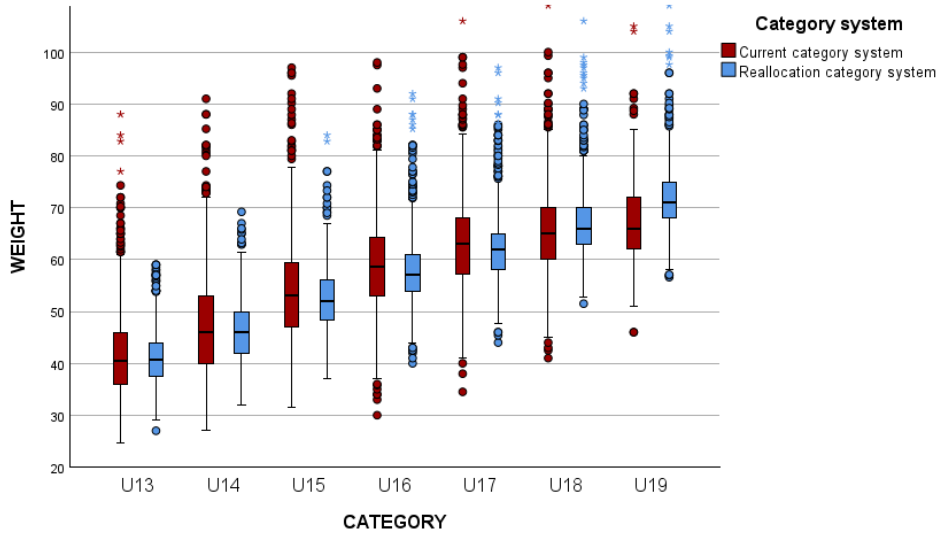


FIGURE 4
Boxplots of weight in the male U13 – U19 category before (red) and after (blue) reallocation

Across all 14 male age categories, lnVR and lnCVR were < 0 for both height and weight, indicating consistently lower dispersion using the reallocation method. For height, the geometric mean SD ratio across categories was 0,660 (mean lnVR = −0,416), corresponding to an average −34,0% reduction in SD. The geometric mean CV ratio was 0,662 (mean lnCVR = −0,412), corresponding to an average −33,8% reduction in CV. The largest per-category reduction in height SD occurred in U15 (lnVR = −0,555; −42,6%) and the smallest in U6 (lnVR = −0,154; −14,3%). For weight, the geometric mean SD ratio was 0,656 (mean lnVR = −0,422), corresponding to an average −34,4% reduction in SD. The geometric mean CV ratio was 0,670 (mean lnCVR = −0,401), corresponding to an average −33,0% reduction in CV. The largest per-category reduction in weight SD was observed in U7 (lnVR = −0,566; −43,2%), with the smallest in U18 (lnVR = −0,236; −21,0%).

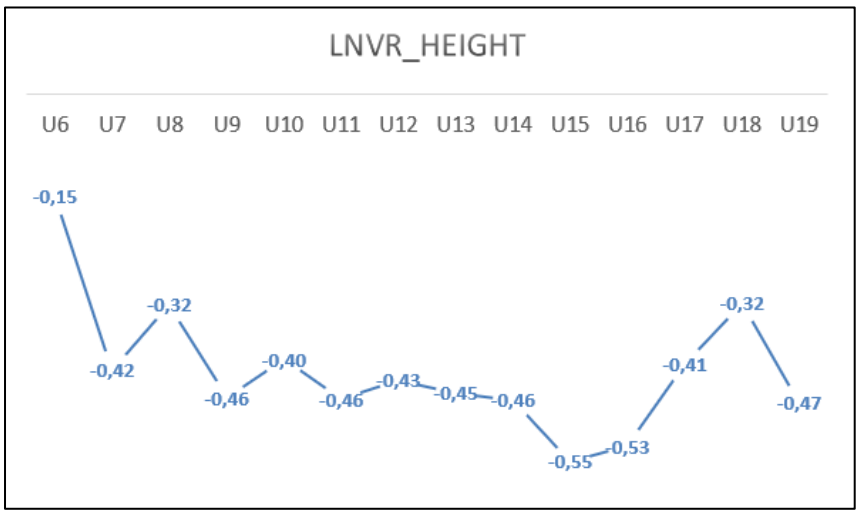


FIGURE 5
LnVR for height in male cyclists (a similar figure was obtained for lnVR for weight)

CAT	REALL	N	MEAN	SD	Minimum - maximum	Range	IQR	CV
U5	POST	2	109,0	/	/	/	/	/
U6	PRE	52	113,27	4,47	103,0 – 120,0	17,0	7,0	3,94
	POST	47	111,39	3,83	103,0 – 120,0	17,0	4,8	3,44
U7	PRE	157	120,32	6,09	105,5 – 134,0	28,5	8,8	5,06
	POST	160	118,74	4,01	109,0 – 127,0	18,0	5,5	3,38
U8	PRE	352	126,49	5,71	112,0 – 142,8	30,8	8,5	4,51
	POST	326	124,78	4,16	114,0 – 134,0	20,0	6,0	3,33
U9	PRE	536	131,01	6,50	113,3 – 150,5	37,2	8,3	4,96
	POST	510	130,08	4,11	118,5 – 148,0	29,5	6,0	3,16
U10	PRE	667	137,58	6,47	121,0 – 160,0	39,0	9,0	4,70
	POST	680	135,94	4,33	120,0 – 150,1	30,1	6,0	3,19
U11	PRE	720	141,78	6,86	118,5 – 165,0	46,5	9,0	4,84
	POST	839	141,70	4,33	128,5 – 154,2	25,7	6,0	3,05
U12	PRE	1184	148,02	6,87	130,0 – 174,0	44,0	8,9	4,64
	POST	1194	147,29	4,46	134,0 – 165,0	31,0	5,8	3,03
U13	PRE	1409	153,41	7,80	130,0 – 180,8	50,8	10,5	5,08
	POST	1438	153,15	4,97	138,0 – 169,0	31,0	6,5	3,24
U14	PRE	1563	160,28	8,97	136,0 – 189,0	53,0	12,1	5,60
	POST	1448	159,58	5,65	134,0 – 175,0	41,0	7,7	3,54
U15	PRE	1738	167,74	9,10	134,0 – 198,2	64,2	12,0	5,43
	POST	1529	166,90	5,23	149,9 – 180,0	30,1	8,0	3,13
U16	PRE	1768	173,71	7,80	146,0 – 201,7	55,7	10,0	4,49
	POST	1580	172,09	4,59	154,0 – 189,0	35,0	6,0	2,67
U17	PRE	1630	177,22	7,14	150,7 – 205,0	54,3	9,4	4,03
	POST	1549	176,06	4,75	153,5 – 198,2	44,7	6,0	2,70
U18	PRE	1484	178,72	6,65	154,0 – 197,0	43,0	9,0	3,72
	POST	1313	180,92	4,85	163,0 – 205,0	42,0	6,0	2,68
U19	PRE	354	180,01	7,22	153,5 – 203,0	49,5	10,0	4,01
	POST	874	184,44	4,53	169,0 – 202,0	33,0	6,0	2,46
U20	POST	125	186,07	4,33	179,5 – 203,0	23,5	6,0	2,33

TABLE 1

Dispersion metrics of height (in cm) in male cyclists in the current category system (PRE, pre reallocation) and in the category system according to the reallocation method (POST, post reallocation) of Helsen et al. (22, 23).

CAT	REALL	N	MEAN	SD	Minimum - maximum	Range	IQR	CV
U5	POST	2	18,20	/	/	/	/	/
U6	PRE	52	19,84	1,94	15,4 – 24,4	9,0	3,1	9,77
	POST	47	18,88	1,45	15,4 – 22,0	6,6	2,0	7,70
U7	PRE	157	22,73	3,39	16,5 – 35,0	18,5	5,0	14,93
	POST	160	21,26	1,93	16,5 – 26,4	9,9	2,7	9,06
U8	PRE	352	25,09	3,85	16,5 – 41,0	24,5	4,5	15,36
	POST	326	23,89	2,55	17,0 – 35,0	18,0	3,0	10,68
U9	PRE	536	27,57	4,80	17,0 – 48,0	31,0	6,0	17,40
	POST	510	26,56	2,92	20,0 – 41,0	21,0	3,5	10,98
U10	PRE	667	31,34	5,34	20,0 – 55,0	35,0	6,0	17,04
	POST	680	29,87	3,07	23,0 – 42,4	19,4	3,7	10,27
U11	PRE	720	33,86	5,72	20,0 – 59,0	39,0	7,0	16,88
	POST	839	33,36	3,93	24,6 – 52,0	27,4	4,0	11,78
U12	PRE	1184	38,13	6,88	25,0 – 69,2	44,2	8,8	18,05
	POST	1194	36,73	4,22	27,0 – 55,0	28,0	5,0	11,48
U13	PRE	1409	41,83	8,06	24,6 – 88,0	63,4	10,0	19,27
	POST	1438	41,11	5,00	27,0 – 59,0	32,0	6,5	12,15
U14	PRE	1563	47,02	9,20	27,0 – 91,0	64,0	13,0	19,58
	POST	1448	46,43	5,72	32,0 – 69,2	37,2	8,0	12,32
U15	PRE	1738	53,45	9,73	31,5 – 97,0	65,5	12,5	18,22
	POST	1529	52,30	5,72	37,0 – 84,0	47,0	7,6	10,93
U16	PRE	1768	58,80	8,88	30,0 – 98,0	68,0	11,3	15,10
	POST	1580	57,46	6,08	40,0 – 92,0	52,0	7,1	10,59
U17	PRE	1630	63,04	8,63	34,5 – 106,0	71,5	11,0	13,70
	POST	1549	62,19	6,05	44,0 – 97,0	53,0	7,0	9,73
U18	PRE	1484	65,24	7,98	41,0 – 109,0	68,0	10,0	12,23
	POST	1313	66,92	6,30	51,5 – 106,0	54,5	7,0	9,42
U19	PRE	354	67,22	8,42	46,0 – 105,0	59,0	10,0	12,53
	POST	874	71,89	6,43	56,6 – 109,0	52,4	7,0	8,94
U20	POST	125	74,81	5,67	66,8 – 92,0	25,2	7,7	7,59

TABLE 2

Dispersion metrics of weight (in kg) in male cyclists in the current category system (PRE, pre reallocation) and in the category system according to the reallocation method (POST, post reallocation) of Helsen et al. (22, 23).

2. Qualitative evaluation of the *Cycling Vlaanderen* dispensation strategies

2.1 Dispensation strategy & competition

2.1.1 Experience & long-term goals

Rider's experience varied with most cyclists competing for 2 years or less. Half of the cyclists described their sport primarily as a source of enjoyment, rather than performance driven. Multiple parents also emphasized the enjoyment-oriented phase. Some cyclists expressed moderate competitive aspirations such as achieving a podium finish, while there were a few with high ambitions like becoming a professional cyclist.

2.1.2 Main reasons for using dispensation strategy

Across interviews, all riders reported performance-related challenges - particularly being dropped early, lapped, or unable to finish races in their original age category. These experiences reduced learning opportunities and created frustration and demotivation. A subset of riders associated these difficulties with RLE and LME, noting substantial differences in height or strength. Others emphasized lack of race experience, especially limited peloton exposure. A smaller group mentioned psychological reasons, including lack of courage to ride at the front, fear of failing starts, demotivation and low confidence, mostly due to previous negative race experiences.

'After the first lap, I often had to drop out. Then I could only ride 5 km, and I couldn't practice riding in the peloton, which I'm not very good at'

'Starting in a lower category gave him a chance to gain experience without being overwhelmed.'

'The struggles last year were not just about strength, we think, but also about confidence and courage. He would stay at the back of the peloton, which of course wasn't very motivating for him. Last year he often ended up doing an individual time trial. To avoid that, when the dispensation measure was introduced, I thought it might be something worth trying. Maybe by taking a small step back, he would be able to keep up with the peloton more easily. And in that way, also dare to ride within the peloton and build more confidence.'

2.1.3 Goals in the dispensation category

Most cyclists focused on performance, with ten riders setting mostly modest outcome-oriented goals, such as finishing a top 10, staying in the peloton, doing more technical courses or simply finishing races. One rider aimed primarily to return to the original category. Two riders pursued process-oriented goals, and two were motivated mainly by enjoyment. One rider reported having no specific goals.

2.1.4 Return to original category

Ten riders did not intend to return during the same season. Some riders were open to returning later in the season, largely out of curiosity or to compare categories. One rider considered returning because of the feeling of a moral obligation.

Topic (and subtopic)	Related interview questions	Quantitative interview results
Dispensation strategy & competition		
Competition experience	*For how long have you been engaged in cycling recreationally/competitively?*	• 1st year: 2 cyclists • 2nd year: 8 cyclists • 3 or more years: 6 cyclists
Long-term goals	*What are your long-term goals within the sport?*	• Enjoyment: 8 cyclists • Moderate ambitions: 6 cyclists • High ambitions: 2 cyclists
Main reasons for using dispensation strategy	*What was the main reason for using the dispensation strategy?*	• Performance imparity: 16 cyclists • RAE & LME: 6 cyclists • Lack of competitive experience: 6 cyclists • Psychological reasons: 5 cyclists
Goals in dispensation category	*What goals have you set for yourself since transitioning to a different competition category? Have you achieved these goals, or have they evolved over time?*	• Performance related: 10 cyclists • Return to original category: 1 cyclist • Process oriented goals: 2 cyclists • Enjoyment: 2 cyclists • No specific goals: 1 cyclist
Motivation	*What role does competition play in your motivation to continue cycling?* *Has this changed since your transition to a different competition category?*	• Competition is key motivator: 8 cyclists • Motivation increased after use of dispensation strategy: 6 cyclists
Return to original age category	*Have you ever considered returning to your original competition category and why?*	• No return considered: 10 cyclists • Considered return: 5 cyclists
Differences in competition	*Was it easier/harder to achieve a good result in comparison with your original category?*	• Easier: 13 riders • No comparison possible: 2 cyclists • No differences: 1 cyclist
Race results	*What were your race results in the dispensation category versus the original category?*	• Less frequently lapped: 16 cyclists • Better race results: 16 cyclists

Physical, psychological and social health			
Physical health		*Have you noticed any changes in your physical health since the change in competition category?* *Have you received any specific (non-medical) guidance as a result of the category change?*	• Changes in physical health: 4 cyclists • Assistance of (para)medical professional: 0 cyclists • Changes in training routine: 2 cyclists • Easier recovery: 1 cyclist, harder recovery 3 cyclists, no difference 10 cyclists, no comparison possible: 2 cyclists
Physiological aspects		*Have you had to make specific adjustments to your training routine following the category change?* *Did you notice a difference in recovery from races?*	• Changes in training routine: 2 cyclists • Easier recovery: 1 cyclist • Harder recovery 3 cyclists • No difference in recovery: 10 cyclists
Physiological health	**Performance pressure**	*How do you feel about performing in the new competition category? Do you experience more or less pressure to perform?*	• Reduced pressure: 4 cyclists • No changes in pressure: 9 cyclists • Increased pressure: 3 cyclists
	Self-confidence	*Has the change in competition category affected your self-confidence, both during and outside of races?*	• Increased confidence: 12 cyclists • No changes in confidence: 3 cyclists • Decreased confidence: 1 cyclist
Mental challenges and social life	**Mental challenges**	*What are the main psychological or mental challenges you face when competing in your dispensation category?*	• No mental challenges: 10 cyclists • Pressure to perform better than riders in the dispensation category: 2 cyclists • Worried about comments other riders/parents: 3 cyclists
	Reactions from teammates	*How were you received by your teammates or fellow riders when you changed category?* *Did you receive positive or negative reactions?*	• Mostly positive reactions • Occasional negative reaction: 3 cyclists
	Team support	*How important is your team's support in your new category?* *Do you feel that your team supports you sufficiently?*	• Passive supportive role of team and trainer: 13 cyclists • Active suggestion of team or trainer to change categories: 3 cyclists
	Effect on social life	*Has the change of category affected your social life outside of the sport?*	• No effect on social life: 13 cyclists • Positive effect on social life: 3 cyclists

RAE & LME		
Beliefs on RAE/LME	*Do you feel that your birth month, compared with others in your category, makes a difference in performance?*	• Believe RAE has an impact: 10 cyclists • Believe RAE does not have an impact but LME does: 5 cyclists • Does not know: 1 cyclist
Physical development/maturity	*How do you experience the difference in physical development between yourself and your peers?*	• Describes themselves as late mature: 12 cyclists • Describes themselves as normally mature: 4 cyclists
General evaluation and suggestions		
Experienced advantages	*What benefits have you experienced since using the dispensation measure?*	• Improved race participation: 15 cyclists • Better skill development: 7 cyclists • Psychological benefits: 6 cyclists • Practical advantages: 2 cyclists
Experienced disadvantages	*What disadvantages have you experienced since using the dispensation measure?*	• Some disadvantages: 11 cyclists • No disadvantages: 5 cyclists • Classification restrictions and forced return to original category: 5 cyclists • Social impact: 2 cyclists • Mid-season category changes: 1 cyclist • Concerns about long-term effects: 2 cyclists
Global evaluation of dispensation	*How do you evaluate the change of category—positively, neutrally, or negatively, and why?*	• Positive evaluation: 15 cyclists • Neutral evaluation: 1 cyclist
Suggestions for dispensation	*Are there any adjustments you would suggest to the existing system of dispensation measures, and if so, which ones?*	• Matching competitors by ability rather than age alone: 9 cyclists • Flexibility for beginners and late starters: 3 cyclists • Dynamic and Gradual Adjustments: 3 cyclists • Access to Championships: 2 cyclists
Suggestions for equal opportunities in racing	*Are there any other suggestions related to the topic of 'equal opportunities in cycling' that you would like to mention?*	• High level of competition at a young age: 3 cyclists • Financial barriers and equipment disparities: 6 cyclists • Start position flexibility: 2 cyclists

TABLE 3
Quantitative interview results per topic

2.2 Physical health & physiological aspects

2.2.1 Physical health

Most riders reported no meaningful changes in physical health after changing categories. Four riders reported minor adaptations (e.g., reduced breathing difficulty), though these were not clearly attributable to the dispensation measure.

No one sought medical or paramedical guidance linked to the category change. Riders did not adjust training volume or intensity specifically because of dispensation. Two riders increased training slightly due to heightened motivation related to competing in the dispensation category.

Most riders reported no major differences in post-race recovery between categories, typically needing about one day of rest. Recovery varied by individual and race. Occasional nausea or fatigue occurred but was inconsistent and unrelated to category changes. In some cases, perceived fatigue was influenced more by mental effort and motivation—such as trying to stay with the lead group—although this did not meaningfully alter overall recovery time.

2.2.2 Perceived physical differences between categories

The primary differences riders noticed were higher average speeds (2-3 km/h) and stronger accelerations in the original category. Some struggled with endurance during longer races, while others found longer distances manageable. Bike-technical skills were generally adequate, though peloton-specific skills remained underdeveloped for several riders.

After moving to the new category through the dispensation measure, results generally improved. Some riders placed within the first third or even the first quarter of the field. Several riders began achieving regular top 10 finishes, and some reached the top five multiple times. In addition, riders were more often able to stay with the peloton and participate in sprint finishes. Although a few still finished near the back, they were lapped less frequently than before.

Progression or regression in physiological parameters could not be reported due to the young age of participants and the lack of physiological testing and monitoring at their age.

2.3 Psychological & social aspects

2.3.1 Performance pressure & self-confidence

Most cyclists, nine to be specific, reported stable levels of pressure. Some experienced increased pressure due to higher expectations or internal standards, while four riders experienced reduced pressure, mostly linked to improved competitiveness.

The majority of cyclists experienced notable increases in confidence, largely because they could remain in the peloton, sprint for positions, and achieve better results. Only one rider reported a confidence decrease, linked to discomfort racing in a younger category.

"I have more self-confidence, because I know I'll be able to keep up and that I won't always be riding behind."

2.3.2 Mental & social challenges

In general, ten riders reported experiencing no mental challenges when competing in the dispensation category. Two riders described feeling pressure to perform better than the other riders in this lower category. Three riders expressed concern about potential comments or judgments from other riders or parents.

However, when questioning further, most riders only encountered neutral or supportive reactions. Peer questioning was mostly curiosity driven. One of the parents described other parents approaching him with positive comments about the dispensation. Parents reported occasional concerns from other adults related to fairness, but these comments targeted the system rather than the child. Occasional critical remarks were mentioned to the children, but this was reported by only three riders and did not dominate their overall experience. Internal pressure, particularly the feeling that one "should" outperform younger riders, was a more prominent source of mental strain than external judgement.

Teams were generally supportive but rarely took initiative in proposing dispensation, riders or parents usually initiated it. In only two cases did the coach or team actively suggest participating in the dispensation category.

For most riders, the category change had no impact on social life outside sport.

"Maybe there was a bit of fear that it would be annoying, that the other children at the club would say something about it. But we haven't received that comment even once."

"I think when others say that you're a year older and that you shouldn't be allowed to compete, that's really annoying. I do find that very unpleasant. Most of them are completely OK with it, but some say things like, 'Yes, you're a year older, so you should normally be able to win.' That's really irritating. And when I see my friends winning, I want that too. Then I feel a lot of pressure and stress. I want it as well, and then my head gets completely confused."

"If I have to work hard to keep up with someone younger, that means I'm not good enough."

2.4 Relative Age Effect (RLE) & Late Maturity Effect (LME)

2.4.1 Beliefs about RAE & LME

Most riders believed early birth months confer an advantage, 5 attributed performance differences primarily to maturity rather than birth month. One rider was unsure.

2.4.2 Perceived maturity

Twelve riders described themselves as late maturers, reporting smaller body size or less muscle mass, which affected physiological performance parameters such as acceleration and closing gaps. Four riders perceived themselves as normally mature.

2.4.3 Reallocation analysis

In addition to date of birth, we also asked the riders for their most recently measured height and weight. With these values, we were able to calculate their developmental birth date and allocation date using the reallocation category system by Helsen et al. (22, 23).

Category recommendation	Number of riders
No need to consider changing categories	3
Transfer the rider to 1 age category lower	8
Transfer the rider to 2 age categories lower	1
Transfer the rider to 1 age category higher	4

TABLE 4
Category recommendation for interviewed riders according to the reallocation strategy of Helsen et al. (22, 23).

2.4.5 Differences in competition categories

Two riders could not compare categories because it was their first competition year. Most riders found achieving a good placing slightly easier in the dispensation category, though personal improvement also played a role. One rider reported that the current category had stronger competitors, making results equally difficult to achieve as in the previous year.

2.4.6 Race results original category versus dispensation category

Before receiving dispensation, most riders had limited competitive success, often being lapped and typically finishing in the bottom third of the field, frequently last or second-to-last. Mid-pack finishes occurred only occasionally. After moving to the new category, results generally improved: several riders finished in the first third or quarter of the field, a few riders achieved regular top-10 and even top-5 placements, and more were able to stay with the peloton and contest sprint finishes. Although a few still finished near the back, they were lapped far less frequently.

2.5 General evaluation and suggestions

2.5.1 Advantages of the dispensation measures

2.5.1.1 Improved race participation

Nearly all riders reported experiencing fewer last-place finishes, being lapped less often, and finding it easier to stay in the peloton. They explained that this allowed them to truly participate in the race rather than riding isolated behind the group. Most mentioned that they could finish races more consistently and, at times, even compete for positions or join breakaways.

‘An advantage for me is that I am able to stay with the group more, which makes it much more enjoyable; otherwise, knowing that I would be last takes away the motivation. Now, I can sometimes still compete with someone.

‘I am able to complete the races, although they are only 30 km, but at least I have ridden the full 30 km.’

2.5.1.2 Better skill development

Seven riders noted improvements in peloton riding, cornering, sprinting, and race tactics. More time in group settings helped them develop technically and reduced fear or hesitation in the peloton.

2.5.1.3 Psychological benefits

The measures lowered stress and pressure for riders rdiers, especially the fear of being lapped or finishing last. Riders described increased confidence, motivation, and enjoyment.

2.5.1.4 Practical advantages

Additionally, practical and contextual benefits were mentioned by two riders, including smaller starting groups and courses that were less physically demanding. For example, groups in the dispensation category included 40 riders (with a maximum of 60), whereas the peloton in their original category sometimes counted 70 to 80 riders.

2.5.2 Disadvantages of the dispensation measures

Five riders did not mention any disadvantages. However, others identified several contextual and structural limitations.

2.5.2.1 Classification restrictions and forced return to original category

Results obtained under dispensation did not count for provincial championships or selection races for the national championships. Additionally, riders who achieved three podium finishes or who won their race were required to return prematurely to their original age category, which was sometimes perceived as restrictive or as a loss of developmental continuity.

'I could not really give it my full effort, because when I was riding towards the podium, I had to be careful that I didn't end up there.'

2.5.2.2 Social impact

Some riders could not compete or train with friends or usual training partners, especially at races or training camps where groups were organised strictly by category. Two riders mentioned this as a disadvantage.

2.5.2.3 Mid-season category changes

Riders had to switch back to their original category once they had a birthday, riders reported that this disrupted progress. The jump in race distance was especially challenging—for example, moving from 25 km to 35 km normally, or even to 45–50 km late in the season when races get longer.

2.5.2.4 Concerns about long-term effects

Two riders worried that racing in a lower category could widen the performance gap when returning to their original group, as peers continued to develop at a higher competitive level. One rider therefore rated the measure as "neutral" rather than positive.

2.5.3 Suggestions of riders and parents

2.5.3.1 Matching competitors by ability rather than age alone

Nine stakeholders suggested that dispensation categories should account more for performance than strictly for age. Riders who consistently win races could move up to the next category, while those who repeatedly finish at the back could move down. This approach would allow children to compete against peers of similar ability, rather than being limited solely by their birth month or year.

''In the dispensation system, they should not focus so much on age or month of birth but rather look more at race results. If someone wins all the races, that rider should move up to a higher level. And those who consistently finish in the last five should be allowed to move down to a lower category.''

''On the other hand, for the riders who are always winning, it eventually becomes routine. It might actually benefit them to have to fight for their position again, rather than easily staying ahead of the group. I think it could also be a stimulus for those stronger riders to sometimes race in the middle of the peloton, so that they can experience that as well.''

It was noted that this would prevent demotivation among slower riders who are otherwise capable but physically less developed. Maturity plays a major role in cycling performance. Some stakeholders argued that competition categories should reflect these differences, especially during puberty, to provide a fair and motivating environment.

2.5.3.2 Flexibility for beginners and late starters

It was proposed by three riders that beginners or riders who are less experienced should have the chance to start in a dispensation category regardless of birth month, with their results evaluated after two or three races. If they perform well, they could transition to their normal category sooner. Conversely, children who are not performing well could stay in a lower category. Suggestions included a “B-category” or less competitive races to introduce new riders gradually.

“For riders who are just starting out, it would be good if they could begin in the dispensation category. Then they could be evaluated after two or three races. For example, if they achieve a top 10 result, it might be appropriate to move them to their regular category after two or three races. We know a boy who started racing and was lapped two or three times in his very first race. Since then, he has not competed in another race. That first race turned out to be both his first and his last. He still trains with his club, but he no longer participates in competitions.”

2.5.3.3 Dynamic and Gradual Adjustments

For riders who were required to return to their original category due to strong results, this transition was perceived as unfair—particularly when those results had been achieved in races with relatively weak competition. A similar issue applied to riders born between July 1 and the end of the season, who were obliged to move back to their original category midway through the season. Several riders and parents suggested implementing a less rigid transition between categories to avoid such abrupt shifts.

“I was thinking that evaluating everything individually might be administratively more difficult for you. But during the racing season, there are actually two periods: one before the summer break, then a short pause, and one after. It might be an idea to approach it that way: riders could receive dispensation for

the first period. If they win several times or achieve strong results during that period, they could then move up to a higher category. It should not happen too immediately, though. Otherwise, you might end up in a situation where some children deliberately hold back. For example, if they finish in the top five for the third time and think it is still too early to move up, they might start holding back on purpose. That is not really the intention. So perhaps this system should be reviewed and reconsidered."

2.5.3.4 Access to Championships

It was suggested by two riders that riders performing well in dispensation categories should be allowed to participate in provincial or national championships, even if they are not strictly in the correct age category. Excluding capable riders from larger competitions was viewed as unfair and demotivating by some riders and parents.

2.5.4 Suggestions regarding the theme of "equal opportunities in racing"

2.5.4.1 High level of competition at a young age

Parents noted that children today are cycling at a very intense level for their age. Three riders and parents expressed concern that this could overshadow the fun aspect of the sport, especially for beginners or less physically developed riders.

2.5.4.2 Financial barriers and equipment disparities

Many participants raised concerns about the high costs of bicycles and racing equipment, which range from a few hundred to several thousand euros. This creates inequality, as some children cannot access competitive bikes. Suggestions included bike rental schemes or lease programs to make cycling more accessible.

2.5.4.3 Start position flexibility

Two riders noted that start positions can create unnecessary stress, especially for new riders who draw a front-row start by lottery in mountain biking. Allowing riders to choose whether they want to be assigned a start position randomly or voluntarily start at the back could reduce anxiety and help them race safely, avoiding collisions during the initial meters.

Discussion

This mixed-methods study examined whether reallocating youth cyclists according to developmental age (rather than chronological age alone) reduces within-category anthropometric heterogeneity, and how *Cycling Vlaanderen's* dispensation strategies are perceived by young riders and their support network.

1. Interpretation of the quantitative effects: why reallocation works

Applying the reallocation method of Helsen et al. (22, 23) substantially compressed the within-category dispersion of height and weight across all youth categories, with geometric mean reductions of ~34% for both SD and CV in boys. These effects were consistent for all dispersion metrics (SD, IQR, range), indicating a robust narrowing of anthropometric spread within the reallocation categories compared to the current category system. These dispersion reductions demonstrate the effects of RAE and LME on the competitive equity when categories are defined by birth year alone. In sports where body size and strength matter for performance in terms of endurance and power capacity, such as cycling, early maturation gives a clear advantage, even among peers of the same chronological age. This pattern, in which maturity status accounts for more variance than birth quarter alone, has likewise been documented in elite youth soccer (12, 13). This observation was supported during the interviews.

By repositioning athletes using an allocation date derived from both chronological and developmental "birth dates," the method of Helsen et al. (22, 23) effectively shifts late-maturing and late-born cyclists toward categories whose median anthropometry more closely matches their own. The resulting compression of height and weight variation suggests a fairer and more developmentally appropriate racing environment that is less dominated by maturational outliers. The largest dispersion reductions occurred in mid-adolescent groups (~U15), when inter-individual differences in growth tempo are typically maximal (1, 2). Together, the present results strengthen the case that both chronological age and developmental age should be considered in competitive grouping in cycling and youth sport in general. This observation was also supported during the interviews.

2. Interpretation of the qualitative effects: motivation, learning, and confidence

The main reasons to request dispensation in the interviewed riders were a combination of factors related to physical development, lack of experience and lack of self-confidence. Being one of the youngest or smallest riders, struggling to keep up with the pace of the race and repeatedly getting dropped or lapped were the most listed elements that made competition in their own age category discouraging and stressful.

Findings from the dispensation interviews pointed to a developmental mechanism that is believed to underlie performance gaps in younger age categories and to contribute to eventual dropout (4). Riders who repeatedly get dropped or lapped in their original age category struggle to gain experience in skills related to peloton dynamics, crucial for competitive cycling. After switching categories, most riders reported spending more time within the peloton and

more actively contesting races, which led to better results, greater perceived competence and increased enjoyment. Literature on youth sports states that chronic mismatch between capacity and challenge or expectation, manifesting as repeated failure, predicts demotivation and drop-out. It is necessary to align competitive demands with an athlete's maturational stage to support competence, confidence and long-term engagement in sports (4, 24, 25).
Riders reported relatively little external stigma, whereas internalized pressure ("I should beat younger riders") was more present. Normalized pathways for moving up and down categories and focus on rider development, may reduce this pressure and create a healthier motivational climate. The rule that riders must return prematurely after strong results (three top 5 finishes or a win) was perceived as restrictive and risked unintended incentives, as one rider explicitly stated they could "not give it their full effort" when approaching a top 5 result. Riders also described disruption from mid-season category switches due to the rule that they should switch back to their original category on their birthday, noting that the sudden jump in race distance (e.g. from ~25 km to 35 km or even 45–50 km later in the season) could be challenging and break continuity in progress. A minority raised concerns about long-term consequences, worrying that racing in a lower category might widen the gap upon returning to the original group as peers continue to develop at a higher competitive level.

In general, riders who used dispensation experienced better race participation (greater ability to remain in the peloton), enhanced learning opportunities (tactics, positioning, cornering, sprinting), higher motivation, and marked gains in self-confidence. Some procedural constraints were noted, (e.g., forced return after good results, mid-season category switches due to birthdate, and championship ineligibility). The global evaluation of the dispensation strategy was positive.

3. Practical and policy implications

1. ***Use dispensation strategically to protect learning windows.*** Contraction of height and weight dispersion by using the reallocation method of Helsen et al. (22, 23) indicates that taking development into account can make categories more homogeneous and competition more equitable. In addition, riders reported improved peloton participation, enhanced race tactics, and more consistent race finishes as key advantages of their dispensation category. The dispensation strategies used by *Cycling Vlaanderen* should not only focus on relative age, but on development as well. We suggest extending the dispensation strategy by integrating the reallocation method of Helsen et al. (22, 23, 26-28).
2. ***Draw the lines to avoid misuse of the system.*** There is consensus within *Cycling Vlaanderen* to impose certain restrictions on riders using dispensation, to ensure that it is used for growth, development, and enjoyment, and not for performance purposes. On the other hand, automatic return after a fixed number of results (one win or three top 5 results) was perceived as restrictive by the interviewed riders, just like the mid-season transition after their birthday. Further development of the rules around dispensation is necessary to address these concerns and still maintain a system that is perceived fair by both users and non-users.
3. ***Address access and equity beyond age/maturity.*** Riders and parents pointed out financial barriers and difficulties to enter the sport as newcomers (lack of practical/theoretical knowledge, early specialization in young riders) as additional inequities.

4. ***Communicate the "why".*** Clear communication about the developmental rationale of dispensation measures is needed at micro-, meso- and macro-levels to target all riders, parents, clubs, supporters and stakeholders to create broad support. At present, club involvement appears limited; greater and more proactive engagement by clubs and coaches may enhance the effectiveness, transparency, and overall acceptance of dispensation measures (26-28).

4. Strengths, limitations and future directions

A key strength of this work is the large, federation-wide quantitative dataset (13604 records) from the mandatory sports medical screenings of youth cyclists for their competitive license, which enhances representativeness across age categories and supports robust comparisons between the current system and developmental reallocation. Limitations include that the quantitative analysis relied on anthropometric data only (no physiological indicators), and measurements were not fully calibrated across assessors (height/weight recorded by different sports physicians).

The qualitative sample used self-reported height/weight and captured perceptions at an early implementation stage (the first year of dispensation), limiting generalizability and preventing conclusions about long-term effects. Despite the early implementation phase, the dispensation strategy was positively received. It was described as enabling more accessible, developmentally appropriate competition, especially by improving meaningful race participation and learning opportunities for younger or less experienced riders.

Future research should also focus on female cyclists (29), conduct long-term follow-up with objective performance indicators (e.g., race completion/lap losses, power or speed proxies), and compare impacts across subdisciplines (MTB, road, cyclocross, BMX), potentially requiring discipline-specific dispensation rules. Also, the psychological effects of RAE and LME remain underexplored in both team and individual sports, particularly in the context of reallocation to new competition categories (27, 30).

Finally, flexible transfer criteria should be investigated incorporating maturity, experience, and performance. This aligns with modern talent development models and should be evaluated alongside administrative feasibility (software workflows, communication, and scalability).

Conclusion

In summary, reallocating youth cyclists using a developmentally informed method substantially reduces within-category anthropometric dispersion. In turn, this results in a fairer competitive structure than the current year-of-birth system. In parallel, early qualitative feedback indicates that dispensation can make racing more accessible and developmentally appropriate for less experienced or late-maturing riders by improving meaningful participation, motivation, and self-confidence. Together, these findings support continued refinement of flexible competition pathways - paired with clear communication and feasible administrative implementation - to promote equitable development and sustained engagement in youth cycling.

Conflict of interest

The authors report no conflicts of interest.

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