KU LEUVEN
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FEB@HUBRUSSEL RESEARCH PAPER
DECEMBER 2013
Nr. 2013/14

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Abstract

Despite the vast amount of literature available on doping in sports, little is known about how the general public actually thinks about doping. It is even more unclear how public opinion on doping differs within the population. Our questionnaire-based study for Flanders (Belgium), with a focus on doping in cycling, shows a strong disapproval of doping use by all respondents. There are statistically significant differences, though, among the population groups. Cycling fans tend to be less negative towards doping in cycling than non-cycling fans. Cycling fans also express a clear feeling of their sport being treated unfairly compared to other sports. Furthermore we observe some clear gender-based and age-based differences in opinion: women and older people are much more opposed to doping than men and younger people.

Keywords: Doping, Cycling, Public opinion, Anti-doping policy, Drugs

1 Introduction

Understanding public opinion on doping is highly relevant for an effective and well-supported anti-doping policy. Still, despite the enormous amount of public discussion that goes on about anti-doping policies and the vast amount of literature available on doping in sports, little is known about how the general public actually thinks about doping. It is even more unclear how public opinion on doping differs within the population among groups of people.

The aim of this study is therefore to gain insight into popular belief on doping in sports. Our work is complementary with the research by Stamm, Lamprecht, Kamber, Marti & Mahler (2008), Solberg, Hanstad & Thöring (2010), Vangrunderbeek & Tolleneer (2011) and Moston, Skinner & Engelberg (2012) who all focus on the question to what extent economic, moral or health considerations regarding doping use find support in society. Our approach differs in two ways. First, while the aforementioned authors analyse doping in general across all sports, we focus on doping in one sport only: i.e. professional road cycling. Cycling is a very popular spectator sport in Flanders.[1] Consequently, many people are quite familiar with the sport. This generates more valid responses since it is well documented that the more people are interested in a topic, the more willing they are to be questioned about it (Solberg et al., 2010). However, whether justified or not, the sport has since long explicitly been associated with doping too. Road cycling is one of the physically hardest sports. Professional riders easily cover 35,000 kilometres in competition and training a year, and face up to 100 competition days, which is extremely high in comparison to other endurance sports like marathon or triathlon. These characteristics make cycling vulnerable to doping (Rebeggiani and Tondani, 2008). In fact, cycling recently went through a turbulent doping period because of the USADA (2012) investigation and the doping confessions by Lance Armstrong, a global cycling icon.[2]

[1] For practical purposes, our research focused on Flanders, the Northern part of Belgium, only.

[2] Interestingly, a previous important doping crisis in cycling, the 'Festina' Tour de France of 1998, lead to the creation of the World Anti-Doping Authority (WADA) in 1999.

Second, rather than focussing on overall popular belief, we compare public opinion across clearly defined population groups which makes this study different from most of the aforementioned papers. Our study raises questions such as: are cycling fans more lenient towards doping than non-cycling fans? Do cycling-active people have a different opinion on anti-doping measures than cycling-inactive people? And does doping knowledge play a role in one's opinion on doping?

Popular belief on doping in cycling was analysed with a two-part questionnaire. The first series of questions measures attitudes and opinions on doping through a number of statements respondents had to evaluate. The second series of questions was used to identify the population group a respondent belongs to. Through the responses of almost 2,000 persons a clear view on the attitudes and opinions on doping of people in Flanders was created.

The rest of the paper proceeds as follows. First, in section 2 we discuss the basic principles that explain the decision of athletes to use doping. Next, a short survey of literature is introduced in section 3. We describe the details of our research methodology and the distribution of the respondents that participated in the questionnaire in section 4. In sections 5 and 6 our results are presented. First, we briefly consider general public opinion on doping in cycling. Next, the differences in opinion among well-defined groups of people are discussed in detail. Conclusions follow in section 7.

2 Why athletes use doping

Two types of reasoning are generally used to explain doping use in sport. The first theory is derived from the economics of crime (Becker, 1968). It basically assumes that whether athletes use doping or not is the result of a well-thought assessment in which costs and benefits are rationally weighed. As long as the benefits (e.g. glory, higher prize money, ...) sufficiently outweigh the costs (e.g. punishment if caught, health costs, ...) athletes will continue to use doping. The testimony of Bobby Julich, 3rd in the 1998 Tour de France, is illustrative of this theory :"*During the 1998 Tour, my fiancé found out what was going on from another rider's wife. She confronted me on it and it was one of the most dreadful experiences of my life. She told me right then and there that if it ever happened again, our relationship would be over. That was motivation enough and I knew I had to stop."* (Cycling News, 2012). When his wife found out, the costs of using doping became so high it was

no longer a rational choice for Bobby Julich to continue using EPO. Note also that a mere net benefit is not good enough since the benefit has to be sufficiently high to compensate the athlete for the ethic standard he breaches. Consequently, all else being equal, the higher the ethic standard of an athlete, the more difficult an athlete will find it to use doping and vice versa. A well-known example of a cyclist whose ethic standards were so high that he preferred to end his career as a professional cyclist rather than to use doping is two-times Tour of Flanders winner Edwig Van Hooydonck. At the other end, we find cyclists like Danilo Di Luca or Riccardo Ricco who, knowing that a second doping offense could lead to a lifetime ban, still took the risk of using doping after they were caught already a first time.

The second theory is based on game theoretic principles. In this analysis, doping use is the result of a 'prisoner's dilemma'-situation athletes are facing. All athletes would be better off if nobody used doping because in that case athletes incur no health costs nor any other doping costs. However, in this ideal situation when nobody uses doping, the advantage of being the sole user of doping is enormous. If all athletes reason like this, they all will take doping and incur the associated costs while the sporting result is likely to be very similar. The net benefit thus clearly is lower than in a no-doping situation since in spite of using doping, benefits are the same while costs are now higher. This is, of course, under the assumption that doping helps to increase performance and that it increases performance for all athletes to the same degree. Game theory predicts the only stable outcome will be that all athletes use doping. In this reasoning, if they want to be successful, athletes do not really have a choice and just have to follow the others to maintain a level-playing field. As a result, they do not feel like being cheaters either, as is clearly obvious from the statement by 1997 Tour de France winner Jan Ullrich: "*Almost everyone at the time was taking performance-enhancing substances. I didn't take anything that was not taken by the others. It would only have been cheating for me if I had gotten an advantage which was not the case. I just wanted to ensure I had an equal opportunity*." (Cycling News, 2013). In his book on doping, former cyclist Tyler Hamilton clearly explains the sentiment among cyclists in the second half of the nineties, when it was still impossible to detect EPO-use. During those years, trying to ride 'clean' was considered by many to be an unprofessional attitude for a cyclist. In fact, it signalled a lack of motivation (Hamilton & Coyle, 2012).

3 Survey of literature

There exists a substantial body of literature in sports economics on the problem of doping. We refer, for instance, to excellent papers by Maennig (2002), Haugen (2004), Kräkel (2007) and Eber (2009). Like many of the texts that discuss doping in a general sense, these papers focus on the pros and cons of fighting or admitting doping use from a theoretical point of view with economic, ethical or health arguments often being part of the reasoning.

Doping has also been discussed in the specific context of professional road cycling. Brewer (2002) presents a historical analysis. He links commercialization and transformations in professional cycling in the second half of the previous century to the rationalization of doping. Complementary to this study is Lentillon-Kaestner, Hagger & Hardcastle (2012), discussing the change in the organization of doping from team-based doping practices to individual cyclist behaviour in the last decade. Wagner (2010) and Coupé & Gergaud (2012) both analyse aspects of the anti-doping policy of the International Cycling Union (UCI). Wagner (2010) describes the many difficulties the International Cycling Union faces when implementing rigorous anti-doping measures like the biological passport, while Coupé & Gergaud (2012) test rather unconvincingly the correlation between the UCI's "Index of Suspicion" and Tour de France performance.

The analysis of public opinion on doping, by contrast, has received little research interest so far. A literature study for WADA by Backhouse et al. (2007) identified only 4 published studies that examined attitudes towards doping amongst non-athletic adults. Three studies were conducted in the United States and one in Australia. All surveys used students in relatively small samples (100 to 400) and the majority of the research focused upon attitudes towards anabolic steroids use in particular. This limits significantly their research relevance.

Research on popular belief on doping has recently gained some more interest. We identified a handful of relevant studies that have been published worldwide since 2007. The basic characteristics of their methodology and the most relevant findings are summarized in table 1.

Four studies favour a questionnaire approach. When public opinion is the focus of the analysis, usually between about 1,000 and 2,500 responses are collected. The

number of respondents is considerably lower when specific population groups are analysed. Two studies use another methodology. In their research on student's perception on doping, Vangrunderbeek & Tolleneer (2011) make use of a discourse analysis while Stewart & Smith (2012) conducted twelve in-dept interviews to analyse differences in elite and non-elite athlete's attitudes to drugs in sport.

Table 1: Literature on popular belief on doping

Study (country)	Methodology (year)	Respondents (number)	Findings
Stamm, Lamprecht, Kamber, Marti & Mahler (2008) (Switzerland)	Questionnaires (1995/98/01/04) (2006)	 All population (1201/800/1535/2114) Top-level athletes (369)	The vast majority of the Swiss population and top-level athletes are strongly against doping and support a strategy that combines strict prohibition and sanctioning with informational and educational efforts. The views stated by the public are largely in line with the current anti-doping strategy followed by the Swiss authorities.
Solberg, Hanstad & Thöring (2010) (Norway)	Questionnaire	Sports consumers (925)	Consumers show no tolerance for pure doping substances. The majority were in favour of tough responses to athletes involved in doping. Those who were strongly interested in sport were more willing than others to accept doping.
Vangrunderbeek & Tolleneer (2011) (Belgium)	Discourse analysis (1998-2006)	Students (155)	Over the years students seem to have developed a more diffuse ethical attitude on the doping issue. A shift from the zero tolerance principle towards a more lenient attitude towards doping in elite sports is observed and discussed.
Moston, Skinner & Engelberg (2012) (Australia)	Questionnaire	All population (2520)	Clubs should be penalized if athletes were found to use drugs and companies and government should stop sponsoring athletes who have been using drugs. Opinion was split on the issue of whether performance-enhancing drug use should be criminalized. These results show that the Australian public support anti-doping measures.
Petróczi (2007) (United States)	Questionnaire	College athletes (199)	Athletes' win and goal orientation and competitiveness do not play a statistically significant role in doping behaviour, but win orientation has an effect on doping attitude. The analysis provides empirical evidence that sport orientation and doping behaviour is not directly related.
Stewart & Smith (2010) (Australia)	In-dept interviews	Elite and non-elite athletes (12)	Athlete's attitudes are contingent upon the legality of the substance, its performance impact and its social impact. Substance use in sport is neither a matter of linear and logical decision-making nor one of fundamental morality. Drug-management policies which are underpinned by punitive models or moral certitude and deterrence do not match with prevailing attitudes.

Most studies show no tolerance for clear doping substances and a solid support for strict anti-doping measures with the general public. Still, when looking at certain population groups, a more diverse picture emerges. Sports consumers are more willing than others to accept doping, while older people turned out to be more negative towards doping (Solberg et al., 2010). The latter result is in line with the findings in a longitudinal study by Vangrunderbeek & Tolleneer (2011) that students have developed a more lenient attitude towards doping throughout the years. Regarding the views of the athletes themselves, evidence is mixed. A Swiss study by Stamm et al. (2008) shows no difference between top-level athletes and the general public while Petróczi (2007) and Stewart & Smith (2010) detect a more pragmatic attitude with U.S. and Australian athletes. Using performance enhancing substances is often a more rational, outcome optimizing, behaviour than deviance and athlete's attitudes are very much contingent upon the legality of the substance. Basically, when athletes balance the costs and benefits of substance use they do so logically. If a substance is not illegal, providing performance support, expediting recovery, or making the user feel better, then it is considered legitimate (Stewart & Smith (2010), p. 65).

4 Methodology and respondents

Our main research question goes as follows: *how does public opinion on doping in cycling differ among population groups*? To this goal, our methodology specifically allows to separate cycling fans from non-cycling fans, cycling active people from cycling inactive people, and doping-informed from doping-uninformed persons. In addition, also differences in opinion based on gender and age will be analysed.

Data were collected using a two-part questionnaire. The first part of the survey consisted of a number of opinion questions. Each respondent could express his (dis)agreement on 26 doping-related statements through the use of a 5-point Likert scale from totally disagree to totally agree. We refer to table A1 in the appendix for a survey of these statements. The statements formulated clear opinions along six dimensions: the acceptability, under certain conditions, of doping use (5 statements, A1 to A5), the reasons why doping use should be fought (4 statements, F1 to F4), the impact of doping use on the image of cycling (4 statements, I1 to I4), the motives of why cyclists use doping (4 statements, M1 to M4), the sanctions that

should be imposed for doping use (7 statements, S1 to S7) and the perceived different treatment of doping in cycling versus doping in other sports (2 statements, D1 to D2).

The second part of the survey was used to determine the profile of the respondent and consisted of 10 questions. These questions generate the necessary information to successfully classify respondents in different population groups. In our analysis, we define different population groups based on 5 characteristics: gender, age, cycling activity, cycling interest and doping knowledge. For cycling interest and doping knowledge, a number of behavioural and knowledge questions were used to identify the population segments a respondent belongs to. We thus work with "revealed" population segments, avoiding the problems associated with self-selection. For instance, questions like "*If you are at home during the Tour de France, how many stages of the Tour de France do you watch?*" or "*to what team did the winner of the Tour of Flanders last year belong to?*" give a much more valid indication of the cycling interest of a respondent than a straightforward question asking the respondent to declare whether or not he is a cycling fan. To measure doping knowledge, similar questions (e.g. "*Which product is not a prohibited substance for a cyclist?*") were included in the questionnaire.

For the design of the online survey the Qualtrics software was used. Respondents were contacted by the authors and their contacts through different channels. The survey period was from August 2011 until February 2012. This survey period predates the turbulent times cycling went through after the Armstrong revelations. Care was taken to have a sufficiently diversified panel of respondents, geographically, demographically as well as socially.

The questionnaire was started by 2,045 respondents but only 1,968 (96.2%) completed the survey. Subsequently, a quality check was performed. Erroneous and invalid questionnaires were deleted. Finally, 1,949 responses were withheld for our analysis representing 95.3% of all initial respondents.

Table 2 shows the distribution of the respondents over the distinctive population groups. Compared to the overall population we have an overrepresentation of young and male people in our dataset. Still, our dataset is sufficiently large to also generate statistically sound results for the underrepresented groups.

Seven out of ten of our respondents said to be cycling inactive. About 9% performed cycling at the competitive level while just over 20% is cycling recreationally. The behavioural and knowledge questions on cycling interest and doping knowledge allowed us to separate cycling-oriented people and doping-informed people from their counterparts. Based on their personal answers, over 43% of our respondents were classified as cycling-oriented and almost 37% as well informed on doping.

Table 2: Distribution of respondents over population groups

Gender	Male		Female			
	1,266	65.0%	683	35.0%		
Age	Young		Middle-aged		Old	
	845	43.4%	631	32.4%	473	24.2%
Cycling activity	Competitive		Recreational		Inactive	
	174	8.9%	423	21.7%	1,352	69.4%
Cycling interest	Yes		No			
	846	43.4%	1,103	56.6%		
Doping knowledge	High		Low			
	714	36.6%	1,235	63.4%		

5 Overall public opinion on doping in cycling

Figure 1 shows the strength of overall public opinion on the 26 doping statements. The vertical axis measures the percentage of respondents that agree with a given statement. It is defined as the ratio of the sum of the respondents that completely agree and rather agree (a score of 4 and 5 on the Likert scale) over the sum of all the respondents that expressed a clear opinion (a score of 1, 2, 4 or 5 on the Likert scale). The horizontal axis measures the percentage of respondents that expressed no clear opinion. It is defined as the percentage of respondents that answered neutral (a score of 3 on the Likert scale) or gave no opinion at all. Suppose, for example, we have a distribution of answers as follows: completely disagree (20%), rather disagree (20%), neutral (10%), rather agree (20%), completely agree (20%) and no opinion (10%). The % agree (vertical analysis) for this question would consequently be 50% (40/80) while the % neutral would be 20% (20/100).

Statements that are situated in the right upper and right lower corner of the figure indicate statements with a broad and pronounced consensus across the whole of the population. The more statements are situated to the left and to the middle the more opinions are divided.

As explained above, each of the 26 statements falls into one of 6 categories. In figure 1, all statements are coded with a letter, indicating the category the statements belongs to, and a reference number, corresponding to the information provided in table A1 in the appendix. The combined score of the questions for each category is marked with a circle.

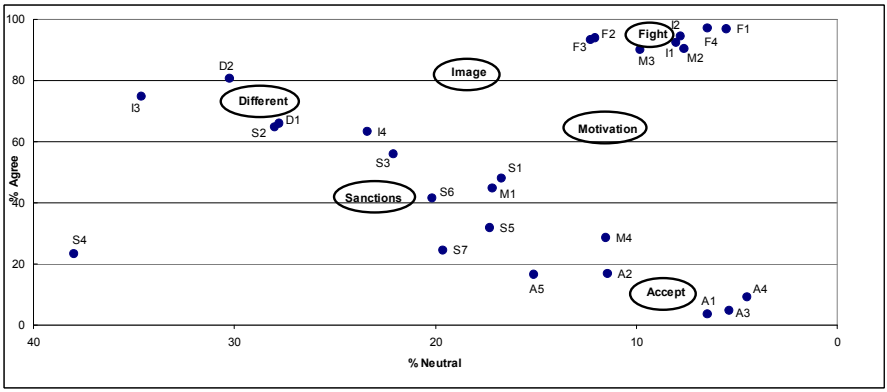

Figure 1: Strength of opinion on doping statements

Our results show a clear consensus on the reasons why doping in cycling has to be fought. The strongest arguments against doping are the fact that it contradicts the principle of fair play (F1) and that it produces bad role models to young riders (F4). For both arguments there is over 95% of agreement and less than 10% of neutral opinion. The health argument (F2) and the financial argument (F3) also have over 90% of agreement, but for these statements a larger part of the respondents feel indifferent. The same consensus is found on the disagreement to accept doping. Almost nobody favours free use of doping (A1, A3). People also prefer a clean performance to an exceptional doping-prone performance, as can be seen from the strong disagreement score on question A4. Although a bit less outspoken, there is also little support to allow doping under strict medical supervision (A2).

There is a strong belief that cyclists use doping because of the pressure put upon them (M2, M3). Often cited reasons for doping use like races that are too hard or the necessity of doping use to deliver top results (M1, M4) find less support with the general public in Flanders.

Flemish public opinion seems to be quite pragmatic about the doping problem in cycling. According to our respondents, doping damages cycling's credibility (I2) but at the same time they feel it will never disappear from cycling (I1) and therefore they are not convinced it really harms cycling's popularity (I4). This confirms research on TV viewing behaviour for cycling in Flanders that showed doping has only a minor negative impact on Tour de France TV viewing (Van Reeth, 2013). We acknowledge these findings are probably heavily influenced by the huge popularity of cycling in Flanders and therefore cannot simply be generalized at the international level. In spite of this pragmatic view, about 75% thinks doping makes it harder to find sponsors willing to invest in cycling (I3). It should be noted, though, that over 30% of the respondents found it difficult to express an opinion on this statement.

There was generally less agreement on statements related to the sanctions and control mechanisms that should be used to fight doping. Highest support, but with only about 60% of agreement and 20% of the respondents expressing no clear opinion, was found for the statements that doping belongs in criminal law (S2) and that anti-doping policy can violate cyclist's privacy (S3). Our results signal that anti-doping measures could not be imposed at any cost. Only 20% of our respondents found it acceptable that, as a result of a strict policy, from time to time innocent cyclists are sanctioned (S7). With almost 40% of our respondents not expressing a clear opinion, it is rather unclear if Flemish people think too much money is being spent on anti-doping policy (S4). Still, amongst the persons who expressed an opinion there is a clear sentiment this is not the case.

A final remarkable result is the shared feeling that, when it comes to doping, cyclists are being treated differently. Between 70 and 80% of our respondents agree with the statements that cyclists are controlled more often and sanctioned harder than athletes in other sports (D1, D2). We think this view is partly the result of the huge attention doping cases in cycling receive in Belgian media. For instance: about 50% of the doping-related articles in Belgian newspapers in 2010

and 2011 mention "cycling" while in reality only 15% of all doping-cases were cycling-related (Lagae, Van Reeth, Benijts & Vanclooster, 2012).

6 Differences in public opinion among population groups

6.1 Comparative analysis

The different scores per population group on the 26 doping statements are presented in table A1 in the appendix. Scores that are at the 1% level significantly different between groups are highlighted. Because a complete analysis of the table would lead us too far, we will limit the discussion to some of the main findings.

There are some notable differences in doping attitude between men versus women and younger versus older people. In general, our results show that women and older people are much more opposed to doping than men and younger people. This last result is in line with the observation by Vangrunderbeek & Tolleneer (2011) of a more lenient doping attitude among students. The reason for this stronger opposition towards doping use can be seen from the statement that doping should be fought because it is unhealthy (F2). The older people are, the more they agree with this view and there is also a marked difference between women and men on this statement. This leads to a similar difference in view on acceptable doping measures. Older people and women much more support strong anti-doping measures, even if this violates cyclist's privacy rights (S3) or creates innocent victims (S7). Still, women appear to be more forgiving than older people. There is no significant difference in opinion on a life time ban for doping offences between men and women, while this difference does exist between younger and older people.

Differences in opinion based on cycling activity are especially prominent on statements that relate to the motives to use doping and on statements that have some aspect of fairness of anti-doping policy. Compared to recreational cyclists and non-cyclists, competitive cyclists show significantly less agreement with the statements that doping use is the result of races that are too hard (M1) or of pressure put upon them (M2, M3). Together with the recreational cyclists, they signal a strong sentiment of unfair treatment compared to other sports (D1, D2). The importance of the fairness element is also illustrated by the fact that competitive cyclists, more than other respondents, claim doping should be fought

because it harms financially cyclists that ride clean (F3). They also express a clear fear of being wrongfully accused (S7) or of wealthy cyclists having better chances of defending themselves (S6). Another remarkable result is that competitive cyclists, together with cycling-inactive people, are much less willing to accept doping, than recreational cyclists are (A1, A2).

Differences in opinion based on cycling interest are for an important part similar to what is discussed for cycling activity. This comes, of course, as no surprise since most cycling-active people probably also show a significant interest in cycling. The most important findings are that cycling-interested people are less convinced that doping use should be considered a criminal offence (S2) or that anti-doping policy can violate cyclist's privacy rights (S3). Consequently, it is not surprising to see that they are a bit more willing to accept doping than the other respondents too (A1, A2).

A better understanding of what doping entails does have an impact on one's opinion on doping. We find especially significant results for statements related to the acceptance of doping, the sanctions for doping use and the different treatment of doping in cycling versus doping in other sports. Our data very much support the idea that the more people know about doping, the more willing they are to accept doping (A1), especially under strict medical supervision (A2). In the same vein, they are less supportive of severe sanctions for doping use (S2, S3, S7). Finally, people who are better informed on doping matters indicate very strongly that they feel cyclists are treated worse under the current anti-doping policy than other sportsmen (D1, D2).

In figure 2 the impact of doping knowledge is analysed more in detail. To this end, for three dimensions of the questionnaire (acceptance of doping, agreement with sanctions and reasons to fight doping) an average overall score was calculated for all the different population groups, subdivided each time in people with high doping knowledge (full line in the figure) and people with low doping knowledge (dotted line). We see that being well-informed on doping does not really make a difference when the reasons to fight doping are looked at. The views between well informed and less informed people differ, however, on the acceptance of doping and on the sanctions that should be imposed for doping use. In general, persons with a better doping knowledge are a bit more liberal towards doping. They are

less convinced of the fact that strict sanctions are an important part of any anti-doping policy (purple dotted line is above the purple full line) and they are slightly more open to some sort of controlled acceptance of doping (blue dotted line is below the blue full line).

The figure also shows that doping knowledge does not affect the intolerance of male and old respondents towards the use of doping, but it does affect their view on how severe doping sanctions should be. In addition, we find that the views on doping by young people and by persons with limited interest in cycling are largely unaffected by differences in doping knowledge amongst them. Conversely, views on doping by cyclists active at the competitive level are the most influenced by mutual differences in doping knowledge. The interpretation of this last observation is not straightforward. One could argue that this shows that the better informed athletes are on doping, the more cautious they become in their views. However, more cynically, one could also conclude from this that a better doping knowledge by some competitive cyclists is proof of their (past or current) use of doping which would, logically, imply that they have a more tolerant attitude towards doping.

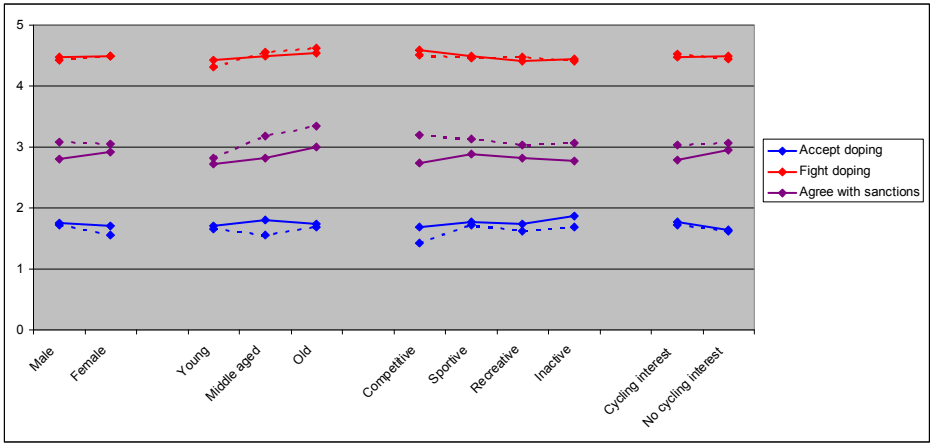

Figure 2: Impact of doping knowledge for different population groups

6.2 Multivariate analysis

In the previous section, the differences in public opinion on doping have been analysed in a disaggregated way only. Overall average scores for all groups were calculated and compared with each other. In this section, we use a multivariate regression analysis to look at the combined impact of all the characteristics of a respondent. To this end, aggregate scores for a respondent were used for each of the 6 dimensions present in the survey questions. The dimension-specific aggregate scores were computed as the average respondent score on all the questions attributed to that dimension. This procedure, validated by a principal component analysis (Varimax with Kaiser normalization), enabled us to regroup the 26 answer scores from a respondent into 6 new meaningful scores, each capturing one aspect of the respondent's opinion on doping in cycling. Six versions of the same regression model were consequently run, with as a changing dependent variable from one regression to another the aggregated scores for the 6 dimensions. The independent variables are dummy variables that define the gender and the age of the respondent, as well as his/her cycling activity, his/her cycling interest and his/her doping knowledge. The reference respondent is a young inactive male person with low doping knowledge and low cycling interest.

The regression results are presented in table 3. When all respondents' characteristics are considered, we see that gender differences are a bit less outspoken than thought at first sight. Only for two dimensions, women have a significantly different view than men. They are less willing to accept doping use and they have stronger sentiments about why doping use should be fought firmly. Age clearly affects the views on doping too. The older persons are, the more they are convinced about the reasons why doping use should be fought and the more they agree with strict sanctions. It should be noted though that age differences do not lead to a significant difference in the willingness to accept doping use. This suggests that although young people find it less necessary to act firmly against cyclists who use doping, they essentially disapprove with doping in the same way as the rest of the population. Younger people are also less pessimistic about the negative doping impact on the image of cycling.

Table 3: Multivariate analysis

	(A)	(D)	(F)	(I)	(M)	(S)
Constant	1.76	3.14	4.22	3.62	3.34	2.85
	(35.96)	*(43.33)*	*(105.78)*	*(67.21)*	*(66.88)*	*(51.86)*
Female	-0.12	-0.05	0.11	0.08	0.04	0.03
(reference category: male)	*(-2.92)*	*(-0.92)*	*(3.44)*	*(1.72)*	*(0.87)*	*(0.67)*
Middle-aged	-0.05	-0.07	0.21	0.15	0.14	0.28
	(-1.40)	*(-1.23)*	*(6.66)*	*(3.54)*	*(3.43)*	*(6.54)*
Old	-0.02	0.11	0.29	0.27	0.13	0.47
(reference category: young)	*(-0.43)*	*(1.73)*	*(8.44)*	*(5.85)*	*(2.90)*	*(9.73)*
Competitive	-0.23	0.44	0.26	0.20	-0.28	0.19
	(-3.16)	*(4.27)*	*(4.43)*	*(2.51)*	*(-3.88)*	*(2.32)*
Sportive	-0.07	0.25	0.07	0.10	-0.01	0.10
	(-1.35)	*(3.07)*	*(1.52)*	*(1.59)*	*(-0.09)*	*(1.65)*
Recreational	-0.08	0.02	0.06	0.01	-0.02	0.02
(reference category: inactive)	*(-1.87)*	*(0.30)*	*(1.74)*	*(0.26)*	*(-0.52)*	*(0.44)*
Rather high doping knowledge	0.03	0.33	0.00	0.00	0.02	-0.21
(reference category: low knowledge)	*(0.80)*	*(5.25)*	*(-0.12)*	*(-0.09)*	*(0.35)*	*(-4.26)*
Rather high cycling interest	0.10	0.41	0.02	-0.02	-0.11	-0.14
(reference category: low interest)	*(2.37)*	*(6.46)*	*(0.58)*	*(-0.37)*	*(-2.37)*	*(-2.89)*
N	1949	1824	1948	1945	1948	1947
R^2_a	0.02	0.15	0.05	0.02	0.03	0.07
F-statistic	4.89	39.72	12.46	5.24	7.44	19.04

(A) : Average score of the questions on the acceptability of doping
(D) : Average score of the questions on the different treatment of cycling versus other sports
(F) : Average score of the questions on the reasons to fight cycling
(I) : Average score of the questions on the image of cycling
(M) : Average score of the questions on the motives of why cyclists use doping
(S) : Average score of the questions on the sanctions for doping use

(t-values between brackets. grey-shaded coefficients are significant at the 5% level)

With respect to cycling activity, we notice that competitive cyclists have a significantly different view on doping in all 6 dimensions. This is probably not so surprising since, after all, in this study they are at the same time respondents and research objects. We can conclude that in general competitive cyclists have a stricter view on doping than other people. The results show a lower willingness to accept doping use, a stronger sentiment to fight doping and a higher agreement with strict sanctions. Competitive cyclists also clearly indicate they feel their sport is treated differently in a negative way compared to other sports. To our surprise,

sportive cyclists or recreational cyclists do not have very different views on doping in comparison with the reference group of the cycling inactive people.

A difference in doping knowledge only has a limited impact. People with a high doping knowledge are, compared to the lesser informed persons, in favour of softer sanctions and they do find cycling is treated differently. There is much more difference in opinion on doping, though, between persons with high cycling interest and persons with low or no cycling interest. Cycling interested people are a bit more willing to accept some level of doping, are less in favour of firm sanctions and feel like their sport is treated unfairly compared to other sports. They also differ in their views on the motives of why cyclists use doping.

In a final analysis we regrouped all our respondents in 14 different types, based on gender, age, cycling activity and cycling interest. Remark that in contrast to the analysis above, not 4 but only 2 levels of cycling activity were now used. Cycling active people were defined as persons who cycle in a sportive way or at a competitive level. Respondents who cycle at the recreational level only were grouped together with inactive persons. Care was taken to create sufficiently large groups to get reliable results. The smallest male group ('Middle aged inactive men with no cycling interest') counts 100 respondents, the largest one ('Middle aged cycling active men') 209. The smallest female group ('Young inactive women with cycling interest') consists of 45 respondents, the largest one ('Young inactive women with no cycling interest') 299.

For all 14 types of respondents, the average scores on the acceptability of doping use (horizontal axis) and the agreement on the reasons to fight doping (vertical axis) are plotted in figure 3. The inverted vertical axis makes it possible to visualize the doping aversion of different types of respondents. The closer a group is situated to the origin (low agreement to allow doping, high agreement to fight doping), the higher the doping aversion of this group. From the figure we can see that especially women have a high doping aversion while inactive men with a high cycling interest have the lowest doping aversion.

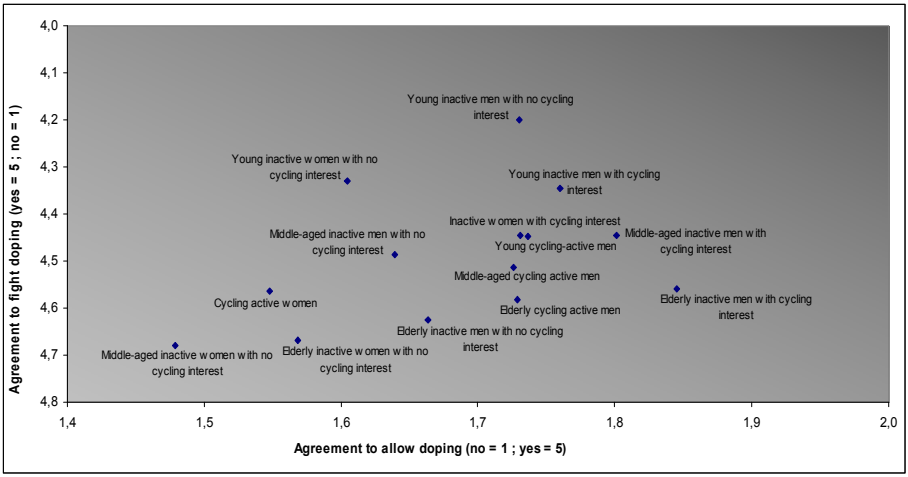

Figure 3: Doping aversion for types of respondents

Figure 4 positions the types of respondents according to their views on doping sanctions. The average scores on the different treatment of cycling (horizontal axis) and the agreement with strict sanctions (vertical axis) are shown. The inverted vertical axis implicates that the further a group is situated from the origin (strong belief that cycling is treated differently and low agreement with strict sanctions), the stronger this group of respondents is convinced that cyclists who are caught using doping are sanctioned too hard. The figure shows that especially cycling interest and cycling activity are of great importance in this respect while gender and age are unimportant. There is a clear separation visible between the six types of respondents that combine inactivity with no cycling interest and the eight types of respondents that are cycling active and/or express a high cycling interest.

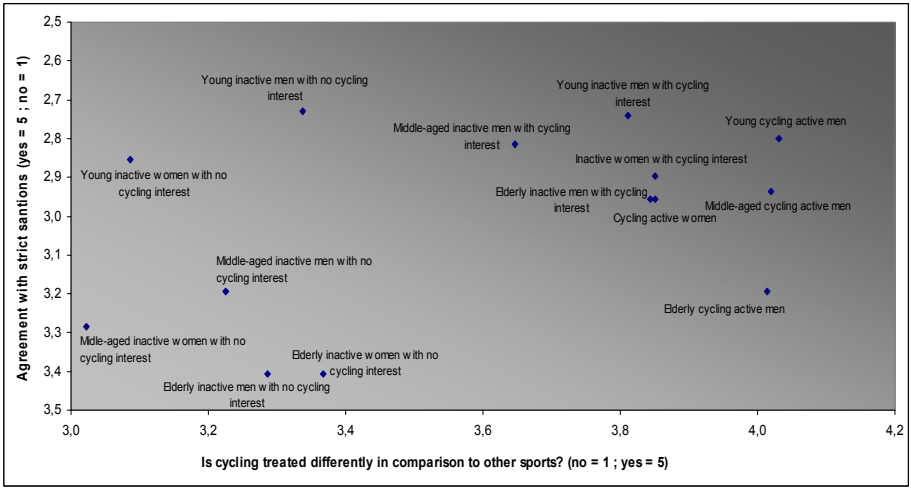

Figure 4: Opinion on sanctions for types of respondents

7 Conclusion

This study analyses public opinion on doping in Flanders, with a focus on the endurance sport of professional road cycling. Our results, based on a survey that was completed by almost 2,000 respondents, show a strong disapproval of doping use by all respondents. There are statistically significant differences, though, between distinct population groups. Women and older people attach greater value to health issues and consequently have a much more outspoken anti-doping attitude than men and younger people. In general, cycling fans tend to be less negative towards doping in cycling than non-cycling fans. Cycling fans and cycling active people, on the competitive as well as on the recreational level, also express a clear feeling of their sport being treated unfairly compared to other sports. Furthermore, competitive cyclists provide some evidence that, contrary to popular belief, doping use is not primarily caused by the severity of the race or the pressure put upon them. We also show that doping knowledge does create a more liberal view on doping reflected in a somewhat greater willingness to accept doping and in less support for strong doping sanctions.

Of course, the (international) generalization of our results is limited by the applied methodology. We only made use of Flemish respondents and all statements were

related to the sport of cycling. Still, we notice some remarkable similarities between our findings and the conclusions drawn in the limited research that has been published in this field so far. Because the doping problem is an international problem and an effective anti-doping policy can only be applied on a global level, we strongly advocate a comparative international survey with equivalent questions to further explore public opinion on doping. In addition, a follow-up study in Flanders could reveal to what extent the doping revelations in professional cycling regarding Lance Armstrong in late 2012 and, among others, Michael Boogerd in March 2013, have had an impact on public opinion on doping in cycling.

Acknowledgements

We are grateful to the participants in the 5th ESEA Conferences on Sports Economics (Esbjerg), the 16th Annual Congress of the Arbeitskreiss Sportökonomie (Magglingen) and the DESport seminar (Paris) for their helpful comments on earlier drafts of this text. Remaining errors are, of course, our own.

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Table A1: Mean scores on doping statements over population groups.

Statement		Gender		Age			Cycling activity			Cycling interest		Doping knowledge	
		Male	Female	Young	Middle aged	Old	Competitive	Recreational	Inactive	No	Yes	Low	High
Doping use should be admitted freely.	A1	**1.4**	**1.3**	1.3	1.4	1.4	**1.3**	**1.5**	**1.4**	**1.3**	**1.5**	**1.3**	**1.5**
Doping use is acceptable under strict medical supervision, so that health risks are limited.	A2	**2.1**	**1.7**	1.9	2.0	2.1	**1.8**	**2.2**	**1.9**	**1.8**	**2.2**	**1.8**	**2.2**
Doping use is not a problem if everybody else is doing it.	A3	**1.4**	**1.3**	1.4	1.3	1.3	1.3	1.4	1.4	1.3	1.4	1.3	1.4
Only the sporting result is of importance, not the way this result is achieved.	A4	1.7	1.6	1.6	1.6	1.7	1.6	1.6	1.7	1.6	1.7	1.6	1.7
Cyclists are adults and can therefore decide themselves on what substances to use, bearing in mind the impact doping use might have on their health.	A5	2.1	2.1	**2.2**	**1.9**	**2.0**	2.1	2.0	2.1	2.1	2.1	2.1	2.1
Cyclists are sanctioned harder than other athletes when found guilty of a doping offense.	D1	**3.6**	**3.1**	3.4	3.4	3.5	**4.1**	**3.8**	**3.2**	**3.1**	**3.8**	**3.1**	**3.8**
Cyclists are controlled more often on doping use than other athletes.	D2	**3.9**	**3.4**	3.7	3.8	3.8	**4.3**	**4.1**	**3.6**	**3.4**	**4.1**	**3.5**	**4.2**
The fight against doping is necessary because doping contradicts the principle of fair play.	F1	**4.6**	**4.7**	4.6	4.6	4.6	4.7	4.6	4.6	4.6	4.6	4.6	4.6
The fight against doping is necessary because doping damages a cyclist's health.	F2	**4.3**	**4.5**	**4.2**	**4.4**	**4.5**	4.4	4.3	4.3	4.3	4.3	4.3	4.3
The fight against doping is necessary because doping harms financially cyclists that ride clean.	F3	**4.4**	**4.3**	**4.2**	**4.5**	**4.6**	**4.5**	**4.5**	**4.3**	**4.3**	**4.5**	**4.3**	**4.5**
The fight against doping is necessary because doping produces bad role models to young riders.	F4	4.6	4.6	**4.4**	**4.7**	**4.7**	4.7	4.6	4.6	4.5	4.6	4.6	4.6
Doping use will never disappear completely from cycling.	I1	**4.2**	**4.1**	4.2	4.2	4.2	4.1	4.3	4.2	4.2	4.3	**4.1**	**4.3**
The doping problem damages cycling's credibility.	I2	4.3	4.4	4.3	4.4	4.4	4.3	4.3	4.3	**4.4**	**4.3**	**4.4**	**4.2**
The doping problem makes it more difficult to find sponsors interested in cycling.	I3	**3.7**	**3.4**	**3.5**	**3.7**	**3.7**	**3.7**	**3.8**	**3.5**	**3.3**	**3.9**	**3.4**	**3.9**

The doping problem damages cycling's popularity.	I4	3.3	3.4	**3.2**	**3.4**	**3.7**	3.4	3.4	3.4	**3.5**	**3.3**	**3.4**	**3.3**
Cyclists use doping because races are too hard.	M1	**2.7**	**3.0**	2.8	2.8	2.9	**2.3**	**2.7**	**3.0**	**3.0**	**2.6**	**3.0**	**2.7**
Cyclists use doping as a result of the pressure to perform put upon them.	M2	**4.0**	**4.2**	4.1	4.2	4.1	**3.8**	**4.1**	**4.1**	**4.2**	**4.0**	4.1	4.0
Cyclists use doping to create a level playing field with the other riders.	M3	4.1	4.1	**4.0**	**4.2**	**4.2**	**3.9**	**4.2**	**4.1**	4.1	4.0	4.1	4.1
Doping use is necessary to deliver top results in cycling.	M4	**2.4**	**2.2**	**2.2**	**2.5**	**2.4**	2.2	2.5	2.3	2.3	2.4	2.3	2.4
Riders found guilty on the use of doping should be banned for life.	S1	3.1	3.0	**2.9**	**3.2**	**3.1**	3.1	3.1	3.0	3.1	3.0	3.1	3.0
Doping is a problem that concerns society as a whole and therefore belongs in criminal law.	S2	**3.3**	**3.5**	**3.1**	**3.3**	**3.7**	3.2	3.3	3.4	**3.5**	**3.2**	**3.5**	**3.1**
To be effective, anti-doping measures may violate privacy rights from cyclists.	S3	**3.1**	**3.3**	**2.9**	**3.2**	**3.5**	3.0	3.2	3.2	**3.3**	**3.0**	**3.3**	**3.0**
Doping is a mere sporting problem and society therefore uses too much money fighting it.	S4	2.5	2.6	2.6	2.5	2.5	**2.2**	**2.5**	**2.6**	2.6	2.5	**2.6**	**2.4**
Regular health controls with short suspension periods are preferable to strict doping controls with two-year suspensions.	S5	**2.4**	**2.7**	**2.4**	**2.5**	**2.7**	**2.2**	**2.3**	**2.6**	**2.6**	**2.3**	**2.6**	**2.3**
The fight against doping is unfair because it privileges wealthy cyclists who have themselves defended better and more easily escape prosecution.	S6	**2.8**	**2.6**	2.7	2.7	2.8	**3.1**	**2.9**	**2.7**	**2.6**	**2.9**	**2.7**	**2.9**
Anti-doping measures should be strict, even if this results in an innocent rider being suspended every now and then.	S7	**2.3**	**2.5**	**2.3**	**2.5**	**2.6**	**2.1**	**2.4**	**2.5**	**2.5**	**2.3**	**2.5**	**2.2**

Scores that are significantly different (at the 1% level) between groups are underlined and put in bold (one-way ANOVA test).